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The main factors of economic growth in the European Union

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Abstract. *Economic growth has been analysed in depth by many studies, especially in recent years when all economic agents, including governments, have made every effort to promote the return of national economies on a growth trend. At the level of the European Union (EU) the economic growth policy is mainly based on job creation, efficient use of financial resources, investment stimulation and innovation and technology promotion. In this article we have tried to identify the main factors that influence the evolution of the real GDP and the GDP per capita in the EU member states through a data panel econometric analysis. The results showed that at the EU level the economic growth is significantly influenced by private consumption, employment rate and net trade. Investments also have a positive effect, but obviously they need to be further supported and stimulated through effective policies. At the same time, tourism has a favorable impact on the income per capita through occupancy and the number of accommodations within this economic branch.*

Keywords: economic growth, private consumption, employment, investments, tourism, data panel.

JEL Classification: F43, J21, E20.

1. Introduction and literature review

Over the centuries, different economists have tried to identify factors that influence the economic growth. Adam Smith identified as the main factors the increase of the number of people employed in the productive sphere and the productivity of the work. Keynes considered that the main determining factor was the actual demand, on which the level of production depended, and this, in turn, determined the degree of employment. The Solow-Swan model shows us how population growth, savings rate and technological progress influence the economic growth and the production level. The new theory of economic growth identifies factors that determine a long-term growth, namely knowledge, innovation and investment in human capital (Moldoveanu, 2011).

After the most recent economic crisis, at the level of the European Union there is a recovery of the economies of all the Member States. The macroeconomic data indicates that the discrepancies between the growth rates of the euro area states are at their lowest level in recent years. In general, higher rates of economic growth were registered in the Member States with a lower GDP per capita. The sustainable economic growth and the lower interest rates have also led to a decrease in budget deficits, which in most states have returned to their levels prior to the economic crisis. However, the EU countries are not without challenges such as unemployment, which still has high rates, especially among young people, household incomes, which in some countries are below pre-crisis levels, the lack of qualified staff and the weak diffusion of technologies. There are also long-term challenges, such as population aging, labor market re-technology, climate changes and the unsustainable exploitation of natural resources.

Romero-Ávila and Strauch (2008) estimated a panel model for 15 European countries, in which they concluded that the population expenditures, government consumption and direct taxes have negative effects on economic growth, while public investments have a positive effect. The study provides solid evidence that the disproportionate taxation affects the medium-term growth through its impact on the private capital accumulation.

Afonso and Furceri (2010) analyzed the effects of government revenues and expenditures on economic growth in the OECD and the EU countries. The results of the study show that government revenues and expenditures, such as indirect taxes, social contributions, government consumption, government subsidies and investments have a negative and significant effect on economic growth in the EU.

Wu et al. (2010) examined the causal relationship between government expenditures and economic growth by conducting the Granger causality test, identifying a two-way relationship between the economic growth and the government size for 182 countries from 1950 to 2004, with the exception of low-income countries because of the inefficiency of governments and institutions. The empirical results strongly support both Wagner's law and the hypothesis that government spending is helpful for economic growth, regardless of how we measure the government size and the economic growth. When countries are disaggregated by income levels and corruption, the research results also confirm the two-way causality between the governmental activities and economic growth for middle and high income countries, except for low income countries. One possible explanation for such

a difference is that, compared to wealthier countries, low-income countries are often characterized by poorer institutional quality and more severe corruption. Thus, institutional quality and corruption are key factors for government performance, which in turn affects the effects on increasing government spending. The result of the study indicates that improving institutional quality could be crucial for developing countries to escape poverty.

Meyer and Shera (2017) conducted a study to identify the impact of labor migration on economic growth in Albania, Bulgaria, Macedonia, Republic of Moldova, Romania and Bosnia and Herzegovina by using annual data from 1999-2013 with the help of a panel model. The results of the model show a positive contribution to the GDP growth per capita from remittances, the number of school enrollments, final consumption of households, trade, gross fixed capital formation and a negative contribution from population evolution, real exchange rate and total debt.

Hamid and Saber (2018) examined the possible role of social, financial and technological factors in stimulating the economic growth in oil-based economies. They developed a panel regression model to analyze the data collected from the developing oil exporting countries (OPEC) from 2000-2016. The results show that the independent variables FDI, inflation, female labor force participation rate, monetary mass, fixed capital formation rate, R&D expenditures and employment have a positive effect on the real GDP growth, except for military expenditures that have a negative effect.

By using the vector error correction model (MCEV), Pradhan et al. (2019), investigated the possible causal directions between venture capital investments, ICT infrastructure and economic growth, based on the annual data from 25 European countries between 1989 and 2016. The results suggest that policymakers should carefully consider the interdependence of different policy measures related to the ICT infrastructure development, the development of a solid economic ecosystem in Europe and economic growth. The strategies that promote the GDP growth should aim at creating appropriate incentives for increasing domestic and foreign investment in European economies, especially in the ICT-based industries and promoting strong green ecosystems in Europe, which will not only create jobs, but they will also create new technology start-ups that will lead to the development of new generation competitive industries.

At the level of the European Union, the Europe 2020 Agenda is an “umbrella” strategy aimed at strengthening the EU's economic growth by 2020. Achieving the objectives of the Europe 2020 Strategy will improve the living standards of European citizens, the results of the education system and will develop the innovative capacities of the EU.

In the last decades, the role of services in the economic and social life worldwide has increased, especially for the developed countries, and this fact is interpreted as an important step in the evolution of society. Mainly constituted by the provision of services, tourism represents one of the essential components of the tertiary sector, the affiliation to this sector deriving from the way of realizing some of its defining features such as mobility, dynamism or ability to adapt to the needs of each tourist, as well as from the particularities of the tourist product, this being the result of the harmonious combination of several services with specific features and own mechanisms of use. The development of tourism involves a

multitude of components with stimulating and driving effects, both of the production of the tourism industry and of other branches of activity within the economy, which participate directly or indirectly in the process of economic growth.

From the European perspective, the tourism contributes to the achievement of the political objectives in the field of employment and economic growth. The European Regional Development Fund (ERDF) supports the competitiveness, sustainability and the quality of tourism at the regional and local level.

Lee and Chang (2008) considered that the tourism development stimulates economic growth by accumulating physical capital and human capital due to the need for an educated and qualified work force in the tourism sector. In other words, new jobs will be created through investments in tangible assets that will contribute to the creation of well-educated and qualified jobs.

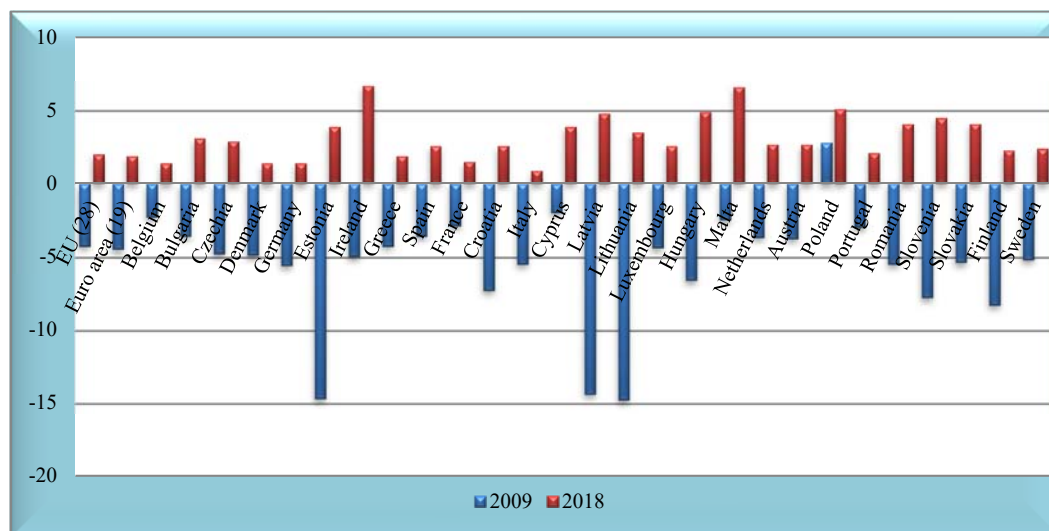
Dogru and Bulut (2018), identify a two-way causation between the growth of tourism revenues and economic growth, suggesting that between economic growth and tourism development there is an interdependence relationship, and tourism development stimulates the economic growth and vice versa.

The institutions of the European Union and the member countries have acknowledged the major importance of tourism on economic growth. In 2018, it contributed with 10.3% to the EU GDP, and about 27.3 million active people worked in this sector, meaning 11.7% of the total jobs. In 2017, the number of arrivals was 671 million people in Europe, accounting for 51% of all tourism worldwide, up by 8% compared to the previous year. The World Tourism Organization has conducted a prospective study that forecasts a slower growth of tourism in Europe by 2030, namely the number of arrivals of 744 million tourists, equivalent to 41.1% of the global total.

2. Descriptive analysis

In this paper we also carried out a statistical analysis of the main macroeconomic indicators with a role in the economic growth, including the target indicators of the Europe 2020 Strategy in order to see the economic evolution of each state of the European Union.

The economic growth in the euro area and in the EU was 1.9% in 2018, respectively 2.0% (Figure 1). This was lower than in 2017 (2.4% in both cases), when the economic expansion was supported by external factors, the net trade having a significant contribution.

Figure 1. Evolution of the real GDP in EU countries (percentage change from previous year)

Source: Eurostat.

The decline of the economic growth in the euro area was caused by both external and internal factors.

First, the slowdown in the growth rate of world trade. In 2018, the tempering of the economic growth in the EU was determined by a small contribution from the net exports compared to 2017, from 0.6% to 0.05%.

Secondly, a number of internal factors have influenced the economic activities during 2018, namely:

1. Temporary internal factors, such as strikes, extraordinary weather conditions, higher tax burdens for consumers and unusually high medical leave.
2. European car manufacturers, especially those in Germany, had problems with the introduction in September of the new “Worldwide Harmonized Light Vehicle Testing Procedures”, which caused production interruptions.
3. Transport problems caused by the water level of the rivers, for example on the Rhine.
4. Social unrest in France, political uncertainty in Italy and other countries with specific problems.

While the slowdown in growth in 2018 was mainly driven by the problems in Germany and Italy, the European Commission expects a narrowing of the gap between the developed and the least developed economies. The real GDP growth rates in Poland and Spain are projected to exceed the EU average in 2019 and 2020, while the Netherlands expects a slower growth in 2019. By contrast, the economies of Great Britain and France will see a growth below the EU average over the next two years.

For Romania, the real GDP growth is expected to exceed the EU average in both years, 3.3% in 2019 and 3.1% in 2020. In non-euro area states, the GDP growth in both years is expected to be slower than in 2018, except for Bulgaria and Denmark. In the euro area, it

is expected that in 2020 only Greece (2.2%) will see a growth compared to 2018, while Luxembourg will have a constant economic growth (2.6%).

In the EU countries the final demand contributed to the economic growth by 3.3% in 2018, and in 2019 it is estimated that it will decrease to 2.7% due to diminished investments (0.4%) and the negative contribution of the modification of the stocks. (-0.2%), while net exports are expected to become negative for the first time since 2016 (from + 0.6% in 2018 to -0.2% in 2019).

Private consumption has been the main determinant factor of the economic recovery since the beginning of 2013. Given that its share in the GDP is about 55%, private consumption has contributed to an increase of 0.9%, down from 1.1% in 2017. The decrease was fully balanced by a larger contribution from investments (0.7% compared to 0.6%), while the government contribution remained stable (0.2%). The main support for the private consumption came from the increased employment and income from work.

The breakdown of private consumption expenditure shows that the slowdown in economic growth in the euro area in 2018 was more pronounced for long-term goods (-1.7% from 2.7%) than for non-durable goods and services (-0.6% of 1.1%). Household expenditures for durable goods have decreased due to the decrease in the number of cars purchased.

Private consumption is closely linked to the evolution of income and wealth of households. In 2018, the available incomes of households were supported by wage increases and the increase in the number of jobs. By 2020, euro area wages are expected to remain the main contributor to the strong growth in available nominal incomes. The real growth in available household incomes should grow to 1.9% in 2019 (from 1.5% in 2018) and come back to 1.5% in 2020.

It is estimated that the average saving rate of households will increase slightly and will slow the growth of private consumption. Consequently, the annual growth rate of private consumption in 2019 should not change significantly compared to 2018, to 1.3% in the euro area and 1.6% in the EU, and then to 1.5% by 2020 in the euro area and 1.7% in the EU.

In 2018, public consumption remained almost unchanged in the euro area (1.1%, down by 0.1%) and in the EU (1.1%, up by 0.1%). As a result, its contribution to the GDP growth has changed only marginally. In 2019, the government consumption in most Member States is expected to grow stronger than in 2018 in the euro area (1.4%, up from 1.1%) and in the EU (1.6%, up from 1.1%). This mainly reflects an increase in intermediate consumer spending and an increase in public sector wages. A strong acceleration is expected in Germany and the Netherlands, remaining almost unchanged in France and slowing down in Spain. In Italy, the government consumption is projected to grow by 2020.

Investments in the euro area grew faster in 2018 than in the previous year, 3.3% in 2018, after 2.6% in 2017. Overall, investments accounted for 21.0% of the GDP in the euro area, respectively 20.6% in the EU.

Investments in the EU had a contribution to the economic growth of 0.7%, up by 0.1% compared to 2017.

Public investments had a small growth, whereas private investments registered a significant increase starting with 2013, reaching the highest level after the crisis period, 18.2% of GDP. Further, it is estimated that public investments in the euro area will increase by approximately 3.0% in both 2019 and 2020, raising their share in GDP to 2.8%.

It is expected that the European Fund for Strategic Investments (EFSI) will continue to support investments in the EU in 2019 and 2020. As of April 2019, operations approved under the Europe Investment Plan were expected to generate investments of 393 billion euros. Approximately 945,000 small and medium-sized enterprises will benefit from this funding. It is estimated that in 2019, the contribution of investments to the change in the GDP will decrease to 0.4% in the EU and will remain constant until 2020.

In 2018, the increase in exports of goods and services decreased in the euro area from 5.2% to 3.2% and in the EU from 5.4% to 3.0%. While Italy, France and the Netherlands registered a strong growth in the second half of 2018, in Germany the exports fell, while in Spain they remained steady.

The dynamics of exports of goods and services was different. The exports of goods slowed down in the first two quarters of 2018, from 3.2% in the second half of 2017 to 1.1%, and the exports of services rebounded strongly in the second half of 2018 (from 0.7% to 3.1%).

In 2019, the increase in exports of goods and services in the euro area is expected to be slower, 2.3%, compared with 3.2% in 2018, and much slower than the 5.2% growth recorded in 2017, but it is expected to grow to some extent in 2020 to 3%. In the EU, exports will drop to 2.5% in 2019 (from 3% in 2018) and will increase to 3.1% in 2020.

Imports to the EU decreased in 2018 to 3.2% from 4.3% in 2017. In 2019, imports of goods and services from the euro area are forecast to fall to 2.8%, respectively 3.1% in the EU and they will grow again to 3.3% in 2020. As a result, it is estimated that the net exports will have a negative influence on the economic growth in 2019 with 0.2%, and in 2020 with 0%.

Regarding the indicators of the Europe 2020 Strategy, we observe that in 2018, 73.2% of the EU population aged between 20 and 64 was employed, up from 72.2% in 2017. This is the highest share registered since 2002. Therefore, the distance from the 75% employment objective is 1.8 percentage points. We note that only the Czech Republic, Germany, Estonia, Ireland, Croatia, Latvia, Lithuania, Malta, Poland, Portugal, Slovenia, Slovakia and Sweden achieved this target in 2018 (Figure 2).

Although the prospects of the youth labor market have improved in the EU, in 2017 the employment rate among young people between the ages of 20 and 29 was considerably lower than for those aged between 30 and 54.

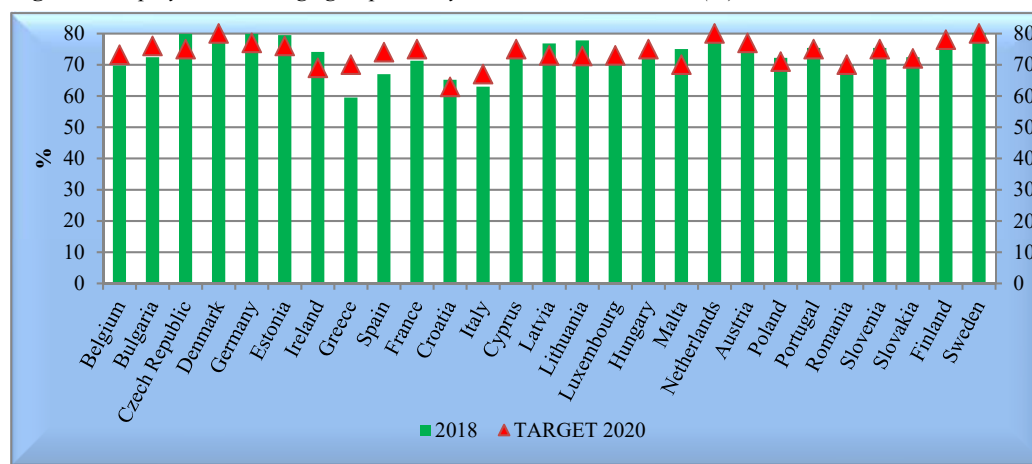
The employment rate among women in 2018 was 67.4%, lower than that of men – 79%. However, the gender employment gap narrowed by 11.5% for all age groups from 2002 to 2017.

In 2018, in Romania, the employment rate was 64.9%, and according to gender, women had an employment rate of 60.6% and men of 78.9%.

The EU primary or secondary school graduates were employed in a percentage of 54.9% in 2017, compared to 84.0% for those with higher education. The employment rate of non-EU citizens (aged between 20 and 64) was by 14.8 percentage points lower than in 2017.

The share of early school leavers and vocational training has declined steadily since 2002, for both men and women. In 2018, the indicator was 10.6%, compared to 14.7% in 2008. For men, the share in 2018 was 12.2% and for women 8.9%.

Figure 2. Employment rate, age group 20-64 years in the EU countries (%)

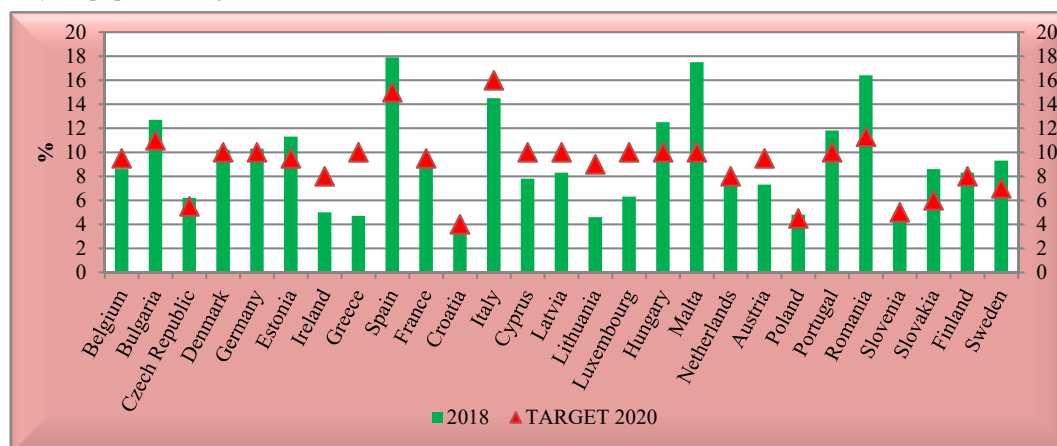


Source: Eurostat.

Compared to women, men are more likely to give up education and training earlier. Residents who were not born in the reporting country are more likely to leave formal education early compared to the locals. Those who drop out of school and training early are facing particularly serious problems on the labor market. In 2017, 55.7% of those who left school and vocational training early were either unemployed or inactive. This share increased by 10.1% compared to 2008.

The countries that have achieved this objective are Belgium, Ireland, Greece, France, Croatia, Italy, Cyprus, Latvia, Lithuania, Luxembourg, the Netherlands, Austria and Slovenia.

Figure 3. The share of people who drop out of school early
(% of the population aged 18-24 in the EU countries)



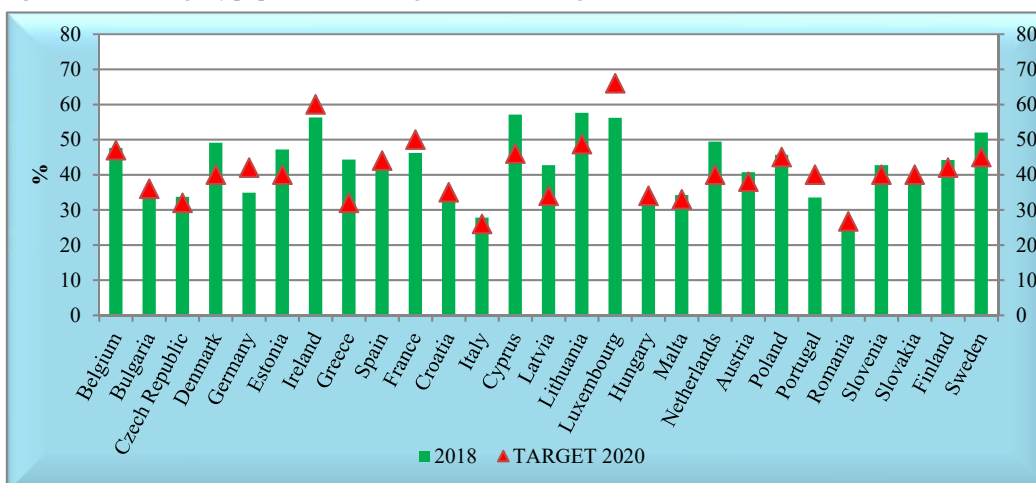
Source: Eurostat.

The share of early school leavers and vocational training in Romania was 16.4% in 2018, and the target is 11.3%. The share of men was 16.7% and 16.1% for women (Figure 3).

The share of people between the ages of 30 and 34 who graduated from tertiary education reached 40.7% in 2018. This means that the EU 2020 target of 40% was achieved two years in advance (Figure 4).

The increase in the number of tertiary education graduates was much faster for women, in 2018 it reached 45.8%, compared to 44.9% in 2017, and for men between the ages of 30 and 34, only 35.7% graduated a tertiary level of education (34.9% in 2017).

Figure 4. Percentage of population with higher education aged between 30 and 34 in the EU countries



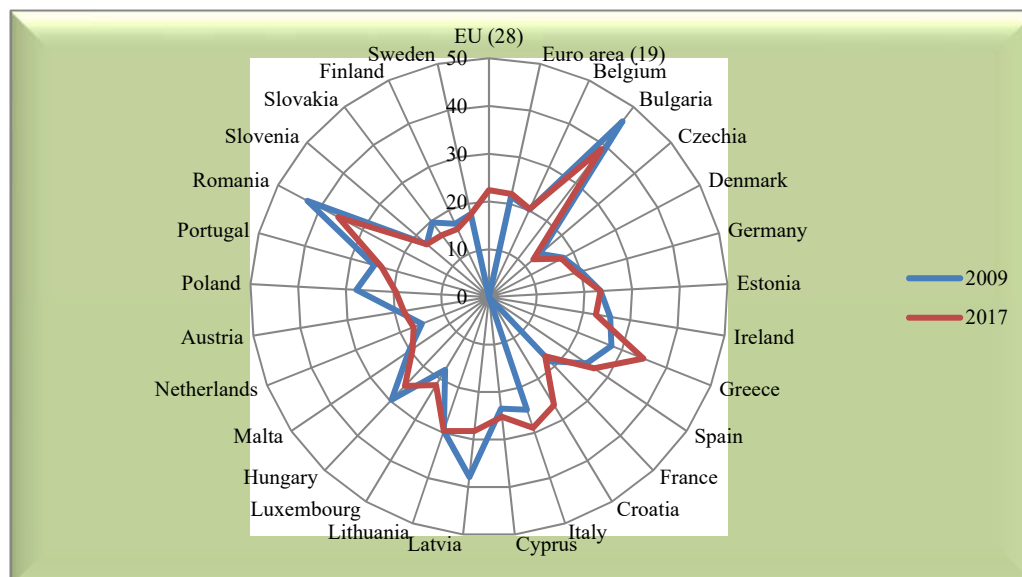
Source: Eurostat.

The countries that have achieved this objective are Belgium, the Czech Republic, Denmark, Estonia, Greece, Italy, Cyprus, Latvia, Lithuania, Malta, the Netherlands, Austria, Poland, Slovenia, Finland and Sweden.

In Romania, the level of tertiary education graduates was 24.6% in 2018, and by 2020 it has to reach 26.7%. For women it was 28.1% and for men 21.4%.

The Europe 2020 strategy aims to reduce by 20 million the number of people at risk of poverty or social exclusion by 2020, compared to the level of 2008. In 2017, 112.9 million people were exposed to the risk of poverty or social exclusion in the EU -28, with 5 million less than in 2016. The share of people at risk of poverty or social exclusion decreased below the levels registered in 2008 (116 million people). However, almost every fourth person (22.4% of the population) in the EU remained at risk of poverty in 2017. Therefore, further efforts are needed to strengthen the recent positive trend and to bridge this gap (Figure 5).

Figure 5. *The evolution of the share of people at risk of poverty or social exclusion in the EU countries*



Source: Eurostat.

The most widespread form of poverty or social exclusion in the EU is the monetary poverty. In 2017, approximately 85.2 million people, representing 16.9% of the total EU population, were exposed to the risk of poverty after social transfers, down from 2016 (17.3%). The second most common dimension of poverty or social exclusion was the very low level of work intensity, affecting 35.3 million people (39.1 million people in 2016), representing 9.5% of the EU population (10.5% in 2016). The third form of poverty or social exclusion – a serious material shortage – affected 33.1 million people in 2017, compared to 37.8 million in 2016. This represented 6.6% of the total population, compared to 7.5% in 2016.

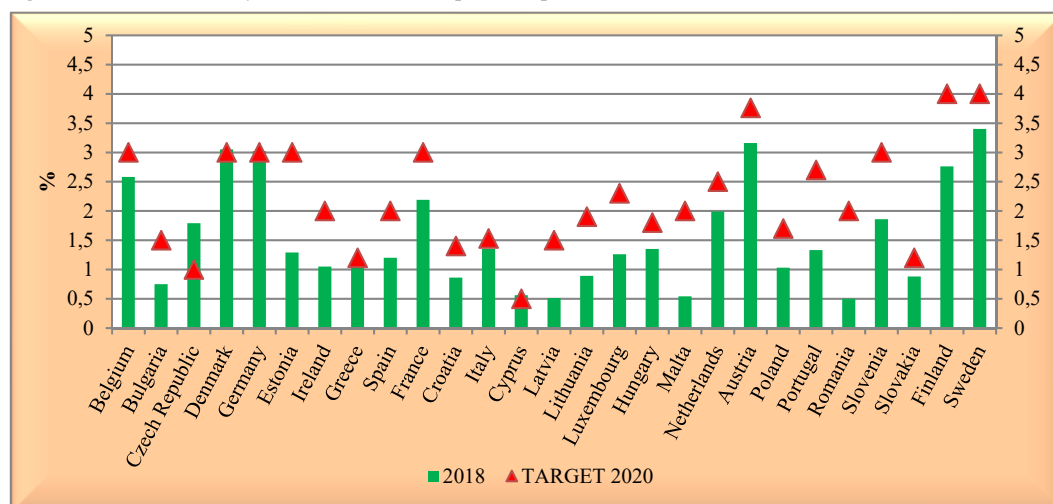
The most vulnerable groups are young people, the unemployed and inactive people, parents with one or more children, single-person households, low-educated citizens and foreigners

born outside the EU and living in rural areas. Of all the groups listed, the poverty risk rate is highest among unemployed and parents with one or more children.

In 2017, the share of people at risk of poverty or social exclusion in Romania was 35.7%, down from 43% in 2009.

The share of expenditures for research and development in the EU was 2.06% of the GDP in 2017, compared to 2.04% in 2016. The gross domestic research and development expenditures as a percentage of the GDP rose slightly between 2008 and 2012 as a result of the GDP growth and the effort to stimulate public spending for research and development, but then stagnated at about 2% of the GDP. This means that until 2017, the EU remained with almost one percentage point below its target for 2020, which requires the increase of public spending on research and development to 3% of the GDP (Figure 6).

Figure 6. The evolution of research and development expenditures in EU countries



Source: Eurostat.

The countries that have achieved this objective are the Czech Republic, Denmark, Germany and Cyprus. Romania has allocated the least amount of money for this sector at the EU level (0.5%).

3. Methodology and econometric analysis

In order to analyze the impact of the various variables on the economic growth, we considered it appropriate to estimate two econometric models, the dependent variables being the real GDP and the GDP per capita. Although initially the number of factors taken into account was higher, as a result of the estimates we obtained that the real GDP (economic growth) is significantly influenced by the level of private consumption (C), private investment (I), government expenditure (G), export (EX), import (IMP) and employment level (EMPL). The GDP per capita is influenced by the private consumption (C), private investment (I), export (EX), import (IMP), employment rate in tourism

(EMPL_TOURISM), the share of arrivals in tourist accommodation units (ARRIVALS_TOURISM) and the participation in tourism for personal purposes (PERSONAL_TOURISM).

For the econometric analysis we decided to estimate a data panel type model, based on the 27 EU countries and a period of 23 years (1996-2018). All processing and estimates were performed in Eviews 10, and the data were collected from EUROSTAT AND AMECO. In the case of the models we considered the individual effects as random because by applying the Hausman P-value test it has a probability of 0.5094%, which forced the rejection of the alternative hypothesis and the acceptance of the null hypothesis.

After this decision, we checked the hypotheses about the model residue. Thus, we ran tests for autocorrelation and homoscedasticity (Drukker, 2003; Baum, 2001), obtaining that the errors are heteroscedastic and auto-correlated. For these reasons, it was necessary to obtain consistent estimators by applying a robust estimate. We tested the stationarity of the variables using the Phillips-Perron test.

$$\text{GDP_real} = 0.0242 + 0.6801 \cdot C + 0.1311 \cdot I - 0.5308 \cdot G + 0.2150 \cdot EX - 0.1140 \cdot IMP + 0.5656 \cdot EMPL$$

$$(0.55)*** \quad (0.03)* \quad (0.02)* \quad (0.17)* \quad (0.03)** \quad (0.03)* \quad (0.24)**$$

where the parentheses contain the robust standard errors, and *, **, *** represent 1%, 5% and 10% significance level (Annex 1).

The variable that has the greatest influence on the dynamics of the real GDP is private consumption (associated coefficient 0.6801), an influence according to the literature as a sign and as an intensity. The positive impact of consumption is not seen as beneficial for a sustainable economic growth, especially in the medium and long term. The level of private consumption may have positive changes in revenue growth, but also negative changes in price increases (inflation) and, as the main driver of the economy, it may affect the economic growth. Another factor that has an important influence on economic growth is the employment rate (0.5656). The increase of the employment rate determines both an increase of the production, as well as a reduction of the poverty and the social exclusion. Exports also have a positive influence on the evolution of the GDP (associated coefficient 0.2150). Investments also prove to be a driver of economic growth and, consequently, of job creation. In the model, investments have a positive influence, but the coefficient is lower (0.1311) compared to the other factors.

The variables that have a negative influence on economic growth are government expenditures (-0.5308) and imports (-0.1140). The negative influence of government expenditures is explained by the crowding-out effect in the sense that an increase in spending will lead to an increase in the money supply for financing the deficit and, implicitly, an increase in the interest rate and a reduction in investments. The impact of trade on economic growth shows that at the EU level there is a greater influence from exports than from imports, so we can say that the net influence is positive. Basically we can say that there is an improved allocation of resources (depending on the comparative advantages), a better use of production capacities, a stimulation of technological improvements and an increased level of the jobs created (see Annex 1).

$$\begin{aligned}
\text{GDP_capita} = & 1.2211 + 0.7806^*C + 0.7239^*I + 0.6093^*EX - 0.4229^*IMP + 0.2943^*EMPL_TOURISM + \\
& (0.21)^* \quad (0.05)^* \quad (0.07)^* \quad (0.04)^* \quad (0.04)^{**} \quad (0.07)^* \\
& + 0.0406^*ARRIVALS_TOURISM - 0.0008^*PERSONAL_TOURISM \\
& (0.02)^{**} \quad (0.00)^{**}
\end{aligned}$$

where the parentheses contain the robust standard errors, and *, **, *** represent 1%, 5% and 10% significance level (Annex 2).

Considering that, lately, tourism is seen as an important factor of the economic recovery, by producing income and creating jobs, we have decided to estimate the impact of some variables in the tourism industry on the GDP per capita. We have kept some of the exogenous variables used in the previous model, but we have also introduced the employment rate in the tourism industry, the share of arrivals in the tourist accommodation units and the participation in tourism for personal purposes. From the estimation we observe that the influence as a sign and intensity of the macroeconomic variables in the previous model is preserved. We also note that the employment rate in tourism has a positive influence on the GDP per capita (associated coefficient 0.2943) indicating that the activity in tourism contributes to the increase of income and to the well-being among individuals. The arrivals of tourists in the tourist accommodation units also have a positive impact on the GDP per capita (0.0406), in terms of the revenues brought to both tourism companies and employees, as well as the public budget. Personal tourism has a negative influence on the GDP per capita, but the associated coefficient is quite low (-0.0008). The negative influence can be explained by the fact that at the EU level, some citizens prefer to spend their holidays outside the national and European borders without contributing to the GDP per capita at the European level (see Annex 2).

4. Conclusions

In recent decades, worldwide disparities in economic growth trends appear to be the result of a combination of “traditional” factors – linked in particular to the efficiency of labor market mechanisms – and elements of the “new economy” that reflect the size of the ICT manufacturing industries, but also the pace of the adoption of this technology by the other industries of the economy. At the same time, we have to also take into account the political and institutional framework that contributes to shaping the business conditions for the existing companies and the new entrepreneurial activities, which can determine the differences in the countries’ ability to bring innovations in the developing industries and to adopt the latest technologies.

At the EU level it is estimated that, in all Member States, the economic growth will continue after the post-crisis period based on a strong domestic demand, an increase in the employment rate and a reduction in financing costs. The expected growth, however, is not without potential international risks, such as a new escalation of trade conflicts and deficiencies on the emerging markets. On the other hand, there are internal risks related to Brexit, political uncertainties and the possibility of returning to the vicious circle of bank debt and sovereign debt.

In order to maintain the rising trend of the GDP, it is necessary to increase the wage incomes of the population correlated with an increase of productivity, thus reducing the risk of poverty and increasing social inclusion. Reducing the risk of poverty results in an increased consumption and job supply. Increasing the employment rate will increase the GDP per capita and it will improve the quality of life. Thus, the rate of early school dropout will decrease and the number of people with higher education will increase which will positively influence work productivity. Rising expenditures on R&D will determine the identification for optimal solutions for increasing productivity. For companies, this aspect will lower the social cost, reducing the intervention costs to reduce the gas emissions and the individual one, by lowering the purchase price of energy. They will have more money for investments, they will create new jobs, and the employment rate will increase having positive effects on the economic growth.

In the last years the rate of creation of new jobs in the tourism sector has exceeded the general average at the EU level and thus the tourism industry is considered to have an important role in achieving the objectives of economic growth.

The results of the first model estimated indicated a positive contribution on the GDP growth rate of private consumption, employment rate, export and investment and a negative contribution of government expenditure and imports.

In the second model we used the GDP per capita as an endogenous variable and we noticed that in addition to the positive influence of private consumption, investments and exports, there was also added the influence of tourism employment and arrivals in tourist accommodation units. The imports and the participation in tourism for personal purposes had a negative impact.

In the next period it is estimated that the level of trade and economic growth worldwide will decrease, and in this context the economic growth in the EU will be based entirely on the domestic activity. Currently, the employment rate in the EU is quite high, and it is expected that this growth trend will be kept, but at a slower pace, and this together with the wage growth, low inflation, favorable financing conditions and the support fiscal measures from some Member States should lead to domestic demand.

On the other hand, private consumption and investments in the EU will be especially resilient, especially if the confidence among firms and consumers would be less sensitive to the uncertainty and difficulties on the internal market and if accompanied by stronger fiscal-budget policy measures, especially in the states that have a margin of budgetary maneuver and reforms to stimulate the economic growth.

Acknowledgements

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Annexes

Annex 1

Dependent Variable: PIB
 Method: Panel EGLS (Cross-section random effects)
 Date: 05/03/19 Time: 11:22
 Sample: 1996 2018
 Periods included: 22
 Cross-sections included: 26
 Total panel (unbalanced) observations: 344
 Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.024249	0.552372	0.043901	0.9650
CONSUM	0.680103	0.032707	20.79386	0.0000
INVESTITI	0.131111	0.022358	5.864076	0.0000
G	-0.530862	0.175135	-3.031163	0.0026
EXPORT	0.215029	0.030487	7.053136	0.0000
IMPORT	-0.114073	0.032126	-3.550786	0.0004
RATA_DE_OCUPARE	0.565609	0.245909	2.300069	0.0221
Effects Specification				
		S.D.	Rho	
Cross-section random		0.037131	0.0648	
Idiosyncratic random		0.141090	0.9352	
Weighted Statistics				
R-squared	0.743713	Mean dependent var	0.553942	
Adjusted R-squared	0.739150	S.D. dependent var	0.277519	
S.E. of regression	0.140957	Sum squared resid	6.695800	
F-statistic	162.9887	Durbin-Watson stat	1.737233	
Prob(F-statistic)	0.000000			
Unweighted Statistics				
R-squared	0.777141	Mean dependent var	0.773244	
Sum squared resid	7.108513	Durbin-Watson stat	1.636371	

Annex 2

Dependent Variable: PIB_LOC
 Method: Panel EGLS (Cross-section random effects)
 Date: 05/22/19 Time: 23:21
 Sample: 2010 2017
 Periods included: 8
 Cross-sections included: 26
 Total panel (unbalanced) observations: 182
 Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.221159	0.217715	-5.608973	0.0000
CONSUM	0.780697	0.054210	14.40139	0.0000
I	0.723940	0.075633	9.571723	0.0000
EX	0.609365	0.044002	13.84843	0.0000
IMP	-0.422968	0.045464	-9.303464	0.0000
OCUPARE_TURISM	0.294350	0.071758	4.101963	0.0001
SOSIRI_UNITATI_CAZARE	0.040615	0.020890	1.944260	0.0535
PARTICIPARE_TURISM_SCOP_PERS	-0.000816	0.000364	-2.239732	0.0264
Effects Specification				
		S.D.	Rho	
Cross-section random		0.343636	0.0463	
Idiosyncratic random		1.559126	0.9537	
Weighted Statistics				
R-squared	0.848196	Mean dependent var	2.792078	
Adjusted R-squared	0.842089	S.D. dependent var	4.097618	
S.E. of regression	1.617756	Sum squared resid	455.3817	
F-statistic	138.8876	Durbin-Watson stat	1.958945	
Prob(F-statistic)	0.000000			
Unweighted Statistics				
R-squared	0.853115	Mean dependent var	3.206354	
Sum squared resid	482.2840	Durbin-Watson stat	1.849673	

Currency risk management model

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Abstract. *The currency risk management is a very important aspect, especially in the case of companies that also carry out import-export activities. The currency risk is the one that can bring a series of elements that can be positive in terms of the results of the trading company or negative. Thus, for example, we can discuss the exchange rate on imports, which as it increases determines a price instability on the importer's market or on export, which as it decreases is favorable for the exporter. In the management of currency risk, volatility, exchange ratio, optimization of the ratio and the specific risks of the commercial bank must be taken into account. The risk management is an issue of utmost importance and it is carried out in several stages, pursuing precise objectives of control and adequacy of currency problems, so as to minimize and eliminate currency risks. This is a problem that is still stressful for Romania, in the context where it is a country that is not part of the Euro-monetary Union and then all intra and extra-EU transactions are made on the basis of the exchange ratio. And the calculation of the macroeconomic indicators of results being performed according to Eurostat requirements and in foreign currency, determines a certain evolution of the most representative indicator of results, namely the gross domestic product. The quantification of currency risk is another matter, which has been emphasized and established which are the issues that commercial banks, economic agents must comply with the regulations and norms of the national bank, the regulator on the banking market.*

Keywords: currency risk, management, financial market, exchange ratio, commercial bank.

JEL Classification: E44, G32.

I. Introduction

The financial market is extremely volatile due to the influence of a large number of objective and subjective factors. For this reason, in their struggle for profit, credit institutions are constantly facing a large number of risks. The innovations appeared on the financial market, the internationalization of the specific operations, the increase of the pressure of the competition are just a few arguments that require the permanent supervision of the risks to which the bank is exposed, followed as a whole, but also individually.

The objectives of banking management in terms of risk and financial profit aim to maximize profits and, at the same time, minimize risks. For this reason, it can be stated that the actual source of the increase in bank profit is constituted by optimizing the ratio between revenues and expenses. The level of profitability of a bank is closely related to the type of strategy adopted in its management, in the sense in which some risks in the unfolded activity are accepted or not. Under these conditions, the objective of a bank becomes inevitable to maximize its profit, while maintaining the risk at an acceptable level.

Defining the notion of risk in banking is difficult, given the subjectivism of accurate assessment and quantification of risks in banking. The simplest definition of risk is the one according to which all risks are considered losses associated with true evolution of the results.

II. Literature review

Aebi, Sabato and Schmid (2012) studied aspects of risk management and banking performance in the financial crisis. A similar theme was studied by Ly (2015). Agoraki, Delis and Pasiouras (2011) addressed a number of elements regarding the legal regulations and the taking of banking risks in the countries in transition. Anghel, Sfetcu, Bodo and Burea (2017) analyzed the main methods of managing bank risk. Anghel, Popescu, Sfetcu and Mirea (2018) dealt with notions of credit risk. Anghelache and Bodo (2018) outlined a number of general methods of managing credit risk. A similar theme is addressed by Gavalas and Syriopoulos (2014). Anghelache (2010) presented notions of environmental management and environmental risk. Anghelache (2010) analyzed the main methods and models for evaluating the profitability and financial risks. Beltratti and Stulz (2012) tried to identify why some banks performed better than others. Cipovova and Dlaskova (2016) compared different credit risk management methods. Cope (2012) conducted a study on quantifying operational risks. Hakens and Schnabel (2010), as well as Jiménez, Lopez and Saurina (2013) analyzed the correlation between competition and bank risk taking. Miller (2014) examined the role of risk management. Peters, Shevchenko and Wüthrich (2009), in their research, referred to operational risk and the combination of different sources of information.

III. Research methodology, data, results and discussions

The risks in the banking activity consist in the manifestation of instabilities that result from choosing a wrong objective and appear in dependence with it and with the concrete causes of the wrong objective chosen.

The risks specific to the banking activity can also be considered in terms of losses arising from the wrong decisions. The most common ones are the ones approached, starting from the classic functions of the banks in which the risks are treated as unforeseen losses registered in the banking activity as a result of adverse developments of the results compared to the anticipated ones.

Some authors consider that the risks in banking are random and uncontrollable, all of which can be attributed to potential and actual losses. It can be said that banking risks are phenomena that appear during the course of the banking operations and that cause negative effects on the respective activity by deteriorating the quality of the business, diminishing the profit or even the recording of losses, affecting the functionality of the bank.

Due to the multiple definitions of risk, we can highlight three main features of it: the causes of bank risk instability; the critical point of manifestation of the banking risks determined by the bank's objectives; the possibility of stable goals not being achieved.

Table 1. *The classification of banking risks by cause and form*

Banking feature	Risk group	Type risk
Balance sheet operations	Financial	Credit risk, liquidity, market risk, bankruptcy
Banking services	The performance	Operational, technological, strategic risk of new products
Activity framework	Ambiental	Risk of fraud, economic, competitive, legal

Bank risk management model

In the field of banking risks, there are no significant differences and clear notional boundaries between management, administration and management, the terms designating related aspects of the management function of the banking companies. Thus, we can attribute to them the significance of managerial and operational banking steps, oriented towards the protection against the risks to which the banking company is or may be exposed.

The purpose of managing the banking risks is that each banking risk can be monitored and controlled at all levels of the bank and in all the activities carried out, starting from the moment of creating or promoting a banking product/service. The deployment of forces that banks direct toward risk management is impressive and covers the entire sphere of human and material resources.

The concept of "Risk management was introduced, for the first time, in the strategy of a company by Henry Fayol, in 1916, but it became a concept formalized with the appearance of the work" Risk Management: A New Phase of Cost Control, of Russel Gallagher, in 1956, in the Harvard Business Review.

The 1950s are considered the beginning and awareness years of the importance of risk management, characterized by disparate measures to minimize losses and damages due to risk events.

In the modern period, there is no banking activity that is not closely linked to the risks and the probability of their occurrence, which demands the institutionalization and regulation of the risk management processes, manifested mainly through risk management responsibilities, at the level of all organizational structures of the bank, regardless of the hierarchical level.

Risk management can be defined as an active, strategic and integrated process that combines both quantification and risk mitigation, aiming at maximizing the bank's value and at the same time minimizing the risk of bankruptcy.

Thus, we can say that risk management is represented by all the organizational tools, techniques and devices necessary for the bank to achieve this objective. These are not stable, fixed, but in a continuous evolution: they are diversified, new dimensions become more precise.

Risk management and asset and liability management first address quantifiable risks. These are mainly the financial risks (the risks related to the interest rate, the risks related to the liquidity and financing of operations, the market risks) that are born on the financial markets and result in unfavorable evolutions of the bank's situation as a result of the changes registered in those indicators.

The contemporary banking companies have the possibility to collaborate with entities specialized in the management of the banking risk, which have developed on the financial-banking market in the context of the increasing needs of the banks to manage the banking risks.

Depending on the tools used to manage the risks specific to the banking activity, several "guidelines" have appeared, both in the specialized literature and in practice.

A first orientation refers exclusively to the basic tools and concepts, which, although imperative, are sometimes difficult in the risk management process.

A second orientation is more scientific, because through rigorous modeling and analysis, relevant conclusions can be drawn. However, this orientation also has deficiencies that are materialized by sometimes significant errors.

The third guideline focuses on the use of banking instruments that manage risks, such as term contracts, swap contracts, options and other methods used in practice.

The stages and objectives of risk management

Whether organizing its risk management activity, or benefiting from the benefit of collaborating with specialized institutions, the general model of risk management in banking companies comprises the stages:

- The identification of potential risks aims to identify and locate the potential risks on specific products and/or banking activities, in order to estimate the potential impact that a risk event would have on the product itself.
- Evaluation/measurement is considered to be particularly important in risk management, centered on the principle "one cannot control what cannot be measured. It implies the expression in value equivalent of the potential losses generated by the bank risk events.

- The risk monitoring and control aims to follow the correctness of the banking activities in accordance with the regulations in force specific to each banking product and the related processes, as well as the permanent updating of the risk profile for each product, according to the risks that may affect the product and in depending on the existing control measures established to mitigate the risks.
- Risk mitigation is the totality of the measures taken to reduce the risk to an accepted level and consists in implementing the action plan decided following the risk assessment sessions.
- Documenting and reporting the risks represents the totality of the activities of recording and keeping in documents the information about the risks to which the banks can be or are exposed, of the risks already produced and their effects on the banking company.

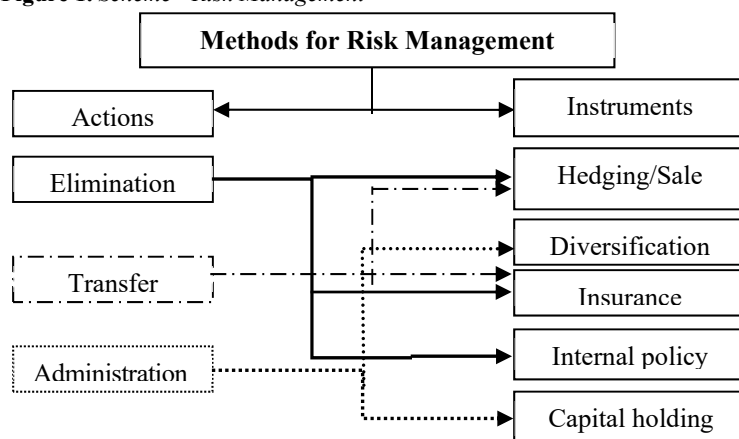
Also, this step involves risk reporting, which involves transmitting them to the bank's structures whose responsibilities are to monitor and control the risks and/or to the national supervisory authority of the bank - the National Bank of Romania (its specialized departments or databases), or other institutions that manage banking risk information.

A successful banking strategy should include both programs and procedures for managing bank risks, which aim, in fact, to minimize the likelihood of these risks occurring and the potential exposure of the bank. The main objectives pursued in the banking management are: maximizing the profitability, minimizing the risk exposure and respecting the regulations in force.

The main objective of risk management is to optimize risks and performance, as well as planning for development and financing. The four main goals are:

- Ensuring the perennality of the institution, by assessing the risks, which translates sooner or later into future costs.
- Extend the internal control of the performance monitoring by monitoring the associated risks and the possibility of comparing the performances between the responsibility centers, customers, products.
- Facilitate the decision price for new operations by knowing the risks, and allowing their invoicing to customers.
- Rebalancing activity portfolios, or operating portfolios, based on the results and effects of portfolio diversification.

However, when there are more risks, more goals and not an optimal goal, more measurements for each risk, more risk management tools, there is no universal way of managing risk. This plurality generates a certain complexity, which explains why risk management remains specific to each bank.

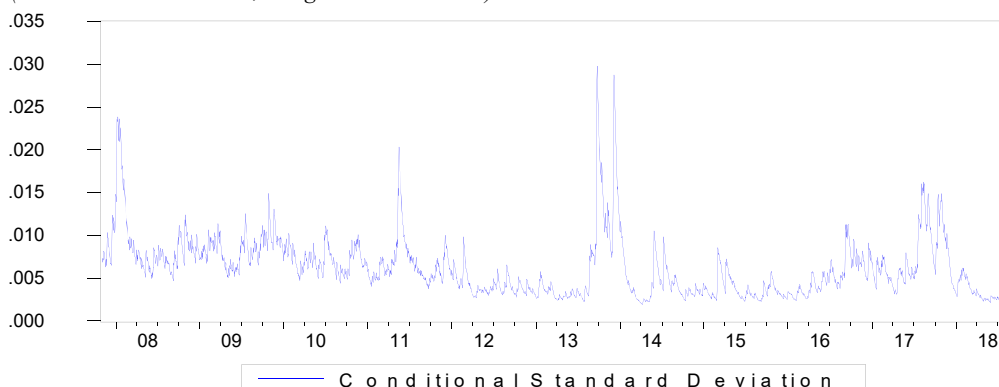
Figure 1. Scheme - Risk Management

Currency risk

The exchange rate risk analysis, as a component of market risk, is a classic field of international finance, for both non-financial companies and financial institutions, and involves methods that are not limited to simple financial and balance analysis.

These methods aim to reduce the expenses or losses due to exchange rate changes, especially since, in the last period, there have often been cases in which the exchange rate of the major international currencies has varied with amplitudes of over 1% during the same day. For this reason, hedging currency risk becomes a necessity for any bank.

Figure 2. Volatility of the EUR/RON exchange rate for the period 2008-2018
(calculated in Eviews 5.1, using a GARCH model)



Taking into account the significant weight of bank assets denominated in foreign currency as well as the fact that foreign currency exposure to the private sector at the end of June 2018 represented 62.8% of the total credit granted to this sector (private sector lending implicitly implies an increase in weighted assets at risk), in the event of a depreciation of the national currency, the change in the capital requirement as a result of the risk-weighted assets in foreign currency could have a significant direct effect on the solvency indicator of credit institutions.

The euro exposure of banks to the real sector is predominant, the assets denominated in other currencies with high exchange rate volatility playing a marginal role, the impact of the exchange rate variation being partially mitigated by subordinated loans, denominated mostly in euros.

Currency risk appears in the form of the possibility of recording losses arising from the evolution of the exchange rate. It can be defined synthetically as the probability of diminishing the net banking profit to an adverse change in the exchange rate on the market.

This risk is significant for banks involved in foreign currency transactions on their own account or on behalf of clients, and at its origin are foreign currency banking operations: external liabilities and assets, elements integrated in the balance sheet of the banking institution by conversion into the national currency at the time of day. In Romania, currency risk is quite important because most banks are licensed for such operations that they offer to customers and that they use and as a way of protecting capital and assets under high inflation conditions.

The factors that influence the bank's exposure to currency risk are:

- Structural factors regarding the nature and extent of the bank's currency operations.
- Strategic factors targeting the efficiency of hedging activities, volume and term matching between currencies and national currency, vulnerability to the real economic value of hedging instruments.
- External factors including economic, market conditions, competition, technological and legislative changes.

The basic factors that determine the currency risk are:

- At the microeconomic level: interest rate fluctuations; the economic situation of the trading partner; the level of development of the foreign exchange market in sight and in time; the level of the modernization of the external settlements; the level of operational information on the evolution of the exchange rate; subjective factors.
- At the macroeconomic level: the pace of economic growth; inflation level; the state of public finances; the balance of payments and trade situation; capital migration.

The exchange rate risk includes other risks that may arise from: the specific volatility of the respective currencies, the correlations between the currencies held in the portfolio or the devaluation of the currencies and may occur in the following environments:

- In a pure floating-rate environment, the value of the currency is free to be appreciated or impaired, depending on market movements. Such an example Euro/American Dollar.
- In a fixed-rate environment, the value of the currency is anchored or linked to another currency, such as the Hong Kong Dollar against the US dollar. This leads to the elimination of risk, which may occur as a result of changes in the parity value of the currency, by devaluation or valuation.
- In case of a change in the currency regime, a fixed rate becomes floating or vice versa.

The currency risk presents a rather complex problem for the efficient management of a banking institution, for this reason it is necessary to analyze it on all its components.

The most important components of this risk are presented below.

The risk of translation, also known as currency exchange risk and refers to the risk of profit or loss when the assets, liabilities and results of a subsidiary are translated from the currency in which the records of the subsidiary are kept, in the national currency of the power station. Appears in the case of banks with international activity: the affiliated companies must report data and consolidate their financial results in the currency of the reference country, the parent company. The conversion can be done during the day or at the average rate for the reporting period. It is a risk that can be hedged.

The transaction risk appears whenever a bank engages in foreign exchange transactions, when there is a risk of profit or loss, if the value of the respective currencies changes compared to the local currency of the bank. The greater the transaction risk, the greater the monetary instability in a country. However, always due to the transaction risk, one partner wins and one loses.

The economic risk is more complex and refers to the impact of the exchange rate change on the long-term profitability of the bank and not on the short-term effect of an operation. This risk reflects the influence of currency fluctuations on the value of the bank. It is relevant if expressed in the currency of the reference country. The market value of the bank is as in the case of financial assets, calculated as the present value of all the incomes obtained in all the operating currencies. The discount is made using the weighted average cost of capital.

As not all assets or liabilities are exposed to the same extent at risk, the question arises of establishing the exchange position for each individual case: one is the situation of short-term debts and liabilities and otherwise the problem of long-term debt is raised. The exchange position will be established on each currency separately, taking into account the distribution over time, respectively the maturity of the receivables and debts.

Management in the field of exchange rate risk should include the following:

- Defining an indicator to measure the decrease of the incomes caused by the adverse change of the exchange rate: Level of Potential Losses.
- Setting trading limits through the Bank's Risk Profile, respectively: intraday; Overnight (Y/N); Stop-loss daily and monthly.
- Monitoring the limits thus established, by the Treasury Department - Back-Office and the Risk Management Department.
- Creating scenarios under abnormal market conditions (stress test scenarios) to calculate the impact of the abrupt change in the exchange rate on the bank's revenues.
- Regularly informing the executive management about compliance or breach of the limits, as well as of the way in which the risk profile is approved.
- Developing an action plan for crisis situations.
- In the event of such a crisis situation, the Treasury Department - is the one that has the obligation to adopt a series of measures, which can be enumerated the following: bringing all trading positions as close to level 0; estimating (and if possible calculating) the impact on the profitability of the Bank; estimating the impact on other activities of the Bank.

Indicators used in currency risk

In the following we will analyze the main indicators used to assess the exposure to currency risk, which can be calculated both at the level of territorial units and at the bank's central level. This includes:

- the individual currency position, calculated for each currency to be managed as the difference between the total assets (receivables) and the total liabilities (liabilities) in a given currency:

$$PV_x = A_x - P_x$$

where:

A_x – total assets expressed in currency x;

P_x – total liabilities expressed in currency x.

For each currency, assets are compared with liabilities, resulting in two distinct positions: Short currency position, when the total of liabilities exceeds the total of the receivables; long currency position (Long), when the total of the debts exceeds the total of the commitments.

A certain currency position may become favorable or unfavorable for the banking company, depending on the evolution of the exchange rate of the national currency against the respective currency.

Table 2. *The influence of the exchange rate variation on the bank's results*

Currency position	Depreciation of the national currency	Appreciation of the national currency
Short currency position	unfavorable	favorable
Long currency position	favorable	unfavorable

- The global currency position is defined as the net balance of foreign currency receivables against foreign currency liabilities, converted into national currency for comparability.

$$PV_g = PV_l - PV_s$$

where:

PV_l – long currency position, equivalent in national currency;

PV_s – short currency position, equivalent in national currency.

This indicator offers the advantage of a global picture on the bank's currency exposure and the disadvantage of canceling the precise currency situation that has to be managed in fact. It is calculated mainly for the purpose of reporting, the management of internal use being focused on tracking the individual currency positions.

The exposure of the banking institution to the currency risk is determined using the individual currency positions managed separately for each currency. At the end of each day, risk exposure is calculated as a potential loss in the event of an adverse exchange rate change for each currency. In Romania, the global currency position at the end of the day cannot exceed 10% of the bank's own funds.

Quantification of currency risk

The banking companies are required to calculate the requirement of own funds to cover the currency risk they are exposed to, by multiplying the sum between its net position on

currency and its net position on gold by 8%, if the value of the total net position on foreign currency and gold exceeds 2% of total own funds.

In order to determine the capital requirements for currency risk, banking companies perform a two-step calculation:

- The net open position of the institution is calculated on each currency (including the reporting currency) and on gold. This net open position consists of the sum of the following items:
 - a) The net spot position represents the totality of the assets, less the elements representing the debt, including the calculated interest and not yet due.
 - b) The net forward position represents all amounts receivable, less the amounts payable in forward transactions in currency and gold, including currency and gold futures and the principal related to currency swaps, which is not reflected in the spot position.
 - c) Irrevocable guarantees. They will definitely be executed and will probably not be recovered.
 - d) Net future income/expenses. They are not yet registered, but they are already fully covered. In this category, credit institutions may include, with the consent of the National Bank of Romania, future net income/expenses that have not yet been recorded in accounting, but are already fully covered by forward transactions in foreign currency.
 - e) The net delta equivalent. It is calculated for the portfolio of options on currency and gold.
 - f) The market value of other options (other than those on currency and gold).
- The total net foreign currency position of the institution is determined, based on the long and short net positions on each currency, other than the reporting currency, as well as the long or short net position on gold, which is converted into the reporting currency at the most common exchange rates spot (spot) of the market.

These positions are further grouped separately to form the total of the short net positions and the total of the long net positions respectively. The largest of these two totals represents the total net foreign currency position of the institution.

Under certain conditions, credit institutions may maintain capital requirements to hedge positions on closely correlated currencies, lower than those resulting from calculations.

In this respect, the central bank can only consider two currencies as being closely linked if, in the next 10 working days, the loss of 4% or less of the value of the corresponding position corresponds to the same and opposite positions on such currencies (expressed in reporting currency), has a probability: of at least 99%, when using an observation period of three years; of at least 95%, when an observation period of five years is used.

The requirement of own funds for the correspondence position, on two closely correlated currencies, is 4% multiplied by the value of the correspondence position.

The capital requirement for positions on closely linked currencies, not correspondent, as well as for all positions on other currencies, is 8% multiplied by the greater of the sum of the short net positions and the sum of the long net positions on the respective currencies (after eliminating the positions on closely correlated currencies, correspondence).

Requirements regarding the currency position

In Romania, the National Bank of Romania has defined and regulated, since 1995, the maximum level of individual currency positions and total currency positions for banks, Romanian legal entities. In order to limit the level of currency risk, both individually and at aggregate level, the central bank adopted new rules.

Based on these legal provisions, the National Bank of Romania has defined the following concepts:

- The currency position in a certain currency - the net balance of the assets in the respective currency, being the expression of the currency risk.
- The balance sheet position in a specific currency - the amount highlighted in the credit or debtor balance of the account 3721 Exchange position, opened on the currency in question.
- The off-balance sheet currency position in a given currency - the amount highlighted in the credit or debtor balance of the account 9361 Exchange position, opened on the currency in question.
- Individual currency position - the long currency position or the short currency position on each currency in lei equivalent.
- Adjusted individual currency position - the individual currency position adjusted with the updated lei equivalent of the subscribed and paid up share capital and of the issuing premiums paid in foreign currencies, calculated according to the exchange rate differences related to the availability in foreign currencies representing the contribution to the share capital and issue premiums paid in foreign currency.
- Total currency position - the highest value, in the mode, between the total of the long adjusted individual currency positions and the total of the short adjusted individual currency positions.

The currency position in a given currency is calculated as the algebraic sum of the balance sheet position and the off balance sheet position.

The total foreign exchange position will be long when the total of the long adjusted individual foreign exchange positions is greater than the total of the short adjusted individual foreign exchange positions and will be short when the total of the long adjusted individual foreign exchange positions is less than the total of the short adjusted individual foreign exchange positions.

At the end of each banking day, the currency positions of a bank are subject to the following limitations: maximum 10% of the bank's own funds for any of the adjusted individual currency positions; maximum 20% of the bank's own funds for the total currency position.

Normative approaches to currency risk according to the Basel agreements

The first normative references regarding the market risk to which the credit institutions are exposed are found in the international regulations in 1988, in the framework of the Basel I Capital Agreement, the issue subsequently resumed in 1996, as part of an Amendment to incorporate the market risk. The amendment involves determining the minimum capital required for credit institutions to cover banking risks, taking into account market risk as well.

Under the Basel I Capital Agreement, capital requirements for market risk were provided, by determining banks' exposure to the main components of market risk: interest rate risk, position risk, settlement and counterparty risk, currency risk and risk freight. In addition to these provisions, the new Basel II Capital Agreement introduces the need to determine capital requirements for market risk, by including credit derivatives and units of collective investment undertakings.

According to the Norm of the National Bank of Romania no. 17/2003, banking companies must define market risk management policies, at least regarding the risks that they intend to take, as well as how the respective risks are controlled.

Thus, with regard to positions in the portfolio for transactions, credit institutions must have procedures that involve at least the following: valuation of these positions at market value, as well as calculation of exposures at least daily; immediate identification of exceedances, as well as their reporting and evaluation at least daily; continuous monitoring of the liquidity of the portfolio for transactions; permanent evaluation and monitoring of open positions, taking into account their size, maturity and complexity.

The central bank resumes the market risk issue in the framework of the basic banking regulation - Government Emergency Ordinance no.99/2006 on credit institutions and capital adequacy, establishing that the methods for determining the capital requirements for hedging position risks, the risk of settlement/delivery, currency risk and freight risk may be internal models or a combination thereof with the methods established by the banking supervisory authority.

In order to use the internal models of market risk management, it is necessary the prior recognition by the National Bank of Romania, the use of models for the purposes of capital adequacy supervision. The recognition is granted only if, in the opinion of the competent authority, the risk management system owned by the institution is conceptually sound and is implemented with integrity and if, in particular, the following qualitative standards are met:

- The internal risk quantification model is an integral part of the institution's daily risk management process and serves as a basis for reporting to the institution's senior management of risk exposures.
- The institution has a risk control unit which is dependent on the units that carry out trading activities and which report directly to the senior management.
- The board of the institution and the senior management are actively involved in the risk control process, and the daily reports made by the risk control unit are analyzed.
- The institution has established procedures for monitoring and ensuring compliance with the formalized set of internal control policies and procedures regarding the general functioning of the risk quantification system.
- The institution's model has a history that demonstrates its reasonable accuracy in quantifying the risk.
- The institution frequently runs a rigorous stress testing program, and the results of these crisis simulations are analyzed by senior management and reflected in the policies and limits it sets.
- The institution must carry out, as a component part of the periodic internal audit process, an independent system analysis or risk quantification.

Ways to reduce currency risk

Exposure to currency risk, which is measured by the long or short currency position, can have large variations from one bank to another, being a particularly harmful banking risk through its effects, which can even determine the bankruptcy of the banking institution.

The use of prudential regulations aims to ensure the coverage of risks through own funds, so that maximum limits of exposure to this risk are established, depending on the own funds of the banking institution.

Surveillance of currency risk is performed by both the bank and the National Bank of Romania, based on the currency position indicators reported by the banking institutions. In order to limit the currency risk, banks are obliged to: have a system of records that allows both the immediate recording of transactions in currencies and the calculation of their results, as well as the determination of the adjusted individual currency positions and the total currency position; to have a system of supervision and management of currency risk based on internal rules and procedures, approved by C.A. of the bank; have a permanent control system to verify compliance with internal procedures; to appoint a manager to ensure the permanent coordination of the foreign exchange activity.

Immunization of the banking company, which involves periodically adjusting its currency positions to suppress long or short positions. It is a relatively expensive operation, because it imposes high management costs and also presents an opportunity cost that does not allow speculation of a certain position (long or short) depending on the trend of the exchange rate.

Currency risk coverage is applied to reduce the impact of exchange rate volatility on bank assets and liabilities. Although it involves high transaction costs, hedging management involves assuming reasonable, anticipated risks. Considering this technique (hedging), the currency risk reduction is based on derivative contractual instruments. They are priced and represent agreements between the parties, each assuming certain obligations in favor of the other.

Thus, it is noted that currency risk can be managed in two diametrically opposite ways: either long or short positions of the bank are kept as close to zero as possible by closing the existing positions (currency sales are made where the positions are long and respectively purchases of currencies where the positions are short), or reasonable open positions are assumed that, on the one hand, allow the speculation of the currency position according to the trend of the exchange rate and on the other hand allow external protection. The main annexes of the paper are presented to cover the exchange rate risk, with details on how they operate and their applicability in managing this risk.

IV. Conclusion

A number of conclusions are drawn from the study regarding currency risk management. The first is that no country can, under the current conditions, carry out its activity in autarchic regime. Therefore, each country must export and import, that is, participate in the international division of labor. From this point of view, it is essential to analyze the exchange rate when importing and the exchange rate when exporting. Both have an

influence on the final result of the company concerned, of the Romanian economic entity and ultimately determine a certain position and certain results at the macroeconomic level. On the other hand, adequate management of the forecasting, monitoring and undertaking of measures must be ensured so as to minimize the currency risk. The indicators used in currency risk analysis are important and they must be viewed in their complexity and correlation as they are calculated and as they result from the data used.

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Assessing the performance of Pillar II in Romania – time weighted versus money weighted rate of return

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Abstract. *Adequate and complete reporting of the return rates for pension funds is of utmost importance for the success of the second pension pillar. This paper points to the limitations of the current way of reporting the returns by the Romanian pension funds administrators, given by the exclusive use of the time weighted rate of return and argues for the merits of jointly using an alternative indicator, namely the money weighted rate of return. Both return indicators are calculated in nominal and real terms over the 2008-2018 periods and also for various sub-samples, the results pointing to relevant differences.*

Keywords: pension funds' performance, money weighted rate of return, time weighted rate of return, Pillar II, Romania.

JEL Classification: G23, J11, J26, J32.

1. Introduction

Revenues from pensions are the main source of income for the elderly throughout the world. In many countries, the public pension system is complemented by the privately managed pension system. The main objective of the public pension systems is to protect the elderly against poverty, while private pension funds aim to ensure a better replacement rate between the salary earned during the active life and pension income.

The public system operates on the basis of the mandatory contributions paid by the population, according to which the amount of the pension is also set. The sources of financing of pension funds are represented by the savings of individuals. In practice, it is known that the transfer of economic welfare from the present to the future is done through saving. As many people do not have the necessary knowledge to adequately manage their savings for retirement, private pension funds can prove to be a very good option. Also, the rapid pace of population aging that negatively affects public finances, increased longevity, and the development of capital markets encourages the operation of private pension systems.

The main purpose of private pension funds is to invest the money from the contributions through financial markets by using the best investment strategies while complying with portfolio management regulations. Therefore, the amount received by the contributors will depend on the return on assets and the financial performance of the funds. In the literature there are many studies regarding the most appropriate way to calculate the rate of return on investments. Two of the most popular methods are represented by the money weighted rate of return (MWRR) and the time weighted rate of return (TWRR). While the latter measures the performance of the funds' managers, the former is a measure that determines the performance of pension funds' contributors, also taking into account the impact of inputs and outputs of flows.

In the report entitled "Averting the Old Age Crisis" (1994), the World Bank recommends a three pillars system pension, where the first component is the public pension sector, the second pillar is the mandatory, privately managed pensions and the third pillar represents the voluntary, privately managed pension.

This paper points to the limitations of the current way of reporting the returns by the Romanian pension funds administrators, given by the exclusive use of the time weighted rate of return and argues for the merits of jointly using an alternative indicator, namely the money weighted rate of return. While the first indicator is the best measure for assessing the performance of pension fund administrators, we provide arguments that the latter is a better measure for evaluating the actual return on the participants' contributions. Also, we calculate both indicators for the entire period of existence of Pillar II in Romania in nominal and real terms and in addition, we show the differences on various sub-samples of the analyzed period. The results clearly show the need of a change in reporting rules for pension funds administrators by imposing the calculation and presentation of the money weighted rate of return as a relevant measure for assessing the returns on investments generated by the pension funds administrators. We expect that our arguments and conclusions to be of great interest for Romanian public authorities and the Romanian citizens in a broad sense.

The remaining of this paper is organized as follows: the next section contains an overview of the relevant literature in the field of the topic researched, section 3 defines the aims and the novelty of our research, section 4 presents the data and methodology used, section 5 exposes the results in a structured manner while the final section concludes.

2. Problem statement

Private pension funds play an essential role in national pension systems. In the literature it is appreciated that the objectives of investment managers should be to determine the optimal structure of portfolios on behalf of clients so as to maximize profits, mitigate risks by diversifying portfolios, bookkeeping and optimizing the taxes paid. In addition, pension fund administrators are also pursuing long-term objectives for retirees such as ensuring a higher purchasing power than the one of the transferred contributions.

Gruber (1996) showed that mutual funds investing in shares had an annual return less than an investment directly in the stock market index as a result of periodically charged administration fees. Impavido (2009) produced a report for the International Monetary Fund outlining the challenges faced by pension funds managing mandatory contributions to developing measures that would reduce administrative fees and increase the performance of long-term asset management. The report shows that the expected returns can be improved if behavioral inclinations in investment decisions are recognized. The process of reducing administration costs is often hampered by the existence of barriers to entering the market, high market shares of existing pension funds and the indifference of the contributors. The author also highlights the concerns that fund managers have exclusive freedom when it comes to asset allocation. At the same time, long-term returns are also affected by low demand elasticity as a result of the fact that people are not properly informed and can not track investment performance.

The mandatory private pensions (Pillar II) were introduced in Romania in 2007 and are governed by Law no. 411/2004 on privately managed pension funds while the first contributions were transferred in May 2008. The contribution to the second pension pillar is mandatory for all employees under 35 and optional for those aged 35 to 45. Initially, the contribution to the second pension Pillar was set to 2% of the gross salary, with the percentage set to increase to the target of 6% with 0.5 pp per year until 2016. After several delays in increasing the contributions due to budgetary reasons, currently the contribution rate is 3.75% of the gross salary, but considering also the change in structure of labor taxation which became operational in January 2018 this corresponds to a level of 4.5% considering the previous system. In terms of administration fees, during May 2008-December 2018 they were limited by law to 2.5% of the contributions transferred each month and 0.05% monthly on the value of the assets. All 7 pension funds present on Romania's market charged an initial administration fee of 2.5% of the amount of the contributions and a monthly fee of 0.05% of the value of the assets, with one of the funds reducing the commission from contributions to 1.7% starting with April 2018.

Methods of quantifying the performance of pension funds

The performance analysis of pension funds is very important in order to track the evolution of contributions paid, to assess the effectiveness of the fund manager as well as to guide future decisions on the placement of savings.

The most commonly used measure of performance quantification of funds managing private pensions is the time weighted rate of return, but specialists also recommend the calculation of the money weighted rate of return - which is in fact an internal rate of return. Feibel (2003) explains that TWRR is the return obtained by fund managers as a result of the decision to select assets that belong exclusively to it. On the other hand, the MWRR is the return attributed to investors - contributors in the case of pension funds- as it takes into account both the moment of investment and the asset selection process.

In line with what has been exposed above, the Global Investment Performance Standards (GIPS) recommends using the MWRR to analyze the extent to which additional contributions as well as withdrawals affect the overall performance of the fund. The Governmental Accounting Standards Board in the US and the RBC PH & N Investment Counsel in Canada also recognized the importance of money weighted rates of return and decided to include them in the annual performance reports of pension funds in 2014 and 2017 respectively.

TWRR was defined by Fabozzi (1995) as a measure of the growth rate of a fund over a certain period of time. This method does not take account of cash inflows and outflows, taking into account only market developments and fund manager decisions. According to the CFA Institute, the TWRR "allows the evaluation of investment management skill between any two periods". Because fund managers can not control cash flows, the TWRR has the advantage of being a good way to compare the different pension funds operating on the market. A disadvantage of this method is that it does not distinguish between the initial investment and a series of investments.

The MWRR, also known as the Monetary Unit Weighted Rate of Return, is a measure of performance quantification that takes into account both the amounts and the moment when the investor decides to place his money, and the efficiency of the decisions the fund manager adopts. This method reflects the impact on the final value of the initial investment as well as additional cash flows. Feibel (2003) points out that the disadvantage of this measure is that it can not be used to compare the results obtained by investors because decisions are taken in different moments and also the amounts transferred are not the same.

MWRR is determined using the internal rate of return (IRR) method, being the interest rate that equates the invested individual cash flows with the final value accumulated over a period. The CFA Institute recommends using IRR to determine investment return in private instruments such as buyout, venture and real estate. Peterson (2017) also showed that IRR is a much more appropriate method than the TWRR for calculating the return on alternative investments that are less liquid. It has shown that TWRR is appropriate for the valuation of highly liquid assets that do not require additional investments.

Concluding, the literature shows that MWRR, compared to the TWRR, is a more appropriate method to measure the return on an investment portfolio, given that inflows or withdrawals as well as the moment of investment are different for each individual investor. The TWRR is appropriate to assess the performance of private pension managers compared to a benchmark, while MWRR shows the return obtained in relation to each contributor financial plans.

3. Research questions/Aims of the research

In this paper we fill the gap in the existing literature and pension funds reporting in Romania through calculating the returns generated by the administrators of the pension funds active on the second pension pillar by using two alternative indicators, namely TWRR and MWRR. Currently, only TWRR is provided by the pension funds and only from the start of the system. We emphasize the merits of the MWRR as a more accurate way for presenting the returns generated for the contributors by the pension funds administrators and we also calculate both return indicators on sub-samples in order to highlight the evolution of the returns for participants who entered the system at a later date. In order to provide an accurate assessment of the return in terms of purchasing power all indicators are calculated both in nominal terms and in real terms.

4. Data and methodology

The data used in this paper are taken from the Association for Privately Administered Pensions in Romania (APAPR), the Financial Supervisory Authority (FSA) and the National Institute for Statistics (NIS), covering the period from May 2008 (the start of the second pension pillar in Romania) and December 2018. The data consists of the overall contributions transferred to Pillar II (net of the commission applied to the amounts transferred), the average of the net asset value per share and the consumer price index with a fixed base set for December 2018.

In order to calculate the two return indicators a number of additional variables were defined and calculated, namely the compounding factor both in nominal and real terms, the average annualized return of each contribution both in nominal and real terms. The formula of the above indicators and of the TWRR and MWRR are described below:

$$\text{Compounding factor}_t = \frac{\text{Average NAVPS}_{\text{december 2018}}}{\text{Average NAVPS}_t} \quad (1)$$

$$\text{Real Compounding factor}_t = \frac{\text{Compounding factor}_t}{\text{Price index}_t} \quad (2)$$

$$R_{\text{annualized}_t} = \sqrt[n_t]{\text{Compounding factor}_t} - 1 \quad (3)$$

$$\text{Final amount}_t = \text{Compounding factor}_t \times \text{Net contributions}_t \quad (4)$$

$$\begin{aligned}
\text{Total final amount} &= \sum_{t=1}^N \text{Final amount}_t \\
&= \sum_{t=1}^N \text{Net contributions}_t \times (1 + \text{MWRR})^{n_t}
\end{aligned} \tag{5}$$

$$TWRR_t = R_{\text{annualized}_t} \tag{6}$$

Where NAVPS represents net asset value per share, N is the total number of months until December 2018, t represents the months, with $t = \overline{1, N}$, n_t is the investment period from month t until December 2018 in years, $R_{\text{annualized}_t}$ is the average annualized return rate of month t .

Basically, the compounding factor t represents the multiplication of the month t contribution until the end of the analyzed period allowing the determination of both the end-period value of a specific contribution and also its average annualized return considering the compounding effect. The TWRR is simply this average annualized return at a certain moment in time while the determination of the MWRR is more complex being based on an internal rate of return type calculation. Thus, MWRR is the interest rate which ensures the equality between the total accumulated amount at the end of the period and the sum of all contributions invested at this interest rate.

5. Results

The data and the intermediate indicators used in this analysis are synthetized in the table below:

Table 1. Data and indicators used in the analysis

Month	Net contribution transferred to PII (mil. RON)	Investment period until Dec. 2018 (years)	Compounding factor Dec. 2018/month t	Nominal average annualized return - contribution month t	Price index Dec. 2018/month t	Real compounding factor Dec. 2018/month t	Real average annualized return - contribution month t	Real final amount (2018 prices) in Dec. 2018 - contribution from month t	Real final amount considering the real average annualized return
May 08	85.99	10.58	2.27	8.06%	1.3632	1.67	4.94%	143.24	113.66
June 08	100.66	10.50	2.25	8.04%	1.3566	1.66	4.95%	167.10	132.76
July 08	95.17	10.42	2.22	7.97%	1.3528	1.64	4.88%	156.34	125.25
Aug.08	106.06	10.33	2.20	7.95%	1.3435	1.64	4.90%	173.95	139.27
Sept.08	102.76	10.25	2.19	7.97%	1.3447	1.63	4.89%	167.66	134.65
Oct.08	101.26	10.17	2.20	8.06%	1.3394	1.64	5.00%	166.23	132.39
Nov.08	101.66	10.08	2.15	7.86%	1.3253	1.62	4.89%	164.57	132.62
Dec.08	107.88	10.00	2.12	7.82%	1.3211	1.61	4.86%	173.36	140.43
...
Jan.18	638.37	0.92	0.99	-0.67%	1.0326	0.96	-4.09%	614.42	653.99
Feb.18	695.71	0.83	0.99	-0.66%	1.0246	0.97	-3.52%	675.25	711.16
Mar.18	575.27	0.75	0.99	-1.51%	1.0216	0.97	-4.27%	556.75	586.76
Apr.18	572.42	0.67	0.99	-1.52%	1.0186	0.97	-4.21%	556.24	582.57
May 18	635.44	0.58	1.01	0.90%	1.0131	0.99	-1.33%	630.50	645.29

Month	Net contribution transferred to PII (mil. RON)	Investment period until Dec. 2018 (years)	Compounding factor Dec. 2018/month t	Nominal average annualized return - contribution month t	Price index Dec. 2018/month t	Real compounding factor Dec. 2018/month t	Real average annualized return - contribution month t	Real final amount (2018 prices) in Dec. 2018 - contribution from month t	Real final amount considering the real average annualized return
June 18	621.05	0.50	1.00	0.57%	1.0084	0.99	-1.09%	617.65	629.29
July 18	630.85	0.42	1.00	-0.86%	1.0082	0.99	-2.79%	623.46	637.82
Aug. 18	636.34	0.33	0.98	-4.56%	1.0131	0.97	-8.20%	618.45	641.95
Sept. 18	631.70	0.25	0.98	-7.37%	1.0102	0.97	-11.06%	613.46	635.88
Oct. 18	621.43	0.17	0.98	-9.11%	1.0055	0.98	-12.06%	608.27	624.17
Nov. 18	637.79	0.08	0.97	-26.52%	1.0003	0.97	-26.78%	621.43	639.19
Dec. 18	641.14	0.00	1.00	0.00%	1.0016	1.00	0.00%	640.12	641.14
Total	39,864.50							47,628.30	47,628.30

Source: APAPR, FSA, NIS, own calculations.

Thus, the contributions transferred to Pillar II in May 2008 amounted 85.99 million RON, they were multiplied in nominal terms 2.27 times until December 2018, corresponding to a nominal average annualized return of 8.06%. Considering the increase in prices during December 2018 and May 2008 of 36.32%, the real compounding factor will be 1.67 corresponding to a real average annualized return of 4.94%. For each monthly contribution, these calculations are performed, the cumulative value of amounts transferred being around 39.86 billion RON while the total accumulated assets amount to approximately 47.62 billion RON. In order to present the computation of the MWRR, the last two columns, based on the determination of the real MWRR for the entire period, show the intermediate calculations, respectively finding the internal rate of rate that equalizes the total value of accumulated assets with the sum of the monthly contributions invested at this rate.

In the table below, are presented the results for the TWRR, both in nominal and real terms for the entire period of existence of the second pension pillar in Romania but also for other sub-samples respectively for a period starting each January of the subsequent years until December 2018 in order to highlight the performance relevant for contributors which entered the system at a later date:

Table 2. Annualized time weighted rates of return in the period May 2008 – December 2018

Month	Nominal average annualized return (%)	Real average annualized return (%)
May 08	8.06	4.94
Jan. 09	7.75	4.79
Jan. 10	6.59	3.87
Jan. 11	5.72	3.69
Jan. 12	5.94	4.08
Jan. 13	5.29	3.99
Jan. 14	4.37	3.15
Jan. 15	2.75	1.45
Jan. 16	3.57	1.48
Jan. 17	2.43	-0.97
Jan. 18	-0.6%	-4.09

Source: APAPR, FSA, NIS, own calculations.

It has to be mentioned that the only information which is publicly available and is promoted as the return of the second pension pillar is the TWRR for the period May 2008 – December

2018 which is 8.06% in nominal terms and 4.94% in real terms. It can be seen the indicator decreased in a significant manner during the subsequent years, being even negative in real terms in the last two years of the analyzed period. Thus, the performance in the first six years was strong, with real average returns around or above 4% but in recent years it has slowdown dramatically. These results are already a strong argument for increased transparency, respectively by presenting to the public the TWRR also on sub-samples in order to better inform the participants about the performance of the pension funds administrators in managing their assets. This information is even more important for the participants which joined the system more recently.

Another important point about the TWRR is that, although it does a good job in assessing the performance of the pension funds administrators, from the point of view of the participant it reflects the actual return of a contribution from a specific point in time. The 8.06% value for the nominal TWRR reflects the return of only the contributions transferred in May 2008, the 7.75% value reflects the return of only the contributions transferred in January 2009 and so one, irrespective of the return for the other flows of contributions. From the perspective of the participant, more relevant is a measure for the return of all contributions which is given by the calculation of the MWRR.

In the table below, are presented the results for the MWRR, both in nominal and real terms for the same periods as TWRR:

Table 3. Annualized money weighted rates of return in the period May 2008 – December 2018

	May 2008- Dec. 2018	Jan. 2009- Dec. 2018	Jan. 2010- Dec. 2018	Jan. 2011- Dec. 2018	Jan. 2012- Dec. 2018	Jan. 2013- Dec. 2018	Jan. 2014- Dec. 2018	Jan. 2015- Dec. 2018	Jan. 2016- Dec. 2018	Jan. 2017- Dec. 2018	Jan. 2018- Dec. 2018
Nominal average annualized return (%)	4.90	4.63	4.25	3.99	3.64	3.14	2.61	2.15	1.69	0.18	-1.88
Real average annualized return (%)	2.67	2.5	2.24	2.06	1.71	1.17	0.41	-0.49	-1.6	-3.5	-4.64

Source: APAPR, FSA, NIS, own calculations.

The MWRR for the period May 2008 – December 2018 is approximately 4.9% in nominal terms and 2.67% in real terms. Although the result can be appreciated as good in absolute terms it can be noticed the relevant gap of about 3.16 percentage points in nominal terms and 2.27 in real terms compared to the TWRR for the same period. This is mostly explained by the fact that the returns of the pension funds were much higher at the beginning of the period when the level of contributions was low, the percentage of the salary transferred to the second pension pillar being increased progressively. Also, salaries were lower at that point. Thus, weighting the returns with the inflows of contributions does influence a lot the returns, with this MWRR indicator being much more relevant for the participants as it reflects the true return of their investment. In the period 2008-2012 the returns generated to the participants which entered the system during this time were positive with yearly real rates of returns around or above 2%. However, for participants who joined the system after

2013 the real returns dropped to 1% or below or even turned negative starting with 2015. These results are even a much stronger argument for increased transparency and more detailed reporting by the pension funds administrators. Basically, in this moment the participants have no information regarding this measure of return which is the relevant one for assessing the increase of their assets with the situation being more unfavorable for more recent contributors to the system. The negative real rates of returns are not necessarily a sign of a lack of viability of the system as the economic environment is characterized by exceptional low levels of interest rates and also asset accumulation for pension being a process which has to be assessed over a longer period of time.

6. Conclusions

Assessing accurately and completely the performance of the pension funds is of utmost importance for all stakeholders to this system - participants, pension funds administrators, the Financial Supervisory Authority, the Government. Currently, there is a lack of transparency and an information gap regarding this subject, with the pension funds only reporting the increase in the value of the net asset value per share or the time weighted rate of return. Also, this is reported exclusively for the whole period of existence of Pillar II with no sub-samples used. Albeit this measure of performance is adequate for assessing the performance of pension fund managers it should not be considered as being the same with the rate of return generated for the participants. For the later, this paper showed the merits of the money weighted rate of return which takes into consideration also the flow of contributions. The results show that the nominal rate of return pointed by this indicator is more than 3 percentage points lower than the TWRR while the real rate is about 2 percentage points lower than its TWRR counterpart. Also, by considering sub-samples we showed a pronounced slowdown of the pension funds' rate of return which is not entirely captured by the current reporting. Similar to other countries, Romania could opt for the use of MWRR alongside TWRR for better understanding of the pension funds rates of return, especially considering the increasing share of their total assets in GDP. In addition, determining the indicators by using sub-samples could early signal any change in the performance of the pension funds and could support participants who entered the system more recently to better understand the return on their contributions.

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Does democracy increase total tax revenues? The case of selected OECD countries

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Abstract. *The aim of the study is to analyze the impact of democracy on tax revenues. The relationship between democracy and tax revenue of 28 countries was empirically tested with the help of data from 2002 to 2014. In the study panel unit root, panel causality and panel cointegration tests are used. Findings of the panel in general, the result being that democracy is usually ineffective in increasing tax revenues. However, when the individual effects are taken into consideration, the effect of democracy on tax revenues has concluded that countries have changed to be positive and negative according to democratic development levels.*

Keywords: democracy, tax revenue, panel causality, panel cointegration, OECD countries.

JEL Classification: C33, H20.

1. Introduction

From a financial point of view, the state collects and allocates taxes to fulfill three Musgravian functions in the economy: allocation, distribution and economic stability. In this context, “tax power” is a very important concept in a democracy. Farmer and Lyal, (1994) view taxation power as one of the state's most basic and jealously guarded privileges to ensure the state's incomes and to become an instrument of economic governance (Mutascu, 2011: 343).

In many ways, increasing tax incomes is the most central activity of any government. The discussion on taxation is puzzling in the evolution of states in Europe and North America (Tilly, 1990; Prichard, 2009). However, recent times, discussion about the field of development are in serious relationship with taxation and the performance of the government.

Brennan and Buchanan (2006), in practice, express “tax power is the power to confiscate”. The government may use tax revenues to finance the transfer of public goods or tax revenues of the different transfers requested by the citizens, based on the social contract. In this case, the democratic or autocratic political regime has an important influence on taxation, especially when it is considered as a percentage of the Gross Domestic Product (GDP) of the taxpayer (Mutascu, 2011: 343).

Democracy can be defined in different ways by researchers. In simple terms, according to Vanhanen (2003), democracy refers to free popular elections to fill power positions, while Welzel (2007) defines democracy as constitutional restrictions on the power of the state and popular control over it. On the other hand, autocracy is the opposite of democracy: it defines a system of government in which one has uncontrolled or unlimited authority over others.

Much of the study in the literature is directed at the political effects of democracy. This theoretical base is named as the model of the political effects of democracy (Meltzer and Richard, 1981; Olson, 1993; Repetti, 2001; Acemoglu and Robinson, 2002). In the model of political impacts of democracy, it is expected that the development of democracy and tax revenues will increase and redistribution will be effective (Houle, 2009). In this context, the relationship between democracy and tax focuses on tax revenues and income distribution. Another theoretical background is that developments at the level of democracy are related not only to changes in tax revenue levels but also to where they are spent at the same time (Acemoğlu et al., 2015).

In this background, the contribution of this work is important to show that if economic-political factors are important in tax policies, they can live with increased democracy.

The literature suggests three fundamental findings about the consequences of the link between tax and the intensity of democratization, albeit to a lesser extent: (a) strong democracy specifies a high level of taxation (De Schweinitz, 1964; Cheibub 1998; Boix, 2001); (b) Taxation of strong autocracy is high (Downs, 1960; Olson and McGuire, 1996; Niskanen, 2003; Tonizzo, 2008); And (c) there is no significant relationship between taxation and democracy (Meltzer and Richard, 1981; Profeta et al., 2009; Mutascu, 2011: 343-344).

In this study, in the period 2002-2014, using a panel data analysis approach with 28 countries, econometric findings related to the relationship between tax revenue and democratization are being investigated.

The rest of the article is organized as follows: Chapter 2 presents the theoretical framework, Chapter 3 provides literature review, Chapter 4 provides the methodology and empirical results. The final part consists of the conclusion and discussion.

2. Theoretical framework

Taxation and public spending are both economically and politically important issues. That's why research on the relationship between democracy and taxation has yielded some of the richest theoretical insights within political science.

It is understood that democracy basically means the sovereignty of the people when it first descends to the origin of democracy. However, democracy does not have a single agreed definition and it is not possible to speak of a single type of popular sovereignty (Türedi and Topal, 2015: 3). According to a simple definition, democracy is the choice of what power to use and where to use power (Vanhanen, 2003: 27). According to Dahl, democracy; social strife, participation in the rights and it is a social system that includes at least three dimensions like civil freedoms (Dahl, 2006: 64). For Sorensen, meaningful and extensive competition among individuals and groups (especially parties) for all portions of government power, at regular intervals (Sorensen, 1993). Schumpeter describes democracy as an institutional contract that manifests itself in the political decision-making processes in which the voters are in a competitive struggle with the voter (Schumpeter, 2010: 313). Constitutionally, it is defined as how the state will use its power and how it will control its power (Welzel, 2007: 400). One of the powers that the states hold in their hands is taxation. Farmer and Lyal (1994) consider power to tax as one of the most basic and jealously guarded prerogative of the state, in order to assure the state revenues, and to be an instrument of economic management. Taxation is the transfer of the state to the common use of income that belongs to the private sector of the society for to ensure justice and economic stability in income distribution. So it can be said that taxation is a privileged power of the state itself in order to generate a sufficient amount of income.

Many people dislike paying taxes, and some will cause trouble when governments raise them. But democracy is only one possible outcome of these conflicts (Ross, 2004: 234).

There is a strong correlation between taxation and democratization, as well as researchers who suggest that there is no significant correlation between them. De Schweinitz (1964) supports the idea that the level of taxation and democratization is strongly connected and is in the same direction. Boix (2003) suggests that a significant share of the public sector actually depends on the political (democratic) regime in place, which also interacts with the distribution of income, citizens' preferences and economic conditions.

One of the conditions required for the proper functioning of the democratic regime is the establishment of a regular tax system for the fulfillment of public services.

The expansion of the level of taxation, the absence of corruption, the high quality of bureaucracy and the high level of accountability, contribute to the democracy by increasing the quality of government (Baskaran and Bigsten, 2013: 92-95). At the same time the high quality of government and public services, high representation power and the wide range of freedoms in democracies increase the tax compliance of citizens and increase tax revenues (Feld and Frey, 2002; Torgler, 2007).

If we look at how the transmission mechanism in the relation of democracy and taxation works; the literature focuses on two main directions. One is “taxation leads to democracy” and other is “political structure affects tax structure” (Erdoğan et al., 2018).

The first argument that comes mostly from political scientist and economic sociologist argues that taxation and tax structure may help to develop democratic governance through fiscal bargaining and an established social contract by making rulers more responsive and accountable to citizens as seen from the Western democracies experience. (Erdoğan et al., 2018).

In advanced democracies, governments taxation decisions are a result of the financial bargain they have with their citizens (Brautigam, 2008: 12). Governments are obliged to give more voice to citizens about how taxpayers will gather and where they will be spent, because they finance public services largely through taxation. This obligation contributes to the democratic development of the society by making governments more transparent and accountable to citizens, serving to produce effective public policies and strengthening tax compliance (Prichard et al., 2014: 9).

Montesquieu argues that the rewards of heavy taxes in the moderate states are freedom, while in states with repressive regimes, concessions are made to liberty against lighter taxes (Montesquieu, 1989: 221). A similar conclusion was made by Huntington. According to Huntington, the alternative social cost of taxation at a low level is less representative. In other words, lower taxation means weaker representation (Huntington, 1991: 65).

The relationship between taxation and democracy can also be considered within the framework of political regimes in the context of the concept of representation. Two political regimes that seem to be the opposite can be mentioned. These regimes are democracy and autocracy. The autocracy is the opposite concept of democracy: the government in which one person has uncontrolled or unlimited authority over others (Mutascu, 2011: 343). Democracy is a more appropriate political system for designing a tax system that will lead to tax reforms and increase tax revenues according to autocracies. Because tax payments in autocratic structures are a result of the pressure of political power on citizens, rather than being a consequence of social contracting (Ehrhart, 2012: 553). Therefore, in such an environment more income needed for power conservation can be unilaterally dictated by political will.

According to Acemoğlu and Robinson (2006), while the autocracies are a rich dictatorship, democracies reflect the sovereignty of the poor and middle-income class. Since the rich oppose the redistribution of wealth through taxation, reforms that will increase the tax revenue in autocracies and increase the public sector are not taking place much in the policy agenda.

3. Literature review

The results of the studies in the literature about the relation between the development at the level of democracy and the tax revenue are different when the methods used in these studies are similar. Overall, the results obtained from these studies indicate that the increases in the level of democracy have a positive impact on tax revenues.

Boix (2001) used the panel data method in his study of the relationship between tax revenues, economic growth, international trade and democracy indicators with the help of data from about 140 for the years 1950-1970 and 1970-1990. The results of the study show that the while authoritarian regimes reversed the redistribution of income, democratic regime do so in the opposite way. In addition, the results of the study show that there is a relatively low rate of taxation in democratic regimes.

Gerry and Mickiewicz (2007) used the panel data method in their study of the relationship between income distribution, democracy and tax revenues with the help of 1989-2002 data on transition countries. The study mainly focuses on the income distribution. On the other hand, the conclusion drawn on the relationship between democracy and tax revenues are that the tax revenues are higher in the authoritarian regime of the countries studied.

Mahdavi (2008) examined the effects of many social, political and economic variables on tax revenues in democracy variable with the help of data from 1973-2002 of 43 developing countries. Mahdavi (2008) used an unbalanced panel data method in which various data sets were grouped and analyzed. In the analysis of economic instability, the extent of women's economic activity, and corruption, democracy has reached the conclusion that it does not have an impact on total tax revenues.

Mutascu (2011) examined the relationship between tax and democratization using data from 51 countries for 2002-2008. Panel data method is used in the study. The countries involved in the study were classified according to development, cultural and political regimes and subjected to different groups of analyses. According to the results of the study, strong democracy and strong autocracy have a positive impact on tax revenues. According to the results of the study, in strong democracies, there is a harmony between the citizens and tax according to the social contract principle. On the other hand, in strong autocracies, the citizens are forced to pay more taxes by the state.

Reza and Hilda (2013) tested the relationship between democracy and tax with the aid of data from 21 countries for 2006-2011. There are three different models in the estimates, each of which is an independent democracy. According to the results of the study, in countries with high and moderate democratization levels, tax revenues have a positive impact on the level of democratization. On the other hand, in countries with low democratization levels, tax revenues have a negative effect on democratization level.

Prichard et al. (2014) used the panel data method (OLS) as a method for studying the relationship between democracy and taxation for two different groups of countries in 2006-2011, and they preferred democracy variable as a dependent variable. Findings from the study suggest that there is the non-linear relationship between taxation and democratization level.

Acemoğlu et al. (2015) examined two separate of 184 countries annual data for the years 1960-2010 and five years' data for the same periods. Authors who prefer panel data method in the study preferred the ratio of total tax revenues to GDP as a dependent variable. According to the result of the study, the level of democracy has a positive effect on total tax revenues.

4. Model and data

In this study, Meltzer and Richard (1981) and Acemoğlu et al. (2015) used model to analyze the effects of democracy on tax revenues. The purpose of establishing model is to observe the effect of democratization on tax revenues. Thus, in this study, basic hypotheses explaining the relationship between democratization and total tax revenues are tested.

Furthermore, in this paper, it should be noted that model is tested using econometric methods that do not take into account the cross-sectional dependence (CD). Cross-sectional dependency tests may be used for the same model.

The dependent variable from the variables in the model represents the ratio of total tax revenues to GDP (TR). Accountability (Voice and Accountability) V as a measure of the level of democratization among independent variables. The created index is subject to the values of countries between -2.5 and 2.5. As the value of the countries approaches to -2.5, the level of accountability decreases and on the contrary it increases (WGI, 2016).

The second independent variable included in the model is expressed as press freedom index M , which is considered to be indicative of democratization level. The press freedom index is composed of three subtitles. These subtitles are; legal, political and economic environment (legal environment-political environment-economic environment). Similarly, the score of the index is also divided by the count. In countries where press freedom levels are between 0-30, they are classified as free, between 31-60 part free, and between 61-100 as not free⁽¹⁾ (FH, 2016).

The generated model has been empirically tested with data from 2002-2014 for 28 countries⁽²⁾ that can access the data among the so-called OECD countries.

$$\ln TR_{it} = \alpha_0 - \alpha_1 \ln M_{it} + \alpha_2 \ln V_{it} + \varepsilon_{it} \quad (1)$$

4.1.1. Empirical findings

In this study, panel unit root test, cointegration test, and panel causality tests are applied to test the basic hypothesis. In the method and findings subheading, statistical results and explanations of unit root tests, cointegration analysis and causality analysis are presented.

4.1.2. Panel Unit Root Analysis

In order to test the stationarity of the series used in the analysis, panel unit root tests were applied in the context of methods developed by Levin et al. (2002) (LLC), Im et al. (2003) (IPS) and the results are shown in Table 1. According to the results in Table 1, all of the series are stationary at I (1) level, allowing to move on to co-integration test.

Table 1. Panel Unit Root Tests

	LLC	IPS	ADF
$\ln TR$	-1.35 [0,1280]	0.20 [0,5828]	54.48 [0,6066]
$\ln V$	-3.46 [0,0003]	-2.43 [0,0074]	99.93 [0,0005]
$\ln M$	-10.33 [0,0000]	-4.55 [0,0000]	130.60 [0,0000]
$\Delta \ln TR$	-6.89 [0,0000]	-3.84 [0,0001]	99.72 [0,0005]
$\Delta \ln V$	-23.60 [0,0000]	-1157 [0,0000]	229.85 [0,0000]
$\Delta \ln M$	-7.88 [0,0000]	-5.85 [0,0000]	131.43 [0,0000]

Note: Values in “[]” indicate the probability value.

4.1.3. Panel cointegration analysis

Co-integration tests developed by Pedroni (1999) are used to test the null hypothesis assuming that there is no co-integration in panel work. The results are shown in Table 2. In the co-integration tests, Panel-pp and Group-pp tests in Table 2 show that there is a relationship in the long run between tax revenues and the variables considered as democracy indicators. These results show that democracy indicators and tax revenues act together and there is a long-run relationship between variables in long-term in OECD countries.

Table 2. *Panel Cointegration Test*

Within-dimension test	Constant	Constant and Trend
Panel- V	-0.18 [0.5749]	-2.38 [0.9914]
Panel- ρ	2.00 [0.9774]	4.47 [1.0000]
Panel- pp	0.22 [0.5874]	1.79 [0.9638]
Panel- ADF	-2.63 [0.0042]***	-1.39 [0.0820]*
Between Dimension Test		
Group- ρ	4.10 [1.0000]	5.82 [1.0000]
Group- pp	0.07 [0.5290]	-3.18 [0.0007]***
Group- ADF	-0.90 [0.1832]	-1.42 [0.0767]*

Note: Values in “[]” indicate the probability value. ***, **, * describes the levels of significance respectively 1, 5 and 10 %.

In estimating the coefficients for each country separately, FMOLS (Full Modified Ordinary Least Square) method and DOLS (Dynamic Ordinary Least Square) method by Pedroni (2000 & 2001) is used. In the tests, CCR (Canonical Co-integration Regression) method, which is directly related to the FMOLS estimation procedure in principle, was also used. The main difference of the CCR method from the FMOLS method is that it uses the stationary transformation equation in the CCR method and stochastic shocks (Stock and Watson, 1993). The results obtained for the estimated model are given in appendix-E.

According to co-integration coefficients shown in appendix-E, the dependent variable of $\ln R$ is affected by the increases and decreases in democracy indicators (M and V).

For the estimated model, it is possible to divide the results into three main groups. The first of these; the coefficients of the variables in some of the countries are consistent with the expected effects. On the other hand, in some parts of countries, the coefficients of the variables are inconsistent with the theory. Finally, it is observed that the coefficients of a certain region of countries are statistically insignificant.

To give an example of the results consistent with the theory, for example, when the coefficients of the Australian variables are interpreted; according to FMOLS results, an increase of %1 unit in M (press freedom) causes the increase of %0.28 $\ln R$ (total tax revenue/GDP). According to the DOLS results, a 1 unit decrease in democracy ($\ln V$) leads to a %1.38 unit increase in $\ln R$.

In countries, one of the coefficient sign of two independent variables is consistent with the expected effect, while the coefficient sign of another variable is inconsistent with the theory. For instance, according to DOLS results from Hungary show that while a 1 unit decrease in democracy (M) leads to a 0.52 unit increase in $\ln R$, according to FMOLS/DOLS results, a %1 unit increase in democracy ($\ln V$) leads to a %0.13/1.52 unit decrease in $\ln R$.

Finally, the FMOLS and DOLS results for Denmark, France, Iceland, Luxembourg, Portugal, Turkey and USA are statistically insignificant.

In the estimated panel general results, only the DOLS results of the $\ln M$ and $\ln V$ variables are statistically significant, and it is understood that the DOLS coefficient results of the V variable are consistent with theory. According to the DOLS results for the panel general, an increase of %1 unit in $\ln V$ causes the $\ln R$ to increase by %0.09.

4.1.4. Panel causality test

Whether or not there is a casual relationship between variables included in the model was examined by the panel Granger casualty method by Dumitrescu and Hurlin (2012). This method has some advantages. For instance, in the case of a country that is valid in terms of a country, the causality relation may be more likely to apply to other countries. In this context, the causality test is more effectively tested with more observation by applying this method.

In the Dumitrescu-Hurlin panel Granger causality test, the absence of a homogeneous Granger causality relationship under the basic hypothesis is tested against the alternative hypothesis that at least one horizontal section has this relationship (Gülmez, 2015: 27). Table 4 shows the result of the Dumitrescu-Hurlin panel Granger causality test for the model.

Table 4. Dumitrescu-Hurlin Panel Granger Causality

Z^{HNC} Test St.			
	K=1	K=2	Comment
$\Delta \ln M \rightarrow \Delta \ln R$	1.01 [0.4930]	4.57 [0.4654]	There is no causality from democracy (M) towards tax revenues.
$\Delta \ln R \rightarrow \Delta \ln M$	1.30 [0.9593]	2.30 [0.4654]	There is no causality from tax revenue towards democracy (M)
$\Delta \ln V \rightarrow \Delta \ln R$	1.70 [0.4328]	3.61 [0.8420]	There is no causality from democracy (V) towards tax revenues
$\Delta \ln R \rightarrow \Delta \ln V$	0.99 [0.4696]	3.20 [0.9263]	There is no causality from tax revenue towards democracy (V)
$\Delta \ln V \rightarrow \Delta \ln M$	2.13 [0.0902]***	5.53 [0.1178]	There is a one-way causality from democracy (V) towards democracy (M)
$\Delta \ln M \rightarrow \Delta \ln V$	3.48 [0.5906]	3.54 [0.8826]	There is no causality from democracy (M) towards democracy (V)

Note 1: K shows the lag length, the values in parenthesis show p- probability value and, *** shows levels of significance at 1%.

Note 2: The variables were analyzed as $\Delta \ln TR$, $\Delta \ln M$, $\Delta \ln V$.

The results of the Dumitrescu-Hurlin panel Granger causality test in Table 4 above show that there is a one-way causality relation to the democracy M (press freedom) democracy V (voice and accountability) for countries betting in 2002-2014. On the other hand, in the analysis, we found that neither of the variables considered as a democracy indicator for one and two lag lengths is a Granger reason for tax revenues.

5. Conclusions

It is argued that in the theoretical approaches which indicate that democracy and taxation are in an interaction, the democracies of the countries are more advanced in the taxation structure. The increase in tax revenues makes governments more transparent by making them more accountable and expanding to the field of individual rights and freedoms.

With the advancement of democracy, it ensures tax collection efficiency and is more legitimate. For this purpose, the aim of this study is to investigate the outcome of this relationship in OECD countries which are advanced in terms of democracy.

In this study, which deals with the relationship between democracy and tax revenues, the resulting model was empirically tested with panel unit root, panel causality, and panel cointegration methods. The findings show that some of the countries where the hypothesis that democracy will increase tax revenues are valid and some are invalid. While some of the coefficients of the countries show that there is a positive and meaningful relationship between democracy and tax revenues, on the other hand, the coefficients belonging to some of the countries show that democracy has negative effects on tax revenues.

The empirical findings of the study, although not very clear, provide some clues about the relationship between democracy and tax revenues. That is; the increase in the levels of democracy experienced in some developed countries the elite theory proposed by Acemoglu and Robinson (2006). Increasing democratization levels in some developed countries negatively affect tax revenues. We may think that one of the underlying reasons for this is that the tax policies are also caused by the redistribution and that the elites will lose their income. According to the findings from the empirical part of the study, countries such as Finland, Germany, Ireland, Japan, Norway, Spain, and Sweden are included in this group. In addition, in some countries with high levels of democracy, the increase in democracy levels positively affects tax revenues. These countries include the Netherlands, New Zealand, Poland and United Kingdom. In these countries, income distribution, media freedom, and accountability variables are observed to be relatively more favorable.

The theoretical approach implies that tax revenues will be higher due to the democratic structure that is still developing countries with relatively low levels of democracy. However, we want to draw attention to another point to be noted here. If the countries that are relatively backward in terms of democracy are collecting tax revenues based on their authoritarian directions, the positive developments at the level of democracy in these countries may bring adverse effects on tax revenues. In other words, authoritarian regimes may be collecting tax revenues more easily with different means (less democratic methods). Empirical evidence from the study suggests countries like the Czech Republic, Greece, Hungary, Italy, and Mexico. It should be remembered that the variables we have included in our study as democracy indicators are variables such as voice-accountability and press freedom, and the above-mentioned issues should be addressed in this context.

As a result, the increase in the democracy levels of developing countries may not be explanatory for increasing tax revenues alone. In this context, if the democracy is included in the reform processes with other structural changes (such as income distribution, accountability and transparency) then improvements in democracy levels may have positive effects on tax revenues. On the other hand, if developing countries act only through increases in democratization levels without taking other structural measures, then tax revenues may also decrease.

Finally, in terms of its being guide for the next studies, two suggestions can be presented: Firstly, this study only concentrated on causality relationship between two macro variables.

Besides this, also including some macro variables in the model, the scope of study can be expanded. The part of literature review is a guide for other researcher. Secondly, in the study, only causality (not consider CD) relationship are tested and any cointegration model was not examined. At this point, in the light of findings, a cointegration (Consider CD or no CD) model can be made.

Notes

- (1) The definitions of the variables included in the model, the sources of the variables and the possible effects of the variables in the model are included in the Appendix section.
- (2) Information on countries included in the model is included in Appendix section.

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Appendixes

Appendix A. Selected OECD Countries Include in Analysis

Countries	Id	Countries	Id
Australia	1	Japan	15
Belgium	2	Luxembourg	16
Canada	3	Mexican	17
Chile	4	Netherlands	18
Czech Republic	5	New Zealand	19
Denmark	6	Norway	20
Finland	7	Poland	21
France	8	Portugal	22
Germany	9	Spain	23
Greece	10	Swedish	24
Hungary	11	Swiss	25
Iceland	12	Turkey	26
Ireland	13	Great Britain	27
Italy	14	USA	28

Appendix B. Dependent and Independent Variable Definitions and Source

	Definitions	Sources
R	Tax Revenue/GDP	OECD Data Base-2017
V	Voice and Accountability	The Worldwide Governance Indicators-2016
M	A: Laws and regulations that influence media content B: Political pressures and controls on the media content C: Economic influences over media content A+B+C=Press Freedom	Freedom Of The Press Detailed Data and Sub-Scores (1980-2016) New Format

Appendix C. Summary Statistic

	Obs.	Mean	Std. Dev.	Min.	Max.	Skewness	Jar. Berra	Prob.
ln R	364	3.48	0.25	2.53	3.90	-1.33	201.018	0.0000
ln V	364	0.10	0.69	-3.52	4.53	-1.98	250.170	0.0000
ln M	364	2.86	0.47	2.07	4.12	0.58	104.679	0.0030

Note: [lnV] represents the absolute value of the variable.

Appendix D. Expected effects of variables

Variables	V (+/-)
	M (+/-)

Appendix E. Panel Cointegration estimate results

Countries	Variable	FMOLS		CCR		DOLS	
		Coef.	T. st.	Coef.	T. st.	Coef.	T. st.
Australia	M	-0.28 [0.0306]	-2.56	-0.28 [0.0060]	-3.57	0.41 [0.0686]	9.25
	V	0.23 [0.5791]	0.57	0.23 [0.5843]	0.56	1.38 [0.0369]	17.23
Belgium	M	-0.04 [0.5235]	-0.68	-0.04 [0.4098]	-0.86	-0.69 [0.1837]	-3.36
	V	0.009 [0.0439]	2.34	-0.02 [0.9189]	-0.10	-1.52 [0.2159]	-2.83
Canada	M	-0.21 [0.0112]	-3.17	-0.23 [0.0343]	-2.49	-0.47 [0.7218]	-0.46
	V	0.09 [0.3559]	0.95	0.06 [0.6651]	0.44	-0.56 [0.3641]	-0.76
Chile	M	0.23 [0.1283]	1.67	0.21 [0.0658]	2.09	-2.50 [0.0022]	-287.50
	V	0.43 [0.0862]	1.92	0.48 [0.1805]	1.45	-1.05 [0.0089]	-71.69
Czech Republic	M	0.09 [0.0292]	2.59	0.08 [0.0213]	2.78	-0.07 [0.3018]	-1.94
	V	-0.40 [0.0004]	-5.48	-0.41 [0.0028]	-4.07	-2.01 [0.0394]	-16.12
Denmark	M	0.008 [0.9057]	0.12	0.01 [0.8897]	0.14	0.03 [0.8129]	0.30
	V	0.11 [0.5066]	0.69	0.12 [0.5488]	0.62	0.62 [0.2930]	0.30
Finland	M	0.24 [0.0595]	2.15	0.14 [0.0292]	2.58	0.94 [0.0045]	142.27
	V	0.08 [0.5626]	0.60	0.14 [0.3833]	0.91	-0.78 [0.0111]	-57.14
France	M	0.17 [0.1411]	1.61	0.18 [0.2589]	1.20	-0.27 [0.7045]	-0.50
	V	0.01 [0.9225]	0.10	0.04 [0.8596]	0.18	-0.11 [0.9158]	-0.13
Germany	M	0.47 [0.0084]	3.35	0.46 [0.046]	3.74	0.11 [0.4335]	1.23
	V	-0.15 [0.3710]	-1.05	-0.13 [0.4575]	-0.77	-0.12 [0.2252]	-2.70
Greece	M	0.06 [0.4962]	0.70	0.07 [0.5249]	0.66	0.20 [0.0750]	8.45
	V	-0.24 [0.0117]	-3.14	-0.24 [0.0159]	-2.96	-0.19 [0.0505]	-12.57
Hungary	M	-0.11 [0.1176]	-1.73	-0.11 [0.1164]	-1.73	-0.52 [0.0074]	-86.57
	V	-0.13 [0.0904]	-1.89	-0.13 [0.1607]	-1.52	-0.77 [0.0057]	-112.20
Iceland	M	-0.007 [0.9544]	-0.05	0.01 [0.9202]	0.10	0.12 [0.7816]	0.35
	V	0.73 [0.2492]	1.23	0.96 [0.1930]	1.40	2.18 [0.2847]	2.08
Ireland	M	0.39 [0.3557]	0.97	0.69 [0.2789]	1.51	2.01 [0.0342]	18.60
	V	0.50 [0.0260]	2.66	0.64 [0.0424]	2.36	1.51 [0.0127]	49.92
Italy	M	0.06 [0.6634]	0.44	0.02 [0.8218]	0.23	-2.23 [0.0034]	-187.57
	V	-0.38 [0.0168]	-2.92	-0.42 [0.0254]	-2.67	-0.73 [0.0021]	-304.38
Japan	M	0.56 [0.0000]	10.60	0.56 [0.0000]	10.92	0.60 [0.0260]	24.44
	V	0.03 [0.7325]	0.35	0.03 [0.7029]	0.39	0.28 [0.1329]	4.71

Countries	Variable	FMOLS		CCR		DOLS	
		Coef.	T. st.	Coef.	T. st.	Coef.	T. st.
Luxembourg	M	0.18 [0.1850]	1.43	0.24 [0.1731]	1.47	5.41 [0.1573]	3.96
	V	0.29 [0.2126]	1.34	0.32 [0.1769]	1.46	-3.05 [0.2290]	-2.65
Mexican	M	0.76 [0.0022]	4.22	0.83 [0.0007]	5.01	0.85 [0.0284]	22.36
	V	-0.08 [0.0009]	-4.88	-0.09 [0.0015]	-4.48	-0.14 [0.0078]	-81.53
Netherlands	M	-0.16 [0.0013]	-4.60	-0.19 [0.0063]	-3.54	-1.51 [0.1308]	-4.79
	V	-0.30 [0.0125]	-3.11	-0.38 [0.2332]	-2.72	-0.17 [0.1652]	-3.76
New Zealand	M	-0.17 [0.0202]	-2.81	-0.17 [0.0118]	-3.14	-0.24 [0.5356]	-0.89
	V	0.27 [0.4810]	0.73	0.29 [0.4376]	0.81	0.55 [0.6580]	0.59
Norway	M	0.006 [0.9534]	0.06	0.03 [0.7566]	0.31	-0.26 [0.2262]	-2.69
	V	-0.31 [0.0456]	-2.31	-0.34 [0.0392]	-2.40	-0.11 [0.2843]	-2.08
Poland	M	-0.04 [0.5004]	-0.70	-0.06 [0.2635]	-1.19	0.19 [0.1823]	3.39
	V	-0.24 [0.0091]	-3.30	-0.24 [0.0106]	-3.21	-0.36 [0.1784]	-3.47
Portugal	M	0.40 [0.1263]	1.68	0.51 [0.1619]	1.52	-1.65 [0.7883]	-0.34
	V	0.08 [0.6569]	0.45	0.14 [0.5436]	0.63	-1.39 [0.7724]	-0.37
Spain	M	-0.44 [0.0034]	-3.93	-0.48 [0.0084]	-3.35	-0.81 [0.0134]	-47.57
	V	-0.37 [0.0578]	-2.17	-0.43 [0.0760]	-2.00	-0.95 [0.0352]	-18.08
Swedish	M	-0.19 [0.0004]	-5.43	-0.18 [0.0003]	-5.73	-0.03 [0.4014]	-1.02
	V	-0.37 [0.0043]	-3.94	-0.39 [0.0048]	-3.71	-0.81 [0.0626]	-10.14
Swiss	M	0.03 [0.1463]	1.58	0.03 [0.1784]	1.45	0.10 [0.0570]	11.13
	V	-0.11 [0.2437]	-1.24	-0.12 [0.2551]	-1.21	-0.28 [0.1329]	-4.72
Turkey	M	0.42 [0.1577]	1.54	0.58 [0.1910]	1.41	1.68 [0.3276]	1.76
	V	0.04 [0.1300]	1.66	0.04 [0.3234]	1.04	-0.08 [0.6601]	-0.59
Great Britain	M	-0.02 [0.7368]	-0.34	-0.06 [0.5543]	-0.61	0.38 [0.2303]	2.64
	V	0.03 [0.7614]	0.43	0.04 [0.6411]	0.48	0.77 [0.0633]	10.01
USA	M	-0.08 [0.6196]	-0.51	-0.17 [0.6019]	-0.54	-0.88 [0.1210]	-5.19
	V	-0.12 [0.6220]	-0.51	-0.15 [0.5928]	-0.55	-1.84 [0.1046]	-6.02
Panel Group	M	0.02 [0.3792]	0.88	---	---	-0.10 [0.1181]	-1.57
	V	0.01 [0.3980]	0.84	---	---	0.09 [0.0297]	2.21
R²		0.97		---	---	0.99	

Note 1: The values in “[]” indicate the probability value.

Note 2: The lag length criteria for DOLS panel estimates is set to 1.

An evaluation of the turnover tax system in South Africa

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Abstract. *As part of the South African government's strategy for accelerated growth, the DTI and the National Treasury introduced various support initiatives for the SMME sector. One of these initiatives was in the form of tax relief for qualifying SMMEs. The government of South Africa introduced the turnover tax system to assist SMMEs in reducing their tax compliance costs and administrative burden, anticipating that this will free up SMMEs to grow and further the economy. This study aimed to determine whether the turnover tax relief system is utilised by the SMMEs as anticipated by the South African government. An inductive, exploratory and qualitative research method was used in this study where questionnaires were provided to SMME business owners as an introduction into their perceptions and knowledge of the turnover tax system, followed by interviews to obtain additional qualitative information. The results provide valuable insight about the perceptions of SMME owners regarding the turnover tax system in South Africa.*

Keywords: Turnover Tax, SMMEs, South African Revenue Service, Small Business.

JEL Classification: H20, H21.

Introduction and background

It is internationally acknowledged that small business plays a vital role in enhancing a country's economic growth and creating jobs. It is therefore in the public interest and in the interest of all governments to provide support to small businesses. Governments need to levy taxes to enable them to provide efficient services and infrastructure (Abrie and Doussey, 2006). Bruce et al. (2014) determined that higher tax rates and compliance costs reduce entrepreneurial activity, growth and employment. Krasniqi (2007) found that the growth of small businesses is reduced by the presence of business barriers such as the tax and compliance burden. The South African GEM (2014) report and the WEF 2014/2015 Global Competitiveness Report listed government bureaucracy as one of the major obstacles to entrepreneurial and business activity in South Africa (Seda, 2016). In addition, regulations in respect of taxes are the most burdensome of all the regulations that affect business operations (SBP, 2005). Due to the importance of small business in the South African economy, as mentioned above, it is expected that the tax system in South Africa should strive to assist small businesses to grow (Aucamp, 2010).

Venter and de Clercq (2007) noted that as part of government's strategy for accelerated growth, the DTI and the National Treasury are increasingly targeting the small business sector of the economy. The National Treasury continues to amend tax policy in favour of small businesses (SME South Africa, 2015). One of the government institutions of South Africa, tasked by the Minister of Finance and the National Treasury to assist the government in achieving their nine-point strategy by 2030, is the South African Revenue Service (SARS). (Stols, 2013).

The South African government implemented the nine-point strategy to reduce the high unemployment rate of South Africa by 2030. South Africa is a developing country, and small businesses, therefore, need to be expanded to enhance the country's economic growth and reduce unemployment. Compared to other developing countries, South Africa's unemployment rate is ranked the 12th highest globally (Moya, 2016). The unemployment rate is estimated at 27.5% with 16.4-million employed people compared to 6.2-million unemployed (Speckman, 2018). In an attempt to address unemployment renewed calls were made for specific tax relief measures for small businesses, often described as the "backbone of the nation's economy" (Temkin, 2010).

The topic is considered to be actual because turnover tax has been implemented by the National Treasury to assist survivalist small businesses with their tax compliance and in so doing providing a platform for these enterprises to grow (SAICA, 2009). During the 2018 Taxation update, Professor Matthew Lester from the Davis Tax Committee mentioned that incentives implemented by SARS, such as the turnover tax relief system, is still being maintained (Lester, 2018). It appears that the government deems this relief measure to be important in the current South African economic climate. A number of institutions however noted that the uptake of these tax incentives were not as anticipated by government.

Literature review

The turnover tax relief system was introduced in South African in 2009 to assist small businesses with their compliance costs. It was noted by the South African Institute for Chartered Accountants (SAICA) that turnover tax would provide a substantial benefit to

South African micro enterprises. It was originally anticipated that decreasing the administrative tax burden on these small businesses is encouraging and that this would free small enterprises up to concentrate on generating profit and creating job opportunities (SAICA, 2009).

The Davis Tax Committee evaluated the effectiveness of the turnover tax system in 2014. As at 4 July 2013 there were only 7 827 active micro enterprises registered on the turnover tax system, 139 with addresses unknown, 59 dormant, 74 in estates, 345 inactive and 49 suspended (Davis Tax Committee, 2014). This indication by the Davis Tax Committee is a cause of concern especially when the total number of registered South African SMMEs is taken into consideration.

Another concern with SARS' attempts to assist small businesses was through a study conducted by Venter and de Clercq (2007) who found that small businesses did not optimally utilise incentives provided by the South African government. Many small businesses do not use the support programmes available to them because small business owners were not aware of the existence of these incentives. Abrie and Doussy (2006) also confirmed that small businesses are often unaware of tax incentives available to them. Engelschalk (2005) discovered through his research that despite the often very generous tax incentives offered by simplified regimes, these regimes have not significantly altered the tax behaviour of small businesses. The problem remains that, although the turnover tax system was introduced to assist small businesses with their compliance burden, these enterprises are not necessarily utilising the system as anticipated and is not freed up to focus on growing the economy.

There is currently sufficient literature available regarding the tax relief measures available to South African small businesses (Aucamp, 2010). There is, however, limited research available whether the current tax relief measures are applied by these targeted small businesses. The main objective of this research is to determine whether micro businesses are applying the turnover tax system as the intention of the South African government was. In relation to this objective, the research aims to determine if selected small businesses are aware of the turnover tax system, to determine if small businesses qualify to apply this system and to identify possible reasons why small businesses do not apply the turnover tax system.

There are also a number of small business definitions in South Africa. These enterprises, referred to as SMMEs in this research, include micro enterprises or small survivalist businesses. In South Africa, a large majority of SMMEs are concentrated on the very lowest end, where survivalist firms are found (Berry, 2007). These firms can take the form of street trading enterprises, backyard manufacturing and services, and occasional home-based jobs (Seda, 2016). According to Stols (2013) the turnover tax relief system is a single tax system available to SMMEs that meets the criteria of a micro enterprise in accordance with the Income Tax Act. The sixth schedule of the Income Tax Act defines a micro enterprise as a natural person or a company where the qualifying turnover of that person for the year of assessment does not exceed an amount of ZAR1 million. SMMEs include a very broad range of firms, some of which includes formally registered, informal and non-VAT registered organisations (The DTI, 2008).

SMMEs range from medium-sized enterprises, such as established traditional family businesses employing over 100 people, to informal micro enterprises. The latter includes survivalist, startup, and self-employed businesses from the poorest layers of the

population. Bankseta (2012) estimated that SMMEs represent over 90 percent of private businesses and contribute more than 50 percent of the GDP in South Africa. The number of SMMEs in South Africa is estimated to be 2.2 million of which only 667 433 are registered enterprises (Statistics South Africa, 2015).

Government policy on South African SMME development was initially documented in the 1995 White Paper on SMME development. The Integrated Small Business Development Strategy provided an action plan with a focus on increasing financial and non-financial support, creating a demand for the products and services provided by the SMMEs and reducing regulatory constraints (The DTI, 2008). The SMME sector stimulates economic growth, addresses rising unemployment and their role in innovation is vital for many of the challenges facing South Africa's economy (The DTI, 2005). SMMEs also contribute 56 percent of the current South African employment rate (Goldstuck, 2012) and often referred to as the employment multiplier (Jain and Chen, 2013).

SARS acknowledges this potential and strives to ensure that its policies, procedures and systems do not limit SMMEs but encourage them to grow instead and further contribute to the economy (SARS, 2015). Turnover tax was introduced into the Income Tax Act through the Revenue Law Amendments Act in 2008 which was promulgated on 8 January 2009 (SARS, 2009). Turnover tax is a simplified and optional tax system aimed at assisting SMMEs with an annual qualifying turnover of less than ZAR1 million, making it easier for these enterprises to comply with their tax obligations. It replaces the normal regulations captured in the Income Tax Act (Cotten, 2011). SARS identified the need to introduce tax relief measures for SMMEs and the turnover tax system was identified to free qualifying micro enterprises from the burden of the income tax, capital gains tax and dividend tax regulations and effectively reducing their compliance costs. Turnover tax is available to qualifying micro enterprises which includes sole proprietors, partnerships, close corporations, companies and co-operatives. Specific reasons can disqualify a person from the ability to apply the turnover tax system. These disqualifications are stipulated in the third paragraph of the sixth schedule to the Income Tax Act.

An entity does not qualify as a micro enterprise where that person holds any shares or has any interest in the equity of another company. A person will also not qualify as a micro enterprise if more than 20 percent of that person's total receipts during that year of assessment consisted of income from the rendering of a professional service (if the person is defined as a natural person) or investment income and income from the rendering of a professional service (if the person is defined as a company). A person who is defined as a personal service provider or a labour broker will also be disqualified from the provisions of the turnover tax system. In addition to the ZAR1 million turnover limitation, there is also a limit on the allowable amount of proceeds from the disposal of the person's assets. If these proceeds exceed ZAR1.5 million over a period of three years, that person will not be able to apply the turnover tax system.

The Davis Tax Committee (2014) identified the turnover tax system as an important component of the tax dispensation for SMMEs. The major benefits for micro enterprises under the turnover tax system is a reduced administrative and compliance burden as well as reduced tax rates (SARS, 2015). In addition, the main intention of the turnover tax regime is to make compliance easier (Visser, 2016).

Methodology and data

The research was conducted through sampling qualitative information from participants and the research methodology was based on an inductive and exploratory research approach. The inductive nature of this research study was chosen because there is limited prior research and therefore no predetermined hypothesis.

Qualitative research is a situated activity that locates the observer in the world (Coe, 2011). It consists of a set of interpretive and material practices that make the world visible. These practices turn the world into a series of representations, including interviews, conversations and recordings. At this level, qualitative research involves an interpretive, naturalistic approach. This means that qualitative researchers study things in their natural settings, attempting to interpret phenomena regarding the meanings people bring to them (Creswell, 2007). Qualitative research relies on truth and meaning to obtain value (Brown, 2007). Qualitative researchers tend to collect data in the field at the site where the participants experience the problem being researched and the research is used in exploratory research studies to develop theories (Creswell, 2007). This research is used to gain a better understanding of reasons, opinions and motivations. The research provides insights into the problem and is also used to inspect the deeper underlying reasons of a problem. Labuschagne (2015) noted that the sample size of qualitative research is typically very small. The reason for this is because as the study progresses more data does not necessarily lead to higher quality information which indicated data saturation points. Qualitative methods is primarily exploratory research and it proposes the gathering of sufficient data until patterns begin to emerge and until it reaches the saturation point (Hill and McGowan, 1999).

Tesch (1994) acknowledges 20 different types of qualitative methods which means that the array of methods available in the qualitative paradigm are extensive. The main focus of a qualitative methodology is enhanced understanding, as opposed to limited understanding offered by single reality methodologies, and often include interviews and participant observation (Hill and McGowan, 1999). This research study is exploratory and inductive in nature and the data collection techniques utilised are qualitative due to the manner in which the questions are structured. SMMEs reflect the individual personality and behaviour of its management in terms of the character and culture and they are unique enterprises (Hill and McGowan, 1999). There is therefore the need to research aspects of SMMEs which reflects its individual and unique characteristics and circumstances in addition to taking account of personalities active within it (Hofer and Bygrave, 1992).

A paradigm which represents people's value judgements, norms, standards, frames of reference, perspectives and ideologies is noted to be a qualitative one (Gummesson, 1991). Eisner (1985) also stated that it is important for researchers to recognise the individuality, personality and attributes of the individual involved in the research process. Through the use of tools such as standardised questionnaires, qualitative methods score more highly on validity, in assessing how people really behave and what people actually mean when they describe their experiences, attitudes, and behaviours. In addition, the reasoning implicit in qualitative work is held to be inductive (moving from observation to hypothesis) rather than hypothesis testing or a deductive approach (Pope, 1995).

Both questionnaires and interviews were used to obtain qualitative information regarding the participants' views and knowledge of the turnover tax system. This qualitative information includes, amongst others, the demographics of the participants, whether or not the participants were aware of the turnover tax system before the questionnaires were provided to them as well as their opinions regarding the turnover tax system in their current business environment. A similar research method was used by Beaman (2011) where the researcher conducted a prequalification questionnaire and extended the research through interviews. This method is relevant to this research study because the questionnaires play an introductory role to determine the demographics, knowledge and perceptions of SMME owners participating in the study, and then performing a deeper investigation into their perceptions regarding turnover tax.

The questionnaires were distributed to the participants at their place of business to complete. The interviews were then conducted after the questionnaires were completed to identify further and document the business owners' opinions. As mentioned above, the questionnaires were used as an introduction into the participants' demographics, knowledge and primary opinions. Based on the questionnaires received, all the participants were contacted to perform interviews with. The interviews were performed on the same participants to obtain a more detail picture of the participants' opinions and objections. The purpose of the interviews was to promote the open perception of ideas and potentially reveal more than the most obvious influences of participants not registering for turnover tax.

The participants were interviewed in private sessions to allow the business owner of the SMME to develop confidentially the impact of the turnover tax and the ideas surrounding this topic. Taxation is a sensitive matter for some participants, which further places emphasis on the confidentiality of the interviews conducted. The purpose of the interview sessions was to gather accurate information from the interviewee while maintaining neutrality and objectivity in order not to bias the outcome (Neuman, 2003).

The participants selected for the interviews were all the SMME business owners who participated in the questionnaires. This study made use of researcher notes to analyse and study the responses to open-ended questions from SMME owners participating in individual interview sessions. The design of the questions assured that each interview followed the same general pattern and covered the same general topics. In open-ended interviews, the researcher can identify the core issues and retain the flexibility to allow the participants to fully express ideas on the specific topic under consideration (Cooper and Schindler, 2003). The interviews were initiated by a two-minute discussion on what turnover tax entails and what the government's vision with this regime was. The participants were then asked to provide their opinions and knowledge with regards to the turnover tax system.

The first part of this research study was conducted using a questionnaire. According to Saunders et al. (2009), a questionnaire is a common strategy used in business research. Kapoulas (2003) acknowledges questionnaires to be a qualitative research method addressing attitudes and feelings towards a certain subject. Rowley (2014) acknowledges that the key components of qualitative data analysis include organizing the data set, getting acquainted with the data, classifying, coding and interpreting the data and

presenting the data. The analysis of the data obtained in the questionnaire assessed the application and experiences of SMME owners of the turnover tax system.

The target population for this research was SMME owners in the North West Province of South Africa. The sample size and number of questionnaires that were distributed was determined and influenced by the point of saturation and similar studies conducted. Data saturation is reached when there is enough information to replicate the study when the ability to obtain additional new information has been attained, and when further data gathering is no longer feasible (Fusch and Ness, 2015). Beaman (2011) adopted a qualitative approach in considering the effects of stress on small business leaders. The point of saturation was established after interviewing 11 participants. The research conducted by Bruce (2016) investigated the generation of revenue by SMME. The study utilised both questionnaires and interviews and included 12 participants.

The measuring instrument for this research was a self-administered questionnaire. The first part of the questionnaire comprised of the demographic and characteristic information of the participants. The second part determined whether the participants qualify as a micro enterprise and the third section addressed the participant's knowledge of the turnover tax system. Because the questionnaires only play an introductory role in the study, further insight had to be acquired into SMMEs and their opinions about the turnover tax system. This inductive study, therefore, relied on expansive interviews (Creswell, 2007; Guest et al., 2006; Beaman, 2011). A semi-structured questionnaire was compiled to conduct the interview, but participants were allowed to engage in discussions as this is essential in the interview process (Beaman, 2011). The total number of participants interviewed was 25 SMME owners in South Africa.

The interviews aimed to gain an understanding of the constructs that the interviewee uses as a basis for forming opinions and beliefs about turnover tax, an understanding of the problems associated with the compliance of the taxation laws as well as the confidence of the interviewee, to overcome the reluctance to be truthful about a taxation issues other than through confidentially in a one-to-one situation. The population of the interviews was a sample of the same participants who completed the questionnaires.

The questionnaires acted as a predetermination of the demographics of the participants, their tax registration profile and their knowledge and opinions regarding the turnover tax system. These 25 participants were also interviewed to obtain a deeper understanding of the SMME owners' perceptions regarding this system.

Demographics of participants

The demographics of the participants of this research study are as follows:

Table 1. *Demographics of participants*

Description		Percentage
Number of employees:	1 – 5	35%
	6 – 50	45%
	51 – 100	20%
Legal form of business:	Sole Proprietor	35%
	Close Corporation	5%
	Company	60%

Description		Percentage
Duration operating:	< 2 Years	45%
	2 – 5 Years	15%
	6 – 10 Years	15%
	10 – 20 Years	15%
	> 20 Years	10%
Tax registration:	Income Tax	90%
	Value Added Tax	50%
	Employees Tax	50%
	None of the above	10%
Monthly time spent to comply with tax legislation:	Less than 1 hour	30%
	Between 1 and 5 hours	35%
	Between 6 and 10 hours	30%
	More than 10 hours	5%
Percentage of annual turnover spent to comply with tax legislation:	Less than 1%	20%
	Between 1% and 5%	60%
	More than 5%	20%

Source: Compiled by authors from accumulated data.

The majority of the participants employ less than 50 employees (80% of participants). The majority of the participants conducted business through a legal entity (65%) whilst 35 percent of the participants were sole proprietors. Start-up businesses (with less than two years conducting business) consisted of 45 percent of all participants. Ninety percent of the participants are registered for income tax and 50 percent are registered for VAT and/or employees' taxes.

Results and discussion

The turnover tax system was introduced to assist micro enterprises in complying with tax legislation. The tax compliance requirements in South Africa has been identified as stumbling blocks for SMMs. Tax compliance is the degree to which taxpayers comply with the law and tax rules (James and Alley, 2004). As mentioned earlier, the main intention of the turnover tax system was to reduce the administrative burden of SMMs and therefore reduce compliance with tax legislation (SARS, 2015; Visser, 2016). As illustrated in Table 1, the majority of participants mentioned that they spend between one and ten hours every month and between one and five percent of their annual turnover to comply with tax legislation. The feedback was in line with the estimation of the South African Revenue Service is approximately two percent of turnover for businesses with a turnover of up to ZAR300 000 (SARS, 2012). It was also noted during the interviews that the participants who spent less than one hour a month on tax compliance, either outsourced the function or was not registered with SARS at all. The other participants indicated that they have internal accountants adhering to the compliance of tax legislation. By outsourcing the administrative duties, fewer hours are spent complying with tax legislation, but the compliance costs increase due to accountants' fees.

The results obtained through the questionnaires imply that most of the participants had no prior knowledge regarding the turnover tax system. It was evident that almost all the participants did not having adequate knowledge about the turnover tax system. Two of the participants indicated that they obtained knowledge about the turnover tax system through discussions with their accountants. Although a small number of participants

indicated that they heard of the system, the participants did not know the possible disqualifications, possible benefits, administrative obligations or the turnover tax rates.

The possible disqualifications from the turnover tax system were discussed with the participants during the interviews. The majority of the participants noted that the disqualifications were stringent and in their opinion, this meant that only a handful of entities would be able to qualify for the turnover tax system. Moreover, the owners of the most of the start-up companies included in the survey estimated that their annual turnover would exceed the ZAR1 million limit within the next 2 to 3 years. These owners indicated that they weren't interested in registering with a system for two years, training their staff on how to keep track of everything, only to deregister and continue with an alternative tax system with different requirements. A number of the participants argued that the transfer from one system to the next will also require a more extensive record keeping system and further training on tax legislation and may result in a more expensive exercise.

During the evaluation of the turnover tax system by the Davis Tax Committee one of the questions raised was why an SMMEs (which is ultimately targeted by this system) that was previously paying no tax would suddenly engage with the South African Revenue Service to register and incur compliance costs (Visser, 2016). The majority of the SMME business owners who participated in the study felt that they already invested in accounting systems to accurately capture their income and expenditure. Against the background that the main focus of the turnover tax system is to reduce compliance costs and that minimal record keeping is required, the participants noted that registering with the turnover tax system would not reduce their administrative duties as they need up to date profit and loss figures to make informed decisions.

Certain SMME business owners noted that they were already on a lower taxation system; the reduced tax table for Small Business Enterprises. This system did not only reduce the tax rates of these SMMEs, but it also allows that assessed losses are set off against future profits. Two of the participants claimed that they were not registered for any form of taxation. During the interviews, these business owners noted that they are start-up businesses and admitted that any form of registration with the South African Revenue Service would cost money which the entity does not have. These entities, as well as the loss-making entities would still be liable for tax on their turnover.

Conclusion

This research evaluated the turnover tax system in South Africa. The turnover tax system was implemented as a tax relief measure to assist SMMEs with their administrative burden and compliance costs in order to assist them to grow.

The research conducted and the information obtained firstly suggests that the turnover tax relief measure is not currently achieving the anticipation of government. This is evident through the low participation rate in the turnover tax system discovered by the Davis Tax Committee (2014) as well as the results of this study which indicates a zero participation rate of participants.

Secondly, the research suggests that SMMEs don't have sufficient knowledge which would prompt them to register for the relief system. These SMMEs were not aware of the turnover

tax system and therefore wouldn't apply it. Other reasons for non-application include factors such as start-up businesses and loss-making entities. These SMME owners noted that they were not willing to pay taxes in a loss-making position, which would be the case if they were to pay taxes based on their annual turnover. SMME owners also felt that registering on the turnover tax system won't automatically lead to lower cost of tax compliance. They would still have to maintain a detailed accounting system to determine their cash flows and profit or loss positions. Participating SMME owners indicated that they would have greater preference to relief measures which included reduced tax rates for SMMEs, reduced penalties and interest charges as well as a SARS helpdesk specifically for SMMEs.

Through the research it was further noted that the turnover tax relief measure could be investigated and streamlined to assist SMMEs. Another major concern of the participants is the stringent requirements for an SMME to qualify as a micro enterprise. It is evident that more research and discussions are necessary before the uptake of the turnover tax regime will increase. Discussions between government and SMME business owners are another method to understand the frustrations SMMEs experience on a daily basis. This may help government understand the flaws of the system to streamline the regime and effectively contribute towards the country's growth.

It seems that the turnover tax system of South Africa was implemented to reduce the compliance costs of SMMEs and not necessarily to lower their tax burden. This factor may be indicative towards understanding the low participation rate and the lack of knowledge of SMME business owners when it comes to the turnover tax system. It is therefore evident that government needs to rethink and restructure this relief measure to achieve their set objectives and to effectively assist SMMEs to grow and further the economy and job creation.

Limitation and recommendations for future research

This study was limited to one tax relief measure, namely the turnover tax system. Further investigation could be conducted and a detailed comparison could be made between all of the tax relief measures available to SMMEs. Further research could also be done with other countries' tax relief measures to enable researchers to make recommendations regarding the current tax relief measures to SMMEs in South Africa.

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Sensitivity of bankruptcy prediction models to the change in econometric methods

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Abstract. *Previous studies on bankruptcy prediction focused on identifying significant indicators to predict bankruptcy. Few studies analyzed the impact of the change in space and time but there are limited studies which attempted to investigate the sensitivity of these models to the change in econometric methods. The current study analyses the impact of the change in econometric methods on the predictive performance of Singh and Mishra (2016a) bankruptcy prediction model. A matched pair of 208 companies comprising distressed and non-distressed firms for the period 2006 to 2014 were selected randomly. The study utilises Multivariate Discriminant Analysis (MDA), logit and probit econometric techniques to model bankruptcy. Secondary sample, long range accuracy and Receiver Operating Characteristic (ROC) tests were used for the validation of bankruptcy prediction models. The major findings of the study suggest that accounting information's, namely, leverage, profitability and turnover ratio remained significant indicators to predict bankruptcy for Indian manufacturing firms. The study further concludes, if significant indicators of bankruptcy are identified, then there is no significant impact of the change in econometric methods on the predictive performance of the default prediction models.*

Keywords: bankruptcy prediction, Indian manufacturing companies, logit, probit, MDA.

JEL Classification: G33, G32.

1. Introduction

The change in the attitude towards financial leverage as a means of economic prosperity led to the credit explosion all over the world. Polonius, a character in Shakespeare's 17th century play Hamlet says, "Neither a borrower nor a lender be", but he was voicing perception of his time (Lamb, 2000). In modern times, since Schumpeter (1911), there is a longstanding debate on the role of finance contributing to economic growth. Some believe that finance promotes growth (Goldsmith, 1969; McKinnon, 1973; Shaw, 1973; King and Levine, 1993a, 1993b, 1993 c): few do not find it worth discussing (Lucas, 1988). Others assert that real sector development itself creates demand for financial development (Robinson, 1952; Singh and Mishra, 2014, 2015). In spite of the differences in the views of economists on the finance-growth nexus, all believe finance works as a facilitator in the economic system and reduces transaction and information cost. Earlier, being a borrower or debtor brought misery and shame. Now the perception of people has changed, and the debtor is seen as a person using financial leverage and entitlement. The use of credit has become a major factor in the economic prosperity of countries as well, and there is a significant increase in the leverage by individuals and corporations all over the world.

The Global Financial Crisis of 2008 made credit risk inescapable and Basel III Accord was the unanimous global response to address the problem of credit risk. Since, Beaver (1966) large number of bankruptcy prediction studies were conducted to identify important accounting and market based financial information to assess the credit worthiness of counterparty. Some studies analysed the impact of the change in space and time (Platt and Platt, 1990; Singh and Mishra, 2016a) but there are limited attempted to investigate the sensitivity of these models to the change in econometric methods. The current study analyses the impact of the change in econometric methods on Singh and Mishra (2016a) bankruptcy prediction model for Indian manufacturing firms. In the light of above discussion the major aim of the paper is to identify significant financial variables to predict bankruptcy and examine the sensitivity of bankruptcy prediction models for Indian manufacturing firms to the change in econometric methods. The current study is unique of its kind which exclusively examines the impact of the change in econometric methods on the predictive performance of default prediction model. The major findings of the study suggest that accounting information's, namely, leverage, profitability and turnover ratio and use of more recent financial information remained as important in default prediction. The study further concludes, if important indicators of bankruptcy are identified, then there is no significant impact of the change in econometric methods on the predictive performance of the bankruptcy prediction models.

The reminder of the paper is structured as follows. Section 2 gives an account of the survey of the literature. Data and methodology are covered in section 3. Section 4 give details of Singh and Mishra (2016a) bankruptcy prediction model. Details about the estimation of logit, probit and MDA models are provided in section 5. Empirical results are reported in section 6. The study concludes with section 7.

2. Survey of literature

Use of accounting information's is widely studied in the literature of default prediction. Initial default prediction studies were univariate in nature and single financial ratios were used to assess the financial position of the firms. Use of multiple financial ratios with the help of statistical tools such as Discriminant Analysis, logit, probit etc. revolutionized the literature of bankruptcy prediction. Some of the notable pioneered univariate studies are Smith and Winaker (1935), Chudson (1945) and Beaver (1966). In the past eight decades there is a substantial development in the literature of bankruptcy prediction. Broadly, default prediction models can be classified into two groups, namely, (a) parametric and (b) non-parametric models.

2.1. Parametric models

These models largely use accounting based financial information and sometimes use non-financial information to foretell bankruptcy. Such models can be categorized into accounting and market based models which can be univariate and multivariate in nature.

Beaver (1966) was pioneered to conduct bankruptcy prediction study on US firms with the help of single financial ratios. Later, Altman (1968) conducted a study on US firms using multivariate financial ratios. Altman et al. (1977) again conducted a study on US manufacturing and retail firms, and developed a bankruptcy prediction model with the help of MDA which had effective classifying power till 5 years prior to bankruptcy. Some of the notable bankruptcy prediction studies based on accounting information are Deakin (1972), Blum (1974), Springate (1978) and Fulmer (1984).

Ohlson (1980) introduced a logit model for bankruptcy prediction utilizing financial and non-financial information. Later, Abdullah et al. (2008) used a logit model to foretell the bankruptcy of Malaysian firms. Zmijewski (1984) developed a probit model to predict bankruptcy for US firms. Later, a large number of studies were conducted to examine the effectiveness of different default prediction models in different markets. Pongsatit et al. (2004) examined predictive accuracy of Altman (1968) and Ohlson (1980) model in case of Thailand and a similar study was conducted by Ugurlu and Aksoy (2006) on Turkish firms. In the Indian market, Bandyopadhyay (2006) developed a default prediction model for the Indian corporate bond sector using MDA and logit technique. Ramkrishnan (2005) developed a bankruptcy prediction model with the help of MDA and logit technique for Indian firms. Similarly, Bhunia and Sarkar (2011) developed a bankruptcy prediction model for Indian pharmaceutical companies using MDA technique. Singh and Mishra (2016a) developed a hybrid default prediction model for Indian manufacturing companies.

The second class of parametric models are market-based models which can be further classified into structural and reduced form models. Some of the notable structural models are Merton (1974); Agarwal and Taffler (2008); Wu et al. (2010); Hillegeist et al. (2004) and Bharath and Shumway (2008). However, some of the notably reduced form models are Jarrow and Turnbull (1995), Duffie and Singleton (1999) and Lando (1994). Agrawal and Maheshwari (2018) utilizing industry factor conducted a study to predict default of the Indian corporate sector. In the Indian market, some of the important studies conducted using market-based information are Varma and Raghunathan (2000), Kulkarni et al. (2005) and Singh and Mishra (2016 b).

2.2. Non-parametric models

Most of the non-parametric models are multivariate in nature and heavily dependent on high computing techniques. Some of the widely used non-parametric models are artificial neural networks (ANN), hazard models, fuzzy models, genetic algorithms (GA) and hybrid models. Kirkos (2015) conducted a default prediction study applying an artificial intelligence technique. Messier and Hansen (1988), Raghupathi et al. (1991), Coats and Fant (1993), Guan (1993), Tsukuda and Baba (1994), and Altman, Marco, and Varetto (1994) are some of the notable studies which applied ANN technique to foretell bankruptcy. Varetto (1998) applied GA, one of the prominent non-parametric technique to predict bankruptcy. Premachandra et al. (2009) in their study compared LR and DEA models. Verikas et al. (2010) examined hybrid and ensemble-based soft computing techniques to predict bankruptcy. Korol and Korodi (2011) applied the Fuzzy logic approach to study the bankruptcy of firms. The early warning system was developed by Shetty et al. (2012) for the Indian IT/ITES sector. Further, Kumar and Rao (2015) using Person Type-3 distribution developed non-linear new Z-score model. Hosaka (2019) developed a default prediction model using imaged financial ratios and co-evolutional neural networks.

3. Data and methodology

3.1. Data

The distressed companies are identified using the Board of Industrial and Financial Reconstruction (BIFR) reference from the list of the companies registered sick during the period 2006 to 2014. The same reference was used in the studies of Bandyopadhyay (2006), Ramkrishnan (2005), Kulkarni et al. (2005), Varma and Raghunathan (2000). The matched pair of non-defaulted companies are chosen randomly based on asset size and industry type. During 2006 to 2014 more than 600 companies were registered sick with BIFR. A matched pair of 208 companies encompassing bankrupt and non-bankrupt firms are selected for the study out of which 130 used for estimation and 78 hold-out for model validation. The balance sheet and income statements at the end of every year were used to collect financial information of the companies from their respective websites. Considering sectoral heterogeneities of the companies', estimated and hold-out sample was categorised into 14 industry category matching with National Industrial Classification Code (NIC) 3 digit classification of 2008 (See Table 1).

Table 1. *Distribution of Firms as per NIC Classification 2008*

NIC Code	Sector	Estimation Sample	Hold-out Sample	Total
107	Manufacturer of other food products	14	6	20
131	Spinning, weaving and finishing of textiles	34	16	50
170	Manufacturer of paper and paper products	4	10	14
201	Manufacturer of basic chemicals, fertilizer and nitrogen compounds, plastics, synthetic rubber in the primary form	18	6	24
210	Manufacturer of pharmaceuticals, medicinal chemical and botanical products	6	2	8
221	Manufacturer of rubber products	4	4	8
231	Manufacturer of glass and glass products	4	2	6

NIC Code	Sector	Estimation Sample	Hold-out Sample	Total
239	Manufacturer of non-metallic mineral products n.e.c.	2		2
243	Casting of metals	16	6	22
261	Manufacturer of electronic components	6	16	22
271	Manufacturer of electric motors, generators, transformers and electricity distribution and control apparatus	4		4
291	Manufacturer of motor vehicles	8	6	14
310	Manufacturer of furniture	4		4
492	Other land transport	6	4	10
	Total	130	78	208

Source: Singh and Mishra (2016a).

3.2. Methodology

The study utilizes MDA, logit and probit econometric techniques to model bankruptcy.

3.2.1. Multivariate Discriminant Analysis (MDA)

The vital assumption of MDA technique is that variance-covariance matrices of the two groups are statistically identical. The weights of the discriminant function are the difference of the mean vectors of the explanatory variables for the defaulted and non-defaulted groups. There are twofold objectives of the MDA technique: The first to look for predictors (financial ratios) that lead to lower misclassification rates within the sample and to get improved predictive accuracy in an un-estimated hold-out sample.

The discriminant analysis model involves linear combinations of the following form:

$$Z = \sum_{i=0}^k a_i x_i \quad (1)$$

Where,

Z= overall index (discriminate function)

a_0 = a constant

a_i 's= the discriminate coefficients or the weight of that dependent variable

x_i 's = the set of independently normally distributed random variables.

i = 1 to k

The weights can be defined as:

$$a = (\mu^1 - \mu^2) \Sigma^{-1} \quad (2)$$

Where μ^1 and μ^2 are the mean vectors of the explanatory variables of the two groups, in the current context distressed and non-distressed. Σ Signifies variance-covariance matrix of the two group which is assumed to be equal. More formally:

$$x^1 \sim N(\mu_1, \Sigma)$$

$$x^2 \sim N(\mu_2, \Sigma)$$

Meaning that x is a k*1 multivariate normally distributed random variables with parameter μ_1 and Σ for group one and parameter μ_2 and Σ for group two.

3.2.2. Probability models

If the dependent variable is binary and it is a function of a set of independent variables, the Linear Probability Model (LPM) can be written as:

$$P_i = E(Y = 1|X_i) = \beta_1 + \beta_2 X_i \quad (3)$$

Where, P_i represents probability, X_i represents various financial ratios of the firms and Y is the dependent variable. When $Y=1$ then the firm is bankrupt and $Y=0$ means non-bankrupt firms, β_1 and β_2 are the slope coefficients.

The inherent defects of LPM led to the development of logit and probit models. In equation (3) the probability of LPM can exceed the limit of 0 and 1. The best way to solve this problem is to transform X_i 's and β 's in a way with probability density function F that probability value should be in a limit between 0 and 1. Mathematically,

$$\text{prob}(y_i) = F(X_i\beta) \quad (4)$$

Where, F is the cumulative density function.

Logit

Choice of F as a logistic distribution yields one of the ways to limit $\text{prob}(y_i)$ between 0 and 1. When logistic distribution is used in the place of cumulative density function to restrict the probabilistic value of response variable, it can be said logit model.

$$\text{prob}(y_i = 1) = \Lambda(X_i\beta) = \frac{\exp X_i\beta}{1 + \exp X_i\beta} \quad (5)$$

In the context of bankruptcy prediction study, the logit model is used to classify whether a company is bankrupt or non-bankrupt by using accounting and non-accounting financial information's.

Probit

In equation (4), if cumulative normal distribution is used to limit the probabilistic value of the response variable in the range of 0 and 1, it can be said probit model.

$$\text{prob}(y_i) = \phi(X_i\beta) = \int_{-x}^{X_i\beta} \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{z^2}{2}\right) dz \quad (6)$$

The standard normal transformation $\phi(\cdot)$ limit the probability to lie between 0 and 1.
or,

$$\lim_{z \rightarrow +\infty} \phi(z) = 1 \quad \text{and} \quad \lim_{z \rightarrow -\infty} \phi(z) = 0$$

4. New Bankruptcy Prediction Model for Indian Manufacturing Companies

Singh and Mishra (2016a) developed a four-step bankruptcy prediction model for Indian manufacturing companies. The study was conducted on the matched sample of 208 companies out of which 130 were included in the estimation sample and 78 were hold-out for the accuracy test.

In the first step 25 financial ratios were chosen based upon the past empirical literature. Subsequently, mean, standard deviation and their respective p-values were checked to test equality in means of between two groups. In the second step forward selection and backward elimination technique were applied with the combinations of statistically significant financial ratios which had a difference in mean between the two groups. Further, in the next step, sectoral heterogeneities of the companies' were considered and the data set has been categorised into 14 industry category matching with National Industrial Classification Code (NIC) 3 digit classification of 2008. For every industry 14 industrial dummies were included but none of them was found to be significant. The final profiles of financial ratios were chosen based upon the sign, statistical significance and classification power. The final profile of financial variables selected for the model are:

BVEBVD (Book Value of Equity/Book value of Total Liabilities): This financial ratio measures leverage of the companies.

SLTA (Sales/Total Assets): This indicator measures effectiveness and efficiency of the firm's assets to generate profit and widely used turnover ratio in the literature of default prediction.

NITA (Net Income/Total Assets): It is the financial indicator to measure the performance of the firm.

NITL (Net Income/Total Liabilities): This financial indicator measures return on an asset which is also the measure of companies' profitability and performance.

5. Estimation of logit, probit and MDA Models

This section covers estimation of bankruptcy prediction models under different econometric methods such as Singh and Mishra (2016a) logit model for Indian manufacturing firms, probit and MDA using the same final profile of financial ratios. The results of Singh and Mishra (2016a) logit model is reported in the second column of Table 2. Further, the results of probit and MDA models are also reported in the third and fourth column of Table 2 respectively. The results show the coefficients of all the variables under different econometric methods are statistically significant at 1, 5 and 10 per cent level of significance respectively.

Table 2. Results of logit, probit and MDA models

Statistic	Logit	Probit	MDA
BVEBVD	-13.859***	-7.364***	-13.859***
SLTA	-1.113*	-0.652*	-1.113***
NITA	-18.759**	-10.134**	-18.760***
NITL	-34.354**	-19.273**	-34.354**
Constant	-0.449	-0.215	-0.604
Wilks' lambda for the discriminant function			0.37
Chi-square test			125.435
LR	164.955	164.892	
P-value	0.00	0.00	0.00

Note: ***, ** and * represents the level of significance at 1 per cent, 5 per cent and 10 per cent respectively.

Source: Author's compilation.

The LR ratio tests for logit and probit shows the overall significance of the models. In the case of logit and probit model the LR ratio is found to be 164.955 and 164.892 respectively at 1 per cent level of significance. Hence, the empirical results show a change in econometric methods have no significant effect on the sign and level of significance of the coefficients of financial ratios.

In the next step, the total error minimization principle is adopted to determine cut-off values of logit, probit and MDA models. Table 3 reports cut-off values for logit, probit and MDA models which are taken as 0.6, 0.7 and 0.6 respectively.

Table 3. *Identification of Cut-off Value of different models*

Cut-off value	Overall correct prediction	Type I Error	Type II Error
Logit Model			
0.7	98.462	3.080	0.000
0.6	98.460	1.540	1.540
0.5	97.690	1.540	1.540
0.4	97.690	1.540	3.080
Probit Model			
0.7	98.461	3.077	0.000
0.6	97.692	1.538	3.077
0.5	97.692	1.538	3.077
0.4	96.923	1.538	4.615
MDA Model			
0.7	85.384	27.692	1.538
0.6	98.461	1.538	1.538
0.5	96.923	1.538	4.615
0.4	90.769	1.538	16.923

Source: Author's compilation.

6. Results and discussion

This section covers the sensitivity of bankruptcy prediction models on their predictive accuracies to the change in econometric methods. Predictive accuracy of all the three models is tested using diagnostics tests such as secondary sample, long-range accuracy and ROC tests.

6.1. Predictive accuracy

Predictive accuracies of logit, probit and MDA models are reported in Table 4. For all the three models the overall predictive accuracy is found to be 98.461 per cent. Singh and Mishra (2016a) logit model with 98.461 per cent of overall correct prediction successfully classifies 96.923 per cent of distressed and 100 per cent of non-distressed firms respectively. Again with 98.461 per cent of overall correct prediction of the probit model it correctly classifies 96.923 per cent of distressed and 100 per cent of non-distressed firms respectively. In case of the MDA model with 98.461 per cent of overall correct prediction the model correctly classifies 98.461 per cent of distressed and non-distressed firms.

Table 4. *Comparison of Predictive Accuracy of the Models*

Models	Estimation Sample			Hold-out Sample		
	Overall	Distressed	Non-Distressed	Overall	Distressed	Non-Distressed
Logit	98.461	96.923	100	89.743	82.051	97.435
Probit	98.461	96.923	100	89.743	82.051	97.435
MDA	98.461	98.461	98.461	89.743	82.051	97.435

Source: Author's compilation

The results reported in Table 4 shows that there is no significant impact on the overall predictive accuracies and classification rate of different models towards change in econometric methods. Hence, change in econometric methods has neither significant impact on sign and significance of coefficients nor on the predictive performance of the models.

6.2. Diagnostics checks

This section deals with diagnostics tests such as secondary sample, long-range accuracy and ROC test on logit, probit and MDA models.

The results in Table 4 also reports the predictive performance of logit, probit and MDA models on the secondary sample. The overall predictive accuracy of logit, probit and MDA model on the hold-out sample is found to be 89.743 per cent. Further, all the models correctly classify 82.051 and 97.435 per cent of distressed and non-distressed firms respectively. The predictive performance of logit, probit and MDA models on the hold-out sample is found to be the same. Hence, all the models have good secondary sample results and there is no impact of the change in econometric methods on the predictive performance of the models

Table 5 reports long-range accuracy results of logit, probit and MDA models on estimation and secondary sample. The overall predictive accuracy of logit model on the estimation sample is 98.461 and 83.076 per cent for one year and two years prior to bankruptcy respectively. On the hold-out sample, it is found to be 88.461 and 70.512 per cent for one year and two years prior to default respectively. In the case of probit model the overall predictive accuracy on the estimation sample is 98.461 and 83.846 per cent for one year and two years before bankruptcy. On the hold-out sample, it is found to be 89.743 and 64.102 per cent for one year and two years prior to bankruptcy respectively. Finally, in the case of the MDA model the overall predictive accuracy on the estimation sample is 98.153 and 76.153 per cent for one year and two years prior to default. The overall predictive accuracy on the hold-out sample is found to be 89.743 and 64.102 per cent for one year and two years before bankruptcy respectively.

Table 5. *Comparison of long range accuracy of the models*

Years before distress	Logit					
	Estimation Sample			Hold-out Sample		
	Overall	Distressed	Non-Distressed	Overall	Distressed	Non-Distressed
1	98.461	96.923	100	88.461	82.051	94.871
2	83.076	67.692	98.461	70.512	48.717	92.307
	Probit					
	Estimation Sample			Hold-out Sample		
	Overall	Distressed	Non-Distressed	Overall	Distressed	Non-Distressed
1	98.461	96.923	100	89.743	82.051	97.435
2	83.846	67.692	100	64.102	38.461	89.743
	MDA					
	Estimation Sample			Hold-out Sample		
	Overall	Distressed	Non-Distressed	Overall	Distressed	Non-Distressed
1	98.461	98.461	98.461	89.743	82.051	97.435
2	76.153	53.846	98.461	64.102	38.461	89.743

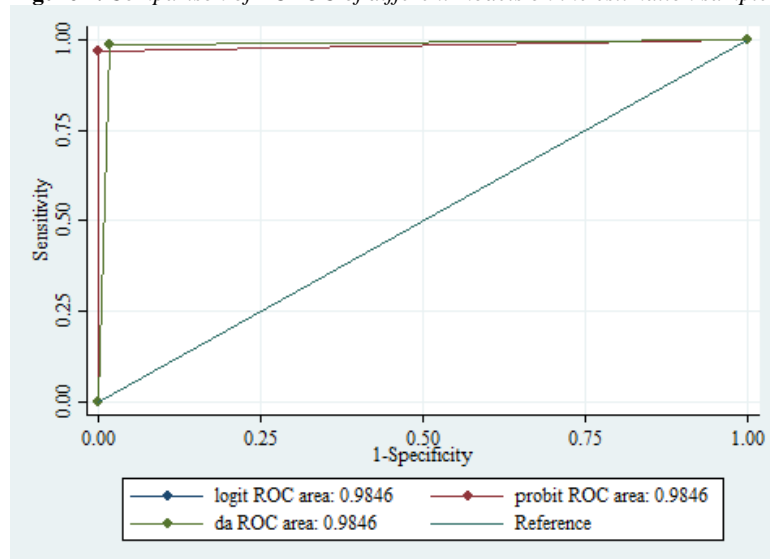
Source: Author's compilation.

The long range accuracy results are fairly good and satisfactory for logit, probit and MDA models. The predictive accuracy of all the models decreases on estimation and hold-out sample as we go more backward from the year of bankruptcy. Hence, the change in econometric methods has no significant impact on predictive accuracy and most recent information remained more helpful to predict bankruptcy with higher accuracy.

The Receiver Operating Characteristic (ROC) is a widely used performance test for a binary classifier. In a single number the Area under Receiver Operating Curve (AUROC) summarizes the performance of binary classifier model. The accurateness of the test depends on how accurately the model classifies between the two groups, namely, bankrupt and non-bankrupt. ROC with AUROC 1 for any model signifies a perfect model whereas AUROC with 0.5 signifies worthless model. Contrary to the misclassification matrix the ROC envisages all possible thresholds. In the test sensitivity is the proportion of the firm which is correctly identified whereas the specificity is the proportion of the firm having negative test results. The ROC curve represents a graph between specificity and 1-sensitivity. Hence, an excellent test has a good balance between sensitivity and specificity.

Figure 1 shows AUROC for logit, probit and MDA models on the estimation sample for one year prior to distress. The result shows the AUROC is 0.984 which is same for all the models. Hence, the test results for all the models on estimation sample one year prior to distress is perfect which accurately classifies between bankrupt and non-bankrupt firms.

Figure 1. Comparison of AUROC of different models on the estimation sample for one year prior to distress

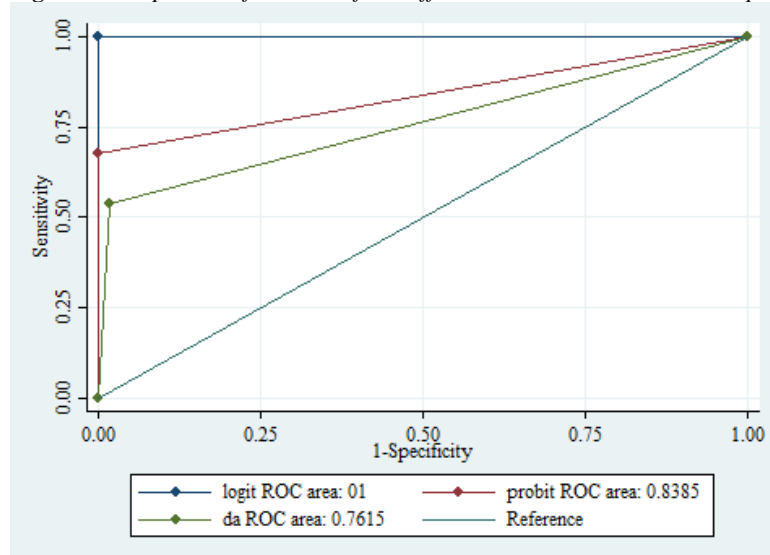


Source: Author's estimation.

Figure 2 reports AUROC for logit, probit and MDA models on the hold-out sample for one year before bankruptcy. The result shows the AUROC for logit, probit and MDA models are 1, 0.838 and 0.761 respectively. Hence, the test results for logit and probit

models are perfect and good for MDA model for one year before bankruptcy which accurately classifies bankrupt and non-bankrupt firms.

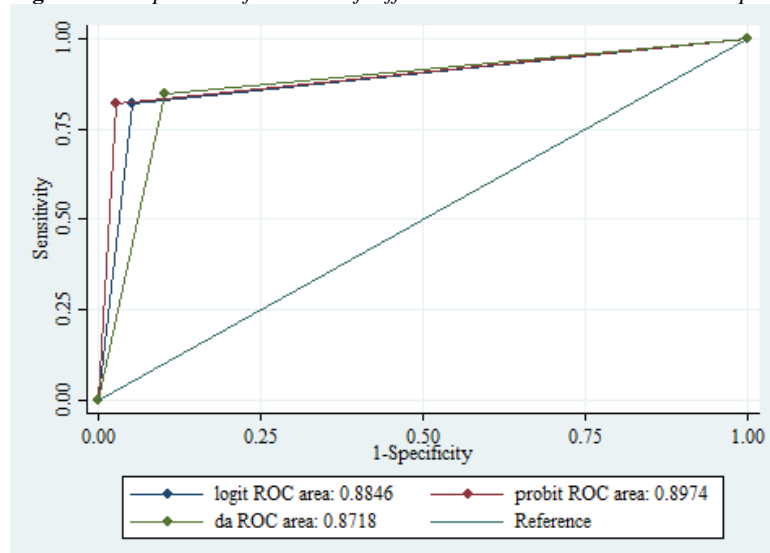
Figure 2. Comparison of AUROC of the different model on the hold-out sample for one year prior to distress



Source: Author's estimation.

Figure 3 reports AUROC for logit, probit and MDA models on the estimation sample for two years prior to default. AUROC for logit, probit and MDA model are found to be 0.884, 0.871 and 0.897 respectively. The test results for all the models are found to be perfect.

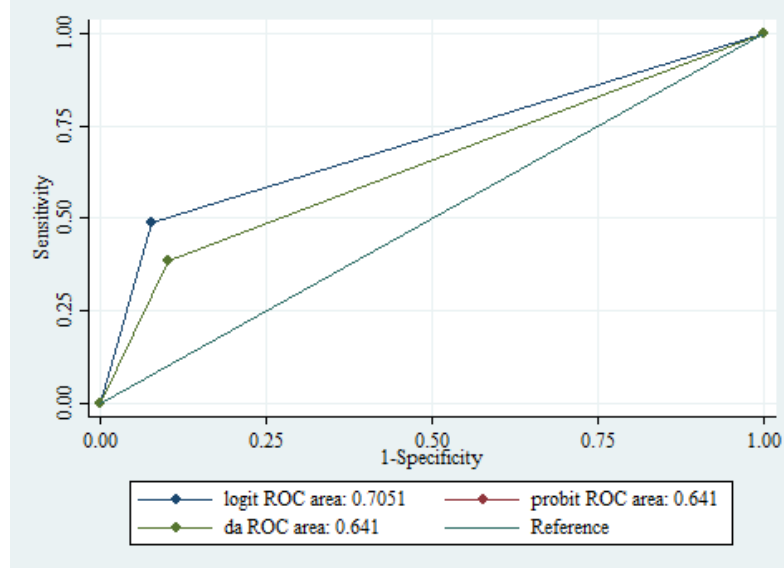
Figure 3. Comparison of AUROC of different models on the estimation sample for two years prior to distress



Source: Author's estimation.

Figure 4 reports AUROC for logit, probit and MDA models on the hold-out sample for two years prior to distress. AUROC for logit, probit and MDA model are 0.705, 0.641 and 0.641 respectively. The test results for all the models are found to be fairly good on the hold-out sample for two years prior to distress.

Figure 4. Comparison of AUROC of the different model on the hold-out sample for two years prior to distress



Source: Author's estimation.

The results of all the diagnostics tests on the predictive performance of binary classifier models confirms all the models are perfect and there is no significant difference in predictive performance of the models. Hence, the study empirically confirms in the Indian setting that there is no significant impact of the change in econometric methods on the predictive performance of the model if significant financial ratios are identified accurately.

7. Conclusion

The paper empirically investigated the impact of the change in econometric methods on the new bankruptcy prediction model for Indian manufacturing firms proposed by Singh and Mishra (2016a). The new bankruptcy prediction model utilized logit technique to model bankruptcy. In the current study probit and MDA econometric techniques were used to re-estimate the Singh and Mishra (2016a) model utilizing the same data set and financial ratios. The probit and MDA techniques are theoretically different from each other. The probit technique is similar to logit because both the econometric techniques are based on cumulative density function whereas MDA is based on discriminant function and widely used in the bankruptcy prediction literature.

The coefficient of probit and MDA models are found to be statistically significant. The predictive accuracy of logit, probit and MDA models on estimation sample is found to be

same i.e. 98.461 per cent whereas predictive accuracy on the hold-out sample is 89.743 per cent which is also same for all the models. The results of all the diagnostics tests on the predictive performance of binary classifier models confirms all the models are perfect and there is no significant difference in predictive performance of the models. The major findings of the study suggest that accounting information's, namely, leverage, profitability and turnover ratio remained as significant indicators to predict bankruptcy for Indian manufacturing firms. The study further concludes, if significant indicators of bankruptcy are identified, then there is no major impact of the change in econometric methods on the performance of the bankruptcy prediction models. Further, the study provides empirical support for the proposition that the predictive accuracy of the bankruptcy prediction model is not sensitive towards change in econometric methods if significant financial variables are identified accurately. Hence, the results give empirical validation to the proposition that the selection of correct financial ratios and the use of more recent financial information are vital in the bankruptcy prediction. The major limitation of the study is that it can be applied to only manufacturing firms and larger data set can be applied to validate the results.

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Risk management associated with the interbank relationships

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Abstract. *The possibility of systemic crises that could affect most financial markets is at the heart of the researchers concerns and specialists around the world. Thus, regardless of the origin of a financial crisis, it is the responsibility of the regulatory authorities to realize the isolation of the crisis, so that it does not spread to the other banks through the credit channel. The contagion from one bank to another is due to a network of financial contracts which come from three sources: the interbank market, the payment systems and the derivatives market.*

Keywords: risk management, interbank market, financial crisis, derivative financial instruments, payment systems.

JEL Classification: G21, G32.

Introduction

The increasing of non-performing loans in a bank's total investments will lead to an increase of losses, which means that there will be a low level of interest and commission income, thus negatively impacting the volume of profit. At the same time, a bank may decide to develop a development strategy based on the risk minimization goal, assuming a lower but secure profit. In such a situation, the bank will pursue the pursuit of non-dilutive placements in high security directions such as investments in government securities or interbank placements. In this way, the bank will limit the credit access by making more drastic interest rates on the subject of credit, the quality of collateral and of the loan itself. At the same time, the bank will stimulate the growth of time deposits (more expensive but less volatile), thus strengthening its liquidities.

Analysis

The interbank market is a significant element of term structures due to the fact that the shortest terms, overnight rates, are determined on this market and therefore has a strong influence on long-term maturity rates. Also, the interbank market is different from other market segments due to very close relations between participants, specific liquidity identification policies and distinct structures.

According to (Iori et al., 2007), they appreciate that interbank markets are central points of complex institutional networks that connect all financial organizations in the banking system and also in the literature there is a wide range of studies that investigate how movements borrowing costs can relate to specific bank informations, such as its size.

Thus, the level of interest rates on the federal funds market is more in the favor of large banks than small banks as evidenced by (Allen and Saunders, 1986). In addition, while larger banks buy and sell federal funds directly on a primary market, many smaller banks lend indirectly only through a correspondent of these large banks. As a result, smaller banks generally pay higher federal funding rates or are completely blocked from the market. Due to features such as size and location, smaller banks are constrained in their ability to borrow federal funds, and some evidence according to (Nobili and Picillo, 2011) shows that better capitalized lenders benefited from lower rates, but the effect was not a solid one.

Instead, there are solid evidence that more liquid lenders have benefited from higher rates, in line with recent theories of uncompetitive and predominant behavior on the interbank market, but in our studies (Gabrieli, 2011 a, b) we can see that the Italian market in the period immediately following the bankruptcy of Lehman Brothers, happens the opposite, and the foreign banks in Italy are borrowing at higher rates than the Italian ones. This is because reputation has become significantly more important in order to obtain more advantageous rates, and medium / small banks and even very small banks also lend themselves to relatively higher rates, depending on the importance of the banks to which they are connected. We consider this to be the fact that a predominant position in the banking network after the collapse of Lehman Brothers seems to lead to a "punishment" on

borrowing costs - which is proof of the market discipline imposed by peer-review to any bank regardless of its size.

Since 2001, large banks have a tendency to have a large number of partner banks, as we can also see from (Furfine, 2001a, 2001b) because they do not face an asymmetric market information issue, and their needs funding exceeds what a limited number of banks can offer. We also found that banking relationships have significant effects on borrowing costs as well, and the interest rate charged for federal funds transactions largely reflects the credit risk of the borrowed institution. Thus, banks that have loans, but higher returns, higher capital rates and fewer problematic loans are rewarded with lower interest rates on federal funds.

However, the higher number of partner banks in the interbank market also translates into a greater dependence on each of them, as can be noted in the study by (Liedorp et al., 2010) on bank relations on the interbank market, in which data has been used for a period of 10 years between 1998-2008, illustrating that intensive connectivity across interbank markets can facilitate the spread of problems within individual banks within the interbank system. Thus, banks' risk increases as interbank exposure increases. Also, as a result of this analysis, banks are likely to reduce their risk through loans from stable partners, and the fact that the potential shocks of stability observed on interbank counterparties spread through the interbank market was made more specifically through the debt and liabilities of the affected bank balance sheet to the other banks.

However, in the case of small banks acting as borrowers, as a result of the research carried out by (Cocco et al., 2003) on the Portuguese interbank market between 1997 and 2001, a particular feature is that they are more prone to rely on loan relationships than larger banks. Therefore, smaller banks are trying to avoid the disadvantage of monitoring by their larger peer bank. We have also found that banks tend to lend to banks with which they have a close relationship when they face a greater imbalance in their reserve account. Also, when market liquidity was low, fund borrowers often relied on loans from banks with which they had a close relationship.

In this way, these relationships allow banks to secure themselves against the risk of financial collapse. This result is important because it suggests that the fragmented nature of the market allows banks to establish relationships, promote financial stability, but with very different results than those that could appear on a centralized market that was not affected by shocks.

According to (Filipović and Trolle, 2012), interbank risk is defined as the risk of direct or indirect losses from interbank money market borrowings. In my opinion, interbank risk is the risk assumed by a bank when another bank that has given it a credit goes bankrupt and can not refund the loan.

The 2007-2008 financial crisis has highlighted the importance of interbank markets for the distribution of liquidity among banks and for lending to non-bank financial institutions. Following the failure of Lehman Brothers, the interest rates between unsecured and secured interbank loans became large and volatile, as evidenced by the (Afonso et al., 2011) and (Cassola et al., 2010). Thus, central banks reacted with a combination of key policy interest

rate cuts, quantitative easing, and adjustments of liquidity management personnel. Because quantitative easing has caused interest rates on the market significantly lower than target rates and some central banks such as the US Federal Reserve and the Bank of Japan have begun to pay interest on bank reserves to maintain market rates close to the target rate and to promote efficiency and stability in the banking sector. However, in the days immediately following the bankruptcy of Lehman Brothers, the market became more sensitive to the characteristics of banks, especially to the amounts borrowed by lenders, but also to the cost of overnight funds. As a result, large banks, with high percentages of bad loans, recorded drastic reductions in daily loan amounts and borrowed from several counterparties in the days after Lehman Brothers bankruptcy.

However, since September 16, 2008, with the announcement of the AIG rescue plan, the trend has reversed, and the spreads for the largest banks have been drastically reduced. We interpret the return to pre-crisis spreads as an effect of government support for systemic banks, but this does not apply to small banks that have continued to face larger spreads. This reversal supports the idea that counterparty risk concerns have been the focus of the federal funds market as rates have returned to normal levels as soon as government interventions have reduced fears about counterparty risk.

In spite of these political interventions, the ability of interbank markets to reallocate liquidity in the banking sector remained undervalued and interest rates persisted as we can deduce from the research conducted by (Angelini et al., 2010) and (Taylor and Williams, 2009). But besides these, an essential role is played by the liquidity contagion (contagion through lack of liquidity) between the top financial banking institutions caused by the 2007-2008 credit crisis, highlighting the importance of identifying causality, equilibrium relations, and structural breaks on the short-term interbank market. If interest rates and spreads are moving independently in the long run, they are said to follow a random move, and rates and spreads are unpredictable. However, if rates and spreads are interconnected and move in a synchronized way, we obtain essential information on the spread of liquidity shocks on the interbank market. In addition, by thoroughly analyzing the interaction of money market spreads before and during a financial crisis, we can understand how structural fractures affect equilibrium relations and what are the implications for the smooth functioning of the interbank market in terms of preventing liquidity crises and their forecast.

The interbank contagion is the result of two risks: firstly, the risk that at least one component of the system is hit by a shock (the probability of a shock) and, on the other hand, the risk of spreading this shock through the system (the potential impact of shock, and in some circumstances, according to the literature, the bankruptcy of a single bank can lead to a domino effect in the entire banking system. This happens when the failure of interbank obligations by the bankrupt bank threatens the ability of its creditor banks to meet their obligations to their interbank creditors. Under these conditions, contagion occurs mechanically through direct interconnections between banks.

But besides direct contagion, according to his analysis (Bandt and Hartmann, 2000), we also find indirect contagion. Direct contagion comes from direct financial links between banks, such as credit risk exposures. In turn, indirect contagion is the result of expectations

of a bank's health and rapid recovery capacity after the difficulties of the entire sector. Instead, banks' exposure to similar events (such as asset price fluctuations) can by definition not lead to direct contamination. Obviously, although these two channels of contagion can work separately, direct contagion and indirect contagion are not mutually exclusive and can even reinforce each other. For example, a bank failure can lead to further bank failures through direct links and may even lead to other bankruptcies, even if depositors only require the existence of links between banks.

The theory shows that the extent to which a crisis in the banking system spreads is closely linked to the structure of interbank connections, but according to (Allen, Gale, 2000) the structure of the interbank market presents three types of interbank structures:

- the structure of the full interbank market - the one in which banks are symmetrically connected to all other banks;
- the structure of the incomplete interbank market - where banks are only connected to neighboring banks;
- the structure of the incomplete interbank market disconnected - two disconnected markets co-exist.

According to this study, the full structures of the interbank market are less susceptible to contagion than the incomplete structures of the same markets, because within the full structure of the interbank market, the impact of a financial crisis in a single bank is absorbed by a larger number of banks.

Small shocks, which initially affect only a few institutions or a particular region of the economy, spread through contagion to the rest of the financial sector and then infect the entire economy as a whole. When a region suffers a banking crisis, the other regions suffer a loss because their claims on the affected region are falling (devalues). If this spreading effect is strong enough, it can cause a crisis in the adjacent regions. In extreme cases, the crisis shifts from one region to another and becomes a contagion. Incomplete information may create another channel for contagion. If a region's shock serves as a signal predicting a shock in another region, then a crisis in a region can create a self-fulfilling crisis in another region.

(Freixas et al., 2000) introduced the fourth structure called the "central bank" (the central bank) - which is symmetrically connected to all other banks and the other banks are not connected to each other. This explains that in some situations the bankruptcy of a bank connected to the money center will not trigger the bankruptcy of the money center, but the bankruptcy of the money center itself may trigger the bankruptcy of interconnected banks.

Under normal circumstances, a system of interbank credit lines reduces the cost of holding liquid assets. However, the combination of interbank credit and the payment system make the banking system prone to speculative actions, even if all banks are solid. If depositors from a home bank wish to move to other banks for deposits, considering that there will be insufficient resources for their consumption at that bank, the best answer is to withdraw deposits from the home bank. But this triggers the early liquidation of deposits from the home bank, which will make other depositors of the same bank do the same.

The structure of financial flows affects the stability of the banking system in terms of solvency shocks. On the one hand, interbank connections increase the system's "resilience" to resist the insolvency of a particular bank, as some of the bank's portfolio losses are transferred to other banks through interbank agreements. On the other hand, this cross-passive network may allow an insolvent bank to continue to operate through the implicit subsidy generated by interbank credit lines, weakening the incentives to close down inefficient banks.

In the literature, the testing of financial contagion through interbank relations during periods of crisis is very difficult to achieve due to the lack of detailed data and the impossibility of recording the transmission of shocks as a result of the extensive network of interbank links. But besides the lack of detailed data on interbank exposures, another major obstacle is the lack of bankruptcy of systemically important banks, as regulators always resort to rescuing these banks in order not to generate major contagion through interbank relations.

(Goodhart and Schoenmaker, 1995) highlighted the preference of the monetary authorities in all developed countries to save those large banks as a result of the risk of systemic contagion. This vision is also reflected in the Federal Reserve Chairman Ben Bernanke's speech in October 2008 in the context of the financial crisis, saying: "The Federal Reserve will work closely and actively with the Treasury and other authorities to reduce systemic risk."

The main finding is that larger interbank exposure generates large withdrawals of deposits. After controlling the fundamental banking principles and the macroeconomic climate, it is highlighted that banks with high levels of exposure to the bankrupt bank face a low deposit growth, as are banks with less robust bank fundamentals. While the effect of high exposure levels on deposit growth is negative, this does not necessarily mean that banks with high exposure levels suffer major withdrawals of deposits, as evidenced by some financial contagion theories.

Specifically, we note that the impact of exposure to deposit withdrawals is higher for banks (i) with a lower capital level, (ii) smaller sizes, and (iii) classified as weak by the regulator authorities. These results suggest that the magnitude of contagion is lower for banks with stronger fundamentals. This, in turn, implies that the weaker fundamentals of the banking system amplify the impact of interbank contagion.

(Degrysea and Nguyen, 2007) exploits a unique set of data on the Belgian interbank exposure series to study the determinants of interbank contagion. In the author's simulations, they tracked the consequences of non allocation (part) of interbank lending on other banks' equity, including any other domino effects. The exercise provides insights into the potential impact of "stress" situations on the Belgian financial system, which may be representative of many other small countries due to the high degree of internationalization of its interbank market, the economic significance of its large banks and similarities, in its market structure interbank.

We found out that the risk of contagion due to internal interbank malfunctions varies considerably over time and thus: increased over the period 1993-1997, decreased

subsequently and again decreased to a very low level towards the end of the sampling period (end of 2002). This is important because existing studies focus on one point in time. The results of this research show that the structure of the interbank market, the global capitalization of banks and the degree of internationalization are important in explaining the behavior of the time series of contagion.

Interbank exposures between Belgian banks currently represent only 15% of total Belgian interbank exposure, suggesting that the potential risk of contagion from foreign interbank exposures is more important. We believe that the failure of some foreign banks could have a significant effect on the assets of Belgian banks.

Existing methodologies imply a fixed LGD (Lost Given Default). When we endogenize (we analyze and develop the LGD bankruptcy loss), we note not only that LGD interacts with other determinants of contagion, such as the market structure, but also that the effects of contagion are more important when transversal variations of LGD are introduced, than those with the corresponding LGD average.

The simulations follow successively the impact of the failure of each Belgian bank in the N and each foreign bank in M for a loss, due to bankruptcy (LGD). It is estimated that the initial failure would cause an additional failure when the exposure of a bank to bankrupt banks is large enough to compensate for the capital and it is assumed that a bank fails if its exposure to a bankrupt bank (i.e. its loss) is higher than the tier 1 capital, and if more than two banks are bankrupt, the third bank will fail as well, if its exposures to the two banks are higher than the tier 1 capital.

(Lelyveld and Liedorp, 2004), scenario analysis is done using the interbank lending matrix, assuming that all banks are also bankrupting due to exogenous shocks. It can be noticed that a bankruptcy does not always imply that the bankrupt counterparty loses the total amount of exposure because the sale of a (part of) the assets of the bankruptcy bank can offer compensation.

Therefore, several loss rates (25%, 50%, 75% and 100%) were used to assess the strength of banks, and even temporary losses may have direct and immediate consequences for the bank's liquidity position, and therefore, for its solvency.

As in the case of the Dutch interbank system, the methodology used by (Upper and Worms, 2004) assesses the impact on the Belgian financial system, the unexpected failure of each bank correspondent of the Belgian banks. The contagion test uses a matrix of the type $(N \times (N + M))$ of bilateral interbank exposures to study the crisis propagation mechanisms. Thus, the matrix of bilateral exposures summarizes the interbank exposures of Belgian banks to the other Belgian banks $(N - 1)$ and to foreign banks M.

Research findings highlight some specific regulatory issues. First, although the risk of contagion is currently low - analysis shows that contagion is a low frequency event - and interbank exposures at certain times may constitute a devastating contagion channel. This type of event is particularly relevant for banking supervisors. Given that contagion risk evolves over time, the supervisory practices should not include only frequent monitoring of large interbank exposures, but also a regular assessment of the structure of the interbank

market. However, the risk of interbank contagion should not be monitored in isolation and independently of other risks.

Secondly, surveillance efforts to control propagation processes will be more effective if they focus on large banks. In addition, although small banks can trigger some limited contagion effects, they do not cause a systemic crisis, if large banks are resistant. Analysis of the different propagation channels will allow surveillance authorities to differentiate the effects of non-systemic contamination from real systemic crises.

Third, the failure of some large foreign banks to meet their obligations has the potential to trigger significant domino effects in Belgium. This suggests that it is important for regulators to monitor cross-border interbank systemic risk sources. However, national regulatory authorities have no control over these banks. Therefore, promoting international regulatory cooperation is essential. Thus European initiatives such as the European Banking Supervisors' Committee or the bilateral or multilateral memorandums of understanding agreed by the regulatory authorities in different countries, are significant advances.

An important role on the interbank market is represented by interbank deposits and the relationship between the volume of deposits of the bankrupt bank, of its counterparties and its withdrawals of deposits. This is also being analyzed by (Lyer and Peydro, 2010) that exploits an idiosyncratic shock and suddenly triggered by the failure of a large bank, in order to provide accurate data on interbank exposures to test financial contagion due to the interbank links. Firstly, we find solid evidence that banks with a higher interbank exposure to the bankrupt bank are experiencing greater withdrawals of deposits and, at the same time, the effect of exposure to deposits withdrawals is nonlinear.

Secondly, we find out two main implications of the contagion: the magnitude of interbank contagion is higher for weaker banks, and the interbank links between surviving banks (beyond ties to bankrupt banks) are the ones that propagate the shock.

The results of this research have important policy implications for both prudential regulation and crisis management. Because interbank links are causing shocks, regulators and banks can develop risk management systems to reduce excessive exposure to single institutions and to limit destabilizing effects that might arise from idiosyncratic shocks. Another potential solution could be that the bank's capital requirements take into account the risk of concentration of large single exposures, taking into account the costs of supplying limited cash. Alternatively, there could be limits on the extent to which banks can rely on interbank market financing to meet their liquidity needs, especially if they are large banks.

Equally important in the evolution of contagion is the structure of the links between the financial institutions participating in the electronic interbank market - e-MID (the only electronic market for interbank deposits in the euro area and the USA) studied by (Temizsoy et al., 2014) in attempt to establish a link between the interest rate and the stability of banking relationships and to explore how this link has evolved in the last period of the financial turmoil by identifying the determinants of their spreading.

The dataset used for this paper was based on a series of e-MID interbank electronic market data from June 15, 2006 to December 7, 2009, with detailed information on each transaction; time, transaction volume, maturity, interbank rate, transaction (buy/sell) and bank code that acts as the victim and aggressor, but also the size of both sides. The interest rate is expressed as an annual rate and the transaction volume is provided in millions of euros. The e-MID market includes contracts with maturities between one day and one year.

Although benchmarks are not correlated with bank sizes, smaller banks get better interest rates when establishing relationships with banks of similar size categories. Therefore, there is no clear evidence that benchmarks can explain the interbank spread for larger banks. In addition, (Eross et al., 2016), they look for a methodological analysis of short-term interest rates and interest spreads to determine the causality of linear interdependencies, equilibrium relations and structural changes on the short-term interbank market. The ultimate goal is to highlight whether liquidity shocks spread on the short-term interbank market and whether these shocks can disrupt long-term equilibrium relationships.

The data set is built using the daily historical spread between the US LIBOR rate and the overnight rate of the OIS swap index (LIBOR-OIS), the three-month spread of US-Germany bonds (USGer3M) and the price the three-month floating rate swap rate on the Fixed and Floating OIS (EUSWEC) exchange rate. The data cover the period from January 1, 2002 to December 31, 2015, including the previous and post-crisis periods, with the possibility of structural break-through in time series.

The dynamic forecasts indicated the presence of at least one structural pause; thus, the magnitude of shocks that translate into structural breaks is large and rare and, consequently, long-term relationships that temporarily decompose. The structural breakdown observed on the short-term interbank market on August 9, 2007 is the same with BNP Paribas' announcement that some of its mortgage-backed assets could not be valued. The uncertainty has increased and this is due to the lack of imminent liquidity developed in the money market, which was, in essence, the beginning of the 2007-08 financial crisis. Therefore, this study shows clear evidence of early warning signals, as well as structural liquidity shocks, that can be detected before the financial crisis.

Large banks are able to adjust their credit position at better rates and even improve them gradually, as it happened between 2007 and 2009, thus highlighting the impact of the change in monetary policy rates on the functioning of the uncollateralized interbank markets, as also follows from the analysis by (Vollmer and Wiese, 2015). The modeling of pricing on interbank markets is a result of a bilateral negotiation process, which is consistent with the fact that interbank transactions are usually conducted as over-the-counter transactions. We note that without the permanent facilities of the central bank, an interbank loan will only be granted if the lender's asset is not too risky, as an increase in risk could lead to a collapse of interbank lending. If the central bank offers only a marginal lending facility and interbank lending will only take place for marginally lending rates, high enough, a decrease in the marginal lending rate significantly reduces the chances of an interbank lending.

As a result, many central banks moved their liquidity framework from a corridor to a floor-type system and reduced the operational objective to the deposit ratio, which in turn decreased significantly during the financial crisis. This change in the liquidity supply framework was justified as "a means to help offset the impaired functioning of the money market," according to the European Central Bank in 2010. The purpose of such a system is to allow the central bank to provide at the same time, excessive liquidity (to prevent market stress), if necessary to stabilize the economy. Although money and credit easing could help restore interbank markets, the ECB's analysis suggests that the increase in the deposit rate may not be a too significant advantage. The main result obtained in this research suggests that an increase in the deposit rate will never lead to an increase in interbank credits, except for rare conditions that are met - stabilization is not met inflationary pressures, by rising interest rates will lead to a reduction in interbank lending, a greater need for quantitative and qualitative relaxation, and a subsequent burst of central bank balance sheets.

Conclusion

The price of a federal loan reflects, in large part, the credit risk of the borrowed institution. In particular, banks with higher profitability, with fewer troubled loans and higher capital rates pay lower interest rates on overnight loans. This suggests that banks can distinguish credit risk between their counterparts, as well as the price of loan contracts.

A bank with a high probability of bankruptcy generally can not attract overnight unsecured funds, regardless of price. However, the finding that less healthy banks are charged with higher interest rates than their perfectly healthy counterparts, highlights the risk assumed by the credit of sick banks, with at least three implications:

- first, banks can and monitor their present risk in their interbank transactions, and proposals to include some sort of interbank tracking in traditional regulation and supervision have given some empirical credibility;
- second, the magnitude of the differential price found on the overnight money market is economically significant;
- third, fixing the price for credit risk at the maturity of the overnight loan suggests that if something similar to the Calomiris plan (1998) applied using a subordinate debt of 10 years, it could be necessary a fairly wide range of admissible interest rates, if the credit risk and the maturity of the overnight loan have a significantly positive correlation.

We have found that banks tend to borrow and borrow itself from banks with which they have a close relationship when the imbalance in their reserve account is higher. In this way, the relationships allow banks to ensure against the risk of lack of funds or funds excess during the period of application of reserve requirements. It is also noticed that when market liquidity was low, debtors of funds were often based on loans from banks with which they had a close relationship.

Immediately after Lehman Brothers bankruptcy, we see that the overnight interbank market becomes sensitive to the specific features of banks, not only in terms of borrowed amounts, but also in the cost of funds. We find clear differences between large and small banks in terms of access to credit: so large banks have low daily loans after Lehman Brothers

bankruptcy and borrow from fewer counterparties. Assuming that very short-term banks do not change their demand for liquidity, this is a possible effect of restricting loans. Instead, smaller banks managed to raise the amount borrowed from the interbank market and even managed to add new counterparties during the crisis.

Only the weakest ROA banks (banking profitability relative to total assets) have accessed the Federal Reserve Window after Lehman Brothers bankruptcy. It is reasonable to suppose that these are banks that have been restricted to federal funds by the credit market, since private banks were not willing to lend them. Although it is difficult to assess whether this means that the interbank markets functioned effectively during the 2007-2008 financial crisis, but it is reassuring that we do not see that performing banks have to turn to discounts again. Such a finding would have been extremely alarming evidence of malfunctioning in the federal funds market.

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Challenging the status quo: Steel producer case study on the enterprise value for M&A

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Abstract. *The purpose of this paper is to analyze the enterprise value determinants, in order to help the interested parties make correct (investment) decisions by studying industry cases of mergers and acquisitions (M&A). In order to understand and identify value-adding opportunities for the companies, the paper investigates a divestiture within a major international steel group. The research questions refer to the understanding the relation between the enterprise value and market capitalization of the selected companies acting in the steelmaking field, including other factors such as the revenue, EBITDA, EPS or ownership structure. In order to understand how the enterprise value is determined, I have analyzed relevant theories, including Tobin's Quotient (q) for a company/ aggregate corporations, for the study of the relation between the market value and its replacement value. If used empirically, Tobin's q helps avoid issues of estimating shareholders' risk-adjusted required return by the market prices. Besides using the graphical visualization of the share price, I have used the datasets available for several years on the value of several mature steel producing companies, market capitalization and other indicators. The methodology also includes Market Comparable method and own spreadsheet calculations. After analyzing the evolution of the share price for the global steelmaking leader (ArcelorMittal), between 2009 and 2018, I have not identified any growth potential; the market value of ArcelorMittal is a proxy for the market value of its assets.*

Keywords: enterprise value; market value; book value; EBITDA; Tobin's q ; capitalization.

Introduction

This article is part of the authors' research⁽¹⁾ on the enterprise value and its determinants, in order to understand the ways to maximize/ increase it, in the context of the accepted theory of value maximization as the single and most important objective of a company (Jensen, 2002). Starting from Professor Jensen's theory (2002), the measure in implementing organizational change should be the increase in the long-term market value of the firm.

In this study, we start with the analysis of the objective of the world's leading steelmaker, ArcelorMittal. The company's Action 2020 plan (2015) is a strategic roadmap, above the ongoing management gains plan (which targets *cost savings* relating to *reliability*, fuel rate, *yield* and *productivity*) and seeks to deliver operating results improvement of \$3 billion, through a combination of cost optimization, volume gains and product mix enhancement; for the European market, the objective is to continue successful asset optimization, continued optimization and the clustering of finishing sites to remove substantial overhead, centralize activities (including procurement) and improve logistics and service together with expected *higher added value (HAV)* mix and volume gains, targeting a US\$1 billion improvement in operating income. (ArcelorMittal, 2016). Company's vision is a fully digitalized enterprise where everything is connected. (ArcelorMittal, 2017)

At present, the mergers and acquisitions make the headlines in bold in the media worldwide, with very large values, showing the very high interest of the large companies to integrate smaller companies in order to create value and growth.

In this paper, the focus is on the activity of a steel producer, ArcelorMittal, a 'Large-Cap' company, which is listed on the major stock exchanges and falls under Basic Materials sector. On April 13, 2018, this company listed on New York Stock Exchange (ArcelorMittal, symbol MT) announced a divestment⁽²⁾ package as part of a European Commission review into its acquisition of an Italian plant. Romania's biggest steel producer, ArcelorMittal Galați (AMG), with about 5,600 employees was the largest of the assets for sale among six other European assets of a combined value of \$752-940 million; on the 12th October 2018, ArcelorMittal received a binding offer for the acquisition of four plants, including the Romanian steel producer, according to the agreement with the European Commission during its merger control investigation into the Company's acquisition of Ilva S.p.A and on the 1st November 2018, the acquisition completed, (ArcelorMittal) being the principal partner, with a 94.4 % equity stake in the consortium and with Banca Intesa Sanpaolo holding 5.6 per cent (ArcelorMittal 2018). Being under state-supervised special administration since 2015 and charged for corruption and environmental crime, *the target company* (Ilva), was about to be cleaned up or closed in 2018. However, the steel group, a strategic buyer, considers the target company a quality asset, as the Europe's single-largest steelmaking site and a unique opportunity to expand and strengthen the Group's European presence, offering a compelling value creation opportunity; Ilva is considered a complementary fit for the existing business, providing significant scale and being strategically well located (ArcelorMittal, 2018). ArcelorMittal invests in growth projects to leverage the operating expertise to grow EBITDA and free cash flow (FCF) over the long-term.

Since its inception, ArcelorMittal has rapidly grown through a successful consolidation strategy with a number of significant acquisitions (ArcelorMittal 2019). Horizontal mergers and acquisitions of companies facing difficulties are a practice for the Group and so it was the case of the former state owned Romanian steel mill, Sidex Galați, which was incurring losses and bought for €70 mil., then rebranded into ArcelorMittal Galați (AMG)⁽³⁾.

The paper is a minor extension to authors' previous research on the factors of enterprise value and the case of a company in difficulty. Instead of making superficial changes with impact for the short term, organizations should make those changes that allow them to increase/maximize the total long-term market value of the firm, i.e. 'the sum of the values of all financial claims on the firm, including equity, debt, preferred stock, and warrants' (Jensen 2002). A company in difficulty should be run to maximize its value to a potential acquirer and avoiding the trap of thinking that the business is just as valuable to anyone else.

Problem statement

Challenging the status quo is about asking the right questions and finding the obstacles to growth and that is what a company in difficulty is supposed to do in order to make the right changes. Poorly managed firms are taken over and restructured by the new owners, who request the additional value. The current status quo of ArcelorMittal Galați is bad because of the market evolution and management. Therefore, how the company market value (stock price) changes when it announced dispose of assets of \$752-940 million? How acquisition valuation of the target firm should be done? Which is the best possible estimate of the target's value?

Every company that doesn't simply close its doors will someday be sold. Buyers have to determine how much the company is worth to them and the sellers have to decide how much they will accept for their shares of the company. Then how to assess the company potential from the acquirer's viewpoint?

Literature review

The relation between value maximization and stakeholder theory, called enlightened value maximization theory, accepts maximization of the long-run value of the firm and specifies value seeking as the firm's objective (Jensen, 2002).

Investors have to know to value a business, not how much a stock has been going up or how sales of a new product are progressing, or "what is this business worth, given all the available facts?" (Mihaljevic, 2014).

Price (1998) specified that his first analysis of an intangible asset was way overstated, increased *book value (BV)*, and showed higher earnings than were warranted, in order to keep the stock price higher than it otherwise would have been warranted in 1975. Stock price must relate to its financials and *book value (BV)*, *cash flow*, *interest* and *ratios* fundamentally value common stock. With this respect, Graham showed the difference between: "Book value including intangibles" and "tangible/net book value" (Graham, 1937).

Depending on the perspective used (market or accounting) there are several types of values used in various situations, as shown in Table 1.

Table 1. *Expressing value*

value			
liquidation (floor) value (non-going -concern)	book value (BV) (accounting)	market value (MV) (fair value)	replacement cost of the firm's net assets (Tobin's q)

Source: authors' representation.

Tobin's q is accepted as a proxy for an underlying "true" *q* to characterize a firm's incentive to invest. Since Brainard and Tobin (1968) and Tobin (1969) introduced the concept of Tobin's *q* over 30 ago, it has become the most widely used measure of a firm's incentive to invest and likely the most commonly used regressor in empirical corporate finance (Erickson and Whited, 2006). Erickson and Whited (2006) adapted the measurement-error consistent estimators, finding that most proxies for *q* are poor.

Keynes (1936) and Grunfeld (1960) considered that a firm should invest in additional assets if this increases the stock market's valuation of the firm:

$$q = MV_{\text{assets}}/RC$$

Where

MV_{assets} – the market value of a firm's assets, or the book value (BV) of *debt*, in practice (Damodaran n.d.);

RC – the replacement cost of these assets.

However, *q* is not (yet) used in practice in the valuations of companies, because of the lack of the necessary input data and Mihaljevic (2010) acknowledged that the *Q* estimation method is not good at dealing with truly exceptional businesses, i.e., companies that have a large off-balance sheet intangible source of sustainable business value (like Coca-Cola, Microsoft and Walt Disney).

The *Market-to-Book* ratio (MB), as a rough proxy for Tobin's *q*, has been a common measure of *firm value*. In contrast to the M/B (using the book value of the total assets as denominator), the Tobin's *Q* applies the replacement values of assets; instead of measuring the financial performance of the existing assets, the Tobin's *Q* measures the financial performance of a new investment, if the existing production capacity is reproduced, being oriented towards the future (Groß 2007).

When inflation pushed up the replacement cost of the assets or where technology has reduced the cost of the assets, *q* may provide a more updated measure of the value of the assets than the accounting BV.

Empirical studies using Tobin's *q* initially focused on explaining it (Lindenberg and Ross, 1981; Salinger, 1984), then predicted investment spending (Furstenberg, 1977; Summers, 1981; Hayashi, 1982). There are studies of the effects of managerial equity ownership (Morck, Shleifer and Vishny, 1988; McConnell and Servaes, 1990) or on the size of a company's board of directors (Yermack, 1996), corporate diversification (Berger and Ofek, 1995; Rajan, Servaes and Zingales, 2000) and dividend changes (Lang and Litzenberger, 1989; Denis, Denis and

Sarin, 1994). Holding investment opportunities constant while investigating the determinants of capital structure (Titman and Wessels, 1988), leveraged buyouts (Opler and Titman, 1993) and takeovers (Lang, Stulz and Walkling, 1989; Servaes, 1991), studies on stock market investments at times when the Q ratio was less than parity have produced above-average long-term returns (Harney and Tower⁽⁴⁾) despite other contrary opinions; “q beats all variants of the PE ratio for predicting real rates of return”. (Mihaljevic, 2010)

Tobin’s Q estimates (Chung and Pruitt, 1994) have been calculated using publicly available and easily verifiable company-specific accounting and market pricing data: at least 96.6% of the variability of Tobin’s q, as calculated more elaborately by Lindenberg and Ross (1981), is explained by the “approximate Q” (Mihaljevic 2010).

$$\text{Tobin's } Q = (MVE + PS + DEBT) / TA$$

Where

MVE – market value of the common equity of a firm;

PS – liquidating value of the firm’s preferred stock;

DEBT – current liabilities minus current assets, plus book value of long-term debt;

TA – the book value of the total assets of the firm.

Jovanovic and Rousseau (2002) extended Tobin’s q theory of investment to *merger waves (the q-theory hypothesis)* arguing that the technology generating profitability lead to Tobin’s q increase and such firms can expand profitably by acquiring other firms (it permits only horizontal mergers and does not synchronize with the empirical observation of lesser merger frequency in unlisted companies). (Bailey and et.al. 2015)

Smithers and Wright (2002) created *equity q*:

$$Q = E / NW$$

Where

E – equity market cap;

NW – net worth at replacement cost. (CFA Institute 2017)

Market-level Tobin's q can be used to judge whether an equity market is disvalued, by comparing the current q with 1 or the historical mean value (CFA Institute 2017):

$$Q = (E + D) / RC$$

Where

RC – estimate of the replacement cost of aggregate corporate assets;

E and D – estimates of aggregate equity and debt market values.

The analysis of the characteristics of companies more likely to be acquired and the relevant indicators summarized by professor Damodaran (2004), in the consideration of an investor’s point of view (Table 2) show that the increasing interest for poorly managed companies can be explained as there is room for improvement and a chance for acquirers to "make a good company great."

Table 2. *Criteria for stocks likely to be targets in M&A*

Indicator	Benchmark
Return on equity (ROE)	> 4% below the peer group ROE
Stock returns over last year lag peer group returns	by > 5%
Annualized standard deviation in stock prices	> 80%
Insider holdings	< 10%
debt to capital ratios (D/C)	< 50%

Source: (Damodaran, Investment Philosophies and Investment Fables 2004)

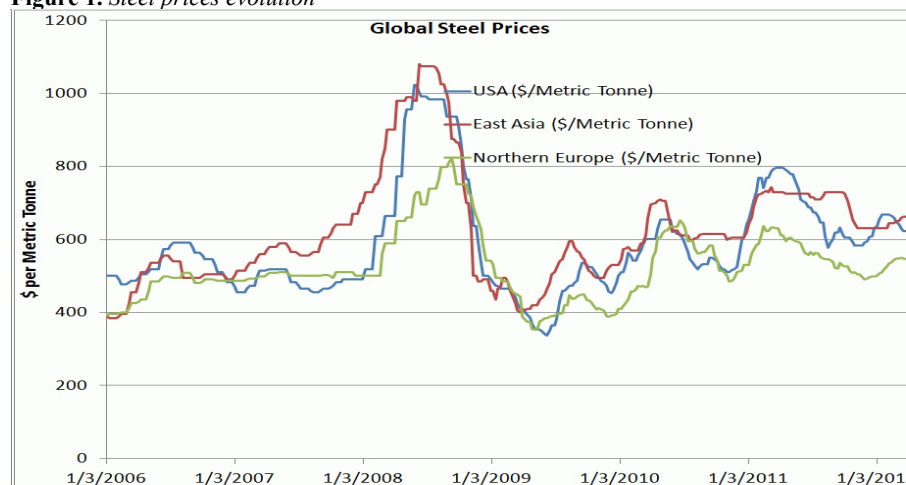
In a study of the period 2007-2017, the market cap of the companies operating in the oil & gas and materials sectors were the least influenced by the economic cycles. A median excess return of up to 12% of the indices over the risk free rate was estimated for the period 2012-2017, compensating investors for taking on the relatively higher risk of equity investment. Financial multiples tend to decrease when the economy contracts, thus financial multiples are a relatively good proxy for investors' expectations (PwC Romania, 2017).

Communication with stakeholders does not support the processes of knowledge management and innovation processes. Not treating communication with stakeholders as a basis for creating enterprise value suggests depreciation of communication in managing surveyed entities, especially that the basis of their functioning (external funding) is communication with stakeholders, e.g. clients or co-developers of innovative basic processes. Improving/modernizing methods/tools of communication with stakeholders is usually a cost for the surveyed enterprises than the source of development, e.g. in the long run (Wereda and Woźniak, 2018).

Research method

After the boom between 2002 and 2007 and after reaching a historical high in July 2008, the average global price of steel has declined each month since then, and in May 2009 reached a level that was 55% lower than July's peak (OECD Steel Committee 2009).

In order to understand the steel market and how the company share price evolved, we look at the steel price evolution shown in Figure 1.

Figure 1. *Steel prices evolution*

Source: Bloomberg, 2012.

The peak of the price of steel was reached in 2008. Looking at the company price (Figure 2), we can see a similar trend, making us understand the importance and the great influence of the market on the company value. After the peak reached in 2008, the company share price followed the steel price evolution, which means that the correlation should be tested.

Figure 2. Company stock price history

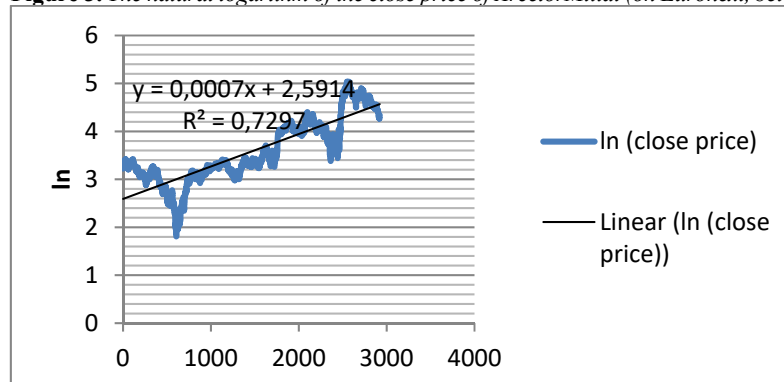


Source: Bloomberg, 2017.

Steel prices and producers' shares are being lifted as per the strong global demand. Nations have strengthened trade defenses after China's so-called steel dumping became a political flashpoint. (Bloomberg, 2017)

Financial data are often considered very 'noisy', being difficult to separate underlying trends or patterns from random and uninteresting features and not being normally distributed; high frequency data often contain additional 'patterns' (as a result of the way that the market works, or the way that prices are recorded) and these features need to be considered in the model-building process (Brooks, 2014).

Figure 3. The natural logarithm of the close price of ArcelorMittal (on Euronext, between 02.01.2007 – 01.07.2018)

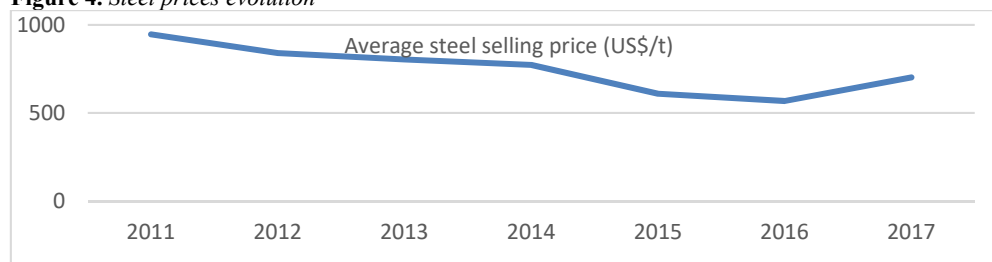


Source: author's calculations.

For statistical reasons, raw price series are converted into series of returns, which are unit-free (Figure 3). The log-return formulation (or log-price relatives, since they are the log of the ratio of this period's price to the previous period's price) have the property that they can be interpreted as continuously compounded returns – so that the frequency of compounding of the return does not matter and thus returns across assets can more easily be compared, and are time-additive. However, the disadvantage of using the log-returns is the continuously compounded returns are not additive across a portfolio; the log of a sum is not the same as the sum of a log, since the operation of taking a log constitutes a non-linear transformation.

In Figure 4, the average steel prices decreased between 2011 and 2017. But even during the downturn, the company kept making deals (like Thyssenkrupp AG's plant in Alabama, Europe's biggest steel plant in Italy - Ilva), or looking at a joint venture in India. (Bloomberg, 2017)

Figure 4. Steel prices evolution



Source: ArcelorMittal, 2018.

The earnings multiplier model can be used to calculate the fair value of the stock (Schweser, 2012). In Table 3 below, we can see the current situation of the market and MT share price, as of the end of 2018, and the company is performing below the market.

Table 3. The Market and MT share price

	7 day Return	1 Year Total Return	Share Price	PE Ratio
United States Market	0%	4.8%	-	16.8x
Netherlands Metals and Mining	-2.9%	-1.7%	-	8.5x
ArcelorMittal [MT]	-7.9%	-26.6%	19.2	4.14

PER (or P/E) is based on the market capitalization of companies on profit and expresses the number of years the investment in one share could be recovered from the issuing company; P/E or PBV reflect the company's profitability and signals over/undervalued enterprise and it represents an alternative to the traditional assessment methods (assets, financial performance) based on the financial statements (which show historical data), which should reflect the image of the company but does not register the brand's reputation, or goodwill (Ion, 2016). A small PER may indicate the stock is undervalued (Pasol, 2004). However, some firms have no interest to report a big profit, in order to optimize costs: there are Romanian companies relying on bank financing and banks look for companies with a solid financial situation – assets, equity, dues (Pasol, 2004).

In a top 5 of the companies from the Materials group by market cap, there are Alro SA, TMK-Artrom SA, Teraplast SA, Vrancart SA, Oltechim SA with net profit margin of 4% to

9% (quartiles), with a median of 6% and PER multiple ranges between 7.9x and 13.4x, with a median of 9.8x (PwC Romania 2017)

In order to understand the interest for the Energy, Mining & Utilities sector, in Table 4 below, we see several relevant transactions in Europe, at the end of 2018, totalling 74 US\$bn, which comes second to the most attractive sector.

Table 4. *M&A targeting Europe in Q4 2018*

Value (US\$ bn.)	Bidder company	Target company	Target sector
79.7	Takeda Pharmaceutical Company Limited	Shire Plc.	Pharma, Medical & Biotech
51.5	Comcast Corporation	Sky Plc.	Media
46.6	E.ON SE	innogy SE	Energy, Mining & Utilities
27.4	China Three Gorges Corporation	Energias de Portugal SA (76.73% Stake)	
39.6	Consortium	Abertis Infraestructuras SA	Construction

Source: Acuris, 2018.

In a Romanian top by value (Figure 5), the transactions that targeted production companies (for 100% stake) totaled 490.8 mil. euro, including industry assets.

Figure 5. *Top 10 transactions in Romania by value*

Nr.	Obiectul tranzacției	Sector	Tipul acordului	Participație (%)	Cumpărător (Tară)	Valoare (mil. euro)
1.	Enel Distribuție Muntenia, Enel Energie Muntenia	energie și utilități	minoritar	13,6%	Enel (Italia)	401,2
2.	A & D Pharma Holdings	distribuție și retail	total	100%	Penta Investment (Cehia)	350*
3.	Bancpost	finanțe și asigurări	majoritar	99,2%	Banca Transilvania (România)	240*
4.	EcoPack și EcoPaper	producție	total	100%	DS Smith (Marea Britanie)	208
5.	Hotelul Radisson Blu din București	real estate și construcții	total	100%	Revetas Capital (Marea Britanie)	169,2
6.	companii din grupul Electrica**	energie și utilități	minoritar	22%	Electrica (România)	165,7
7.	operațiunile din România ale Takata Corp.	producție	total	100%	Key Safety Systems (SUA)	153,9***
8.	Bitdefender	telecom & IT	majorare de capital	30%	Vitruvian Partners (Marea Britanie)	151,3***
9.	Premium Porc Group	agricultură	total	100%	Polaris Private Equity (Danemarca)	134*
10.	active ale Oltchim	producție	total	100%	Dynamic Selling Group, Chimcomplex (România)	128,9
- Top 10						2.102,2

* estimare a pieței oferită de EMIS pe baza datelor disponibile. ** SDEE Distribuție Muntenia Nord, SDEE Distribuție Transilvania Nord, SDEE Distribuție Transilvania Sud, Electrica Furnizare. *** estimare EMIS. SURSE: CMS și EMIS

Source: CMS n.d.

Most active sectors in M&A were Industrial and Consumer (with 15 and 12 deals closed during 2007 – 2017), according to PwC Romania (2017). In Table 5, the PER ratio is presented for the industrial and other similar sectors, which recorded figures mainly above the other sectors.

Table 5. *PER ratio for the interval 2007-2017*

Industry	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Volatility of P/E ratio	Last 5 yr max	Last 5 yr min
Industrial	30.6	7.2	7.6	10.1	15.3	8.1	12.1	11.0	8.6	9.4	12.0	25%	12.1	8.6
Materials	27.5	6.4	11.8	14.0	6.8	10.2	13.1	7.3	5.7	10.7	9.8	30%	13.1	5.7
Electricity	46.6	9.1	2.7	25.0	9.3	19.4	5.6	13.0	11.4	12.5	15.9	53%	15.9	5.6
All sectors	24.8	7.0	8.4	12.5	9.5	7.8	11.3	9.5	9.3	10.9	11.7	18%	11.7	9.3
GDP growth	6.9%	8.3%	-5.9%	-2.8%	2.0%	1.3%	3.5%	3.1%	4.0%	4.8%	7.0%	169.5%	7.0%	3.1%
Industrial production growth	10.1%	1.9%	-5.0%	4.9%	7.9%	2.6%	7.4%	6.3%	3.0%	1.7%	8.2%	103.3%	8.2%	1.7%

Source: from PwC Romania, 2017.

Companies with differing risk profiles compared to the valuation target are used to estimate value. The strategic reasons for acquiring a particular company in a specific market led to prices that are out of line with typical values of most frequently used multiples - price to sales ratio, price earnings ratio (PER) and price/book value of equity ratio (P/BV). Market multiples are valuation metrics widely used to value businesses. Assuming that the selected peer companies have similar valuation multiples and by applying the industry multiple to a specific company's financial metrics, can arrive to the company's market value - enterprise value (EV) or equity value. The PwC Romania (2017) analysis on the local M&A market activity on 50 transactions completed (the period 2007-2017) show that the historical average EV/EBITDA multiple for transactions closed over the period 2007-2017 is 8.3x (Table 5). The multiples selection considers the robustness of the data information available within the data set while focusing on the multiple that best represents the sector/sub-industries (Table 6). The selection of the best indicator amongst the median and the mean considers the dispersion test. Outliers, defined by PwC Romania (2017) as multiples exceeding 50, were excluded.

Table 6. The historical average EV/EBITDA for the transactions closed between 2007-2017

	2008	2010	2017	Average (the period 2007-2017)
EV/EBITDA	11.2x	2.6x		
Avg. EV/EBITDA			7.5x	8.3

Source: adapted from PwC Romania, 2017.

Buyers and sellers usually know the *EBITDA multiple* to be used, depending on the projected growth rate of the business, its history and reputation, and market conditions or rely on a *weighted average of EBITDA* over the previous 3-5 years. If a start-up is acquired or the company has yet to earn a profit, the multiple is often applied to projected future EBITDA. (Knight 2016).

EBITDA⁽⁵⁾ is considered to have several limitations that become more crucial as risk tolerance among high-yield investors increases and underwriting standards and financial covenants loosen (i.e. investor demand remains strong for bonds issued by companies with weak balance sheets, so companies negotiate aggressive adjustments to EBITDA to depict lower leverage and a seemingly better credit profile). (Moody's 2014)

According to professor (Damodaran), acquisition valuations are complex, involving issues like synergy and control, which go beyond just valuing a target firm. M&A analysis requires the application of valuation tools for the decision, such as bid and takeover premium, distribution of gains between acquiring firm and target firm shareholders as in Table 7.

Table 7. Motives behind acquisitions and firm value

Acquisition motive	Value target firm as	Examples
Undervaluation by the financial markets	Status Quo Valuation: no extra premium	Ilva S.p.A
Diversification, for stabilizing earnings and reducing risk		
Operating Synergy -Cost Savings: in same business to create economies of scale; -Higher growth	Target Firm Value = Independent Value + Synergy Synergy = value of the bidding firm (pre-acquisition) - value of the target firm (with control premium)	
Financial Synergy, from:	Tax Benefits: Value of Target Firm + PV of Tax Benefits	

Acquisition motive	Value target firm as	Examples
	Increased Debt Capacity: Value of Target Firm + Increase in Value from Debt Cash Slack: Value of Target Firm + NPV of Projects/ Target	
Control (of poorly managed firms)	Value of Target Firm run optimally (industry averages) Value of Control = Value of firm, with restructuring - Value of firm, without restructuring	As in the case of Sidex Galați (mentioned previously);
Manager's Interest	Value of Target Firm: No additional premium	

Source: adapted from (Damodaran)

With their scale and scope, ArcelorMittal (2017) wants to remain ahead and lead the industry in the future of steelmaking. The company ambitious plans include a digitalisation phase of the manufacturing sector, driven by four disruptions:

- the rise in data volumes, computational power, and connectivity, especially new low-power wide-area networks;
- the emergence of analytics and business intelligence capabilities;
- new forms of human-machine interaction such as touch interfaces and augmented-reality systems;
- improvements in transferring digital instructions to the physical world, such as advanced robotics and 3-D printing.

In a regional top (Table 8), the steel producer from Galați, benefiting from globalization and group synergy, accessed new markets, dominating by its turnover the other local retailers and producers.

Table 8. Local (Galați) top firms by turnover

Name	turnover (mil. Lei)	turnover (mil. euro)	Activity
ARCELORMITTAL GALAȚI SA	4700	1100	steel production
ARABESQUE SRL	1700	387,1	retail
MAIRON GALATI SA	1000	231,6	retail
PRUTUL SA	649,4	147,6	production
SANTIERUL NAVAL DAMEN GALATI SA	531,8	120,9	shipbuilding
BELOR ROMANIA SOCIETATE PE ACȚIUNI	514,4	116,9	retail
COMPANIA DE NAVIGATIE FLUVIALA ROMANA NAVROM SA	222,9	50,7	transportation
NEXT ENERGY PARTNERS SRL	212,1	48,2	energy
BAUROM CONSTRUCT SRL	198,3	45,1	retail
MAIRON TUBES S.R.L.	186,2	42,3	production
ARCADA COMPANY SA	184,9	42	constructions

Source: Top Firme 2018.

Company's present market value is the effective cost of buying the company or the theoretical price of a target company before a takeover premium is considered; rather than the equity value, EV include all ownership interests and asset claims from both debt and equity (see Table 9).

Table 9. Company's Multiples for 2018

VALUATION RATIOS	USD
Enterprise Value (EV)	42 B
Market cap	35.3 B
Current P/E Ratio - LTM	6.5
Enterprise Value (EV)/EBITDA	8.15

Source: ADVFN 2018, Yahoo Finance & Morningstar, Inc., 2018.

$EV = \text{Market Capitalization} + \text{Market Value of Debt} - \text{Cash and Equivalents}$

or

$EV = \text{Common Shares} + \text{Preferred Shares} + \text{Market Value of Debt} + \text{Minority Interest} - \text{Cash and Equivalents}$

Assets, or the application of funds are financed through liabilities and shareholder's equity as the sources of funds used.

When we say value, we mean the current or market value of the company, the market value of liabilities and the market value of equity.

Next, in Table 10 are presented quarterly indicators published by the company, including EBITDA.

Table 10. *Quarterly indicators (for the year 2017)*

Indicators (USDm)	1Q 17	2Q 17	3Q 17	4Q 17
Sales	8,222	9,180	9,196	9,610
Operating income / (loss)	636	652	546	525
Depreciation	273	290	302	336
EBITDA	909	942	848	861
Average steel selling price (US\$/t)	649	698	723	736

Source: ArcelorMittal, 2018.

In Table 11, the EBITDA improved over the last years, overcoming the level registered in 2011.

Table 11. *Indicators for the European segment of the group company (2011-2017)*

(USDm) unless otherwise shown	2011	2012	2013	2014	2015	2016	2017
Operating income / (loss)	(369)	(5,725)	(985)	737	171	1,270	2,359
Depreciation	2,153	1,944	2,003	1,510	1,192	1,184	1,201
Impairments	301	5,032	86	57	398	49	0
Restructuring / Exceptional charges	219	587	517	(0)	632	0	(0)
EBITDA	2,304	1,838	1,621	2,304	2,393	2,503	3,560

Source: ArcelorMittal, 2018.

Results

Dividing the market cap (at the end of the fiscal year) by the weighted average EBITDA, the result is company's EBITDA multiple (12.17), which is used as a good benchmark for other businesses in the same industry. A publicly traded company often trades at a higher multiple than private businesses, because its stock is more liquid.

Table 12. *Weighted EBITDA Valuation Methodology*

in US\$ millions						Total
Weighting	5	4	3	2	1	15
FISCAL YEAR	2017	2016	2015	2014	2013	
EBITDA	\$3,560,000	\$2,503,000	\$2,393,000	\$2,304,000	\$ 1,621,000	
Weighted EBITDA	16,230,000	11,284,000	10,596,000	3,854,000	1,617,000	43,581,000
MULTIPLE: 4.0					Average EBITDA	2,905,400
					Business Value	11,621,600

Any model for the EV should consider the market conditions, i.e. the steel price, as a factor and the future research will analyze this correlation. For the company (MT), higher ($r > 0$)

EV was correlated with higher market cap, Pearson's (or correlation coefficient) r is .62, which is normally considered a large effect. In Table 13 below, some statistics are included.

Table 13. Descriptive statistics for the enterprise value and market cap

EV		market cap	
Mean	49782895036	Mean	42057366926
Standard Error	5553908764	Standard Error	9618244999
Median	49614716642	Median	28393036755
Standard Deviation	20024902829	Standard Deviation	34679075524
Kurtosis	0.47965804	Kurtosis	0.505953475
Skewness	0.728659731	Skewness	1.242409931
Minimum	22808955176	Minimum	7027955176
Count	13	Count	13

The ArcelorMittal group, the successor to Mittal Steel, a business originally set up in 1976 (ArcelorMittal 2019) which was \$33,3 B, enterprise value for the stock listed on NYSE (MT), end of 2018. After the drop in 2009, the company did not manage to recover and reach or beat those results, following the evolution of the price of steel. In the issue of 'Equities and Tobin's q ', September 2010, for the ArcelorMittal (MT) price of \$32.83 (-20% low and 51% high), MV of \$49,587mn and EV of \$70,012mn, price/book was 0.9, q was 0.5, similarly to the year and quarter before (see Table 14).

Table 14. Interpreting Tobin's q

q for the company (MT)	q value	Explanation
	$q > 1$	It is profitable to invest in the capacity reproduction; if a company has a Q ratio meaningfully in excess of parity, the market may be pricing in sustainable long-term outperformance and investors may want to verify their assumptions about the true sustainability of a company's high returns on capital.
0.5; 0.34	$q < 1$	negative excess returns; firms do not utilize efficiently their assets; further capital investment is unprofitable; firms likely to be taken over for restructuring;

Source: adapted from CFA Institute, 2017, Mihaljevic, 2010, and Damodaran, 2012.

When investing in/managing assets, the key is not only to know their value but also to understand the sources of value and the ways to increase it, or at least prevent its decrease. Tobin's q and other multiples prove to be useful tools in making investments. For the target price of ArcelorMittal, the calculated odds of ArcelorMittal to move above current price is about 31.89%, based on normal probability distribution (the probability density function to fall within a particular range of prices over 60 days).

Tobin's q may still support improvements and developments in the theory and practice; for example, its significance can be further developed, for smaller intervals, such as q of 0.5 to indicate investment for the short term, while for the long term investment, $q < 0.5$.

Companies need to permanently consider the changes in their value and manage this process at their best. Enterprise Value is a firm valuation proxy that approximates current market value of a company, to determine takeover or merger price of a firm, unlike market capitalization, which is smaller; EV takes into account the entire liquid asset, outstanding debt, and exotic equity instruments that company has on its balance sheet.

When takeover occurs, the parent company will have to assume the target company's liabilities but will take possession of all cash and cash equivalents.

Conclusions and implications/Discussions

Challenging the status quo is an exercise that every manager and company owner should practice often, as the competition surely does it. Asking the right questions and finding the obstacles to growth and that is what a company in difficulty is supposed to do in order to make the right changes. According to (OECD Steel Committee, 2009), the global economic crisis has pushed the world steel industry into recession and steelmaking capacity continues to increase despite the market downturn. The Romanian steel company has to understand the changes undergoing in the field and challenge its status quo of a company in difficulties; instead of making superficial changes with impact for the short term, should prepare a long-term strategy of value maximization that will allow it to thrive as it happened in the past in the communist era. When the company is in difficulty it should be run to maximize its value to a potential acquirer, by looking closely at the financials and avoiding the trap of thinking that the business is just as valuable to anyone else. Poorly managed firms are taken over and restructured by the new owners, who request the additional value. The interest for production companies from the materials sector generate important transactions. The issue of control is equally important, which means that the target firms' value should be considered as run optimally.

Digitalization, with the right focus, brings competitive advantage, which is vital in today's highly competitive environment. (ArcelorMittal 2017)

ArcelorMittal (2019) has rapidly grown through a consolidation strategy with a number of significant acquisitions. The two European plants from Romania and Italy, taken over by the world largest steel group, were undervalued as they were heavily indebted, while the buyer could increase and diversify the products offer.

Notes

- (1) <http://www.ectap.ro/supliment/international-finance-and-banking-conference-fi-ba-2017-xvth-edition/27/>
- (2) Divestment operations consist of two stages: (i) a division of enterprise' secondary activities by outsourcing them (as independent enterprises); (ii) the offer of the unincorporated enterprises for sale and the recovery of their capital in order to develop the main activities (Toma 2011).
- (3) See also Ion, M. (2018). Factors of enterprise value - the privatization of 'Sidex Galati' Romania (case study), Proceedings of the International Conference on Business Excellence, 12(1), 466-475. doi: <https://doi.org/10.2478/picbe-2018-0042>
- (4) <http://public.econ.duke.edu/Papers/Other/Tower/Pessimism.pdf>
- (5) earnings before interest, taxes, depreciation and amortization

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Innovation as imperative for increasing productivity and economic growth: The case of the selected EU member countries and non-EU member countries

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Abstract. *In the changeable environment of increasingly powerful and multiplex competition, it becomes one of the key preconditions for an appropriate reaction to worldwide challenges. The productivity and economic growth have to be recognized as a multi-dimensional mechanism containing various interlinked components accomplished through investments in innovation. The purpose of this paper is to explore the link between the components of innovation, productivity and economic growth in selected EU- member countries and non-EU member countries. The research results have shown that the productivity and economic growth in selected countries are significantly linked with their innovation rank. The innovation capability indicators measured by the innovation indices can be beneficial in comparative analysis between countries, and provide valuable information for countries to identify their own strengths and weaknesses, compare themselves with similar countries, and create consensus about fields of future actions.*

Keywords: innovation, productivity, economic growth, EU-member countries, non-EU member countries.

JEL Classification: C8, E0, O10, O57.

1. Introduction

The economic background and conditions that bring innovation to the leading edge are relevant in the survey of the innovation accomplishment of countries. To classify the priorities and to determine appropriate innovation policies, it is very important to mention the impact of the government institutions, academics and individual entrepreneurs in the innovation accomplishment. In the past decade, different paths to economic growth with different scale of success have been detected worldwide. Nonetheless, all countries faced the identical problems: poverty and inequality in the world economy.

Economic theory has long ago identified productivity as the crucial determinant of economic growth. Different economic surveys have accentuated the relevance of innovation in increasing productivity and economic growth. The innovation capability indicator measured by the innovation indices can be precious in comparative analysis between countries, and they assure relevant information for economists, government, academic institutions, stakeholders, etc. This paper explores the primary characteristics that, while not promising, are increasing and differentiate the innovation accomplishment in selected EU member countries and non-EU member countries, also containing their effects on aggregated innovation indicators. Accordingly, an investigation was performed of the constitutional elements of innovation indices influencing productivity and economic growth in selected countries. The idea for this research aftermath from recognizing the tenacity of indicators that variously affected innovation in the EU member and non-EU member countries, a theme that had not received adequate consideration in past decade by economists and government, but still persists to restraints productivity, economic growth and innovation. So, a comparative analysis of innovation, productivity and economic growth in selected countries was performed, identifying and highlighting the relevant differences in connection to different countries, and concentrating basically on components of innovation indicators.

The paper indicates that the innovation accomplishment in selected countries is significantly linked with their innovation rank. The similar indices answerable for feeble productivity and economic growth are connected with feeble innovation capability indices. This scheme, in comparison with the EU-member countries average indicators, shows differences in each innovation component. The conducted exploration deliberates that the application of suitable economic instruments could mitigate the problems that remain in non-EU member countries.

2. Theoretical overview of the literature: Innovation as crucial component for increasing productivity and economic growth

Innovation was identified as a significant by many famous economists. Adam Smith (1776) indicated that new team of professionals could increase productivity by usage of adequate knowledge. Friedrich List (1841) anticipated adequate institutions and infrastructure that could assure economic growth and development by creating and allocating knowledge. Joseph Schumpeter (1934) identified innovation as a tremendous force of the economic performance.

At the leading edge of examination in modern growth economics are the forthcoming and basic elements of technological development, that along with human capital development, is seen as the fundamental driver of the system and a basic cause of increasing standards of living. The most relevant instruments involve the formation of new high-tech knowledge in Research & Development sections of enterprises (Romer, 1986) and the creation of human capital in learning activities (Lucas, 1988). The above-mentioned instruments rapidly got approved as the basic drivers of economic growth. Numerous authors (Cassiolato and Lastres, 2008; Rosenberg, 2004; Castellacci et al., 2005; Fagerberg and Sapraser, 2011) showed that innovation represents the engine of the economic growth, and a crucial component of the development accomplishments. According to Grossman and Helpman (1991) innovation plays a crucial role in accelerating economic growth. They analyzed innovation and economic growth in the global economy, and investigated the elements that affect long term economic growth. In the last few years, many economists highlight the role of innovation in stimulating socioeconomic renewal of developing economies. Innovation is fostering economic growth and competitiveness, and the governments are investing in innovation with an extensive set of future aims (Bozeman and Sarewitz, 2011; Mazzucato and Semieniuk, 2017).

The most powerful worldwide institutions (INSEAD, WIPO) publish numerous indicators that are beneficial for examining the influence of innovation in increasing productivity and economic growth. The global innovation index (GII) compiles the innovation components of a national economy. Innovation is valuable because it drives to the creation of new products, new technologies, and it increases economic growth. Gross Domestic Product measures economic growth and it rejects variables such as social cohesion or the natural environment. Still, labour productivity growth is the commonly used aggregate indicator of the economic effects of innovation performances. The most popular indicator of productivity, could be determined as value added per unit of labour. Productivity growth is the essential to achieving higher standards of living because it allows employees to produce more for the identical amount of work.

3. Data and research methodology

According to Romer (1986) who designated research technology that is depressed and comparable of individual scale,

$$k_i = G(I_i, k_i)$$

where: I_i represents the quantity of abstain consumption in research by enterprise i , and k_i represents the enterprise's actual quantity of knowledge. The production function of the consumption good comparative to enterprise i is equal to:

$$Y_i = F(k_i, K, x_i)$$

where: K is the aggregated 'quantity of knowledge' in the specific national economy and x_i represents the element of entire inputs distinctive from knowledge.

The production function represents homogeneous function of degree one in k_i and x_i and homogeneous function of a higher greater than one in variables k_i and K . Romer believes that determinants different than knowledge are in constant supply, that indicates that knowledge represents the specific capital good applied in the production of the goods for

consumptions. Spillovers derived from private R&D performances enhance the public quantity of knowledge. The positive externality is defined as answerable for income growth per capita. Lucas's approach of the process by measures where human capital is created is the by following variables:

$$\dot{h} = \nu h(1 - u)$$

where ν represents a positive constant variable. The more human capital community as a comprehensive has accumulated, every individual representative will be productive. This can be presented in the ensuing macroeconomic production function:

$$Y = AK^\beta (uhN)^{1-\beta} h^{\lambda}$$

where the labour input represents the number of employees (N), (u) represents the fraction of time spent working, (h) represents the labour input in efficiency entities, and h^{λ} represents the externality. The most popular and suitable new growth model was the *AK linear model* admitted to which:

$$Y = C^\alpha H^\beta = A * K$$

where K is the variable of aggregate capital that contains a physical capital (C) and human capital (H), and A represents constant productivity variable.

When looking at the augmentation of innovative performances to productivity increasement, the prevailing starting remark is to adjoin an indicator of the knowledge or intangible capital developed by innovative action to the production function:

$$Q = AC^\alpha L^\beta K^\lambda$$

where K represents type of intermediary for the knowledge stock of the specific entity. K is a number of visible features of the entity's innovative capability: its technological knowledge obtained by Research & Development, its capacity to transform research results in useful innovative products or processes. K can be established on innovative success or innovation capability. Traditionally, K has been evaluated as a stock of past Research & Development spending but as other types of data have become available, other variables involving innovation indicators have been used.

The Global Innovation Index (GII) is composed by aggregating appropriate scores. The scores linked to innovation represent greatly individual scores. The GII is founded on two primary sub-indicators that include: the Innovation Input Sub-Index and the Innovation Output Sub-Index. Other input indicators involve elements of the national economies that implement innovative performances:

- Institutions.
- Human capital and research.
- Infrastructure.
- Market sophistication and
- Business sophistication.

The output indicators incorporate real proofs of innovation outputs that include:

- Knowledge and technology outputs and
- Creative outputs.

Examination of the relevance of the previous-mentioned innovation indicators, and especially the linkage between issues captured by the seven indices, should surpass the purview of this paper. Briefly, global innovation consequences are clearly deliberated, farther regulating their capability for comprehensive policy plan of actions. The calculation of the index starts at the sub-pillar level, with each sub-pillar allocated a score of mostly the simple average of its indicators, with a few cases where explicit weights are given to specific indicators. A simple average is then taken to calculate the innovation pillars, followed by a simple average of the pillars to calculate the two sub-indices. Then the Global Innovation Index is calculated as the simple average of the Innovation Input and Output sub-indices.

4. Findings from Innovation Indices: A comparative analysis between selected EU member countries and non-EU member countries

Table 1 presents the innovation accomplishment rankings in selected EU-member and non-EU member countries according to the global innovation index. The survey was performed in the following countries: Albania, Bosnia and Herzegovina, Macedonia, Montenegro, Serbia, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovenia and Slovakia in the 2018.

Table 1. Innovation accomplishment rankings according to the Global Innovation Index in selected non-EU member and EU member countries in 2018.

	GII	INS	HCR	INF	MSO	BSO	KTO	COU
Non-EU member countries								
Albania	83	55	95	62	38	98	110	86
Bosnia and Herzegovina	77	72	37	99	85	63	74	94
Macedonia	84	49	76	83	69	99	67	107
Montenegro	52	46	55	57	87	58	96	32
Serbia	55	50	58	48	101	70	50	64
EU member countries								
Croatia	41	44	48	34	66	45	46	43
Czech Republic	27	27	35	31	48	25	17	25
Estonia	24	22	36	21	35	30	29	5
Hungary	33	40	38	49	86	32	16	44
Latvia	34	31	53	45	24	36	51	23
Lithuania	40	38	46	32	50	35	58	33
Poland	39	36	44	41	57	41	44	42
Romania	49	48	65	38	83	55	42	61
Slovenia	30	19	28	35	78	29	34	16
Slovakia	36	35	59	36	52	37	31	41

Note: INS- Institutions, HCR-Human capital and research, INF-Infrastructure, MSO- Market sophistication, BSO-Business sophistication, KTO- Knowledge and technology outputs, COU-Creative outputs.

Source: The Global Innovation Index Report 2018, INSEAD - WIPO (World Intellectual Property Organization).

Table 2 presents the indicators ranks according to innovation, economic growth and labour productivity in selected non-EU and EU member countries in 2018. Estonia has achieved the highest rank, according to innovation, infrastructure and creative outputs, compared to the other observed countries. Czech Republic has demonstrated the highest rank according to business sophistication and GDP PPP per capita.

Table 2. Indicators ranks according to innovation, economic growth and labour productivity variables in selected non-EU and EU member countries in 2018.

	GII	INS	HCR	INF	MSO	BSO	KTO	COU	GDP PPP pc	LP
Non-EU member countries										
Albania	14	14	15	13	3	14	15	13	14	15
B&H	13	15	4	15	12	12	13	14	13	13
Macedonia	15	12	14	14	9	15	12	15	15	14
Montenegro	11	10	10	12	14	11	14	5	11	12
Serbia	12	13	11	10	15	13	9	12	12	11
EU member countries										
Croatia	9	9	8	4	8	9	8	9	10	8
Czech Republic	2	3	2	2	4	1	2	4	1	3
Estonia	1	2	3	1	2	3	3	1	5	6
Hungary	4	8	5	11	13	4	1	10	7	7
Latvia	5	4	9	9	1	6	10	3	8	9
Lithuania	8	7	7	3	5	5	11	6	4	5
Poland	7	6	6	8	7	8	7	8	6	4
Romania	10	11	13	7	11	10	6	11	9	10
Slovenia	3	1	1	5	10	2	5	2	2	2
Slovakia	6	5	12	6	6	7	4	7	3	1

Source: Author's own calculation.

Slovakia and Slovenia had achieved the leading positions in productivity in comparison to other observed countries. Estonia and Czech Republic have accomplished the high position in innovation and assured a remarkable spotline, in comparison with the other EU member countries and non-EU member countries. Macedonia and Albania are the lowest ranked countries by Global Innovation Index GDP PPP per capita and Labour Productivity.

The link between various innovation, productivity and economic growth components are conferred in Table 3. Spearman's correlation coefficients have determined a linkage between important variables, specifically among different components of the Global Innovation Index – GII (Institutions – INS, Human capital and research – HCR, Infrastructure – INF, Market sophistication – MSO, Business sophistication – BSO, Knowledge and technology outputs – KTO, Creative outputs – COU), GDP PPP per capita (GDP PPP pc), and Labour productivity (LP). The data were gathered from primary and secondary sources. The research was implemented using the SPSS 24 statistical software package.

Table 3. Link between various innovation, productivity and economic growth components

	GII	INS	HCR	INF	MSO	BSO	KTO	COU	GDP PPP pc	LP
GII	1.000	.925**	.718**	.750**	.396	.964**	.821**	.839**	.886**	.821**
INS	.925**	1.000	.607*	.764**	.496	.896**	.671**	.904**	.886**	.846**
HCR	.718**	.607*	1.000	.475	.064	.775**	.521*	.579*	.632*	.575*
INF	.750**	.764**	.475	1.000	.468	.764**	.629*	.721**	.807**	.768**
MSO	.396	.496	.064	.468	1.000	.368	.089	.443	.354	.275
BSO	.964**	.896**	.775**	.764**	.368	1.000	.761**	.818**	.925**	.836**
KTO	.821**	.671**	.521*	.629*	.089	.761**	1.000	.443	.739**	.754**
COU	.839**	.904**	.579*	.721**	.443	.818**	.443	1.000	.775**	.675**
GDP PPP pc	.886**	.886**	.632*	.807**	.354	.925**	.739**	.775**	1.000	.957**
LP	.821**	.846**	.575*	.768**	.275	.836**	.754**	.675**	.957**	1.000

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Source: Author's own calculation.

Examination results have shown the very strong and significant intercorrelation between the variables of innovation, productivity and economic growth, presented by a set of relevant and objective components. It is determined positive correlations between the Global Innovation Index (GII), Labour Productivity (LP) and Gross Domestic Product PPP per capita (GDP PPP pc) presented by correlation coefficients 0.886 and 0.821, which indicate that achieving higher productivity and faster economic growth relies on higher innovation accomplishment in selected countries. Very strong positive correlation is diagnosed between GII and BSO (0.964). The interdependence is revealed among GDP PPP per capita and following variables of innovation: Institutions (0.886), Infrastructure (0.807), Business sophistication (0.925), Knowledge and technology outputs (0.739), Creative outputs (0.775) and Labour productivity (0.957), respectively. The level of innovation performance, productivity and enhancement of economic growth between selected countries relies on Institutions, Infrastructure, Business sophistication, Knowledge and technology outputs and Creative outputs.

Conclusion

The aim of this paper was to examine the significance of innovation in increasing productivity and economic growth in the selected non-EU and EU member countries. The research results have shown positive relationships between the Global Innovation index, GDP PPP per capita, Labour Productivity and other innovation indicators: Institutions, Infrastructure, Business sophistication, Knowledge and technology outputs and Creative outputs. According to the calculated inter-correlations, it may be concluded that innovation performance in selected countries depends on institutions, infrastructure, improved environment for business sophistication, and a higher level of innovation activities related to Knowledge and technology outputs and Creative outputs.

The conducted research has proposed several insights. First, innovation presents a worldwide phenomenon. The relevance of the capability and necessity for innovation reveals the need for a global insight in understanding the innovation capability indicators measured by the innovation indices. This can help to assure not only a strong foundation for accepting the multiplicity of innovation performances, but also to increase the future theoretical foundations for adequate policies about specific countries. Second, innovation capability is linked to multi-stakeholder actions. Governments should help build institutions and infrastructure, improve better conditions for business sophistication, develop new technologies and accept policies that are helpful towards markets and technological catching-up. Third, it is important to develop plan of actions that will help increase innovation, productivity and economic growth in a particular areas of an economy. The calculated innovation indicators offer relevant avenues for action in this regard. Several “weak indicators” need strengthening in more than one economy. Countries can use the innovation indices to identify their own strengths and weaknesses, compare themselves with the similar countries and create consensus around desired fields of action.

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International Financial Markets face to face with Artificial Intelligence and Digital Era

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Abstract. *Economic development is the process by which a nation improves the economic, political and social well-being of its people. The research paper starts from the reality that financial markets play an important role in each economy. The research find out that, the inequalities in the levels of development of the regions have arisen from two main reasons: economic and social conditions; and, the level of implementation of artificial intelligence and digital finance – FinTech. Nowadays, investments and financial markets are moving to a next stage: artificial intelligence and secured financial services and transfers using digital financial system, Blockchain. The research paper comes to present how artificial intelligence combine financial information with tech capabilities, accelerate digital transformation of finance to create a more safety business and economic environment, reducing human error.*

Keywords: financial markets; financial intermediaries; financial instruments; artificial intelligence; digital finance; Blockchain.

JEL Classification: D53, E44, E58, F15, F18, F21, F3, F5, F65, G15, G2, O14, O33, Q55.

1. Introduction – features of financial markets

In a common understanding, *market* means a place where people and companies *exchange* different items. Financial market is that place (physically and virtually) financial instruments (securities). Financial markets have been around ever since mankind settled down to growing crops and trading them with others. The growth of exchange in goods and services and appearance of money, increase more the importance of financial markets. At the beginning, banks were those, which represented most financial markets places. People with excess of money needed to keep them safely and/or to receive an incentive for it, so they started to use the banks. Those in need of money approached the banks to borrow the money. So, we may say that this was the first form of financial market, the place when you can sell and buy *money*, in a shape of loans, or deposits, and later in more sophisticated financial securities. The first form of financial market, at local level, began with banks, who made grain loans to farmers and traders. This was around 2000 BC in India. Later, in ancient Greece, during Roman Empire, lenders (based in temples) made loans, accepting deposits in the same time, to perform the change of money. The first international financial market was noted in Europe, in Italy, where the leaders in the field and the first to start trading securities from other governments. They would carry slates with information on the various issues for sale and meet with clients, much as a broker (financial intermediary) does today (Beattie, 2018). In the present time, people and companies wanting to borrow money are brought together with those who have surplus of funds, in the *financial markets* (Brigham and Houston, 2016), though *financial intermediaries*.

Financial intermediaries appear as a middleman between borrowers and lenders. They bring together people with surplus of financial funds with those, which are in need of money. At the beginning, banks were those institutions, which use to facilitate, indirectly, the channeling between lenders and borrowers (Figure 1).

Figure 1. Financial intermediary process (banks' operations example)



Flow of funds transfers are usually conducted among people and companies through financial intermediaries. If at the beginning, there were only banks, as main intermediaries, once with the emergence and development of businesses, more types of financial intermediaries risen, depend on their types of activities. Mention this that, financial intermediaries base their activities on flow of money of people and companies. When funds are moving from lenders to borrowers through a financial intermediary, the process it is called *indirect finance*.

Financial intermediaries are financial institutions, which make the financial system and financial markets work. Without this financial institutions and financial markets it would be difficult to move funds from people who save to those which have productive investments.

Financial system include all actors, such: financial institutions, public authorities, which regulate and supervise financial institutions, people and businesses. Financial intermediaries include financial institutions like banks, savings and loans associations, pension funds, financial companies, and investment companies. All this institutions may be grouped in: depositary institutions; contractual saving institutions; and, investment intermediaries.

Financial intermediaries are working with financial instruments. *Financial instruments* are monetary contracts between parties. They are created, and can be modified, traded and settled. They can be subject of currency, evidence of a loan or ownership, or can be a contractual right to receive or pay cash (https://en.wikipedia.org/wiki/Financial_instrument). In other words, a financial instrument is a contract (document) that can be traded in a market, and it represents an asset to one party and a liability or equity to the other (<https://www.collinsdictionary.com/dictionary/english/financial-instrument>). Depends on their risk, and term, financial instruments may be grouped in: currency, deposits, municipality notes, or bills; treasury bills; money market mutual funds; treasury bonds; municipality bonds; corporate bonds; mortgages; stocks; commercial papers; loans; and, leases. All these above can be subject of exchange on financial markets.

People and investors wanting to borrow money are brought together with those, which have surplus of funds in the *financial markets*. Depend on type of financial instrument traded, there are public or private market; primary or secondary market; money and capital market; spot and future market; internal or international market; and, physical or virtual market.

Digital solutions and new technologies offer great potential to overcome massive development challenges and can contribute achieving the goal of universal access to financial services (Rizzo, 2014). Artificial intelligence and digital business promise a universe of applications and digitalized assets that are expected to work together to allow a rapid development of new capabilities that will give competitive advantage. One of these advantages will be the integration of many low- and middleclass income earners into the financial inclusion domain (Economic Corporate Network, 2016).

2. Research methodology

The present work paper is an exploratory research, based on investigative techniques. It is a fundamental and qualitative research, which aims to identify and encourage managing new financial methods through artificial intelligence and digital systems to achieve an efficient sustainable investments on financial markets. Author of the paper wants to promote innovative techniques for development financial systems, using Artificial Intelligence, Smart City, and Blending Facilities. The research paper comes to present how artificial intelligence combine financial information with tech capabilities, accelerate digital transformation of finance to create a more safety business and economic environment, reducing human error.

3. Literature review - the internationalization of financial markets

At the beginning, financial intermediation was conducted only on internal financial markets. Once with the international trade development, foreign investments, international financial markets started to work almost automatically. Securities of large well-known companies started to be *listed* on international markets, first regionally; later globally. The extraordinary growth of foreign financial markets has been the result of both large increases in the pool of savings, in 1980s, and liberalization of movement of capital, and labor force. Investing the money inside the country, it is not enough. In the present time, financial markets, though electronic financial system it help movement of money from one party to the other, often across national boundaries. In their absence, companies would be greatly impeded in their ability to do business with each other, and economic growth would suffer (Greenbaum et al., 2016).

3.1. The impact of international financial markets on local economies

The internationalization of financial markets is having profound effects on all countries involved in foreign direct and indirect investments. Foreign investors and international bodies provide funds to corporations in certain countries, helping finance existing businesses, open new ones or helping the government (by investing in Treasury or municipality bonds). Without these foreign flows of funds, the economies would have grown far less rapidly in the past 20 years. The internationalization of financial markets is also leading the way to a more integrated world economy in which flows of goods and technology between countries are more commonplace (Greenbaum et al., 2016).

Positive impact of internationalization of financial markets. Internationalization of financial markets brought many benefit to investors and countries in the same time. Financial markets facilitates trade, risk management improvement, mobilizes resources, and acquires and processes information that helps in the allocation of capital.

An important service provided by financial market is helping individuals and businesses improve their management of various sorts of risks. This is important for economic growth because an increase in risk reduces investment. By facilitating improved risk management for both borrowers and savers, spurs long-run investments that fuel economic growth. On financial markets, financial intermediaries facilitate flows of financial resources. Investors can invest their money in productive opportunities, and businesses can access the needed capital to grow.

Financial markets obtains and processes information and facilitate capital allocation. Individual savers may not have the resources or expertise to evaluate firms, projects, and managers before deciding whether to invest in them. On the other hand, financial intermediaries may have a cost and expertise advantage in collecting and processing such information, and then helping the capital-allocation process based on that information. This, in turn, encourages investors to supply capital to these intermediaries, which channel the capital to businesses that make investments that fuel economic growth. Financial markets help to increase the flow of goods and services, increase the rate of physical capital accumulation, and increase the efficiency of combining capital and labor in production. As a result, there is more economic growth (Greenbaum et al., 2016).

Negative impact of internationalization of financial markets. The importance of the financial sector in all national economies that participate in the global financial markets has increased remarkably as well, illustrating that today domestic financial development and international financial linkages are typically complementary phenomena, rather than substitutes. Unfortunately, the scale and frequency of financial crises – especially banking crises – have increased as well (Calomiris and Neal, 2013). The value of markets has been for a long time understood to be dependent on information, leading to market asymmetry and to governance of those markets (Cerne, 2019). Informatization and computerization of society is one of the most important processes of present, everywhere around the world. Opportunities for new activities open up, while the information and technological environment as such contains the potential danger of deformations in the structure of personality and the ways of its social integration. In this regard, there is reason to assume that the development of information technologies in our modern age has both constructive and deconstructive consequences for a person or for a business (Lokova et al., 2018).

Financial crisis from 2007-2009 has propagated around the world through the international investment linkage. Back in time, the absence of a globally integrated financial framework, clear international regulations and interventions tools lead to a chain reaction from national to global.

3.2. Digital-Financial Markets – FinTech

The most valuable derivative of digitization is the rich pool of gathered data, which is growing very fast. Advanced computing capability has paved the way for *big data* analytics. Social media, mobile, analytics and cloud (SMAC) and application program interface (API) technologies have allowed different data streams to *talk* to each other in a highly efficient manner. This has led to the integration of multiple services into a single platform, thus creating a plethora of cases for digital financial services –fueling the *app economy* (Economic Corporate Network, 2016).

To remain competitive and achieve longevity in the market, financial services has to keep up with digital transformation. The survival of financial institutions is connected with the adoption of innovation, and embracing digital changes, to improve the efficiency and the performance within the organization (Scardovi, 2017). Digital transformation and new technology adoption have changed the way of doing business and channels that offer banking and financial products and services are more intuitive and trustworthy (Mohamed and Ali, 2019).

Digital systems are becoming more and more used, representing a much faster, cheaper and safer way when it comes to financial transactions. Access to modern telecommunications systems is a priority in all countries around the world, as in their evolution, financial and banking systems implement, use and encourage online services for domestic and international financial transfers. Digitization and digital transformation have become the most commonly used words in the last decade, but especially in recent years. There is an excess of definitions of this term, used to describe the offline-to-online migration of commercial operations and businesses, including those found in many published research works. Contemporaneous economists defined digitalization as *the realignment of, or new*

investment in, advanced technology and business models to more effectively engage digital customers at every touchpoint in the customer experience lifecycle (Solis et al., 2014).

Financial technology – *FinTech* refers to an emerging financial services sector that is becoming increasingly indispensable to financial institutions and has a steady impact on how technology supports or allows banking and financial services. Fintech, Financial Technology targets construction systems that model, value and process financial products, such as shares, bonds, money and contracts. Contemporary economists define Fintech as *a new financial industry that applies technology to improve financial activities* (Schueffel, 2016). Currently financial technologies are used by all types of business, from start-up to large corporations, in all economic sectors.

3.3. Artificial Intelligence

The digital revolution is changing the way of living, working and communicating. The transformation, that takes place within the telecommunications industry, it has a great impact on the surrounding world with the emergence and continued improvement of digital technologies (Zhao, 2018). Artificial Intelligence is one of them. It is a recent technological breakthrough, which, combined with industrial technology, it helps overcoming many human errors, exceeding human performance in different areas. IT programs are becoming more accurate, detecting and scaling objects better than human performance. Speech recognition systems can now identify the language of telephone calls and voice recordings with levels of accuracy that match human abilities. Translating from one language into another is now done in real time, using a simple application on the phone. Glasses can be connected directly to google map or other search program. All of these are already part of our lives. *Artificial Intelligence* solutions have the potential to transform such diverse and critical areas as education, research, healthcare, finance, accounting, auditing, transport and energy. It is not a single technology but a family of technologies. In addition, *Artificial Intelligence* solutions can help sustainable, rapid and viable regional development. The regional economic disparities that exist in different areas of the world can be diminished considerably. Therefore, *Artificial Intelligence* can help to successfully implement regional development policy objectives (Moşteanu, 2019), regardless the geographical area, the spoken language or the sectors of predominant activity. In many countries/regions public authorities require the application of the XBRL to enhance business operations and transparency, with the aim to advance their market's standing in the eyes of investors.

The history of *Artificial Intelligence* started around 100 years ago, in 1920, when Czech writer Karel Čapek published a science-fiction piece called Rossumovi Universal Robots, which introduced the word *robot*, a humanoid *machine* which work for people (Turing, 1950). In 1950, Alan Turing (mathematician, computer scientist, logician and cryptanalyst) asked himself (publically) *Can machines think?* (Koistinen, 2016), and from this question the *Artificial Intelligence* started its journey. Turing continued to develop three distinct strategies that might be considered capable of reaching a thinking machine: through programming; *ab initio* of machine learning (Koistinen, 2016); and, knowledge management (using logic, probabilities, learning skills). As a result of discoveries in neurology, information theory and cybernetics in the same time, researches, and with them Alan Turing, created the idea that it is possible to build an *electronic brain*. Turing

introduced his widely known Turing Test, which was an attempt to define machines' intelligence. The idea behind the test was to call machines (e.g. a computer) *intelligent*. If a machine (A) and a person (B) communicate through natural language and a second person (C), a so-called evaluator, cannot detect which communicator (A or B) is the machine (Schultebrasucks, 2018). And the research continued. On 11 May 1997 IBM's chess computer defeated Garry Kasparov after six games. In the last two decades, *Artificial intelligence* has grown heavily. The *Artificial Intelligent* market (hardware and software) has reached \$9 billion in 2018 and the research firm IDC (International Data Corporation) predicts that the market will be \$47 billion by 2020. This all is possible through knowledge management to explore Big Data, and take advantage of faster computers and advancements in machine learning techniques (Schultebrasucks, 2018).

3.4. eXtensible Business Reporting Language (XBRL)

eXtensible Business Reporting Language – XBRL – is a language used for electronic communication of business and financial data, which is revolutionizing business reporting around the world. XBRL enable business to generate their required reporting information directly from their financial data. It is a consistent tool also useful for comparability and overall business evaluation.

The birth of modern accounting had its origins in the Italian Renaissance where the favorable climate existed for double entry bookkeeping to be developed. In 1458, Luca Pacioli wrote his fifth book, *Summa de Arithmetica, Geometria, Proportioni et Proportionalita* (*Everything about Arithmetic, Geometry and Proportions*). This was the first book on Algebra and it is the first systematic documented source of double entry bookkeeping method. Its basics are familiar and similar in the modern accounting system, but the rules of accounting have been developed over the years, especially in the last 40 years. Now the accounting rulebook has expanded to over 4,000 pages, and is perpetually changing to accommodate new business practices. The use of a standardized coding structure, such as XBRL would help to reduce these wage expenses by removing the replication of data-entry over many channels, and reducing lost data costs. In 2000, an accounting industry specific language was released, this was version 1.0 and it was renamed the eXtensible Business Reporting Language, what we called now XBRL (Kloeden, 2006). In 1999, the American Institute of Certified Public Accountants, six information technology companies, and experts reported that they had joined forces in an attempt to develop an XML-based Financial Reporting Language and extend XBRL internationally for use in business reporting. If the *father of accounting* is Luca Pacioli, the *fathers of XBRL* are Charles Hoffman and Wayne Harding (Hoffman and Strand, 2001). The American Institute of Certified Public Accountants was receptive to this idea and funded the creation of a prototype, once a plan was presented. When the prototype was finished, the AICPA created and promoted XBRL International. The group was formed as a not-for-profit global consortium of companies and agencies with one common goal, the development of XBRL and the widespread acceptance and use of the new global coding standardization process for financial information (Tie, 2005). Currently, XBRL is used by more than 100 regulators in over 60 countries (Europe, Middle East and Asia, North and South of America), supported by over 200 software packages and a growing number of

companies, to facilitate structured data reporting across millions of companies (Nitchman, 2016).

3.5. Blockchain

Blockchain is another newest technology, which enable businesses to generate their required reporting information directly from their financial data. Blockchain technology continues to grow and it is being used in more and more business sectors, finance, accounting and auditing has been identified as areas that could greatly benefit the distributed registry and other features of this one.

Blockchain is a new technology that was introduced a decade ago, after financial crisis of 2008 (Nakamoto, 2008), and there is still a long way to be accepted and adopted by everyone. Blockchain can be described as the chronological record of block transactions. To ensure transactions, the cryptography is used, based on a chain of digital signatures. Each block is a group of transactions that are added to the last block by reaching a consensus on its authenticity among users, which is then passed to each network user to update their database. The Blockchain system records all transactions ever made, shared by consensus distributed and shared among each participant's users, and it is very difficult to force it. Since every two-key sign-in and any transactions are cryptographed and simultaneously maintained in distributed ledgers of each Node, which make this almost impossible to be hacked. Nowadays double-entry bookkeeping it is not an absolute system but it is logically extendible to triple-bookkeeping by including a set of *force* in its third axis (Yuji, 1982; 1986). In the accounting industry, Blockchain helps the companies to write their transactions directly into a join bookkeeping, creating an interlocking system of enduring accounting records. Double entry accounting has been used for a very long time now. Triple entry accounting adds a level of clarity and honesty to bookkeeping that double-entry accounting cannot offer (Faccia and Moşteanu, 2019).

3.6. Cryptocurrencies

As digital finance and artificial intelligence occupy an increasingly important place in the financial services market over the last decade, cryptocurrencies appear too. *Cryptocurrencies* are virtual digital currencies and named as such because cryptographic techniques lie at the heart of their implementation (He, et.al, 2016). Historically, the idea and concept of storing important information by using cryptographic techniques is considered older, as the term crypto is taken from an ancient Greek word Kryptos, which means *hidden*. World Bank classified cryptocurrencies as a subset of digital currencies, which it defines as digital representations of value that are denominated in their own unit of account, distinct from e-money, which is simply a digital payment mechanism, representing and denominated in fiat money. In contrast to most other policy makers, the World Bank has also defined cryptocurrencies itself as digital currencies that rely on cryptographic techniques to achieve consensus. Today, the advent of cryptocurrencies is traced to the emergence of the first cryptocurrency, that is, *bitcoin* in 2009. After the emergence of bitcoin in 2009, the experiments in cryptocurrencies started happening in 2011 with the release of SolidCoin, iXcoin, Namecoin, and others. As of August 1, 2018, there are more than 1,737 different cryptocurrencies in the market. This number of

cryptocurrencies breaks down into 819 coins and 918 tokens. According to CoinMarketCap data, the combined market of overall cryptocurrencies to date is valued at \$269 billion (Mohamed and Ali, 2019).

Central banks have started to consider whether they might issue digital currencies of their own. Due to the advent of cryptocurrencies and blockchain technology, the central banks of major economies started to think and work on their own Central Bank's Digital Currency (CBDC) (Mohamed and Ali, 2019). A fundamental matter raised by CBDC issuance relates to the appropriate roles – in financial intermediation and the economy at large – of private financial market participants, governments and central banks. With CBDCs, there could be a larger role for central banks in financial intermediation. As the demand for CBDC grows, and if holdings of cash do not decline in lockstep, central banks might need to acquire (or accept as collateral) additional sovereign claims and, depending on size, private assets (e.g. securitized mortgages, exchange-traded funds and others). If demand becomes very large, central banks may need to hold less liquid and riskier securities, thereby influencing the prices of such securities and potentially affecting market functioning. Central banks may also need to provide substantial maturity, liquidity and credit risk transformation at times to both banks and markets. Since central banks could assume more important roles, they could have a larger impact on lending and financial conditions (Committee on Payments and Market Infrastructures, 2018).

4. Conclusion – necessity of Supervision of Financial Markets

The global financial and economic crisis has done a lot of harm to public trust and confidence in governing and financial institutions, as well as the principles and the concept itself of the market economy. It has also eroded a lot of public trust in corporations. The climate of global financial uneasiness can partly be attributed to the global meltdown of 2008 where governments and other regulatory agents failed in their responsibility to monitor and steer unrestrained speculative and damaging financial activities (Scardovi, 2017). Financial crises often lead to the emergence of new national and international institutions. Financial digitalization lead to new responsibilities of financial supervisor. The recent global financial crisis has provided a unique opportunity to go beyond economic data and to capture cross border financial data and other information that could assist international and national institutions (Moshirian, 2011), to measure and manage financial risk more effectively, and to prepare for challenges raised by *new financial technologies*. Only an internationally integrated financial system will make large banks global.

FinTech has revolutionized the entire financial services industry by using innovative and advanced technologies such as Blockchain, cryptocurrencies, XBRL, Artificial Intelligence and robot-advisors. These innovative financial technologies come to realign and reboost the efficiency and quality of financial services by cutting the human errors and time processing.

Central banks are the lead authority for macro prudential policy in most jurisdictions. Macro prudential responsibilities are more likely to be given to the central bank when the central bank is also the micro prudential supervisor for banking and financial institutions.

Dedicated committees are also responsible for macro prudential policy in a number of jurisdictions and typically include government representatives, central bankers and supervisory officials. More generally, most jurisdictions have strengthened their frameworks for monitoring financial stability (Calvo et al., 2018), typically by setting up public authorities.

The involvement of central banks is a key feature of any financial supervisory architecture. This is also a source of synergies and conflicts of interest. Synergies stem from the links between financial and economic stability and from the connection between monitoring the overall liquidity of the system – the role of central banks – and the oversight of financial system solvency, which is the role of the prudential supervisory function. On the other hand, conflicts of interest may emerge as monetary policy decisions concerning the setting of interest rates can affect banks' profitability and solvency. The assignment of prudential responsibilities to the central bank also raises concerns of a political economy nature including reputational risk and excessive concentration of authority. In the United States, different functions are typically assigned to several agencies at the federal or state level. In the European Union, member states and those on the accession process share a single prudential supervisory authority (the European Central Bank's Single Supervisory Mechanism) for significant banks (Calvo et al., 2018). However, Member States do keep responsibility for the prudential oversight of smaller institutions and for other supervisory functions, through their central banks or dedicated supervision public authorities (for other institutions than bank, such: insurance companies and private pension funds). Currently there are 268 financial supervisors (around the world) (List of financial regulatory authorities by country, 2019).

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Determinants of domestic saving rate in Turkey: A new generation econometric analysis

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Abstract. *In this study, the determinants of domestic savings rate in Turkey are investigated by Johansen cointegration test and DOLS method for 1975-2018 periods. At the end of the analysis, the most important determinants of savings are found to be per capita income, real interest rates, inflation, employment and economic risk perception (gold prices). Error correction mechanisms of the models operate. The causality relationships between the variables are examined by Breitung and Candelon (2006) frequency domain causality test. While no causal relationship from real interests and gold prices to savings is determined, permanent causality from national income and employment to savings and temporary causality from inflation to savings are found.*

Keywords: domestic saving rates; determinants of saving; frequency domain causality test.

JEL Classification: D91; E21; O16.

1. Introduction

Domestic savings constitute the most important source of financing for investment and consumption expenditures in a country. When savings within the country are not sufficient to finance investment and consumption expenditures, the savings of the citizens of other countries are borrowed in order to close this deficit. In this case, however, the country's external debt stock and interest payments are increasing, making the country more vulnerable to economic shocks.

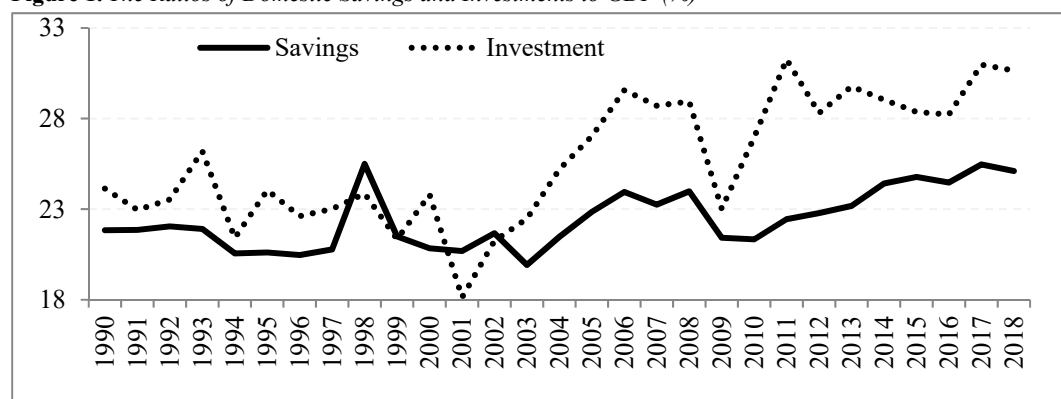
When the savings-investment gap is tried to be eliminated through external financing sources, the current account deficit of the country is also increasing. Increasing current account deficit is one of the most important leading indicators of economic crises (Ozbek, 2008; Yasar, 2011; Karagol, 2011). One of the most important reasons behind the 1994 and 2001 crisis in Turkey is the high current account deficit in those years.

As can be seen, the savings-investment gap has the potential to significantly affect the macroeconomic measures of the countries and cause economic crises. For this reason, it is useful to examine the subject in detail and keep it on the agenda.

In this context, the aim of the study is to analyze the determinants of savings behavior by econometric methods after savings-investment gap in Turkey is revealed with the help of graphs and tables. To do this, the data of Turkey's savings, real per capita income, real interest rate, inflation rate, employment rate and gram gold prices of 1975-2015 period is used to conduct new generation time series analysis methods. In the second part; Turkey's savings- investment deficit and current account deficit are investigated with the help of tables while the third part presents a summary of the related literature. In the fourth section, econometric analysis is carried out and the study is completed with results and recommendations. With this study, it is aimed to attract the attention of policy makers and economists on this issue. It is considered that the study will make a contribution to the literature due to the actuality of the subject and the analysis methods used.

2. Domestic savings in Turkey

While domestic savings was able to finance domestic investments in the 1990s in Turkey, it was unable to finance domestic investment in the period after 2000. The historical development of the ratios of domestic savings and investments to Gross Domestic Product (GDP) is shown in Figure 1.

Figure 1. *The Ratios of Domestic Savings and Investments to GDP (%)*

Source: IMF (2019).

As seen in Figure 1, in 1990, while savings were around 22% of GDP and investments were around 23% of GDP, savings rates in the post-2000 period began to decrease or increase relatively less, investments declined in the 2001 and 2009 crises and increased in general, except for those periods. The difference between savings and investments reached to 8.8% in 2011, and domestic savings inclined at a certain rate by the help of 25% state contribution to those who have been included in the Private Pension System as of January 1, 2013. However, by the end of 2018, there is still a difference of 5.5% between domestic savings and domestic investments. The distribution of savings and investments between public and private sectors is given in Table 1.

Table 1. *The distribution of savings and investments between public and private sectors in Turkey (Ratio to GDP, %)*

Year	Public Savings	Private Savings	Public Investments	Private Investments
1990	2.6	22.1	5.2	16.0
1995	-0.1	24.6	3.1	19.6
2000	-3.4	24.2	5.0	17.3
2001	-7.0	27.7	4.6	13.5
2005	2.7	20.2	3.6	23.0
2009	-0.8	22.2	3.9	18.5
2010	1.5	19.8	3.9	20.8
2011	3.4	19.0	4.1	24.2
2012	2.6	20.1	3.8	23.5
2013	2.9	20.2	4.3	24.2
2014	2.7	21.8	3.9	25.0
2015	3.6	21.1	4.1	25.6
2016	2.7	21.7	4.1	25.3
2017	2.6	20.3	4.0	24.3
2018	2.4	20.1	3.8	24.1

Source: Ministry of Development, Economic and Social Indicators, 2019.

As can be seen in Table 1, public sector savings in Turkey is generally very low, in many periods also took negative values. In the 2001 crisis, while the public sector savings decreased to -7.1%, private sector has protected itself and increased its savings up to 27.7%⁽¹⁾. After 2003, people prefer consumption rather than saving as the United States and also Turkey began to apply low interest rate policy, in addition to the political and economic stability atmosphere. The result was a substantial decrease in private sector

savings down to 19% of GDP in 2011. Although public savings inclined to 3.4% this year, total savings remained at 22.4% of GDP. When the investments are examined, it is seen that public investments are far below the private investments, after the 1994 crisis and in the period of 2005-2010 it has decreased to 3%. It is observed that the private sector's investments decreased especially in the economic crisis periods, decreased to 13.5% in 2001 and to 18.5% in 2009. The average economic growth of Turkey needs to exceed 5% to generate employment, which requires over 22% investment (TİSK, 2014). From this perspective, both public and private sector should increase their investments.

Because of the low level of domestic savings in Turkey, banks operating domestically cannot collect enough deposits from the public. In this case, banks use syndicated loans from foreign banks in order to meet the domestic credit demands and distribute the funds they provide to the domestic market. However, this time the external debt stock of the country increases rapidly. Changes in Turkey's external debt stock are given in Table 2.

Table 2. *External debt stock of Turkey (Billion Dollars)*

Year	Short Term	Public	CBRT	Private	Long Term	Public	CBRT	Private	Total
1990	9.5	0	0.9	8.6	42.9	33.3	7.5	2.1	52.4
1995	15.5	0.3	1.0	14.3	60.4	41.8	11.2	7.5	75.9
2000	28.3	2.5	0.7	25.2	90.3	47.6	13.4	29.2	118.6
2005	38.9	2.1	2.8	34.0	131.8	68.3	12.7	50.9	170.7
2006	42.9	1.8	2.6	38.5	165.3	69.8	13.1	82.3	208.1
2007	43.1	2.2	2.3	38.7	206.9	71.4	13.5	122.0	250.0
2008	52.5	3.2	1.9	47.4	228.4	75.1	12.2	141.2	280.8
2009	49.0	3.6	1.8	43.6	219.9	79.9	11.4	128.6	268.6
2010	77.2	4.3	1.6	71.4	214.6	84.8	10.0	119.8	291.7
2011	81.6	7.0	1.2	73.3	222.3	87.3	8.1	126.9	305.3
2012	100.2	11.0	1.0	88.1	239.5	93.0	6.1	140.5	342.1
2013	130.4	17.6	0.8	112.0	259.8	98.3	4.4	157.1	392.6
2014	131.7	17.9	0.3	113.5	271.0	99.8	2.1	169.0	405.7
2015	102.7	14.6	0.2	88.0	295.3	98.4	1.2	195.7	400.3
2016	101.3	19.7	0.110	81.4	307.9	103.6	0.711	203.5	409.2
2017	118.6	22.11	0.658	95.8	336.4	114.4	0.8	222	455
2018	116.8	21.3	5.4	89.9	331.6	115.6	0.8	215.9	448

Source: CBRT – EDDS, 2019.

Looking at the data in Table 2, Turkey's external debt stock jumped in the period after 2000, increased rapidly in the period after 2006 and it exceeded \$400 billion in 2014. When we look at the composition of debts in 2018; 26% of the debts are short-term debts and 68.2% of the total debt belongs to the private sector. In recent years, the international credit rating agencies also emphasize the highness of Turkey's external debt stock in their statements and, in particular, they point to the fragility of the private sector. For example; Fitch, a credit rating agency, declared in April 27, 2016; "In the emerging economies, risk arisen by private sector foreign exchange debt increases and the debt ratio is the highest in Turkey", (Yildirim, 2016). In this statement; in terms of external debt to GDP ratio of the private sector, it was also underlined that Turkey is located at the top. The total debt of the private sector reaches 1.1 trillion dollars⁽²⁾. The increasing savings gap also raises the current account deficit. Domestic saving gap and current account deficit data are presented in Table 3.

Table 3. *Domestic saving gap and current account deficit data (Ratio to GDP, %)*

Year	Saving-Investment Gap	Current Account Deficit
1990	-2.3	-1.2
1995	-3.4	-1.0
2000	-2.9	-3.6
2005	-4.1	-4.1
2006	-5.6	-5.6
2007	-5.4	-5.4
2008	-4.9	-5.1
2009	-1.5	-1.7
2010	-5.6	-5.7
2011	-8.8	-8.9
2012	-5.5	-5.4
2013	-6.5	-6.7
2014	-4.6	-4.6
2015	-4.3	-4.3
2016	-3.7	-3.8
2017	-5.5	-5.5
2018	-5.5	-5.7

Source: IMF, 2019.

As seen in Table 3, there is a very strong relationship between savings-investment deficit and current account deficit. The increasing savings-investment gap brings along the current account deficit. Especially in 2011, the current account deficit, approaching 10% of GDP, has made Turkey considerable vulnerable to economic crises. Indeed, in a report released in August 2013 by a US investment bank Morgan Stanley, the countries are evaluated according to current account deficit to GDP ratios and most vulnerable countries to capital inflows are determined. In the end, India, Brazil, Indonesia, Turkey and South Africa are named as "fragile five" (Morgan Stanley, 2013). Turkey, meanwhile, is said to be the most vulnerable country in this basket. According to the report, the basic economic problems of the countries mentioned are significant current account deficit due to the fact that their domestic savings are not sufficient to finance their investments, weak economic growth, inflation risk, the fact that their economic growth is largely dependent on foreign capital and, as a result, exchange rate risk (Gocer and Akin, 2016).

3. Literature summary

Rijckeghem and Ucer (2008), in their study that examines the development and determinants of private saving rates in Turkey, estimated the main determinants of private saving rates as public savings, inflation and real GDP per capita growth rate. Duzgun (2009) examines the determinants of private savings by OLS method in Turkey for 1987-2007 periods. At the end of the study, it is found that public savings, money supply, interest rate and inflation have negative impact on private savings, while foreign savings have a positive effect. Yarasir and Yilmaz (2011) investigated the determinants of private savings in OECD countries by using the Dynamic Panel Data Analysis Method for the period 1999-2007. As a result of analysis; it is determined that the savings rates of the previous year,

the loans given to the private sector, the current account balance and inflation affect private savings negatively while public sector savings and the elderly dependency ratio affect positively.

Sancak and Demirci (2012), which studied the importance of national savings in order to have sustainable economic growth in Turkey; stated that in spite of the relative improvement in public savings in recent years, there has been a significant decrease in private sector savings and national savings have a positive effect on the sustainability of economic growth in the short and long term. Ozcan and Gunay (2012), in the study examines the determinants of savings in Turkey for the period 1975-2006; found that one of the most important factors that determine the private savings is the savings inertia, the public savings have a decreasing effect on the private savings and increases in real interest rates and terms of trade positively impact the private savings. In addition, economic growth, financial depth and inflation have reducing effects on private savings. Young and old population dependency ratios and urbanization rates have a negative effect on private savings and women with higher education have a negative effect on private savings, while women's labor force participation rate and university graduate people have an increasing effect on private savings.

Colak and Ozturkler (2012) investigated the propensity of households to save in Turkey by OLS and quantile regression methods using the Household Budget Survey Micro Data Set 2010 prepared by TurkStat and found that the coefficient of house ownership and social security variables in the household with the lowest income of 20% are positive and the coefficient of the number of individuals with higher education diploma and the population living in the city are negative. In the household with the highest income of 20%, it was found that living in the city reduced the tendency to save. Karagol and Ozcan (2014), in their study that investigated the reasons for the decline in savings, revealed that the main causes of the decline in savings rate in Turkey is the increase in household consumption expenditures, low real interest rates, inadequacy of financial markets and low female employment. Özel and Yalcin (2013), in their study on domestic savings and private pension system in Turkey; stated that the 25% state incentives to the private pension system could increase domestic savings by 1.5 points, but the high operating expenses of the fund would limit the increasing effect of this change in the PPS. In other words, based on the current fund operating expense ratios, it would be more advantageous for the participants to evaluate their investments outside the system. It has been pointed out that their evaluation may be more advantageous for themselves. Therefore, measures to lower the operating costs of the fund in Turkey should be taken as soon as possible in order to provide development in PPS.

World Bank (2014) report, on the low level of savings in Turkey, stated that the low level of financial education, low women labor force participation rate, not having the households' savings planning, saving only for precautionary motive, having the ultimate goal of saving to buy a house and the absence of other long-term targets, the high transaction costs in the banking system and the low net returns are effective. Hamarat and Ozen (2015), in the study investigating the variables affecting savings preferences in Turkey by canonical correlation analysis method with for 23 provinces, determined that

population density, income, number of bank branches and number of enterprises have significant effects on saving preferences. Moreover, the per capita stock exchange amount, the per capita TL deposit amount and the TL deposit amount per account were among the most affected savings preferences, while the foreign exchange and gold preferences were less affected than the other preferences. Aksoy (2016) took the consumer and commercial loans as the determinants of the savings and analyzed by GECC method and the maximum likelihood estimator using the data of 1980-2014 period for 52 countries, 32 of them developed and 20 of them developing. In the study, it is estimated that public sector savings have a crowding-out impact on private savings. Moreover, 1% increase in public savings, consumer credits and commercial credits decline private savings by 0.60, 0.21 and 0.05%, respectively, while 1% increase in per capita income, terms of trade and CPI volatility improve private savings by 0.10, 0.06 and 0.12%, respectively.

4. Econometric analysis

4.1. Data set and model

In order to find the determinants of savings in the study, the ratio of Turkey's 1975-2018 period savings to GDP (S , %), real per capita income (Y , thousand TL), the real interest rate (R , %), inflation rate (π , CPI, %), employment rate (E , %) and gram gold prices (G , TL) are used. Data were compiled from TurkStat Statistical Indicators 1923-2013, Ministry of Development Savings Statistics, TurkStat Basic Labor Force Statistics and CBRT-EVDS. Real income per capita is obtained by deflating GDP per capita with CPI 2003=100 series. Real interest rate series is formed based on Fisher Equality⁽³⁾, by subtracting inflation rate from nominal interest rates. Gram gold prices are included in the study as a leading indicator of the economic crisis in Turkey because when an internal or external crisis risk arises in the economy in Turkey, gold prices react quickly in the direction of increase⁽⁴⁾. Similarly, the inflation rate serves as a control variable for the study⁽⁵⁾. The following models are used to determine the determinants of savings in the study:

$$S_t = \beta_0 + \beta_1 Y_t + \beta_2 R_t + u_t \quad (1)$$

$$S_t = \alpha_0 + \alpha_1 Y_t + \alpha_2 E_t + e_t \quad (2)$$

$$S_t = \gamma_0 + \gamma_1 Y_t + \gamma_2 \pi_t + \varepsilon_t \quad (3)$$

$$S_t = \theta_0 + \theta_1 Y_t + \theta_2 G_t + \epsilon_t \quad (4)$$

Here, R , E , π and G are included as control variables.

4.2. Methodology

In the study, the stationarity of the series is controlled by Augmented Dickey-Fuller (ADF), Phillips-Perron (1988, PP), Kwiatkowski et al. (1992, KPSS) and Vogelsang and Perron (1998, VP) structural break unit root tests, the existence of the cointegration relationship is tested by Johansen (1991, 1995) method and long and short-term analyzes are performed using the Dynamic Least Squares (DOLS) method.

4.3. Unit Root Test

The stationarity of the series is tested with ADF, PP, KPSS and structural break ADF methods. ADF is used because it is the most widely used test, PP is because, especially in the trend-containing series, it is considered to be more powerful than the ADF (Perron, 1988), KPSS is because, unlike the ADF and PP test, its null hypothesis is "series are stationary", that is, it is a justification of ADF and PP. Since Turkey's economy faced many structural transformation and economic crisis during the analysis period, the study is extended with the structural break ADF test developed by Vogelsang and Perron (1998). The results are presented in Table 4.

Table 4. *Unit Root Tests results*

Variable	ADF	PP	KPSS	Structural Break ADF	Structural Break Date
S	-1.76 (0.39)	-1.84 (0.35)	0.30 (0.34)	-2.76 (0.80)	1998
Y	-0.53 (0.87)	0.77 (0.99)	0.77 (0.46)	-1.88 (0.98)	2004
E	-1.37 (0.58)	-1.36 (0.59)	0.70 (0.46)	-1.98 (0.98)	1991
R	-3.02** (0.04)	-3.11** (0.03)	0.43 (0.34)	-3.45 (0.40)	1994
π	-2.04 (0.26)	-2.05 (0.26)	0.41 (0.34)	-3.82 (0.22)	2002
G	-2.13 (0.23)	2.90 (1.00)	0.78 (0.73)	-1.29 (0.99)	2008
ΔS	-7.26*** (0.00)	-7.18*** (0.00)	0.07*** (0.73)	-7.17 (0.00)	1999
ΔY	-3.83*** (0.00)	-6.04*** (0.00)	0.21*** (0.73)	-4.24* (0.08)	1988
ΔE	-5.45*** (0.00)	-5.51*** (0.00)	0.21*** (0.73)	-6.63*** (0.00)	2004
ΔR	-5.06*** (0.00)	-8.96*** (0.00)	0.12*** (0.73)	-6.73*** (0.00)	1996
$\Delta \pi$	-6.72*** (0.00)	-7.06*** (0.00)	0.17*** (0.73)	-7.03*** (0.00)	1996
ΔG	5.59 (1)	-3.58** (0.01)	0.64*** (0.73)	-6.05*** (0.00)	2008

Note: The values in parenthesis are probability values in ADF and PP tests, and 1% critical values in KPSS test. ** and *** indicate that the related series is stationary at 5% and 1% significance level, respectively.

According to ADF test results; while real interest is stationary at level, saving, income, employment and inflation are stationary in the first difference; gold prices are not stationary at the level or the first difference. The study is expanded with PP test. In the PP test, real interest is stationary at the level values and the other series are found to be stationary at the first difference. This time, KPSS test is used in the study. As result of the KPSS test, all series are not stationary at the level and become stationary at the first difference. The study is also extended by VP structural break unit root test. In the structural break ADF test, the series are not stationary at the level values but stationary at the first differences, that is I(I). Looking at the structural break dates of the structural break ADF test; the crises of 1994, 2001 and 2008 appear clearly. On the other hand, period of high inflation in 1996, the 1998 Russian economic crisis and its impact on Turkey is also revealed by the test method.

4.4. Cointegration Test

In the study, there are more than one explanatory variable in each model and in such cases, Engle-Granger (1987) method is considered to be weak. Therefore, cointegration relationship between the series is examined by Johansen (1991, 1995) method and results are given in Table 5.

Table 5. *Johansen Cointegration Test results*

		Eigenvalue	Trace Statistic	0.05 Critical Value
Model 1	None *	0.450	42.40	42.91
	At Most 1	0.33	24.27	25.87
	At Most 2	0.17	6.73	12.51
Model 2	None *	0.47	22.14	21.87
	At Most 1	0.11	3.81	15.001
	At Most 2	0.02	0.61	2.70
Model 3	None *	0.32	27.89	24.27
	At Most 1	0.27	11.47	12.32
	At Most 2	0.01	0.73	4.12
Model 4	None *	0.52	34.16	32.06
	At Most 1	0.12	7.84	16.16
	At Most 2	0.0015	0.09	2.70

Note: Optimum lag length is taken as 1 according to Akaike, Schwarz and Hannan-Quin criteria in all models.

According to the results in Table 5, it is evaluated that the series are cointegrated in all models, that is, they move together in long term and regression analysis performed with the level values of this series will not have spurious regression problem.

4.5. Long Term Analysis: Estimation of Cointegration Coefficients

The cointegration coefficients are estimated by DOLS method and the findings obtained are presented in Table 6.

Table 6. *Cointegration Coefficients Estimation results*

	Model 1	Model 2	Model 3	Model 4
Y	-0.19*** [-5.01]	1.19*** [2.43]	0.007 [0.09]	1.21*** [2.81]
R	0.18** [2.23]	---	---	---
E	---	1.84** [2.12]	---	---
π	---	---	0.13*** [3.50]	---
G	---	---	---	-0.62*** [-4.48]
Constant	28.84*** [10.74]	-93.32** [-2.21]	9.55** [2.96]	-4.95 [-0.71]
R²	0.59	0.78	0.88	0.83
\bar{R}^2	0.45	0.51	0.71	0.72
JB	0.64	0.32	0.88	0.05

Note: The square brackets are the t statistics for the corresponding parameter. *, ** and *** implies 10%, 5% and 1% significance levels, respectively. JB shows probability value of Jarque-Bera normality test.

According to the results in Table 6, when the real national income per capita inclines, it is seen that the saving rate decreases. This situation supports Keynesian approach for money demand that increased income will increase demand for money. With increasing demand for money, savings rates are also declining. Indeed, with increasing per capita income, the savings rate in the period after 2002 has dropped significantly in Turkey. In this model, it is determined that the increase in real interest rates increases the domestic saving rate. This situation supports the idea of Keynes that savings are an increasing function of interest. The results obtained about the real interest rate are compatible with Duzgun (2009); Ozcan and Gunay (2012); Karagol and Ozcan (2014). In Model 2, it is observed that the increase in per capita income has an increasing effect on savings. Similarly, it is found that the increasing employment rate improves the saving tendencies of the people. This finding supports the Lifetime Income Hypothesis of Modigliani. To keep their consumption for life, people save a portion of the income they earn while working. The results obtained are compatible with the studies of Rijckeghem and Ucer (2008); Aksoy

(2016). In Model 3; it is seen that increasing inflation led people to the participate in the financial system instead of keeping cash which cause increases in the savings. In fact, in the 1990s when inflation ranged between 70% to 130% in Turkey, domestic savings remained above 20% of GDP. This result is compatible with Rijckeghem and Ucer (2008); Yarasir and Yılmaz (2011); Ozcan and Gunay (2012). In Model 4, it is seen that the per capita income increases the savings, but the increase in the gold prices ascends the risk perception of the people causing the fact that the savings are taken out of the financial system. Here, the precautionary money demand approach of Keynes can also come to mind.

4.6. Short term analysis: Error correction model

Short-term analysis, based on the error correction model, is carried out as follows with stationary series created by taking first difference and one period lagged of the error term series obtained from long-term analysis (ECT_{t-1}):

$$\Delta S_t = \beta_0 + \beta_1 \Delta Y_t + \beta_2 \Delta R_t + \beta_3 ECT1_{t-1} + u_t \quad (5)$$

$$\Delta S_t = \alpha_0 + \alpha_1 \Delta Y_t + \alpha_2 \Delta E_t + \alpha_3 ECT2_{t-1} + e_t \quad (6)$$

$$\Delta S_t = \gamma_0 + \gamma_1 \Delta Y_t + \gamma_2 \Delta \pi_t + \gamma_3 ECT3_{t-1} + \varepsilon_t \quad (7)$$

$$\Delta S_t = \theta_0 + \theta_1 \Delta Y_t + \theta_2 \Delta G_t + \theta_3 ECT4_{t-1} + \epsilon_t \quad (8)$$

Short-term analyzes are performed by DOLS method and the findings are presented in Table 7.

Table 7. Short Term Analysis results

	Model 1	Model 2	Model 3	Model 4
ΔY	0.58 [1.25]	0.24* [1.44]	0.92** [1.89]	0.29* [1.63]
ΔR	0.016 [0.15]	---	---	---
ΔE	---	-0.37 [-0.75]	---	---
$\Delta \pi$	---	---	0.12 [0.89]	---
ΔG	---	---	---	-0.023 [-0.10]
ECT_{t-1}	-0.27** [-2.10]	-0.35** [-2.11]	-0.62*** [-2.74]	-0.48** [-1.95]
Constant	-1.39 [-1.06]	-0.73* [-1.45]	-1.73** [-1.91]	-0.58 [-0.97]
R^2	0.68	0.25	0.62	0.23
\bar{R}^2	0.58	0.23	0.45	0.14
JB	0.58	0.92	0.32	0.94

Note: The square brackets are the t statistics for the corresponding parameter. *, ** and *** implies 10%, 5% and 1% significance levels, respectively. JB shows probability value of Jarque-Bera normality test.

According to the results in Table 7, error correction mechanism of all models operates. In the long run, the deviations in the short run between the series moving together disappear and the series converge again to the long term equilibrium value. This situation also proves that the long-term analyzes are reliable.

4.7. Frequency domain causality test

Conventional causality tests give the relationship between the series for one test statistic, while frequency distribution causality analysis generates different test statistics for different frequencies. Therefore, the frequency distribution causality test considers the relationship between the series to be short, medium and long term (Adiguzel et al., 2013: 59; Senturk et al., 2014: 160). In addition, this test is able to reveal whether the

relationship between the series is permanent or temporary (Bozoklu and Yilanci, 2013: 877).

Geweke (1982) and Hosoya (1991) established the following VAR model by creating two-dimensional time series vector, $z_t = [x_t, y_t]'$ where $t = 1, \dots, T$, in order to analyze causality relationship:

$$\theta(L)z_t = \varepsilon_t \quad (9)$$

Here, $\theta(L) = I - \theta_1 L - \dots - \theta_p L^p$ and $L^k z_t = z_{t-k}'$. Then the causality for different frequencies is defined as follows:

$$M_{y \rightarrow x}(\omega) = \log \left[\frac{2\pi f_x(\omega)}{|\psi_{11}(e^{-i\omega})|^2} \right] = \log \left[1 + \frac{|\psi_{12}(e^{-i\omega})|^2}{|\psi_{11}(e^{-i\omega})|^2} \right] \quad (10)$$

If $|\psi_{12}(e^{-i\omega})| = 0$, no causality relationship exists from y to x in ω frequency. If Z 's components are stationary at first-order and cointegrated, this series has unit root. Subtracting z_{t-1} from both sides of Equation (5) (Breitung and Candelon, 2006: 365):

$$\Delta z_t = (\theta_1 - I)z_{t-1} + \theta_2 z_{t-2} + \dots + \theta_p z_{t-p} + \varepsilon_t = \tilde{\theta}(L)z_{t-1} + \varepsilon_t \quad (11)$$

$$\tilde{\theta}(L) = \theta_1 - I + \theta_2 L + \dots + \theta_p L^p \quad (12)$$

Breitung and Candelon (2006) assumes ε_t has White Noise process and defines $E(\varepsilon_t, \varepsilon_t') = \Sigma$ where $E(\varepsilon_t) = 0$ and Σ is positive. Defining G as sub triangle matrix of Cholesky decomposition, $G'G = \Sigma^{-1}$, $E(\eta_t \eta_t') = I$ and $\eta_t = G\varepsilon_t$. If the system is stationary, $\psi(L) = \phi(L)G^{-1}$ and MA indication of it is:

$$z_t = \phi(L)\varepsilon_t = \begin{pmatrix} \phi_{11}(L) & \phi_{12}(L) \\ \phi_{21}(L) & \phi_{22}(L) \end{pmatrix} \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{pmatrix} = \begin{pmatrix} \psi_{11}(L) & \psi_{12}(L) \\ \psi_{21}(L) & \psi_{22}(L) \end{pmatrix} \begin{pmatrix} \eta_{1t} \\ \eta_{2t} \end{pmatrix} \quad (13)$$

When this impression is used for the spectral density of x_t :

$$f_x(\omega) = \frac{1}{2\pi} \{ |\psi_{11}(e^{-i\omega})|^2 + |\psi_{12}(e^{-i\omega})|^2 \} \quad (14)$$

Breitung and Candelon (2006) conducts an F test and compares obtained test statistic with $F(2, T-2p)$ table value to test the null hypothesis that there is no causality relationship from Y to X , under the linear constraint of $\beta = [\beta_1, \dots, \beta_p]'$. In this study, the frequency domain causality test developed by Breitung and Candelon (2006) is performed and the results are presented in Table 8.

Table 8. Frequency Domain Causality Test Results

Null Hypothesis	Long Term (Permanent Causality)		Medium Term				Short Term (Temporary Causality)		Decision
	0.01	0.05	1.00	1.50	2.00	2.50	0.01	0.05	
$Y \nrightarrow S$	5.12*	5.09*	1.48	1.95	0.84	2.58			There is a permanent causality from national income to savings. In accordance with the Keynesian theory, an important determinant of savings is income.
$R \nrightarrow S$	0.66	0.66	1.05	1.34	2.47	0.60			There is no causality relationship from real interest to savings. So saving behavior in Turkey are formed independently of real

Null Hypothesis	Long Term (Permanent Causality)		Medium Term		Short Term (Temporary Causality)		Decision
$E \rightarrow S$	18.64*	18.78*	14.92	0.43	0.79	7.30*	interest rates. This case is considered to be due to very low real interest rates in Turkey which causes liquidity trap. There is a permanent causality relationship from employment to savings. In other words, increased employment affects the saving behaviors by increasing the income of individuals.
$P \rightarrow S$	1.99	1.98	5.60*	9.71*	7.41*	2.58	There is a causality relationship from inflation to savings in the short and medium term. Thus, increased inflation may affect the consumption and saving behaviors in the short term by panicking individuals.
$G \rightarrow S$	1.78	2.33	0.39	1.54	1.06	1.17	There is no causality relationship between gold prices and savings.

Note: Critical value used to compare test statistics at 5% significance level is $F(2, 17) = 3.59$.

According to the results in Table 8, the most important determinants of savings in Turkey are income and employment. Looking at the determinants of the savings with the help of figures⁽⁶⁾.

Figure 2. $Y \rightarrow S$ Causality Relationship

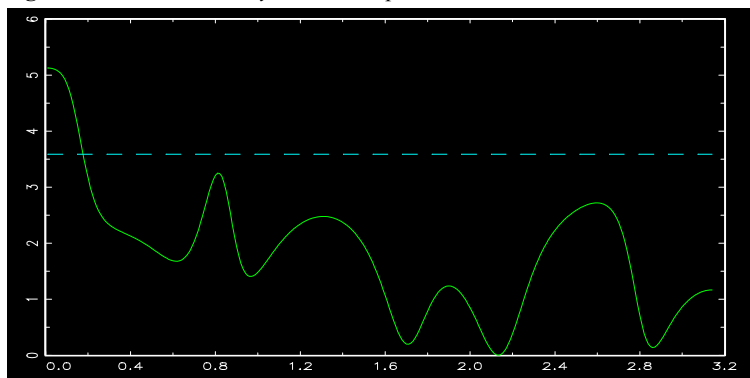


Figure 2 shows that there is a long-term causality relationship from national income to savings. So, saving behavior in Turkey is influenced by national income.

Figure 3. $R \rightarrow S$ Causality Relationship

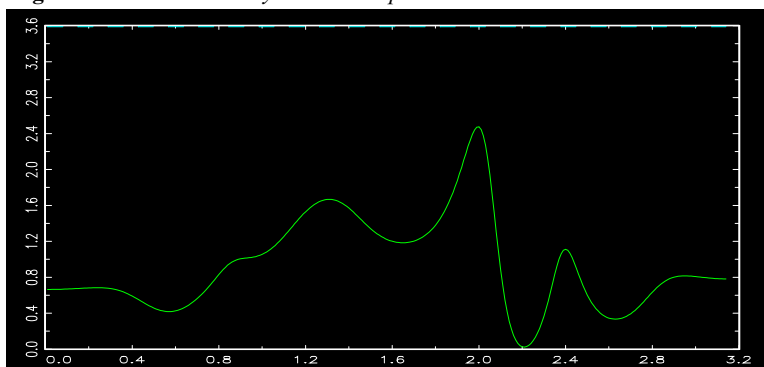


Figure 3 shows that there isn't any causality relationship from interest to savings.

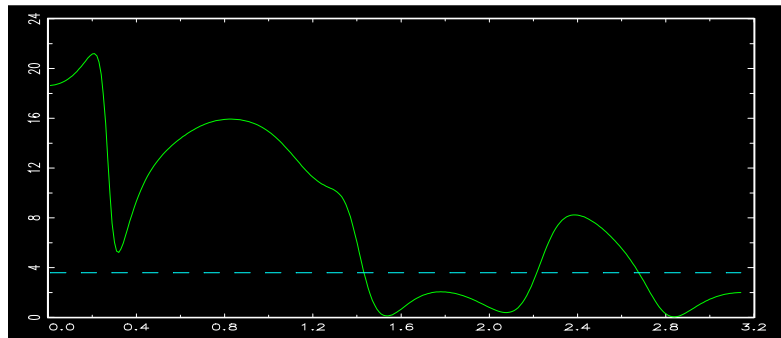
Figure 4. $E \rightarrow S$ Causality Relationship

Figure 4 shows that there is a causality relationship from employment to savings both in the long-term and short-term. In other words, saving behavior in Turkey is significantly affected from employment. Based on this information, it is also considered that the recent rise in unemployment is a cause of fall in saving rates in Turkey.

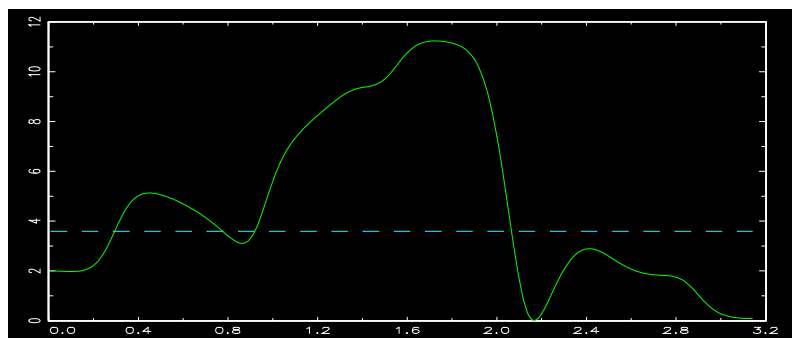
Figure 5. $\pi \rightarrow S$ Causality Relationship

Figure 5 indicates that there is a causality relationship from inflation to savings in the medium term. So saving behavior in Turkey is affected from inflation at a certain rate.

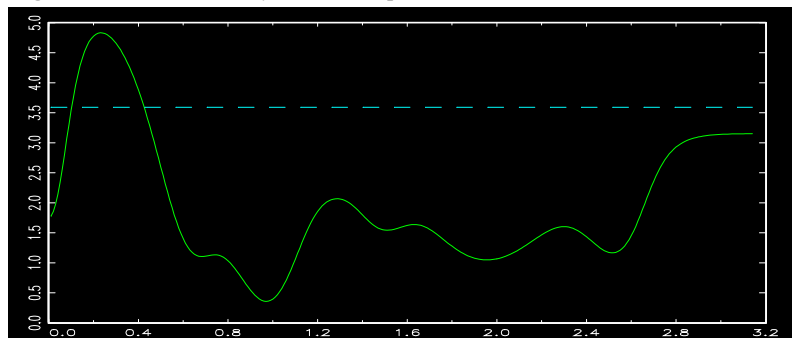
Figure 6. $G \rightarrow S$ Causality Relationship

Figure 6 provides evidence of a long-term causality relationship from gold prices to savings. So, although not a very powerful relationship exists, saving behavior in Turkey is slightly affected from the price of gold.

Conclusion and recommendations

Domestic savings are the most important source of financing of countries' investments, and, for a sustainable high growth level, high savings rate is of great importance. As Solow (1956) stated; for high economic growth, there is a need for a continuous increase in the fixed capital stock per labor. To provide this, the increase of investments is required and the savings must incline to increase the investments.

Behind the current account deficit, one of the most important problems of Turkey's economy in recent years lays the insufficiency of domestic saving to finance investment. When it is not possible to finance investments with domestic savings, foreign savings are used, which increases the country's external debt stock, external debt interest payments and fragility to economic shocks.

In this study, the determinants of domestic savings rate in Turkey is investigated by using real national income per capita, real interest rate, inflation rate, employment rate and price of gram gold for the period of 1975-2018. As result of the analysis, the most important determinants of savings are estimated to be per capita national income, real interest rates, inflation, employment and economic risk perception (gold prices). Error correction mechanisms of the models operate.

Based on the findings of the study; policy makers willing to increase savings in Turkey has to pay attention to increase the disposable income of people, to provide high real interest rates and to incline employment rate. Banks are also required to cut their transaction fees from savings owners and try to offer higher real returns to them. Households should not try to consume first and save then, but to save first and then spend remaining money and to try to save more for the future of family and country.

Notes

- (1) This is a good example of Money Demand for Precautionary Motive of Keynes.
- (2) It is the total debt of the private sector consisting of domestic debts, foreign debts, bank credits, checks and bills and is calculated by (Yildirim, 2016).
- (3) Fisher equation is $R = i - \pi$.
- (4) In fact, although the most responsive indicator is stock market indexes, because BIST established in 1986 in Turkey and start trading in 1987, data belong to the period before that date are not available.
- (5) When the inflation rate increases, the national currency rapidly depreciates, in which case the household converts the money into gold or foreign currency, or if the real interest rates are above zero, they invest in time deposits or spend as soon as possible.
- (6) In the figures, it is decided that there is a causality relationship in periods when the graph exceeds the critical value line. For more detailed information on the interpretation of graphics, see Breitung and Candelon (2006).

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A behavioral model of failure in business

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Abstract. *The authors start from the idea that those who do not encounter any failure in their business are not real entrepreneurs. Using a causal determinism type of analysis, we identify the factors that lead towards failure and the stages of its development. At the end, we present a couple of reflections regarding the regaining of moral by the entrepreneur after failure.*

Keywords: failure, risk, bankruptcy, attitude, experience.

JEL Classification: M21.

*“Failure should be a teacher, not a gravedigger.
Failure means delay, not defeat. It is a temporary detour, not a dead end.”*
John Maxwell

Business failure is part of the path to success. As a result, it naturally occurs. It is said that 9 out of 10 new businesses meet with failure in the first five years since their onset (Kiyosaki, 2018). Is it daunting?

It depends on the attitude of the entrepreneur. Different surveys show that there is no real entrepreneur who would not have faced a failure. A healthy attitude towards it has made him learn from mistakes, from the lessons he has received. In this way he gained more experience. He grew up. He notices better what are the new opportunities after his moral restoration. In any case, failure is an ingredient of success. There is a strong link between risk and gain, especially in the business environment.

If you met with failure, do not look for excuses in the inevitable circumstances. For example, to blame others. If you are a follower of “the excuses trend”, you would better give up being an entrepreneur. Always, a real entrepreneur has the power to discover and see his own mistakes. Moreover, he will learn from them in order not to fall into the same kind of harmful decisions. As a result, we could say that failure is not essential for the entrepreneur, but what he does immediately after he realizes it and has to make a decision in the new conditions of reality.

1. Hard to overcome: fear of failure

If an entrepreneur is convinced that he must be all-knowing, totally competent and able to achieve his goals, it means that he is dominated by the fear of failure. This fear will follow him alongside his presence in the business environment.

Entrepreneurs who are afraid consider that they are only valuable when they obtain achievements. When they record failures, they consider themselves worthless. They forget about past achievements and regain the moral with difficulty after failure.

This belief that an entrepreneur is valuable only he obtains success is false, irrational. There are some arguments through which we can reject it:

- a) The permanent chase after long-term success is inconvenient because it assumes (physical and mental) efforts which exceeding certain limits bring the entrepreneur into a state of exhaustion. He becomes a workaholic, distances himself from the family and forgets to live, to enjoy life.
- b) The competition for success reflects the entrepreneur’s desire to overcome others. He may come to the conclusion that he is worthless in comparison with others in the same sector in which the competition takes place.
- c) The intense desire to achieve success generates anxiety. The entrepreneur is afraid of taking risks. He will not accept the idea that failure is a step towards success. He did not reflect the well-known quote of the famous scientist Albert Einstein, *“failure is success in progress”*. As such, failure can be the road opener to success. It means *“delay, not defeat”*, as John Maxwell says.

Fear of failure spreads in two directions:

- To ourselves (To).
- Compared to others (Tc).

Following the first direction (To), fear that we will lose confidence in our own forces will be installed. The toughest fight we carry is with ourselves.

The fear acquired by following the second direction (Tc) is tougher. As such:

$$T_c > T_o$$

This is because no one is accompanying or appreciating a business entrepreneur who fails in the business world. A competitor will not want to be in the place of the one who fails or is identified with such a model. In any area of the business environment, entrepreneurs would like to identify with successful people.

A study made by the Insolvency House in Transylvania shows that 92% of the businessmen who have gone through a failure are withdrawing from the entrepreneurial activity. The vast majority of those who experienced a failure at the first attempt are afraid to try again. It all depends on their attitude towards failure.

If they looked at it as a step towards success, as a lesson in which they gain experience, these entrepreneurs would know how to stop repeating mistakes and create sustainable business.

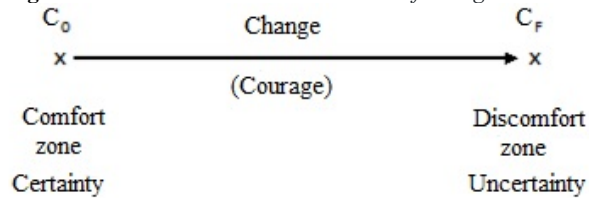
Another study made by Gallup International shows that the most important component of successful entrepreneurs' actions is perseverance. They take advantage of the lessons of failure having the ability to turn failure into an opportunity to grow their business.

2. A causal chain of entrepreneurial behavior

Every mistake accumulated on the way where we get where we want is a step towards success. This is best remarked in the research programs conducted by scientists. Any "mistake" means progress. They are guided by Edison's principle: *a mistake is a discovery demonstrating that what we are testing does not work*. Discovering mistakes and considering their steps to success, they ignore frustration and self-satisfaction. They persist in thinking about success.

Following the same principle used by researchers, the entrepreneurs eventually arrive at the expected outcome. In this context, we ask why do entrepreneurs often fail to avoid frustration?

Psychologists say that a great part of the human behavior is determined by customs, habits (around 80%). In order to make a change (as a result of some decisions), a shift from comfort to discomfort is needed (see Figure 1).

Figure 1. *Human behavior in conditions of change*

Failure arises from a series of misconceptions. The causal chain that leads to failure starts from childhood, when we are told that we are not good enough, that we can't be count on, that we are not capable of anything, that we do not deserve ... As a result, we enter into a disappointment state. We have seen that nearly 92% of entrepreneurs give up fighting after the first failure. It demoralizes them. They can no longer find the power to continue to realize their dreams.

As such, fear of failure involves fear of change. In the area of discomfort (post-change) it is difficult for them to adapt or they are even incapable of doing that. The change occurs as a result of some decisions (considered good or bad). If they make a wrong choice, the entrepreneurs do not support the mistake from an emotional point of view. It's a "reaction" since childhood – when they were wrong, they were punished. So, they easily give up the decision to start a business (even through the start-up mechanism) and accepts the comfortable area (the service they have, especially in the public sector). That's not because they would not want financial independence but because they doubt that they will succeed, that they will get something better (after the change).

They prefer the comfort zone, fearing the risks. In themselves, they know what they want, but they have no courage to act or wait until they realize their dream. Preferring the comfort zone, the safety zone, these entrepreneurs compromise their own values. Each of these entrepreneurs may have doubts, disappointments, expectations, frustrations, explanations for the decision made. Everybody treats them in relation to their attitude. Everyone should learn from them. These obstacles that occur in the psychological level can be overcome.

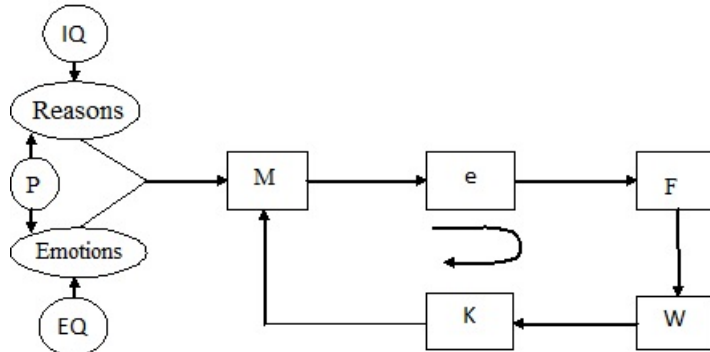
Failure, as an experience, is the best teacher, as John Maxwell said. This experience the entrepreneur cannot get by reading books, taking into account the mistakes of others, but only through action, by learning by mistake. In fact, there are no failures but lessons we learn.

Failure is not the effect of a singular event. It does not appear suddenly, but it is a result of the accumulation of erroneous decisions. The sequence of reasoning mistakes occurs because each mistake is considered to be of little importance, even harmless. The accumulation of these mistakes will cause at some point to pay the price for decisions that seemed to be of relatively small importance. Often those errors of reasoning that lead to bad decisions occur in the prosperity period. Because the immediate effects of these mistakes have no consequences that draw our attention, we risk repeating the bad decisions.

Let it be F – failure, C – the set of causes (c_1, c_2, \dots, c_n) that determines it (identified or not), e – vector of effects (e_1, e_2, \dots, e_m) generated by the "m" wrong decisions (errors), M – the vector of "mistakes" taken by entrepreneurs, $M = (m_1, m_2, \dots, m_m)$.

A graphic description of the behavioral model is given in Figure 2.

Figure 2. *The model of causal determinism associated to entrepreneurial behavior*



W – the vector of failures recorded by the entrepreneur as lessons or experiences that will be used to make corrections (K) on wrong decisions (M).

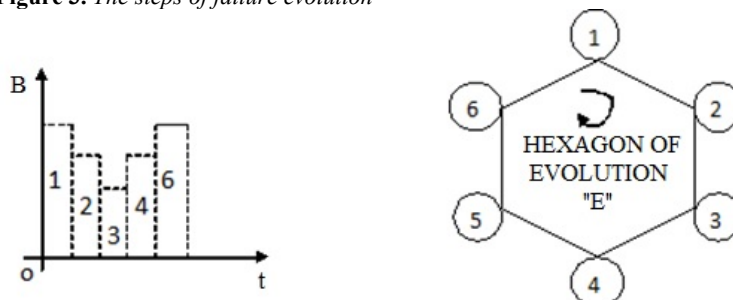
The knowledge of the entrepreneur contributes to the crystallization of his life philosophy (P) from where we can identify the rational intelligence (IQ) and emotional intelligence (EQ) indices. In many leadership papers it is shown (and demonstrated) that:

$EQ > IQ$. As a result, the psychological elements determine the trajectory of the entrepreneur's business, also called "the hexagon of the evolution of failure".

3. The stages of evolution

Studies on the casework of business failures have revealed some crucial elements in the evolution of failure. These elements are analyzed from the perspective of emotional intelligence that defines an often hidden structure of failure. Often the evolution of failure can be represented graphically, highlighting the transition from one stage to another. We can resort to such two intuitive representations:

Figure 3. *The steps of failure evolution*



where:

B – the business amplitude;

1, 2, ..., 6 – the stages of evolution;

t – time.

In the “hexagon of evolution” the movement from 1 to 6 is clockwise. The interpretation of these two representations explains what happens when we fail:

- 1) It is the first stage we call “The attempt”. We start a business, something that motivates us to take a risk. We do not really think about the consequences. We have no fear. Enthusiasm annihilates it. The entrepreneur is living this new challenge in his life. But it is also the step categorized in a possible failure as a “scapegoat”. Because of the enthusiasm and the beginning of euphoria, we believe that we have met with failure. And the fact that we tried something new, feeling good, does not entitle us to blame us later.
- 2) It is the step called “The awakening”. Once you start your business, you find out that you have not studied the market properly, you have not placed the sales points well, that you have prepared the business plan hurry-scurry, you have not calculated the cost-income ratio in more detail ... Of course, such signals should have been included in the area of pro-active measures were, but in our enthusiasm we ignored them or did not want to see them. All this is in the vector “C”.
At this step, we see that many “M” decisions were incorrect, wrong. We realize we’ll have a series of “e” effects. It is the period of “awakening to reality”. It is the hardest to accept because we experience the business disaster, the losses, the consequences.
- 3) It follows “The retreat”. We’re trying to isolate. We can’t believe the result we have come to. We can exclaim, “It is not!”. We tend to deny the cruel reality. We have the impression that we have not lost the money invested and that everything will be fine. Failure has changed the polarity of reality. At this stage, where failure occurs as “a bad dream,” most entrepreneurs remain stuck. They do not have the strength to come to light.
- 4) We try to explain to others why we have hidden. We go to the “Alibis” stage. We invent excuses:
 - “I was not lucky. The crisis has just begun.”
 - “The business partner betrayed me. I had too much confidence.”
 - “The market conditions have changed.”
 - “The state changed the rules during the game.” etc.

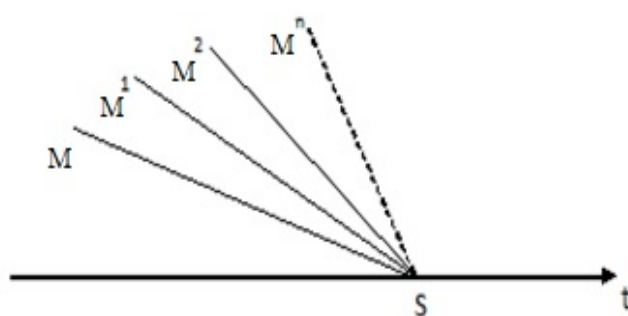
These apologies show that we are not yet ready to take responsibility for failure. You’re starting to realize that the collapse would have been due to you. As surveys show, 92% of entrepreneurs stop. They do not have the power to take responsibility for the reasoning mistakes. Learning from mistakes will never happen if those who fail blame the others or the inevitable circumstances in which they decide and act. At this stage, the entrepreneurs are very creative about the multitude of excuses that underlie their failure.

- 5) It is the step where we start again, we move on. We are entering a new step: “The unlocking”. At this stage, we realize the set of “M” mistakes we made. We are ready to bear the consequences, the “e” effects of these mistakes. It is the stage where we accept failure. We take its responsibility. In order to find solutions to begin, excuses must be abandoned, and we have to believe in the certainty of the hope of realizing the dream. At this stage, the entrepreneurs are trying to get into action, even if they have not

managed to recover morally, entirely after the failure. At this stage, they analyze the lesson learned: they see what they have done wrong, perceive how misconceptions can be eradicated in the future, they start acting, they feel much better, the enthusiasm, the mood to rebuild the business “piece by piece” returns.

- 6) It is the step where the entrepreneurs say to reason: “Let’s remember”. They ask themselves: Can the same mistakes repeat in the future $M' \neq M$. The business analysts respond affirmative. The learning process of mistakes is convergent, as suggested in Figure 4:

Figure 4. *The convergence of the process of learning from mistakes*



where:

$M^n < M^{n-1} < \dots M$, and S – the point of convergence – the success.

Any successive failure means experimentation. Hence the personal development of the entrepreneurs. This convergent process requires perseverance. The entrepreneurs do not give up their dream if they go to the “alibis” stage, where most of them get stuck. When they reach stage 4, all the excuses that are said make them suspicious of others, and they condemn them. They react instinctively, as the subconscious dictates, knowing from childhood that the wrongdoer is punished. Society has taught us that we are bad (unprepared, incompetent, unworthy) and if we are wrong, we receive all sorts of punishments, sometimes even from close ones. The effect: we shut down emotionally, we turn left and return to the “comfort zone” where we have self-imposed limits.

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The effect of oil prices on foreign trade deficit in the economics of Bulgaria

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Abstract. *Oil takes up a significant place in global energy consumption and oil prices are notable indicators of countries' economic performances. As a matter of course, the bigger and longer-lasting the increase in oil prices, the bigger effect it has on macroeconomic variables. The present study investigates the relationship between changing oil prices and foreign trade of Bulgaria using annual data between the years 1982-2017 by means of Fourier ADF and Fourier KPSS unit root tests and Arai-Kurozumi co-integration test with a structural break. Presence of co-integration between series was concluded.*

Keywords: oil prices, foreign trade deficit, Bulgaria, structural break tests, Fourier ADF.

JEL Classification: F32, F41.

1. Introduction

Energy, being a fundamental input of economy holds a determining role in countries' economic and political decision-making procedures. On the other hand, the scarcity of fossil fuel sources in particular as well as short-lived political stability and technological insufficiencies make energy even more valuable for the economy. Fuels such as oil, coal and natural gas currently maintain their importance due to higher measures of energy of fossil fuels and especially of oil compared to renewable energy sources as well as lower costs of extraction.

The significance of energy today as an essential source of human life and a fundamental factor of industrialization is indisputable. Importance of energy requires it to be found whenever and wherever needed as well as in any needed quantity and with low cost. Unequal geographic distribution of energy sources leads to imported energy dependence and causes the economy of some countries to be negatively affected by the increasing prices of energy. Particularly the changes in oil prices affects macroeconomic variables through different channels, especially leading to declines in output costs by means of causing changes in input costs which in turn result in a shrinkage of GDP as well as an inflationary effect.

High energy prices caused by oil price increases cause a temporary shift in production function and cause a decrease in output. The decrease in the output and the subsequent increase in the interest rate increases the price level in a certain nominal amount of money by decreasing the real money demand. For this reason, one of the most significant reflections of high oil prices is to reduce GDP and to increase inflationary pressure.

According to Killian (2010), a positive shock in oil prices is a terms of trade shock for a country that imports oil. Such a terms of trade shock can be considered to be a problem impacting production decisions of the economy. As oil is an important input of production, the increase in the prices of this input will concurrently upset the trading equilibrium.

In the present study, the relationship between global real oil prices and the balance of foreign trade in Bulgarian economy is investigated using annual data from 1982-2017 via Fourier ADF and Fourier KPSS unit root tests as well as Arai-Kurozumi co-integration test with a structural break.

2. Economic structure of Bulgaria

Bulgaria, which has been under the influence of the Soviet Union over the course of the Cold War, was involved in the democratization process in 1990s among other Central and Eastern European countries. As per their switch to a capitalist system, Bulgaria held their first multi-party election in 1990, defeating the communist one-party hegemony which had been present since the Cold War era. Adoption of the new constitution and the presidential elections in the following years are considered to be the indicators of democracy and leaving behind the socialist system in the country.

Relations between Bulgaria and the European Union (EU) began diplomatically in 1988. Two years after that, Bulgaria signed a treaty of commerce with European Economic Community and in 1995, submitted their application to EU. Negotiations with EU began in 2000 and in 2007, Bulgaria joined EU as a full member. The membership of Bulgaria in the EU marked a new period in the country whereby the Gross Domestic Product (GDP) per capita appeared to increase steadily. However, the country also appears to be one of the two poorest in the Union in terms of GDP per capita. Main macroeconomic indicators of the Bulgarian economy are given in Table 1.

Table 1. *Macroeconomic indicators*

Year	Current Deficit	Oil Price	GDP (growth rate)	Inflation	Unemployment
2000	0.0564	28.5	4.7	7.1	16
2001	-0.0498	24.44	3.7	6.1	19
2002	-0.0259	25.02	5.9	3.7	18
2003	-0.1044	28.83	5.1	2.2	13
2004	-0.1182	38.27	6.4	5.6	12
2005	-0.1653	54.52	7.1	6.5	10
2006	-0.2392	65.14	6.8	6.7	8
2007	-0.2639	72.39	7.3	11	6
2008	-0.2869	97.26	6	8.1	5
2009	-0.1693	61.67	-3.5	4	6
2010	-0.0552	79.5	1.3	1.1	10
2011	-0.0314	111.26	1.9	5.9	11
2012	-0.0653	111.67	0.03	1.5	12
2013	-0.0155	108.66	0.4	-0.7	12
2014	-0.0351	98.95	1.8	0.4	11
2015	-0.0323	52.39	3.4	2.2	9
2016	0.0019	43.73	3.9	2.2	7
2017	-0.0139	54.19	3.8	3.4	6

Despite improvements in the past years, Bulgarian economy is still fragile. As a result of the collapse of the Soviet market, the country has been through serious financial crises. Later on, the application of the currency board following agreements with the International Monetary Fund (IMF), having the Bulgarian currency Lev pegged to the German Mark and the applications of strict monetary policies led to an increase in growth rates in the country. However, this recovery was not on a sufficient level. Private sector received an increased share by means of privatization policies in the country. Additionally, increase in domestic demand led to an increase in import, which in turn resulted in increase in current deficit.

Following Bulgaria's switch to market economy, an economic crisis erupted in 1996 as a result of unsuccessful reforms. The country's economy which saw positive growth starting in 1994 shrank by 10.9% in 1996. Consumer price inflation on average was 7.8% by 2008 and 0.6% by 2009. It is seen that Bulgaria saw a rise in economic performance following their EU membership in 2007. Increase in GDP per capita appears to be 6.1% between 2004-2007 (OKA).

Despite the social problems unemployment created on a significant scale between the years 2000-2006, rates of unemployment appear to be decreasing in the past years. Active policies by the state towards job creation, as well as increasing employment opportunities in the private sector in the past years played a significant role in handling the issue of unemployment.

3. Literature research

However, the impact of a positive shock in oil prices on current deficits of countries importing or exporting oil, and how such a shock may have affected developed and developing countries has not been investigated in detail. At the present time, due to lack of substitutionary energy sources, crude oil is a significant revenue item for countries which manufacture oil and a cost item for countries such as Bulgaria, which consume rather than manufacture oil. At this point, it is certain that oil trade has a significant position in countries' external equilibrium. The first study looking into the relationship between oil prices and external equilibrium is conducted by Agmon and Laffer in 1978. In their study based on developed countries, Agmon and Laffer (1978) concluded that balance of foreign trade became unstable immediately following the oil price shock, however it recovered right after the initial disturbance.

Karabulut and Danişoğlu (2006) investigated the factors contributing to current accounts deficit in Turkey by means of VECM analysis based on quarterly data of the years 1991-2004. Consequently, it was concluded that the increases in oil prices had a negative impact on current deficit and that there is a positive correlation between oil prices and current deficit.

Demirci and Er (2007) analyzed the effect of changes in crude oil prices on current deficit in Turkish economy using AR-MA, VECM and VAR analysis based on monthly data from the period 1991:12 - 2006:12. It was determined as a result of the analysis that there is a long term relation between oil prices and current deficit and that oil prices affect current deficit negatively.

Erdoğan and Bozkurt (2009) analyzed the determiners of current deficit in Turkey with the help of MGARCH models based on monthly data of the years 1990-2008. As a result of the analysis, it was concluded that balance of foreign trade and oil prices have primal impact on current accounts deficit.

Demirbaş et al. (2009) investigated the effect of changes in oil prices on current deficit in Turkish economy via causality analysis based on data covering the years 1984 to 2008. As a consequence, a positive significant correlation between current deficit and crude oil prices was concluded.

Özlale and Pekkurnaz (2010) investigated the relationship between oil prices and current account balance in Turkey using VAR analysis based on data of the period between 1999 and 2008. As a result of the analysis, it was determined that oil price shocks have a significant effect on current account balance in the short term.

Irhan et al. (2011) investigated the long term co-integrated relationship between the variables included in their study using ARDL bounds testing in order to analyze the determiners of balance of foreign trade in Turkey. The analysis showed that loss in value in real exchange rate affected balance of trade significantly and strongly and that the balance of foreign trade improved strongly as a result of an increase in foreign reel income. It was also concluded that crude oil prices had no significant effect on balance of trade.

Gün (2011) investigated the effect of oil prices on current accounts deficit in Turkey using time series analysis based on data from the years 1975 to 2010. As a result, a strong correlation between oil prices and current accounts deficit was concluded.

Bayat et al. (2012) analyzed whether the changes in oil prices had an impact on balance of foreign trade in Turkey in the given period of time using data of monthly oil prices and foreign trade data for the time period 1992:01 to 2012:04. In the study, nonlinear cointegration, nonlinear and frequency domain Granger type causality analysis were used. The results of the study concluded a unidirectional causality of real oil prices on foreign trade deficit. It was also concluded that the long-term disturbances in balance of foreign trade were not caused by oil price shocks.

Bildirici and Kayıkçı (2012) analyzed the relationship between current account balance and oil prices using Markov Switching autoregression model based on annual data between the years of 1975 and 2009 in Argentina, Mexico, Brazil and Turkey. The analysis concluded that oil prices affected current account balance positively in Brazil, which is an oil exporter country, and negatively in oil importer countries such as Turkey.

Mucuk et al. (2013) analyzed the relationship between international oil prices and the current account deficit in the work for Turkey's economy in 1992:01 - 2013:02 with the help of monthly data. As a result of the study using the VAR analysis method, they found that there is a long-term causality relationship between international oil prices and current account deficit.

Altıntaş (2013) analyzed the relationship between real oil prices and relative export price variables with the help of quarterly data covering the period 1987-2010 in Turkey by the ARDL method and causality test. As a result of the study, it was found that the value of elasticity showing the effect of real oil price on export was positive and meaningful.

Özata (2014) examined the relationship between oil imports, real effective exchange rate, GDP and current account and the relationship between GDP and current accounts with structural vector autoregression test. It was used data for 1998:Q1 - 2012:Q4. As a result of the study, it was determined that the sudden shock in oil prices affected the deficit negatively and this sudden oil shock effect would last for a long time.

Lebe and Akbaş (2015) investigated the ways in which the current deficit in Turkey is affected by changes in imported crude oil prices and the exchange rate based on monthly data covering the time period 1991:12 - 2012:11. The Vector Autoregressive Model and the causality test by Dolado and Lutkepohl (1996) were utilized in the study. The analysis based on the Vector Autoregressive Model suggested real oil prices and exchange rates had significant effect on current deficit. Results from the Dolado and Lutkepohl causality appeared to agree with the results from the Vector Autoregressive Model.

Bayar and Karamelikli (2015), examined the relationship between foreign trade deficit and energy use in Turkey's economy by using 1997:03 - 2005. As a result of the study, foreign trade balance, real effective exchange rate, oil and natural gas prices have been found a

long-term relationship. Also concluded that there was a one-way causality relationship between oil and natural gas prices and foreign trade.

Sarılı (2015) examined the long-term relation between crude oil prices and external terms of trade, and CPI and current account deficit for Turkey's economy. In the study, monthly data was used between January 2005 and November 2014 and VAR analysis was performed. In the analysis, it was determined that a shock in oil prices would have the most effect on foreign trade. In addition, it concluded that the impact of the shocks on the current account deficit is shorter and more limited than the terms of foreign trade.

Güngör et al. (2016) analyzed the effects of changes in oil prices on current deficit in Turkish economy with the use of ARCH-GARCH models based on monthly data covering the period between the years 1992:1 - 2015:12. The analysis concluded that oil prices had a decreasing effect on current deficit and that structural breaks had no significant effect on current deficit.

Alagöz et al. (2017) have examined the impact on macroeconomic variables of oil prices in Turkey, China, South Africa, Mexico, Colombia, Costa Rica with the help of panel data analysis. They used the data from the period 1980-2016 annual data in the analysis. They used panel data analysis in the study. In the analysis, it was concluded that the one-dollar increase in the price of crude oil caused a 0.04% increase in inflation in the said countries and that the increase in the crude oil price had a negative effect on the current account deficit and affected the current account deficit.

Özaytürk and Alper (2017) looked into the effect of importation of oil on current deficit in 11 OECD countries including Turkey (Czechia, Finland, France, Germany, Ireland, Italy, Portugal, Spain, Sweden, Turkey, United Kingdom). The study utilized panel data analysis and was based on the data covering the years between 2000-2013. As a result of the analysis, it was found that there was a positive correlation between gross domestic product, amount of oil imported and the level of financial development and that the amount of oil important had the greatest impact on current deficit.

Şengönül et al. (2018) were examined the impact on exports of oil prices in Turkey by the ARDL bounds testing approach. They used the data from the period 2000:01 - 2016:12 in the analysis. The study concluded that the increase in oil prices in the long term positively affected exports.

Unutur (2018) investigated the relationship between oil prices and balance of foreign trade in Turkey using non-linear co-integration analysis based on monthly data from the year 2000 to 2015. Consequently, a long-term relation between oil prices and foreign trade deficit was found. It was also concluded that the changes in oil prices effected foreign trade deficit with a three periods of delay.

Cangül (2019) had examined the relation on current account balance of crude oil imports for Turkey and EU Countries in between 1996-2016 by the help of VAR analysis. The

results of the study showed that the results were in parallel with the results obtained in the literature.

4. Data and method

The present study analyzes the relationship between oil prices and current deficit in Bulgarian economy using annual data of the period between the years 1982-2017 with the help of time-series. Variables and their sources used in the analysis are shown in Table 2.

Table 2. Variables and sources used in the model

Variables	Using Variable	Elde Edildiği Kaynak
XM	Export-import (constant 2010 US \$)	World Bank WDI
OP	Oil Prices (brent crude oil prices \$/barrel)	OECD data

Table 3. Descriptive statistics of variables

	XM	OP
Average	0.0293	42.3404
Median	-0.044	28.6400
Maximum	0.6545	111.6700
Minimum	-0.2869	12.7200
Std. Error	0.2234	31.1392
Skewness	1.2866	1.1146
Kurtosis	4.0726	2.9174

The descriptive statistics of the variables to be used in econometric analysis (Table 3.) show that the mean values of all variables are neither near the maximum nor the minimum values. The standard deviation of the variables also appear to be scattered from the average. As a result, it can be said that there is no sample deviation in the data set.

4.1. Becker, Enders and Lee (2006) Fourier Function Unit Root Test

The Fourier Function Unit Root Test was developed by Becker et al. (2006) in an attempt to eliminate weaknesses of standardized tests. Fourier examines stationarity using the selected frequency component of a function. The test is designed to allow the best estimation in cases where breaks occur gradually.

KPSS type stasis testing is recommended because the unit rooted zero hypothesis is weak in the stationary series. The greatest advantage of the Fourier KPSS test is that it does not require the location, number and form of the breaks in the series to be determined in advance. The following equation is estimated.

$$y_t = \alpha_0 + \gamma_1 \sin\left(\frac{2\pi kt}{T}\right) + \gamma_2 \cos\left(\frac{2\pi kt}{T}\right) + \varepsilon_t \quad (1)$$

$$y_t = \alpha_0 + \beta_t + \gamma_1 \sin\left(\frac{2\pi kt}{T}\right) + \gamma_2 \cos\left(\frac{2\pi kt}{T}\right) + \varepsilon_t \quad (2)$$

k – indicates frequency value, t , trend value and T , number of observations.

Equation (1) tests the null of level stationarity while Equation (2) tests the null of trend stationarity. The test statistic is given by:

$$\tau_{KPSS} = \frac{1}{T^2} \frac{\sum_{t=1}^T \tilde{S}_t(k^2)}{\tilde{\sigma}^2} \quad (3)$$

Becker, Enders and Lee (2006) suggest that the frequencies in (1) and (2) should be obtained via the minimization of the sum of squared residuals.

The hypotheses of the test are as follows:

$H_0: \rho < 1$ Series is stationary.

$H_1: \rho = 0$ Series is non-stationary.

In the case that the calculated test statistics is greater in absolute value than the table value, H_0 is rejected.

4.2. Enders and Lee (2012) Fourier Unit Root Test

Enders and Lee (2012) proposed a new Dickey Fuller (DF) type root test with Fourier function.

$$y_t = \alpha(t) + \rho y_{t-1} + \gamma_t + \varepsilon_t \quad (4)$$

$$\Delta y_t = \rho y_{t-1} + c_1 + c_2 t + c_3 \sin\left(\frac{2\pi kt}{T}\right) + c_4 \cos\left(\frac{2\pi kt}{T}\right) + \varepsilon_t \quad (5)$$

The hypotheses of the test are as follows:

$H_0: \rho = 0$ Series is stationary.

$H_1: \rho < 1$ Series is non-stationary.

In the case that the calculated test statistics is greater in absolute value than the table value, H_0 is rejected.

Fourier unit root test results are shown in Table 4.

Table 4. Unit root test results

OP		Statistic	Critical value (%5)	Fourier
Fourier KPSS Test (Beckers et al., 2006)	Constant	0.2730	0.172	1
	Constant +trend	0.1258	0.054	1
Fourier ADF Test (Enders and Lee, 2012)	Constant	-2.999	-3.81	2
	Constant +trend	-3.2816	-4.35	2
XM				
Fourier KPSS Test (Beckers et al., 2006)	Constant	0.3264	0.172	1
	Constant +trend	0.4037	0.054	2
Fourier ADF Test (Enders and Lee, 2012)	Constant	-2.0110	-3.81	2
	Constant +trend	-3.2034	-4.35	2

Table 4 shows the results of Fourier KPSS and ADF unit root tests. It is known that the H_0 hypothesis is rejected when the calculated test statistic is greater than the table value. Accordingly, it is seen that both variables in the table have unit roots in both test groups. Therefore, it is decided that the variables are stationary in I (1).

Thus it had decided cointegration test for the variables. Arai-Krozumi cointegration test results are shown in Table 5.

Table 5. *Arai-Krozumi Co-integration Test Results for Level and Regime Shift*

	Level shift	Regime shift
KPSS Test Statistic	0.047	0.046
Fraction	0.139	0.139
Critical Value (%5)	0.259	0.257
Break Date	1991	1991

When the results in Table 5 are analyzed, it is seen that the calculated test statistics are less than the critical value, so there is a cointegration relationship between the series. The series moves in the long run. When the structural breakdown dates are examined, it can be seen that the test successfully predicted the effects of serious financial crises as a result of instability and strike waves in Bulgaria during the first half of 1990 and collapse of the Soviet market with the end of communist administration.

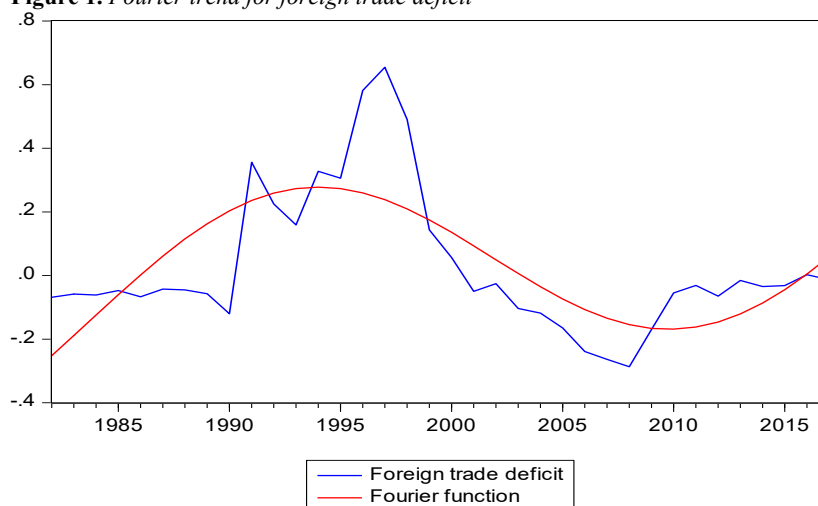
Figure 1. *Fourier trend for foreign trade deficit*

Figure 1 shows the Fourier trend for the foreign trade deficit in Bulgaria for the period 1982-2017. As seen in the figure, one of the largest structural breaks in 1982-2000 was in 1991 and the other in 1997. With the dissolution of the Eastern Bloc in 1989, radical structural, economic and social reforms have been introduced in Bulgaria. The radical structural, economic and social reforms began to come into effect in in Bulgaria with the dissolution of the Eastern Bloc in 1989. Bulgaria underwent a transitional period following the post-socialist era. Political crises during this transitional period brought upon financial instability which triggered outside forces in addition to causing the people of the country to become impoverished. In 1996, an economic crisis began in the country. Leva has decrease in value significantly against the dollar. There were difficulties in the payment of external debts. The economy of the country showing positive growth since 1994 was reduced to 9 percent in 1996. In February 1997, the economic crisis deepened. Thus, the tendency of Fourier function is clearly seen rather than a single break.

Conclusion

The mechanism by which oil prices affect real economic activity is the inclusion of both supply and demand channels. Some researches indicate that the transfer of the effects of rising oil prices as the main channel will lead to recession due to supply-side. In this case, oil price increases affect the potential production in economies. In addition, higher oil prices increase the cost of production and decrease the competitiveness of export industry in the country, leading to a decrease in the overall export volume. In this context, in order to examine the relationship between foreign trade and oil prices for the Bulgarian economy, data for the years 1982-2017 were used. Fourier ADF and Fourier KPSS unit root tests and Arai-Krozumi structural fracture cointegration tests were used to examine this relationship. According to the results, it is determined that there is a relationship between oil price and foreign trade in the long term. When the structural breakdown dates are examined, it can be seen that the test successfully predicted the effects of serious financial crises as a result of instability and strike waves in Bulgaria during the first half of 1990 and collapse of the Soviet market with the end of communist administration.

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Relationship between mortality and financial crisis. The case of Greece

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Abstract. *This manuscript is presenting the facts of crisis in Greece and especially the mortality raises. Using a set of seven variables proposed by earlier authors (Alcohol and tobacco consumption, crisis(lagged) and unemployment(lagged), Number of heart attacks and suicide attempts and health expenditure per capita) respectively. Under an exact statistic method (Robust Least Squares) for a 38-year period (1979-2016). The results show that six variables had positive relation to mortality but the effect of the two lagged variables needed one year to show. Health expenditure per capita cuts had the expected negative effect.*

Keywords: crisis, health expenditure, mortality, unemployment.

JEL Classification: I18, G41, F34.

Introduction

The present work is presenting the rapport between the financial crisis and mortality in Greece. How the turbulence conditions affected Greek habitant's well-being? Has mortality been elevated because of the crisis? Health spending per capita decrease has been important factor and why? And finally has the tobacco and alcohol consumption rise had affect due to economic crunch and mortality? When possible crisis and unemployment consequences affect mortality and how? The paper is stated as follows: On the first part research questions and a brief introduction is placed. Second part present the established literature on the field and its extensions. Methodology is presented on the third sector. The results are presented on the fourth share. Finally, the last part presents research conclusions as long as further quest proposals.

Past works

The country that concentrated the most interest during the decades of 80's and 90's on the field of financial crises was Mexico having a rich and fascinating history of turbulences. Thus, the link between crises and public health became clear under the proposed framework Cutler, Knaul, Lozano et al. (2002), where vulnerable ages (children and elderly) were recognized as the main victims of the country's mortality increase, along with the considered factor of women rising share to the labor force. The more working women lead to less caring and higher loss of life. Child health has been focused also on a latter work Paxon and Schady (2005) for the same period. They concluded that the collapse in the public sector finance has increased infant mortality in a set of countries under examination.

Asian crisis has also been under consideration on social policy and possible financial crisis. In any under examination country the expenditure cut was as expected a negative factor but on the same way or without possible lags due to dynamic character of these policies Holiday (2005) for the case of Indonesia and Waters, Saddah and Pradhan (2003), where devaluation of national currency was extremely high, both healthcare incidents and reports were reduced in contrast to the compared Thailand. Thus, there is no clear evidence on this major question out of Asian crisis facts.

On the global credit crunch of 2008 and its aftermath rich and recent reference findings are presented. In an early bird work Stuckler and Basu (2009) are presenting the economic crisis mainly as an unemployment effect and its mortality side along to the government intervention. They concluded that percentage change to unemployment had greater effect to the suicides while labor increase policies didn't have the expected positive remedy level. In a proximate work Stuckler and Basu, Suhrcke et al. (2011) have returned engaging more detailed analysis consider major lag between crisis and its effects to unemployment and public health. Eastern European response to 2008 crisis compared to the established facts of the earlier rubble crisis (1997) has been presented on Arinaminpathy and Dye (2010) where possible upturn to raised tuberculosis mortality has been noticed for both periods. The case of Spain is presented on a latter work Gili, Roca, Basu et al. (2012) present the rise in major depression, anxiety, somatoform and alcohol dependence was really high. The case of Greece has raised interest when the crisis was spread. For the case of Greece an

early research Kentikelenis, Karanikolos, Papanikolas et al. (2011) name the Greek situation as concerning. The budget cuts make inhabitants to lose the access to care and preventive services and mortality raised. Simou and Koutsogeorgou (2013), present the effects of the economic crises to the healthcare. The Greek government had practiced successive cut expenditures for health from 2009 to 2013 they set as alarming issue the number of suicides, the mortality has been stable due to reduce of traffic accidents mortality rate.

Sample, methodology, variables and results

We have deployed the mortality (rate of deaths out of 1,000) for Greece in an annual frequency for a 38 years period (1979-2016) as given by Greek Statistic Authority (EL. STAT.). Possible vectors are delivered of the past literature suggestions as presented on the previous part.

Alcohol: Variable refers to alcohol consumption per capita both recorded and unrecorded as given by WHO (World Health Organization) statistics. As expected a larger alcohol consumption leads to higher mortality and vice versa.

Tobacco: Variable refers to cigarette or other forms of tobacco consumption per capita under the Tobacco Atlas and WHO framework. Tobacco dependence and consumption have been increased both in the case of Greece as Dapontas (2016) states. A possible raise to tobacco consumption is expected to lead to increased mortality.

Crisis: Rich literature has been deployed over the definition of “crisis” for a country. Under recent research by Dapontas (2014) it’s a possible national currency decline against an international currency (USD for this case) of 10% over a month or 25% over a quarter period. Alternatively, under a free floating or a possible bonding scheme, the criterion is a 25% deployment to the country’s international reserves or an interest rate raise over than 25% for month’s period as defined by Dapontas (2012). The authors used a binary nominal model which gets the value (0) when there is no crisis and (1) for periods of turbulence. Mortality is expected to raise during crises.

Health expenditure as percentage of GDP: Is the final consumption under the OECD definition where both spending on health and pharmaceutical sources is presented. For the calculation of the GDP possible deflators are used based on national methodologies. OECD and National Statistical Office are the sources for this series. We expect a negative link between mortality and the variable because higher financing would lead to deadliness decrease.

Heart: The variable refers to number of reported cardiovascular and ischemic and stroke per year provided by European Heart Network and Hellenic society of cardiology. The higher number of these incidents, even though there are not only fatal, leads to higher mortality in the short or long term. Thus, we expect positive relationship.

Suicides: number of suicide attempts recorded is a mental health rate for a country. In our case data provided by WHO and national statistical office for number of attempts over 100,000 habitants. We expect positive intercourse between mortality and suicide attempts.

Unemployment: Is the percentage of people of working age who actively seek employment and they cannot find one. Data given by ILO and Employment organization of Greece. Unemployment has major negative effect on sacked person's mental and physical health. We expect positive relation between unemployment and mortality.

We used EVIEWSTM statistical package for the data process. Under the framework of the given literature we assume that the effect of both crisis and unemployment is dynamic. A VAR model have to be used to explain the optimal lag between discharge, crisis and the mortality. Through VAR we could explain the endogenous character of each variable and its role as lagged variable. Model lays as follows:

$$y_t = A_1 y_{t-1} + \dots + A_n y_n + B_1 X_1 + e_t$$

Where y_t is a k vector of dependent variable, x_i is a d vector of independent variables, A and B are matrices of coefficients to be estimated and e_t is an innovative vector remained uncorrected for both all values. We will have to determine the maximum lags. Due to data annual frequency we choose to let a small number of lags (2) as suggested by Gutierrez, Souza, Texeira (2007). The number of lags is given by a set of possible criteria:

- Sequential modified LR testing (LR).
- Final Prediction Error (FPE).
- Akaike Information Criterion (AIC).
- Schwartz Information Criterion (SC).
- Hannan-Quinn information Criterion (HQ).

The lags are determined by the maximum number of criteria implemented. The full lag length analysis is given in the appendix. For both variables under all criteria, the optimal lag was one year before the mortality raise.

The data nature leads to possible unconventional regression modes because established methods cannot lead to a clear relationship among the variables. An exact method is suitable to get more than parametric or non-parametric methods. Robust least squares (RLS) is one of them which is less sensitive to datasets outliers. This method is also adjustable and flexible under a variety of regression methods. A variety of methods can be described as robust. Among them we select the classic M – estimation introduced by Huber (1973). The method has to do with regressors' differing significantly from the model pattern.

Every least squares (LS) method aims to minimize possible residuals sum:

$$\hat{\beta}_{LS} = \underset{\beta}{\operatorname{argmin}} \sum_{i=1} r_i(\beta)^2$$

Residual function is given by:

$$r_t(\beta) = r_i - X_i' \beta$$

M function aims to minimize the weight of possible residuals function ρ :

$$\widehat{\beta}_M = \operatorname{argmin}_{\beta} \sum_{i=1}^N \rho_c \left(\frac{r_i(\beta)}{\sigma w_i} \right)$$

Where σ is the residuals scale, c is a tuning constant determined by chosen function and w_i refer to weights and its minimized to 1. The ρ function is set to Cauchy distribution which is similar to normal distribution but with heavier tails. Provided that data sensitivity gets higher and possible findings are robustized this distribution is selected. Its constant is $c = 2.385$.

$$\left(\frac{c^2}{2} \right) \log \left(1 + \left(\frac{X}{c} \right)^2 \right)$$

With the scale σ known k first non- linear equations can be found in order to achieve $\widehat{\beta}_M$ standardization.

$$\sum_{i=1}^N \psi_c \left(\frac{r_i(\beta)}{\sigma w_i} \right) \frac{x_{ij}}{w_i} = 0 \quad j = 1, \dots, k$$

Where $\psi_c(.) = \rho_c(.)$ The derivative of the ρ_c function and the value of j regression x_{ij} . The initially unknown σ can be found under the Huber method that escalated the old estimation to a new scale estimator of $\widehat{\beta}_M^{(s-1)}$ to an updated scale $\widehat{\sigma}^{(2)}$:

$$\widehat{\sigma}^{(s)} = \sqrt{\frac{1}{hN} (\widehat{\sigma}^{(j-1)})^2 \sum_{i=1}^N N \xi \left(\frac{r_i^{(s-1)}}{\widehat{\sigma}^{(s-1)}} \right)}$$

Where $\xi(v) = \min \left(\frac{v^2}{2}, \frac{2.5^2}{2} \right)$ $h=0.48878$ N

R squared can be found:

$$R^2 = \frac{\sum_{i=1}^N \rho_c \left(\frac{y_i - \tilde{\mu}}{\widehat{\sigma} w_i} \right) - \sum_{i=1}^N \rho_c \left(\frac{\hat{r}_i}{\widehat{\sigma} w_i} \right)}{\sum_{i=1}^N \rho_c \left(\frac{y_i - \tilde{\mu}}{\widehat{\sigma} w_i} \right)}$$

Where $\tilde{\mu}$ is the M estimate from the constant only specification.

The results are shown on the table below where important variables are highlighted and their coefficient is presented to the right column:

Table 1. Robust least squares results

Variable	Coefficient
Constant	78.328
Alcohol	3.2587
Crisis	-0.0049
Crisis (-1)	3.4805
Health Expend.	-7.222
Heart	0.0004

<i>Variable</i>	<i>Coefficient</i>
Suicides	2.3485
Tobacco	0.0006
Unemp.	-0.4312
Unemp. (-1)	0.1645
R-squared	0.8811

Results show that seven variables are important and with the expected sign. Alcohol and tobacco consumption raise are connected to fatality increase. Suicides attempts and heart attack incidents increase have also positive effect. The most important effect has to do with crisis and unemployment. One period lagged crisis is important and positive which means that crisis effects are delayed for one year seem to have significant effect on mortality. On the other hand, both variables on present time have negative sign but they are not significant. A very large determination is noted (0.8811) showing a strong relationship between mortality and proposed variables. The present situation of unemployment and crisis seem to be unimportant in terms of mortality. This is explained on uncertainty

Conclusions and further research proposals

In the present work we considered the mortality during economic crisis under the examination of a set of proposed by earlier works variables for the case of Greece. The fact that the crisis and unemployment effect is shown a year latter result that possible analysis of the negative consequences of the crisis needs time and correlation to further variables more related to health such as number of heart attacks which had also positive effect to mortality and suicides attempts who can be named as the expression of mental illness raise during turbulences. The tobacco and alcohol consumption have been increased during crisis and its raise boosted also mortality. The most interesting fact even though it had been noticed earlier was the health expenditure decrease due to government and private finance cuts. The large effect of them can be a policy lesson for all governments where the remedy of the possible crisis victims is critical for them, instead of guiding them to less health care providing.

A researcher could investigate the possible effect of the expansive policies as a remedy in the long term to mortality for example in 5-10 years for the same country and he could compare possible results. Also, doubtful can be the implication of the austerity measures to tobacco and alcohol consumption long term effect at the end of crisis. The possible successful policies which guide to redress can and should always be a lesson for policy makers and economic and academic scholars. The discussion on the aftermath of a possible crisis could last until the next occurs or stable and fast policies are deployed.

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Appendix. Variables optimal lags**Variable 1: Crisis**

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-25.21690	NA	0.251235	1.456495	1.500481	1.471847
1	-12.83772	23.38291*	0.133528*	0.824318*	0.912291*	0.855023*
2	-12.30146	0.983140	0.137050	0.850081	0.982041	0.896139

Variable 2: Unemployment

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-120.0725	NA	48.83194	6.726247	6.770234	6.741600
1	-94.00497	49.23859*	12.13200*	5.333609*	5.421583*	5.364314*
2	-93.96187	0.079004	12.79790	5.386771	5.518731	5.432828

Profit management in the case of financial distress and global volatile market behaviour: Evidence from Borsa Istanbul Stock Exchange

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Abstract. *The purpose of this paper is to find out how firms manage earnings under volatile market behaviour and financial distress in Borsa Istanbul Stock Exchange (BIST). We used in order to determine four discretionary accruals models such as Jones, Adjusted-Jones, Kasznik, and Kothari. 171 listed companies in BIST for the annual data between 2006 and 2016 were used. Model was analysed by using panel data methods such as fixed effects, random effects estimation. Our results indicate that nondiscretionary accruals, discretionary accruals, firm size and leverage by the future profit value are significant determinants of earning management behaviour in Turkey. However, we do not find a significant relation between future profitability and volatile market index, financial distress. This research will lead the way of accounting standard setters and policy makers to understand earning management activities under volatile market behaviour and financial distress in Borsa Istanbul Stock Exchange BIST.*

Keywords: discretionary accruals, earning management, profit management.

JEL Classification: M41, G30.

1. Introduction and literature review

Over the last few decades, earning management is a main subject for researchers and policy makers. Plenty of studies (Healy and Wahlen, 1999), (Beneish, 1999), (Dechow et al., 1995), (Kasznik, 1999), (Kothari et al., 2005), (Adıgüzel, 2018) investigate how firms manage their earnings and what ways they do this. Although earning management is defined in different ways in the literature and the most commonly used that it is the legal practice to apply some of the most profitable accounting policies (Scott, 2009). Furthermore, earnings management is the change in the firm's profit values making the Generally Accepted Accounting choices in line with the economic and financial situation of the managers. On the other hand, in literature there are some people called earning management as fraudulent. But, (Dechow and Skinner, 2000) give a certain difference between earning manipulation and earning management. They defend that if accounting practices violate the GAAP (Generally Accepted Accounting Principles) and IAS (International Accounting Standards), it is named earning manipulation or earning fraudulent (Lo, 2008) and if discretionary is used for accounting practices which do not violate the GAAP and IAS, then it is defined earning management.

The literature confirms that companies apply to profit management due to capital markets which is listed in stock exchange, contractual reasons and political reasons. Firms tend to announce high profit value prior to the issuance of shares to investors and financial analysis (Healy and Wahlen, 1999), receiving a premium over the profits made by the managers agreement (Nelson et al., 2002), (Hosseini et al., 2016), (Watts and Zimmerman, 1986), (Cheng and Warfield, 2005) the shareholders entitled to vote to leave positive reputation about their performances and the fear of losing his job (Jiraporn et al., 2008). On the other hand, they want to show low profit value to take over the company's management (DeAngelo, 1988) and increase the political and governmental costs.

There are lots of theoretical and experimental studies related to earnings management in the literature. The quality of the company's earnings is determined by the way of real activities or accrual-based (Healy, 1985) (Dechow et al., 1995), (Jones, 1991), (Kasznik, 1999), (Kothari et al., 2005). The real profit that occurs after transactions such as increasing sales and reducing costs. At the same time, earnings quality also provides the basis for sustainability to provide the future of the enterprise. In case the quality indicators are not attractive for the related persons and groups, the managers of the enterprises have to make arrangements in their presentations or manipulate the expectations of those concerned. However, since it is difficult to change the expectations of third parties, it is mostly chosen to adapt the presentations to expectations. Earnings are made to be adapted to the expectations of the person or group by the ways; accrual based earnings management or gain management applications based on real transactions (Özden and Ataman, 2014). Real earning management based on real transactions may be in the form of increasing sales through a reduction in sales prices during the period, excessive production to lower the cost of goods sold, or disrupt discretionary expense accruals. Such practices also affect the cash flow in the period, but they are recognized by investors and discourages investment decisions (Enomoto et al., 2015), (Tabassum et al., 2015), (Braam, Nandy et al., 2015), (Mellado-Cid et al., 2017), (Cohen and Zarowin, 2010).

The purpose of this study is to examine the change of earning manipulation of firms which is listed Borsa Istanbul Stock Exchange (BIST) under volatile market behaviour and financial distress. In the study, there are 171 data between 2006 and 2016 years and 1881 firm-level observations in total. Model was performed by using fixed effect and random effect panel data methods. In order to analyse that there is individual effect or not and to understand the sample was selected randomly or not for our sample, we used panel data technics such as fixed and random effect methods. In this study, (Jones, 1991), (Dechow et al., 1995), (Kasznik, 1999), (Kothari et al., 2005) models are used for earning management analysis. After these models were estimated, the best explaining model was selected and nondiscretionary accrual and discretionary accruals were determined. Points to consider is an administrator may change profitability reporting through discretionary accruals. In fact, discretionary accruals provide a flexible area that managers change and please itself the profit value. (Kothari et al., 2005) model is used to detect earning management for Borsa Istanbul listed firms.

Firstly, we clarify data information and variable definitions. Secondly, we determine discretionary accrual with proper model by using (Jones, 1991), (Dechow et al., 1995), (Kasznik, 1999), (Kothari et al., 2005) approaches. After determination of discretionary accruals, then we improved main regression model. In following, we construct the model with high explained discretionary accrual model. Finally, all outputs are interpreted financial and economic supports and point of views.

2. Data and hypothesis development

Our dataset is eliminated from the banking and insurance industrial data because of cash flow and accounting process of them is different from other industrials. In addition, we used data for 2006 and later owing to the fact that we could not find data for some variables for 2005 and earlier due to accounting arrangements. In totally, there are eleven years and 171 firm data in our dataset.

Our data provider is Bloomberg and Financial Information News Network FINNET. We use Stata MP-33 package and in data-running process benefit from (Yerdelen Tatoğlu, 2018). Currency is Turkish Liras (TL).

We investigate the earning management under volatile market behaviour and financial distress for Borsa Istanbul listed companies. We expect that earning management activities with accrual based increase when global market volatility is in high period. In our hypothesis, managers tend to report higher earning in high volatile market behaviour. In the light of expectations, we state first hypothesis.

H1: There is a significant positive relation between next-year profitability and earning management with discretionary accruals.

Furthermore, other hypothesis is that managers tend to announce earnings high if firm is in financial distress. Since, firms reach financial credit easily they should be in a financial wellness situation. Any of credit provider company do not want to give to credit a firm which is in financial distress and low- profit value because irrevocable liability (Habib et al., 2013).

In order to determine the impact of distance of bankruptcy on earning management, we investigated Hypothesis 2 as follow.

H2: The impact of earning management with discretionary accruals on the next year profit is higher for firms in high financial distress than for those in low financial distress.

We concentrate on earning management of BIST listed companies as firm profit management behaviour are sensitive to economic and financial situation. In order to capture the information about financial distress, we add Altman Z-Score to understand the internal status of companies. Firm leverage and firm size is other explanatory variables in order to capture firms' internal information. Altman Z-Score is used for detecting the firms' distance of bankruptcy.

On the other hand, (Moghaddam and Abbaspour, 2017) suggest that high leveraged firms execute more earning management activity than low leveraged firms. Since, high leveraged firms need and want to make a good impression to investors, shareholders and analysts with high profitability value. We developed Hypothesis 3 as follow.

H3: The impact of earning management with discretionary accruals on the next year profit is higher for firms with high leverage than for those with low leverage.

In addition, literature has no strict consensus about the relationship between firm size and next year profitability. There is an ambiguous relation between company size and earning management. Researchers have no consensus about this question (Usman et al., 2015), (Teuta, 2013). Empirical results point out unsatisfactory results. But, we expect that the amount of earning management is more for large size firms than small size ones. Since, large size firms have more discretionary accruals. Under this expectation, we proposed the hypothesis 4 is as follow.

H4: The impact of earning management with discretionary accruals on the next year profitability is higher for large size firms than for small size firms.

When we do this, we use the annual panel data obtained from the Independent Audit Reports of the companies traded on Borsa Istanbul Stock Exchange BIST between 2006 and 2016. Macro-economic control variables are obtained from Bloomberg as VIX (The CBOE Volatility Index) that based on market prices of options on S&P 500. Since economic and financial behaviour contagion (Kenourgios, 2014), we use VIX that provide us information about economic turmoil that took place the outside of Turkey. Namely, we use VIX index to investigate how market volatility in USA affect firms' earning management in Borsa Istanbul listed companies in Turkey. In this way, we build following hypothesis 5 as below.

H5: The impact of earning management with discretionary accruals on the next year profit is higher for firms under high volatile market behaviour than for those under low market behaviour.

Under all of these hypothesis, we construct a model and skip methodological part.

3. Methodology and variable definitions

Earning management is possible with three general ways in the literature. First of them is the total accrual based model. Second of them is the model which is focusing on the specific accrual. Third of them is the model which calculating income is changing around specific threshold point.

The manger may change profitability reports through discretionary accruals. In fact, discretionary accruals item gives managers to some elbow room. Firms are making the earnings management through discretionary accruals. In literature, (Healy, 1985) is the first researcher to analyse total accrual based earning management analysis. Weak side of his study is that carry out not to decompose total accruals to discretionary and nondiscretionary accruals. In order to overcome this weakness, (Jones, 1991) fills this gap in literature by the way of decomposition of total accruals such as discretionary and non-discretionary accruals. Discretionary accruals are obtained by deducting non-discretionary accruals from the total accruals.

$$DAC = TA - NDAC$$

In determining total accruals, two approaches based on such as cash flows and balance sheet items. In this study, we aimed to calculate total accruals from balance sheet items. Firstly, we estimate total accruals (TA) by the ways (Jones, 1991), (Dechow et al., 1995), (Kasznik, 1999), (Kothari et al., 2005) models. After model, we have decomposed total accruals to discretionary accruals (DAC) and non-discretionary accruals (NDAC). We determined the total accruals (discretionary and non-discretionary accruals) with four models in the literature. These models are indicated below Table 1.

Table 1

	Models	
1	Jones Model (1991)	$TA_{it} = \alpha_1 + \alpha_2 \Delta REV_{it} + \alpha_3 PPE_{it} + \varepsilon_{it}$
2	Adjusted Jones model (1995)	$TA_{it} = \alpha_1 + \alpha_2 (\Delta REV_{it} - \Delta REC_{it}) + \alpha_3 PPE_{it} + \varepsilon_{it}$
3	Kasznik Model (1999)	$TA_{it} = \alpha_1 + \alpha_2 (\Delta REV_{it} - \Delta REC_{it}) + \alpha_3 PPE_{it} + \alpha_4 \Delta CFO_{it} + \varepsilon_{it}$
4	Kothari et al. Model (2005)	$TA_{it} = \alpha_1 + \alpha_2 \Delta REV_{it} + \alpha_3 PPE_{it} + \alpha_4 ROA_{it} + \varepsilon_{it}$
	ΔREV : Change of Revenue over Total Assets, PPE : Gross Property Plant and Equipment over Total Assets; ΔCFO : Change of Cash from Operations over Total Assets, ΔREC : Net Receivables over Total Assets, ROA : Return on Assets	

After analysing the data, we see that Kothari, Andrew and Charles model better explained earnings management in Borsa İstanbul Stock Exchange listed companies by looking at the result of adjusted R-squares at Table 2. The significance level of Kothari, Andrew, and Charles Model is also high. (Kothari et al., 2005) model adjusted R-squares is the highest value among other four ones. In our study, we have obtained the accrual estimate by means of the estimation of the total accrual model (Kothari et al., 2005) which has the highest explanations and significance level.

Table 2

Model Comparison							
	Variable	Coefficient	t-statistic	p-value	F-statistic	p-value	Adj R-squared
Jones Model	ΔREV	0,000032	0,08	0,937	5,14	0,006	0,0044
	PPE	-0,0463007	-3,21	0,001			
Adjusted Jones	$(\Delta REV - \Delta REC)$	-0,0000255	0,06	0,949	5,14	0,006	0,0044
Model	PPE	-0,0462968	-3,21	0,001			

Model Comparison							
	Variable	Coefficient	t-statistic	p- value	F-statistic	p-value	Adj R-squared
Kasznik Model	(Δ REV- Δ REC)	-0,000088	-0.25	0.799	97.97	0,000*	0.1340
	PPE	-0,0614657	-5.38	0,000*			
	Δ CFO	6,937577	16.80	0,000*			
Kothari	Δ REV	0,0000798	0,24	0,81	291,96	0,000*	0,3182
Andrew,	PPE	-0,0442048	-3,7	0			
Charles Model	ROA	126672,9	29,34	0			
Note: * denotes significance level at %5; respectively. Δ REV: Change of Revenue over Total Assets, PPE: Gross Property Plant and Equipment over Total Assets; Δ REC: Net Receivables over Total Assets, Δ CFO: Change of Cash from Operations over Total Assets, ROA: Return on Assets							

After determine suitable model for accrual measurement, we designed main research model. In regression, we analyse that global economic turmoil and financial distress lead managers to profit management. Companies can change their profit values as long as the accounting standards allow. In doing so, we also investigated the question of how firms' size, distance to bankruptcy and leverage rates affect profitability management.

Our dependent variable is profitability for the next year. We calculated the profitability ($Profitability_{it+1}$) by deducting the accrual from the net income for the previous year (Rezaei, 2012), (Siregar and Sidharta, 2008). We used discretionary accruals (DAC_{it}), non-discretionary accruals ($NDAC_{it}$), leverage ($Leverage_{it}$), logarithm of total assets ($LSize_{it}$), volatility Index (VIX_{it}), and financial distress of companies ($ZScore_{it}$).

We also sought answers to the question of how the profitability of the two variables is effected by using covariates. As the covariate factor, we received discretionary accruals and the global economic policy uncertainty ($DAC*VIX_{it}$), discretionary accruals and the financial distress of companies ($DAC*ZScore$), discretionary accruals and leverage ($DAC*Leverage_{it}$), discretionary accruals and the logarithm of total assets ($DAC*LSize$). The reason that we use covariate variable is to observe the increasing impact of each variable on the future profitability with discretionary accruals.

As we can easily see the below, Table 3 indicates all variable and data descriptions.

Table 3

Descriptive Statistics					
	Observations	Mean	Minimum	Maximum	Std. Dev.
Profitability	1881	0,0000423	-1,03e ⁻⁶	0,0793773	0,00183
NDAC	1881	0,2597363	-199,1379	117,0113	7,298
DAC	1881	-0,221719	-117,0357	199,1885	9,4107
Lsize	1881	8,5826	0	11,4889	0,8187
Leverage	1881	45,62724	0	293,9812	25,4067
Z-Score	1881	12,63	-20,12	1493,79	56,6859
VIX	1881	20	12,81	32,69	6,5747
DAC*VIX	1881	-3,249	-1498,822	6270,17	188,1696
DAC*Zscore	1881	6,35852	-55157,51	43314,38	1892,068
DAC*Lsize	1881	-2,0067	-784,2556	1344,164	49,8246
DAC*Leverage	1881	-16,12605	-1487,052	303,989	52,58527
Discretionary accruals (DAC), non-discretionary accruals (NDAC), leverage (Leverage), Logarithm of total assets (LSize), volatility Index (VIX), and Financial Distress of Companies (ZScore), Discretionary Accruals and the Global Economic Policy Uncertainty (DAC*VIX), Discretionary Accruals and the Financial Distress of Companies (DAC*ZScore), Discretionary Accruals and Leverage (DAC*Leverage), Discretionary Accruals and the Logarithm of Total Assets (DAC*LSize)					

There are 1881 firm-level data for all variables. Next Year profitability has 0.99 mean and 0.0018 standard deviations. Also, next year profitability change between $-1.03e-6$ and 0,079. Non-discretionary accrual has 0.259 mean and 7.298 standard deviations. Minimum of non-discretionary accruals is -199.137 and maximum of non-discretionary accruals is 117.011. Discretionary accrual has mean of -0.221 and standard deviation of 9.4107. Logarithm of size has 8.5826 and 0.8187, mean and standard deviation, respectively. When minimum of logarithm of size is zero, maximum of logarithm of size is 11.4889.

Mean of leverage is 45.62724 and standard deviation of leverage is 25.4067. Minimum of leverage is zero and maximum of leverage is 293.9812. Z-Score change between -20.12 and 1493.79. Z-score has the value 12.63 in mean and 56.6859 standard deviations. Volatility Index VIX has minimum and maximum value between 12.81 and 32.69. Mean of volatility index is 20, standard deviation of volatility index is 6.5747.

Moreover, we have four covariate variables such as $DAC \cdot VIX_{it}$, $DAC \cdot ZScore_{it}$, $DAC \cdot Leverage_{it}$, $DAC \cdot LSize_{it}$. $DAC \cdot VIX_{it}$ has a value of minimum -1498.822 and maximum 6270.17. Also, mean of $DAC \cdot VIX_{it}$ is -3.249 and standard deviation is 188.1699. $DAC \cdot ZScore_{it}$ change a margin which is minimum value -55157.51 and maximum value is 43314.38. Mean of $DAC \cdot ZScore_{it}$ is 6.35852 and standard deviation is 1892,068. $DAC \cdot Leverage_{it}$ changes between the interval which is minimum value -487.052 and maximum value 303,989. $DAC \cdot Leverage_{it}$ has mean of -16.12605 and standard deviation 52.58527. $DAC \cdot LSize_{it}$ has a minimum value of -784.2556 and maximum value of 1344,164. $DAC \cdot LSize_{it}$ has 49.8246 standard deviations with mean of -2.0067.

4. Results

The next year *Profitability* value for $(t+1)$ year is used as the dependent variable (Subramanyam, 1996), (Stregar and Utama, 2008). The next year profitability is measured as cash flow from operation by adding depreciation to Earnings before Interest and Taxes EBIT and subtract the taxes.

Our model is based on (Kothari et al., 2005) approach. Accruals decompose from total accruals to discretionary accruals (DAC_{it}) and non-discretionary accruals ($NDAC_{it}$). There are four control variables such as $Leverage_{it}$, $LSize_{it}$, VIX_{it} , $ZScore_{it}$. $Leverage_{it}$ is measured that total debts divided by total assets. $LSize_{it}$ is measured the logarithm of total assets (Swastika, 2013). VIX_{it} is an index which indicates the global economic and financial turmoil. $ZScore_{it}$ indicates the distance to bankruptcy of firms known as Altman-Z score. While we are doing this, longitudinal data multiple regression approach is used on account of analysis.

$$Profitability_{i(t+1)} = \beta_0 + \beta_1 NDAC_{it} + \beta_1 DAC_{it} + \beta_3 Leverage_{it} + \beta_4 LSize_{it} + \beta_5 VIX_{it} + \beta_6 ZScore_{it} + \beta_7 (DAC \cdot VIX)_{it} + \beta_8 (DAC \cdot ZScore)_{it} + \beta_9 (DAC \cdot LSize)_{it} + \beta_9 (DAC \cdot Leverage)_{it} + \varepsilon_{it}$$

In addition, we use covariate (interaction) variables on behalf of determination behaviour of dependent variable next year profitability as two explanatory variables change simultaneously.

Next year Profitability is positive cash flow operation in average that is to say companies are in a situation which is defined financial wellness. According to Table 4, next year Profitability have negative relation with DAC and positive relation with NDAC. This means that firms tend to manipulate earning management increasingly the case of declining profit value (Hassanpour and Ardakani, 2017).

Consistent to correlation relation, next year Profitability has positive value in the average by the explanation of negative relation between profitability and DAC.

Moreover, next year Profitability has positive correlation with LSIZE. In our sample, we mostly have large scale firm in the average whose size change between 0 and 11, 49.

Firms reflect to all information about the market. If market uncertainty and fear is high, then firms tend to make capital structure decision in the light of information. When Volatility Index VIX increases, firms have low profit value by the reason of low production, low selling, reaching to debt difficulty then before etc. (Mollik et al., 2013). This means that market volatility is high in sample period. Accordance to Table 4 next year profitability is negatively correlate with VIX. Although Volatility Index is between 12.81 and 32.69; in our sample period VIX is 20 in the average.

ZScore is defined financial distress condition for companies. Moreover, Zscore gives the information about distance to bankruptcy for firms. In our sample, there are companies with high financial distress; but in the average, there are firms with low or above financial distress in our sample. Pursuant to correlation table, increase of financial distress cause decrease of next year profitability in sense.

Table 4

Correlation Table											
	Profitability	NDAC	DAC	Leverage	Lsize	VIX	Zscore	DAC* VIX	DAC* ZSCORE	DAC* LSIZE	DAC* LEVERAGE
Profitability	1										
NDAC	0,9996	1									
DAC	-0,9998	-0,9997	1								
Lsize	0,0195	0,0201	-0,0174	1							
VIX	-0,0252	-0,0259	0,0247	-0,0692	1						
Zscore	-0,0217	-0,0218	0,0222	-0,126	0,0244	1					
Leverage	0,0279	0,0268	-0,0324	0,255	-0,0365	-0,1631	1				
DAC*VIX	-0,9616	-0,9615	0,9617	-0,0302	0,014	0,0791	-0,0413	1			
DAC* ZSCORE	-0,8817	-0,8819	0,882	-0,0049	0,0473	-0,07266	-0,008	0,8021	1		
DAC* LSIZE	-0,9994	-0,9992	0,9996	-0,02	-0,0232	0,0251	-0,0346	0,9621	0,8805	1	
DAC* LEVERAGE	-0,2863	-0,2819	0,2878	0,0716	-0,067	0,0111	-0,2415	0,2809	0,1309	0,2989	1

There is negative correlation between next year profitability and DAC*VIX, DAC*ZScore, DAC*Lsize, DAC*Leverage in our firms' sample. In other words, companies with higher VIX, Zscore, Lsize, and Leverage tend to increase their profitability values through discretionary accruals.

In this study, we used balanced panel data (longitudinal panel data) whereas panel data refers to individual firms to time points. Heterogeneity can be found in firms for panel data analysis. In addition, in the longitudinal data cross section and time series observations give more likely to data. In addition, panel data cause less collinearity and more variability among variables because of becoming more efficiency and increasing degree of freedom. Panel data analysis is strong to capture and measure the effect of variables that cannot do so in the solely time series and cross section analysis. Panel data analysis easily overcome bias results and the right model specifications (Baltagi, 2012), (Hsiao, 2014).

Fixed effect model allows heterogeneity among firms and ensures that each firm has its own intercept terms. This intercept terms change from one firm to another firm. Intercept term refers that each firms have own special features. In the fixed effect model, each firms' intercept is time invariant namely It does not change over the time. Thus, for each firms have slope which is not variant over the time. Fixed effect model proposes possibility which neglect the fixed effect for pool analysis. It is also proposed a solution which create bias slope. In order to avoid this problem, model uses dummy variable technique. On the other hand, random effect model is proposed an estimation which intercept values are drawn randomly from the population of firms. All firms have own fixed intercept value. We can easily see about lack of information of dummy variables through disturbance term. Hence, this random effect model is called error component model (ECM). Error term of random effect model has either cross-sectional or time series error terms which is named idiosyncratic. This error term does not correlate with responsive variables (Bell and Jones, 2015), (Wooldridge, 2005), (Petersen, 2004).

In order to determine proper model, we made Hausmann test. Null hypothesis under Hausmann test is based on fixed effect model and random effect model estimators do not differ substantially (Baltagi and Liu, 2012), (Hahn et al., 2011), (Frondel and Vance, 2010), (Baltagi et al., 2003). Chi-Square distribution determine the null hypothesis rejection or acceptance. If null hypothesis is rejected, then random effect is suitable for parameter estimation.

We estimated our model via two methodology such as fixed effect estimation, random effect estimation (Shahzad, 2016), (Laird and Ware, 1982). All outputs are available in Table 5. In order to have panel data, we prefer to estimate with panel data multiple regression models. To check individual effect and detect the randomness of sample, we used the random effect and fixed effect models.

In Table 5, DAC have negative relation with next year profitability for all models with %5 significant level. In other words, we see that the discretionary accruals increase, next year profitability decrease. This means that firms raise their next year profit value

In this study, leverage and next year profitability has negative and significant coefficient for sample of BIST listed firms. This tell us that high-level debt firms have lower profitability value for next year. Furthermore, DAC*Leverage coefficient is negative but insignificant for all Model I, Model II with next year profitability of firms. This infers that the impact of discretionary accruals on future profitability is lower for highly leveraged

firms than for low leveraged firms. Essentially, we see that high leverage firms which is listed Borsa Istanbul tend to apply less earning management than low leverage companies.

Moreover, the relation between $DAC*LSize$ and future profitability is positive coefficient but insignificant for all models. The impact of discretionary accruals on next year profitability is higher for large-scale companies than low-scale firms. One of the important factors affecting profitability is the scale. Moreover, we see a significant and positive relationship between $LSize$ and future profitability. This is consistent with the study (Arslan et al., 2017), which concludes that the values of the companies with blue chips are higher than the values of smaller companies

Again, the relation between $DAC*Zscore$ and next year profitability is positive coefficient but insignificant for all models (Hassanpour and Ardakani, 2017). Discretionary accruals on next year profitability is higher impact for highly financial distress firms than for low financial distress firms (Campa and Camacho-Miñano, 2015) (Lin et al., 2016). ZScore indicates the distance of bankruptcy of firms. In the average, indicating approximately 20.00 Zscore refers that firms are in a financial well-being situation for selected sample. In Table 5; there is a positive and significant relation between Zscore and future profitability. Namely, firms want to announce profitability value for next year in the condition of increasing of financial distress positions. This result can read that firms can not want to inform to public from bad situation of Therefore, the impact of discretionary accruals on future profitability is high for firms which is high financial distress.

Table 5

Hypothesis Results				
	Model I		Model II	
	Coefficients	p-value > t	Coefficients	p-value > t
NDAC	-0,081701	0	0,06403	0
DAC	-1,083918	0	-0,94158	0
LSIZE	0,025955	0,001	0,02926	0
LEVERAGE	-0,001383	0	-0,00146	0
ZSCORE	0,000081	0,222	0,00003	0,663
VIX	-0,000731	0,07	-0,00051	0,237
DAC*VIX	0,000067	0,249	-0,00002	0,747
DAC*ZSCORE	1,63e*06	0,622	3,68e*06	0,296
DAC*LSIZE	0,000045	0,983	0,00075	0,731
DAC*LEVERAGE	-0,000075	0,275	-0,00004	0,552
Constant	-0,107056	0,119	-0,1407	0
# of Obs.		1881		1881
F-Statistic		0		0
Adj. R-Squared		0,9997		0,9997

Model I, Model II are based on Fixed effect, Random effect models, respectively. Confidence Interval is 5% for all model.

The VIX index formed from the options in the Chicago Board Options Exchange was an appropriate measure of the volatility in the implied stock market volatility. VIX index is used by capturing future behaviour of market and containing of past information about market behaviour. We use VIX index in order to capture global market uncertainty and market fear (Agapova and Madura, 2016). The relation between $DAC*VIX$ and future profitability has positive coefficient for Model I, negative coefficient for Model II; but insignificant for all models. Discretionary accruals on future profitability is higher impact for highly volatile market than for low volatile market. On the other hand, we can see that

the relation between VIX and future profitability has a negative coefficient for all models. High volatile market behaviour causes of decreasing the future profitability of firms. This result supports the relation between DAC.

5. Conclusion

This study stands on an important point for ones which try to read market behaviour and want to invest their money to right firms. Under global turmoil market behaviour and firms' financial distress, investors can be myopic about financial decisions. It seems that global volatile market behaviour diffuse step by step all kind of financial and economic forms. Under uncertainty and fear, investment and capital structure attitudes are changed by firms like individuals because of that uncertainty and fears are contagious. On the other hand, we tried to analyse whether the situation of financial distress lead to earning management of company basis. We try to answer this question and fill in this gap in logical approach. It is clear that firms tend to propensity of earning management under volatile market behaviour and financial distress situations. In addition, we investigated whether firm size and level of leverage affect earning management activities or not. High debt level decrease value.

In the end, we see that companies reflect all information in situations to earning values via discretionary accruals. Under global turmoil, next year profit of firms tends to decrease. Moreover, impact of discretionary accruals on future profitability is higher for highly volatile market than for low volatile market. Financial distress firms have positive coefficient next year profitability. It means that firms' managers don't prefer to transmit the financial distress information to next year public reports in the cause of resistance of decreasing market value and stock price of firms.

This study shed in light for policy makers, investors, capital structure makers and managers about the firms which is listed in Borsa Istanbul Stock Exchange (BIST) to understand the relation of earning management activities under market volatile behaviour and financial distress situations. In conclusion, we advise that researchers to carry out a study which is indicated and detected for machine learning system such as (Dbouk and Zaarour, 2017). In addition, this study can be searched by using two control such as group financial and non-financial firms with using Beneish model (Beneish, 1999), (Beneish, 2001) as (Ahmed and Naima, 2016), (Kim and Yoon, 2008).

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Insurance consumption in the Maghreb countries (Algeria, Morocco and Tunisia): Financial and institutional determinants

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Abstract. *This article seeks to examine the determinants of insurance consumption in the Maghreb countries (Algeria, Morocco and Tunisia) over the period 1996-2017. We focused mainly on financial and institutional determinants. The main results show that only the level of financial development measured by M2/GDP has a negative impact on the insurance markets. However, we have demonstrated the positive effect of GDP/cap on insurance development in the study countries.*

Keywords: insurance; Maghreb; panel data model.

JEL Classification: G22; O16.

Introduction

Insurance is considered as a very important determinant in economic development. In fact, the first session of the United Nations Conference on Trade and Development (UNCTAD) in 1964 recognized that a developed insurance and reinsurance market is a characteristic of developed countries (economies). This has allowed the insurance sector to take an increasing place in the financial system of countries.

Many studies have attempted to link economic, financial, demographic and legal variables to the insurance business. The first studies concerned the American insurance market. Later, more general analyses tried to find homogeneous explanations for the determinants of insurance demand in developed and developing countries.

In addition, the importance of the relationship between financial development and economic growth and the relationship between insurance development and economic growth is well recognized and addressed in the economic literature.

The Maghreb countries' awareness of the importance of insurance in the economic and financial development process has led to a wave of reforms ranging from market liberalization to private and foreign partners to the application of prudential rules in line with international standards. This has led to considerable progress in this sector in recent years. For example, we note an average increase in insurance premiums from \$794 million in 1995 to \$3122 million in 2016.

This strong increase in insurance consumption is a positive factor in mobilizing savings in these countries. It is then necessary to study the factors that determine this variation.

This article seeks to examine, over the period 1996-2017, the determinants of insurance consumption in the Maghreb countries (Algeria, Morocco and Tunisia). It also aims to fill the small number of studies on insurance demand in these countries.

This article will be organized as follows. Section 1 highlights the review of the literature - theoretical and empirical - on insurance demand. Section 2 is devoted to the presentation of the insurance sector in the Maghreb. Section 3 presents the methodology and results of the study before concluding.

1. The importance of insurance in economic growth: Literature review

Insurance activity is one of the components of the country's financial infrastructure. It can influence the economy on several aspects and in particular on growth, financial depth, trade openness, foreign direct investment, urbanization, consumption, employment, poverty (Cristea et al., 2014).

(Skipper, 1997) summarizes the contribution of insurance to the economy by the following elements:

1. Insurance promotes financial stability and reduces anxiety.
2. It can be used as a substitute for government security programs.
3. Insurance facilitates trade and commerce.

4. Mobilizes national savings.
5. Insurers enable risk to be managed more efficiently.
6. Loss mitigation.
7. Insurers and reinsurers have economic incentives to help insureds reduce losses.
8. Promotes a more efficient allocation of capital.

For Ward and Zurbruegg (2000), the economic importance of insurance depends on its role as a production driver. In fact, risk transfer and disaster compensation encourage people who are risk averse to make more purchases and thus spend more (in real estate and automobiles). This results in positive externalities in terms of increased purchases, profits and employment, both within the insurance sector and in other sectors. In addition, insurance facilitates innovation in an economy by proposing to cover new risks as part of “civil liability insurance”.

In addition, insurance promotes financial intermediation and the accumulation of productive capital. As a financial intermediation and corporate investor service, it contributes to the diversification of the corporate portfolio and consequently to greater risk taking and better productivity. In the case of individuals, when the price of insurance increases, individuals are more motivated to change their behavior (they become more cautious). This will have beneficial effects on the accumulated productive capital.

Webb, Grace, and Skipper (2002) argue that life insurance and property and liability insurance can contribute to economic growth, both according to their specificities:

1. Life insurance helps to optimize the allocation of resources by reducing the demand for liquidity and other assets by transforming the composition of the personal savings portfolio into more productive assets. This aspect is similar to the banking sector in the choice of investment quality.
2. Property and liability insurance reduce the probability of corporate bankruptcy in the event of catastrophic losses. This therefore influences investment and reinvestment decisions.
3. In addition, insurers can reduce the cost of financing risk and so increase the return of the projects.

Currently, the importance of insurance in economic growth is significantly increased in the context of the liberalization, globalization and the deregulation of financial markets (Outreville, 2014). The increasing integration of the insurance sector into the financial sector will encourage many economists to investigate the impact of insurance on the economy through empirical investigations. Examples include: (Browne et al., 2000; Ward and Zurbruegg, 2002; Hussels et al., 2005)

Demetriades and Hussein (1996) use a country-specific cointegration and causality test to understand the dynamic and causal relationship between economic growth and insurance sector.

In a related perspective, Ward and Zurbruegg (2000) examine this causal relationship in nine OECD countries. The study covers annual data on GDP and total premiums written from 1961 to 1996. The results show that there is no consensus among countries. The cause is the specific circumstances of each country, such as the level of development of the

insurance market. In another study, Ward and Zurbruegg (2002) find that the income elasticity of insurance in Asia is declining considerably and appears to be inelastic, suggesting that the link between economic development and insurance market development is very weak.

In order to verify the results of Ward and Zurbruegg (2000), which show the absence of a long-term relationship between the insurance sector and economic growth in the United Kingdom, Kugler and Ofogui (2005) conducted a study on the English insurance market that strongly contradicts the results of the first study.

Arena (2008) finds that there is a close relationship between the activity of the insurance sector and economic growth, regardless of the insurance branch, life or non-life. The author used the Generalized Moment Method (GMM) on a panel of 55 developed and developing countries for the period 1976-2004. He finds that life insurance contributes to economic growth only in the case of developed countries. While non-life insurance drives growth, in both types of countries, with a greater level in developed countries. In these countries, insurance activity contributes, in cooperation with the banking sector and the financial market, to reducing transaction costs, pooling risks, improving financial intermediation through better allocation of resources and better interaction between the three components of the financial system.

Han et al. (2010) test the same relationship on a panel of 77 developed and developing countries during the period 1994-2005. They followed the method used by Beck and Levine (2004) regarding banks, the financial market and economic growth. The conclusion of the study confirms the existence of a more significant relationship between non-life insurance and growth than life insurance. Regarding the separation between developed and developing countries, the authors reveal that the impact of insurance on growth is more significant in developing countries than in developed countries. They argue that a 1% increase in life insurance leads to economic growth of around 2.495% in developing countries and only 0.812% in developed countries. The same is true for non-life insurance, where a 1% increase in insurance density leads to economic growth of 8.78% in a developing country compared to 1.309% in a developed country.

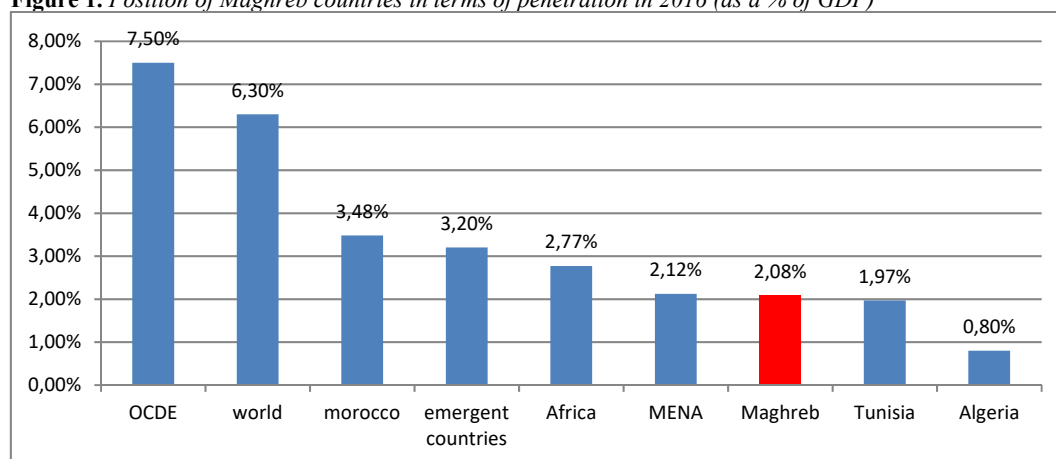
Chen, Lee, and Lee (2012) focus on the conditions that affect the relationship between life insurance and economic growth. The results vary from one country to another. Indeed, the impact of insurance on growth is positive. However, it is rather low in middle-income countries compared to low-income countries. They also conclude that the financial market and insurance are substitutable and not complementary. The estimation shows the existence of a negative and significant effect between financial development indicators and life insurance.

In conclusion, the results of studies on the link between growth and the insurance sector are controversial. All the studies take the insurance penetration rate or density as a variable measuring the level of insurance development, GDP per capita as a measure of economic growth. In addition to macroeconomic, demographic and institutional variables.

2. The background of Maghreb country insurance industry

In order to position the Maghreb insurance market worldwide, we refer to the traditional comparative aggregates, namely, the penetration rate and insurance density. The first is to determine the participation of insurance in to the national wealth creation. While the second one, gives us information on the expenditure devoted by the inhabitants to the insurance sector.

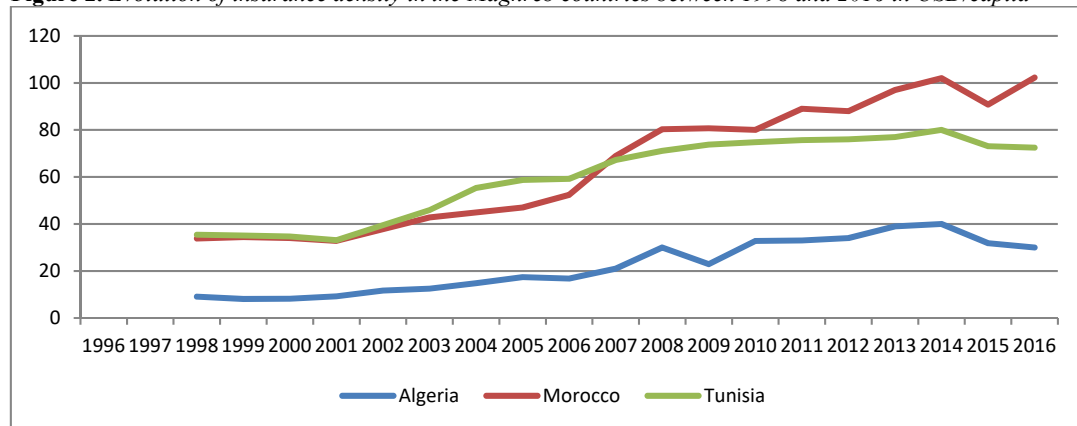
Figure 1. *Position of Maghreb countries in terms of penetration in 2016 (as a % of GDP)*



Source: Produced by us from Sigma 3-2017 data.

The evolution of the insurance sector's share of GDP in the Maghreb countries is stable, with a premature decline in Morocco, which should be one of the countries with the lowest insurance penetration rate in the Maghreb region given its income level and population. However, it is the most efficient in the region. With a rate of 3.48% in 2016, Morocco was able to surpass the average of emerging and African countries as well as the MENA region. For the other countries, the penetration rates have evolved in very small ranges (between 0.5 and 0.8% in Algeria and 1.5 and 2% in Tunisia). This shows the inability of the reforms undertaken in these countries to give a dynamic to this sector and thus play its role as a financing partner of the economy.

The Maghreb countries rank last in terms of insurance penetration rate with a rate of 2.08%. This rate is approximately the same as in the MENA region, but far from that of OECD countries.

Figure 2. *Evolution of insurance density in the Maghreb countries between 1998 and 2016 in USD/capita*

Source: Produced by us from Swiss.Re data.

Insurance density represents the average insurance expenditure per capita. The evolution of this aggregate shows a considerable improvement for Morocco and Tunisia between 2000 and 2007 with a slight increase in Tunisia. This situation was soon inverted to enable Morocco to triumph in the Maghreb market with an average expenditure of \$102 per capita in 2014. Algeria comes last, very far from its neighbors, with an estimated expenditure of \$40 per capita (representing half of what a Tunisian spends on average).

The insurance sector in the Maghreb countries has very low development rates; we list below the main factors that explain this developed sector in the study by Feyen, Lester, and Rocha (2011). They cite first and foremost the religious factor. Indeed, insurance is less developed in Muslim-majority countries due to the lack of conventional sharia-compliant products (Feyen et al., 2011). Research has also shown that demand for insurance is boosted by the existence of a retail credit market (such as mortgage loans and household loans), which is less developed in the Maghreb countries. In addition, the dominance of state-owned enterprises tends to slow down the development of this sector.

There are other factors that are difficult to measure and empirically test and that constitute obstacles to the growth of the insurance market, such as:

- The fragmentation of the insurance sector;
- The size of insurers who cannot attract insureds and who lack innovation;
- Lack of professional competence;
- Weak consumer protection regulation (due to lack of transparency and trust).

3. Methodology and results

This study seeks to explore the factors that may affect insurance demand in the Maghreb countries from 1996 to 2017; we try to take into account the economic, financial and institutional specificities of this region. Based on the existing literature and in particular on the analyses of Outreville (1996), Lewis (1989), Browne and Kim (1993), Beck and Webb (2003), we propose to estimate insurance consumption through the penetration rate according to the variables:

- Economic and financial: GDP per capita, level of financial development, credits to the private sector, level of savings and share of social insurance.
- Institutional: the rule of law and regulation.

Economic and financial variables

The variable used for the insurance sector is the insurance penetration rate, which measures the contribution of insurance premiums to gross domestic product (GDP). This variable is used in several empirical studies alongside insurance density.

GDP per capita: Studies on the determinants of insurance demand identify income as the main factor positively affecting insurance demand (Campbell, 1980; Lewis, 1989; Outreville, 1996; Beck and Webb, 2003; Li et al., 2007; Sen, 2008; Poposki et al., 2015). Increased income is likely to lead to an improvement in people's living conditions and thus a greater preference for luxury products and services and better savings and investment prospects. As a result, this leads to an increase in the consumption of insurance products.

Social security: For Browne and Kim (1993) and Beck and Webb (2003), social security systems reduce agents' insurance needs. We use GDP contributions as a measure of the social security system. We expect a negative relationship between this ratio and insurance consumption.

For the financial sector, the choice of variables was based on work by King and Levine (1993) and Outreville (1990). The first one is the liquidity ratio, calculated as the ratio between money supply (M2) and GDP. This indicator measures the "financial depth" and overall size of the financial system. The second variable is the quasi-money to GDP, which is a measure of the progress of financial intermediation in that it is through term deposits and savings that banks contribute to the optimal allocation of resources in the economy. In fact, these two indicators are the most used in empirical research, because they are available for many developing countries over a long period of time. The third variable is credit to the private sector as a share of GDP. It measures the importance attached to private sector financing by the banking sector.

Institutional determinants

We assume that the financial and insurance development also depends on the regulatory framework established by the government. This framework ensures the smooth conduct of financial transactions and guarantees the protection of policyholders (Fergusson, 2006, in Cezar, 2012). Regulatory quality captures the ability of government to formulate and implement good policies and regulations that promote economic practice. Together with the rules of law (Esho et al., 2004) measure the contribution of the legal, regulatory and institutional framework to the development of financial and insurance systems.

Sources of data

The data are taken from the annual reports of the National Insurance Council (CNA) for Algeria, the Tunisian Federation of Insurance Companies (FTUSA) for Tunisia and the Ministry of Economy and Finance for Morocco. For regulatory and legal data, we used the database "The Worldwide Governance Indicators, 2018 Update". The other data are from the World Bank database.

Model specification

The model is based on previous empirical work (Browne and Kim, 1993; Outreville, 1996; Beck and Webb, 2003), in which we introduced financial sector development indicators and institutional measures.

Using the panel data, the equation is formulated:

$$PEN_{it} = \beta_0 + \beta_1 M2_{it} + \beta_2 cred_{it} + \beta_3 GDP_{it} + \beta_4 Q.M_{it} + \beta_5 R.Q_{it} + \beta_6 R.l_{it} + \mu_{it}$$

where *pen* is the annual insurance penetration rate; *M2* is the matrix of financial sector development indicators; *cred* is the matrix of private sector credits, *GDP* is the economic variables used as an income measure, *QM* is the savings matrix, *QR* and *RI* represent the matrices of institutional variables; $\beta_{1,2,3,4,5,6}$ are the coefficients to be estimated; μ_{it} is the error term; *i* is country; and *t* is time or period.

We carry out a panel data analysis on a sample of 3 countries over the period 1980-2017.

Estimation method

In panel data, it is often interesting to identify the effect associated with each individual. That is, it does not change over time, but varies from one individual to another. This effect can be fixed or random. Hausman's (1978) specification test is the most commonly used to select the appropriate model, the fixed-effects or random-effects model.

Results and interpretations

The results of the Fisher test lead us to reject the null hypothesis of inter-individual homogeneity, so we must favor a model that takes into account individual specificities.

Based on the estimation results, and more specifically, the Hausman test statistics, it can be seen that the estimates used will be those of models with fixed individual effects. The Hausman test refutes the hypothesis that there is no correlation between the random term and the explanatory variables of the model. (P-value = 0.00% < 5%). The estimators of the compound error model are biased; it is preferable to retain those of the fixed effect model that are unbiased.

Table 1. Financial and institutional determinants of insurance demand

Models	Pooled OLS	Fixed effect model	Random effect model
Coefficients	Estimates [std. Error] (P-value)	Estimates [std. Error] (P-value)	Estimates [std. Error] (P-value)
Intercept	4.423025 1.758889 0.0147	9.65738 2.06128 0.00002	4.423025 1.758889 0.012
GDP	2.69081 0.575728 0.0000	3.01220 0.521542 0.00000	2.690809 0.575728 0.000
Credit to private sector	0.6021165 0.1798084 0.0014	0.0533382 0.212985 0.8032	0.6021165 0.1798084 0.001
M2/GDP	-2.35653 0.6092171 0.0003	-3.74374 0.649291 0.0000	-2.35653 0.609217 0.000
Social cotisation	-0.2495212 0.1421709 0.0845	-0.287706 0.127569 0.0280	-0.249521 0.1421709 0.079
Quasi-Money	-0.3708632 0.3403498 0.2804	-0.229779 0.306614 0.4567	-0.37086 0.3403498 0.276
Regulatory quality	1.281969 0.338807 0.0004	0.590396 0.350465 0.0975	1.281969 0.338807 0.000
Rule of law	0.1091925 0.1322068 0.4122	0.0790255 0.118532 0.5077	0.1091925 0.1322068 0.409
R ²	0.9032	0.900499	
Adjusted R ²	0.8915	0.923839	
F test	0.0000	0.00023	

VIF = 3.07, LM = 1.000, Hausman = 0.0000, Durbin Watson = 1.956.

According to the results of the estimation, GDP per capita seems to be a very important indicator of insurance activity in the Maghreb. An increase of GDP/CAP of 1% leads to an increase in the insurance penetration rate of more than 3%. This finding is consistent with the previous studies (Outreville, 2013), which found a high income elasticity of insurance demand in developing countries. The indicator credits to the private sector as a percentage of GDP (cred) has a particular advantage, because it represents the volume of funds chained to the private sector. This indicator is more related to insurance through the existence of the obligation of insurance policies relating to companies. This ratio is a more appropriate indicator to measure the capacity of investment to increase insurance demand. In all regressions, this ratio is positively correlated with the insurance penetration rate (but not significantly). Arena (2008) explains this result by a problem of collinearity between these variables.

The money supply ratio (M2/GDP) can be an indicator of financial intermediation, mainly in the Maghreb countries where the main component of financial development has taken place in the banking sector. The relationship of this ratio with insurance shows a negative sign, which means that an improvement in this ratio of 1% leads to a decrease in insurance of 3.74%. This is justified by the fact that the M2/GDP ratio does not actually provide information on financial development in the Maghreb countries, if we know that M2 is essentially composed of monetary liquidity and not sophisticated financial instruments (cheques, bank cards, etc.). This result is not different from the results obtained by (Carson et al., 2014) regarding the supply of insurance in developing countries.

The quasi-currency variable provides us with information on the relationship between the use of savings in the financial institutions and the demand for insurance. Indeed, we assume the existence of a positive relationship due to the fact that economic agents who trust their banks may have the same intention towards insurance, which is also a means of saving, especially in the case of life insurance. The estimation of this relationship in the case of the Maghreb countries shows a non-significant and negative relationship. This can be explained by the lack of an insurance culture among the local population who limits their savings at the bank level.

The regression shows that the variable “social contributions” has a negative and significant coefficient. This is consistent with the recent theoretical and empirical literature presented above. The Maghreb countries have compulsory social security systems, considered generous in terms of compensation, which leaves the population indifferent to economic insurance.

The institutional indicators, represented by the quality of regulation and compliance with the law, do not seem to have any effect on insurance consumption in the three countries studied, as the coefficients are positive but not significant at 5% level. This result is in contradiction with those found by (Hussels et al., 2005) and (Poposki et al., 2015) concerning the rules of law.

4. Conclusion

The aim of this article was to explore the financial and institutional determinants of insurance demand in the Maghreb countries (Algeria, Morocco and Tunisia). In this context, we presented a synthesis of the existing empirical literature on the determinants of demand for life and non-life insurance. A consensus is reached for some variables while others have remained ambiguous.

The main results of this study are firstly the positive and significant effect of economic growth, measured by GDP per capita, on the insurance penetration rate. While in the opposite way, social insurance affects negatively the demand for insurance.

Second, among the financial variables, only the financial deepening variable (M2/GDP) is considered to be a barrier to the development of insurance demand. While, credits to the private sector / GDP and quasi-currency have no relationship with the insurance sector.

Third, it seems that the institutional variables used in this study, namely the rule of law and regulation, are not determinants of insurance demand in the Maghreb countries.

In summary, GDP/cap is the most important factor that determines insurance consumption in the Maghreb countries and over time.

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Non-linear finance-growth nexus for African countries: A panel smooth transition regression approach

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Abstract. *The economic growth effects of financial development have been the focus of much research in empirical growth literature. Recent literature has focus on the nonlinear effects of financial development on economic growth using advances in econometric techniques. Using a novel data set, we examine the conditioning role of the overall level of financial development, financial institutions development and financial markets development in finance-growth nexus for African countries using panel smooth transition regression approach (PSTR). Our results show that a sufficient level of the overall financial development is needed for finance to be growth enhancing in African countries, while a robust non-linear finance-growth nexus cannot be established when we conditioned finance-growth nexus on financial institutions development or financial markets development.*

Keywords: financial development, non-linearities, growth, Africa.

JEL Classification: E44, G21, O47.

1. Introduction

The role of finance in economic growth literature has received great attention, especially with the proliferation of endogenous growth models (Beck et al., 2000; King and Levine, 1993b; Levine, 1997c, 2005; Levine et al., 2000). However, the debate on the role of finance in growth is subject to divergent views. Theoretical models show that financial development promote growth through the rate of saving, the amount of savings channeled to investment, and the social marginal productivity of investment, implying the need for lower transaction cost (Murinde, 2012; Pagan, 1993). Similarly by increasing the proportion of saving channeled to investment financial development promotes growth (Bencivenga and Smith, 1991; Greenwood and Jovanovic, 1990). In addition, financial systems that evaluate promising entrepreneurs, mobilize savings to productivity-enhancing projects, diversify risks, and reveal expected profits from these innovative activities are growth enhancing (King and Levine, 1993b). Moreover, empirical evidences show that financial systems that are able to produce information about possible investments and allocate capital; monitor investments and exert corporate governance; facilitate trade, diversify and manage risk; mobilize and pool savings; and ease the exchange of goods and services are able to promote economic growth (King and Levine, 1993b, 1993a; Levine, 2005).

These evidences however have been found on the backdrop of a linear finance-growth nexus, which have been call to question (Aghion et al., 2005; Berthelemy, 1996; Deidda and Fattouh, 2002; Deidda, 2006). Theoretical models that explain non-linear financial development and growth show that financial development and growth relationship exhibits multiple equilibria. These multiple equilibria in finance-growth nexus are explained in terms of reciprocal externalities between the real and financial sectors (Aghion et al., 2005; Berthelemy, 1996). In a simple overlapping generation model with risk averse agents and costly financial transaction, financial development impact growth ambiguously at low levels of development, but as development continues finance impacts growth positively (Deidda and Fattouh, 2002). The impact of the banking sector on economic growth depends on the level of financial markets development, so that countries with developed financial markets reap more from financial systems impact on growth (Deidda and Fattouh, 2008).

Moreover, (Beck et al., 2014) finds evidence for non-linearity in finance-growth nexus. Using a panel smooth transition regression model to account for non-linearity in finance-growth nexus for a sample of 45 advanced and developing countries during 1975-2009 (Doumbia, 2010) finds evidence of finance-growth nexus exhibiting an inverted U-shaped relation. Non-linearity stems from the level of income, so that in low income and lower middle income countries financial development enhances growth through boosting savings and investment, while its effect is nil or negative in more advanced economies. In a panel mean group (PMG) estimation method for middle income countries (Samargandi et al., 2013) show that financial development has a long run non-linear relationship with growth, however the short run effect is not significant.

Generally, the African evidence show a long run relationship between finance and growth as espoused in (Bangake and Eggoh, 2011; Hassan et al., 2011; Murinde, 2012). (Allen et al., 2000) finds that finance positively impacts long run investment, implying that financial

development's effect on growth through capital accumulation is positive. Moreover, (Rousseau and D'Onofrio, 2013) in a sample of 22 sub-Saharan African countries from 1960-2009 finds that financial development causes real activity (capital accumulation and economic growth) in two-third of the countries studied. However, the measure of financial development that appear to be growth-promoting is monetization, lending evidence to the role of money rather than finance.

Despite these efforts, the literature on non-linear finance-growth nexus with focus on Africa has not been given much attention. Using (Hansen, 1999, 2000) panel threshold regression technique, (Ibrahim and Alagidede, 2017) finds that the level of financial development, economic development and human capital stock mediate financial development's effect on economic growth in sub-Saharan countries during 1980-2014. However this technique (Hansen, 1999, 2000) panel threshold method- assumes an immediate shift from one regime to another, hence cannot model transition from one regime to another.

We differ with the extant literature on finance-growth nexus in Africa from a methodological aspect, as well as from exploring a new data set. We used panel smooth transition regression approach which is an improvement on the (Hansen, 1999, 2000) technique in that it allows the researcher to model the transition from one regime to another. Knowledge of how long it takes to move from one regime to the other is especially important for policy implementation when financial development is within the neighborhood of the threshold value. Another novelty of this study is the use of a broad based measure of financial development allowing us to better capture the concept of financial development as defined from the function approach (Levine 2005). To the best of our knowledge is the first time this data is used in the analysis of finance-growth nexus for African countries.

2. Data and methodology

2.1. Data

The dataset use in this study comprise thirty-three African countries during the period 1980-2014, where countries are included base on availability of data. The data set is derived from different sources such as from World Bank Development Indicators (WDI), Penn World Tables (PWT), International Country Risk Guide (ICRG) and IMF. Table 1 illustrates breakdown of the data and its sources. Economic growth, human capital, openness, inflation and per capita income are all taken from the World Development Indicators database, while data on financial development is source from IMF based on (Svirydzenka, 2016). Investment data and institutional quality data are source from PWT and International Country Risk Guide (ICRG) respectively. Growth refers to GDP growth rate, initial income is per capita GDP measured at 2011 international dollar, human capital is measured by gross tertiary school enrolment ratio, while trade openness is taken as the ratio of imports and exports to GDP. Government expenditure is given by the general government consumption expenditure as percentage of GDP, and institutional quality is measured by the ICRG's polity2 index.

Table 1. *Data and sources*

Variable	Measure	Source
Overall Financial Development	Financial development index	IMF
Financial Institutions Development	Financial institutions index	IMF
Financial Markets Development	Financial markets index	IMF
Growth	GDP per capita growth	WDI
Income	Per capita GDP (at 2011 Int'l \$)	WDI
Human Capital	Tertiary school enrollment ratio	WDI
Investment	Share of gross capital formation	PWT
Institutional Quality	Polity2	ICRG
Trade Openness	Export+ Import / GDP	WDI
Government expenditure	General government consumption expenditure/ GDP	WDI

In line with growth empirics and to purge out business cycle effects, 5-year averages are taken for each variable, with the initial income referring to the first period values in each 5-year average.

2.2. Panel smooth transition regression approach

Following (Deidda and Fattouh, 2002) we first examine a linear regression:

$$Growth_{it} = \mu_i + \beta_0 FD_{it-1} + \beta_1 X_{it-1} + \varepsilon_{it} \quad (1)$$

Where $Growth_{it}$, $findev_{it-1}$ and X_{it-1} refer to GDP growth, financial development, and the vector of controls respectively for the i^{th} country in period t . The terms μ_i and ε_{it} represent country fixed effects and the residual error terms respectively, where the error term is assumed to be *i.i.d* $(0, \sigma_\varepsilon^2)$. Financial development impact growth positively if $\beta_0 > 0$ and impacts negatively if $\beta_0 < 0$. However, recent literature has questioned the linear relationship between financial development and economic growth, hence we employ a panel smooth transition regression approach proposed by (Fok et al., 2005; Gonzalez et al., 2005) to capture the nonlinearity between financial development and economic growth as well as control for cross country heterogeneity in finance-growth nexus (Jude, 2010). For the purpose of simplicity, we specify a two-regime PSTR model given by the following expression.

$$Growth_{it} = \mu_i + \beta_0 FD_{it-1}(q_{it-1} < \gamma, c) + \beta_1 FD_{it-1}\Gamma(q_{it-1} > \gamma, c) + \varphi_0 X_{it-1}(q_{it-1} < \gamma, c) + \varphi_1 X_{it-1}\Gamma(q_{it-1} > \gamma, c) + \varepsilon_{it} \quad (2)$$

where the transition function $\Gamma(q_{it}; \gamma, c)$ is a continuous bounded function, taking values between 0 and 1 depending on the threshold variable q_{it} , the threshold value c and γ the slope of the transition function. The transition variable in this study is the level of financial development. Based on the time series smooth transition autoregressive (STAR) model, (Fok et al., 2005; Gonzalez et al., 2005) specified a logistic function for the transition function as follows:

$$\Gamma(q_{it}; c) = \frac{1}{1 + \exp[-\gamma(q_{it} - c)]} \quad (3)$$

Depending on the values that the slope parameter assumes the PSTR model lies between the panel fixed effect model and the panel threshold regression (PTR) model of (Hansen 1999, 2000). Theoretically, PSTR offers the advantage that both time-varying and cross-country heterogeneity in finance-growth coefficient is captured, and allows the parameters

to change smoothly depending on the threshold variable. The finance-growth coefficient when the transition variable is financial development is defined as:

$$e_{it} = \frac{\partial Growth}{\partial FD_{i,t-1}} = \beta_0 + \beta_1 \Gamma(FD_{i,t-1}; \gamma, c) + \beta_1 \frac{\partial \Gamma(FD_{i,t-1}; \gamma, c)}{\partial FD_{i,t-1}} FD_{i,t-1} \quad (4)$$

Depending on the sign of β_1 , the finance-growth elasticity (e_{it}) takes a weighted average of the parameters β_0 and β_1 as follows: if $\beta_1 > 0$, then $\beta_0 \leq e_{it} \leq \beta_0 + \beta_1$; and if $\beta_1 < 0$, then $\beta_0 + \beta_1 \leq e_{it} \leq \beta_0$ because $0 \leq \Gamma(q_{it}; \gamma, c) \leq 1$. As can be notice from above, the true effect of financial development on economic growth can be different from the extreme parameters β_0 and β_1 . Precisely, the direct effect of finance on growth is fully captured by β_0 when the transition function tends to 0; and the direct effect of finance on growth is directly captured by $\beta_0 + \beta_1$ when the transition function tends to 1. The intermediate state comprise of an infinite weighted average of these two extremes for finance-growth coefficient. This is why, like Probit and Logit model, it is difficult to directly interpret the values of finance-growth coefficient. Hence, researchers concentrate on the sign of the parameters. The sign will show whether financial development increases or decreases with growth as the transition variable varies.

The estimation process involves three steps (Fouquau et al., 2008): a linearity test, test of no remaining linearity and PSTR parameter estimation. The linearity test in our context involve testing if finance-growth nexus is adequately modelled by a homogenous linear panel model or by a PSTR with at least two regimes. The null hypothesis (H_0) is therefore constructed under linearity and the alternative (H_1) hypothesis is a PSTR with atleast one threshold. The test is conducted using three statistics: The Fisher LM test, Wald test and the likelihood ratio test specified as:

$$LM_F = \frac{(SSR_0 - SSR_1)/K}{SSR_0/(TN - N - K)} \sim F(K, TN - N - K)$$

$$LM_w = \frac{NT(SSR_0 - SSR_1)}{SSR_0}$$

$$LR = -2[\log(SSR_1) - \log(SSR_0)]$$

Where SSR_0 denote the sum of squares residual under H_0 of linear panel model and SSR_1 is the sum of squares residual under (H_1) PSTR with atleast one threshold. The LM_F follows an $F(K, TN - N - K)$ distribution, and LM_w and LR statistics follow a $\chi^2(K)$. The K degress of freedom refers to the number of explanatory variables, while T and N are the number of periods and number of countries. If the null hypothesis cannot be rejected, then the finance-growth nexus is adequately captured by a linear homogeneous panel model. However, we the null is rejected then the appropriate model is a PSTR with at least one threshold. Upon rejection of the null hypothesis, the second step involves testing the appropriate number regimes to capture the nonlinearity in the PSTR model, and this is called the test of no remaining nonlinearity. The null hypothesis H_0 is constructed under a PSTR model with atleast one threshold or two regimes, while the alternative hypothesis H_1 is constructed under a PSTR with at least two threshold or three regimes. If the null hypothesis cannot be rejected the test ends and a PSTR model of one threshold is

estimated in the third stage using non-linear least squares estimation techniques. However, if the null in the second stage is rejected the test is reconstructed with a null of at least two thresholds against an alternative of at least three thresholds. This procedure is followed until the null cannot be rejected, i.e. until all nonlinearities in the finance-growth nexus is captured. The test of no remaining nonlinearity is conducted using the Fischer, Wald and Likelihood Ratio test statistics.

According to (Fouquau et al., 2008) *the use a PSTR limits the potential endogeneity bias since for each level of the threshold variable there is a “particular” value of the estimated FH regression parameter.*” PP-20. Despite this we rely on one period lag of financial development ($FD_{i,t-1}$) to correct for any remaining endogeneity.

3. Multidimensional measure and financial development in Africa

Financial development has come to be defined based on what the financial system does (Levine, 1997, 2005). Accordingly, financial development is defined as an improvement in the quality of the following five key functions of the financial system: 1. producing and processing information about possible investments and allocating capital based on these assessments; 2. monitoring individuals and firms and exerting corporate governance after allocating capital; 3. facilitating the trading, diversification, and management of risk; 4. mobilizing and pooling savings; and 5. easing the exchange of goods, services, and financial instruments.

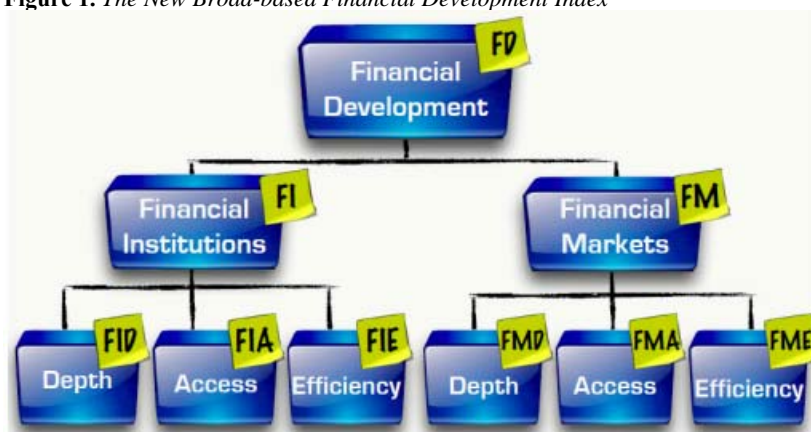
Base on this functional definition of financial development, it would be ideal to have a direct measure of how well the financial sectors performs: 1. information production and processing about possible investments and allocation of capital base on this information, 2. individuals and firms monitoring to exert corporate governance after capital is allocated, 3. facilitation of trading, diversification and management of risk, 4. mobilizing and pooling risk, and 5. easing exchange of goods and services. Without the challenge of measurement, one would like to be x able to say, for example, in terms of information acquisition and processing, country X scores, say 50 out of 1000, and Y scores 79 out of 100, and so on.

However, measurement challenge is a key problem in the financial development literature. Traditional measures of financial development based on depth such a private credit, domestic credit or bank liquidity do not capture broadly these functions of the financial system. In fact Levine (2005) content that such proxies often do not adequately capture the concept of financial development put forward by theory. This defines the move away from the traditional one-dimensional measures towards a multifaceted measure of financial development (Demirguc-Kunt and Maksimovic, 1996; Martin Cihak et al., 2012; Svirydenka, 2016) backing on the functional approach to the role of financial sector in the economy. The idea is to capture some characteristics of the financial system, such as depth, access, efficiency and stability. These characteristics do not necessarily measure the functions directly but of the services provided by the financial system (Martin Cihak et al., 2012). For example depth does not measure information acquisition and the allocation of capital; it is rather an imperfect ex-post proxy for the overall depth of the financial services.

It is against this backdrop that this study is based on a multifaceted measures of financial development introduced by (Svirydzenka, 2016).

(Svirydzenka, 2016) developed a comprehensive measure of financial development that covers both financial institutions development and financial markets development. This broad measure of financial development recognizes the fact that financial services are provided by a broad range of institutions and that the availability of different markets allow households and firms to acquire loans and raise capital from diverse sources. This measure, unlike the traditional measures, capture the real gap in the financial services for a country that has a dominant banking sector as it is the case in most African countries. It assesses financial institutions and markets on three main dimensions: depth, access and efficiency. The depth dimension looks at the size and liquidity of financial institutions and markets, which is what the ad hoc measures of financial development seeks to capture (private credit to GDP ratio and liquid money to GDP ratio). Access to financial institutions and markets are equally important in the measuring of financial development, hence the access dimension of this new measure captures the ease of access for households and businesses to financial services in the economy. The efficiency dimension measures the ability of financial institutions and markets to provide funds to agents at low cost while maintaining sustainable profits. The figure below displays the various components to the index.

Figure 1. *The New Broad-based Financial Development Index*



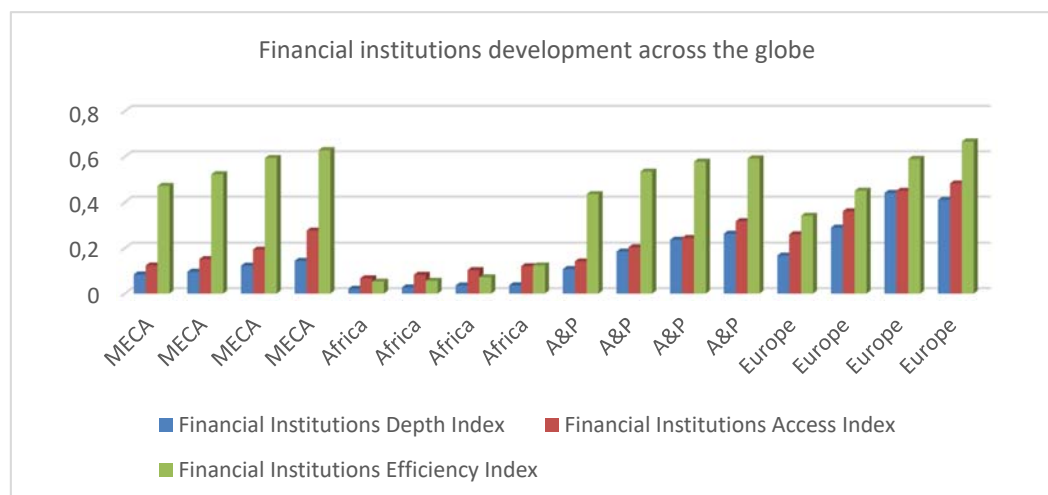
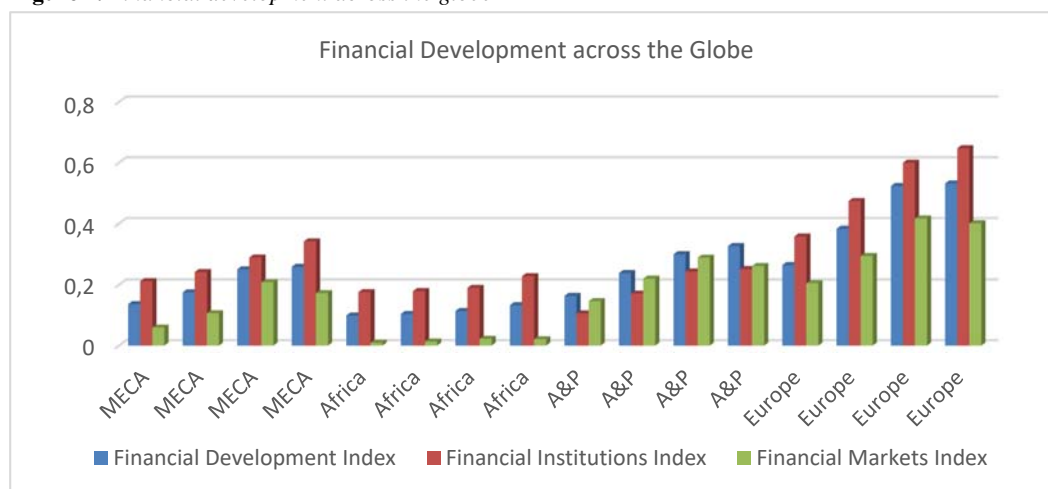
Source: Svirydzenka (2016).

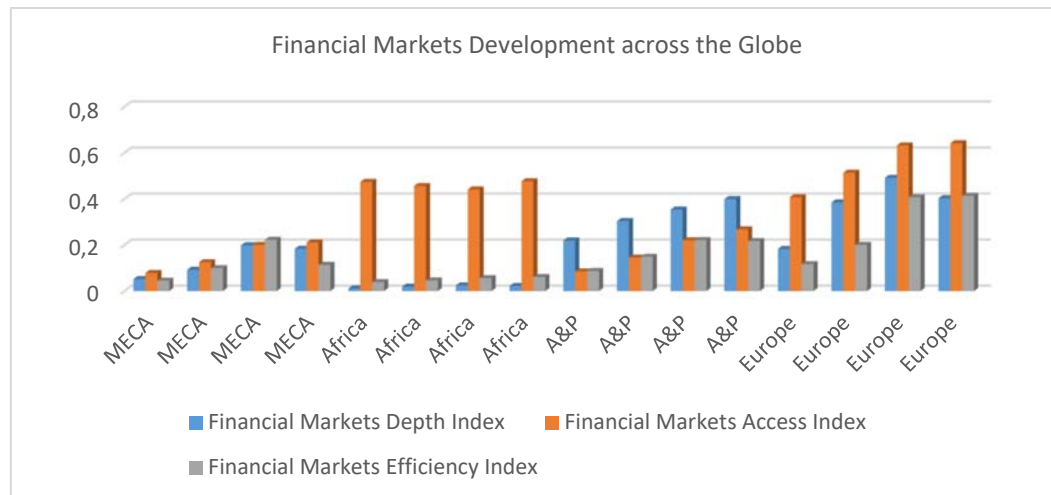
On average financial institutions are more developed than financial markets in Africa, which springs from the fact that the Africa's financial sector is mainly dominated by deposit money banks, and other financial institutions like insurance companies. Furthermore, while deposit money banks, insurance companies and other financial institutions are present in all countries, financial market are absent in some African countries, resulting in a very low average financial markets index. On the other hand, where financial markets exist they seem to put up a relatively higher level of financial development compared to financial institutions. The maximum financial markets index is higher than that of financial institutions development.

Table 2. *Description of financial development based on (Sviryzhenka, 2016)*

Variable	Observation	Mean	Std. Dev.	Min	Max
Overall financial development	231	0.15027	0.1394	0	0.78668
Financial institutions development	231	0.22282	0.14389	0	0.77497
Financial markets development	231	0.06773	0.13545	0	0.80344

To make sense of these figures, we compare financial development and its various dimensions in Africa with other regions. Figure 2 shows the evolution of financial development, financial institutions development and financial markets development in Africa, Middle East and Central Europe (MECA), Asia and Pacific (A&P) and Europe during the 1980s, 1990s, 2000s, and 2010-2014 periods. For each region, the group of bars are listed chronologically.

Figure 2. *Financial development across the globe*



While Africa has the lowest level of overall financial development among all regions, until 2000s financial institutions development in Africa has been greater than in the Asia and Pacific region. The rapid development in Asia since the turn of the millennium means that today Africa is home to the shallowest financial sector among all regions by all dimensions. Strikingly, despite the enormous financial markets development in other regions- in some places exceeding financial institutions development- in Africa financial markets are almost non-existent. However, the trend in financial sector development has been increasing in Africa, just as in other regions, alluding to the enormous globalization since 1980. The 2008 Global financial crisis has led to the rewind in financial markets development significantly in other regions and just marginally in Africa (from 0.021 to 0.020 for 2000s and 2010-2014 periods, respectively).

Delving into the dynamics of financial institutions and markets development across regions, Africa's financial institutions development has been driven mainly by access to financial institutions. This story is corroborated by the homegrown innovative financial inclusion products in East Africa that leverage mobile technology. In the meanwhile, efficiency of financial institutions has driven their overall developing in other regions, especially in Asia and Pacific and Middle East and Central Europe. The advancements in information and communication technology has aided financial institution in their urge to efficiently serve their customers at low cost while making profit. An important observation is that though the most common traditional measures of financial development are those that capture financial institutions depth (Beck et al., 2000; Levine, 1997, 2005) data shows that financial institutions depth is the lowest contributor to overall financial institutions development in Africa since 1980.

Overall financial markets development is low in Africa, but were they exist access to markets are much more developed than elsewhere in MECA and A&P. In fact, it is as if financial markets development is one-dimensional, and focuses only on access. Financial markets depth and efficiency are moderate in the continent. This structure of financial markets development contrast other regions. In Europe for example financial markets

access, then depth and finally efficiency contributes the most to financial markets development. However, in the Asia and Pacific region, the structure is dominated by depth, then access and efficiency last; while markets development in MECA is balanced between all dimensions.

Figure 3. *Financial development across Africa*
Year: 1990-1999 and 2000-2009

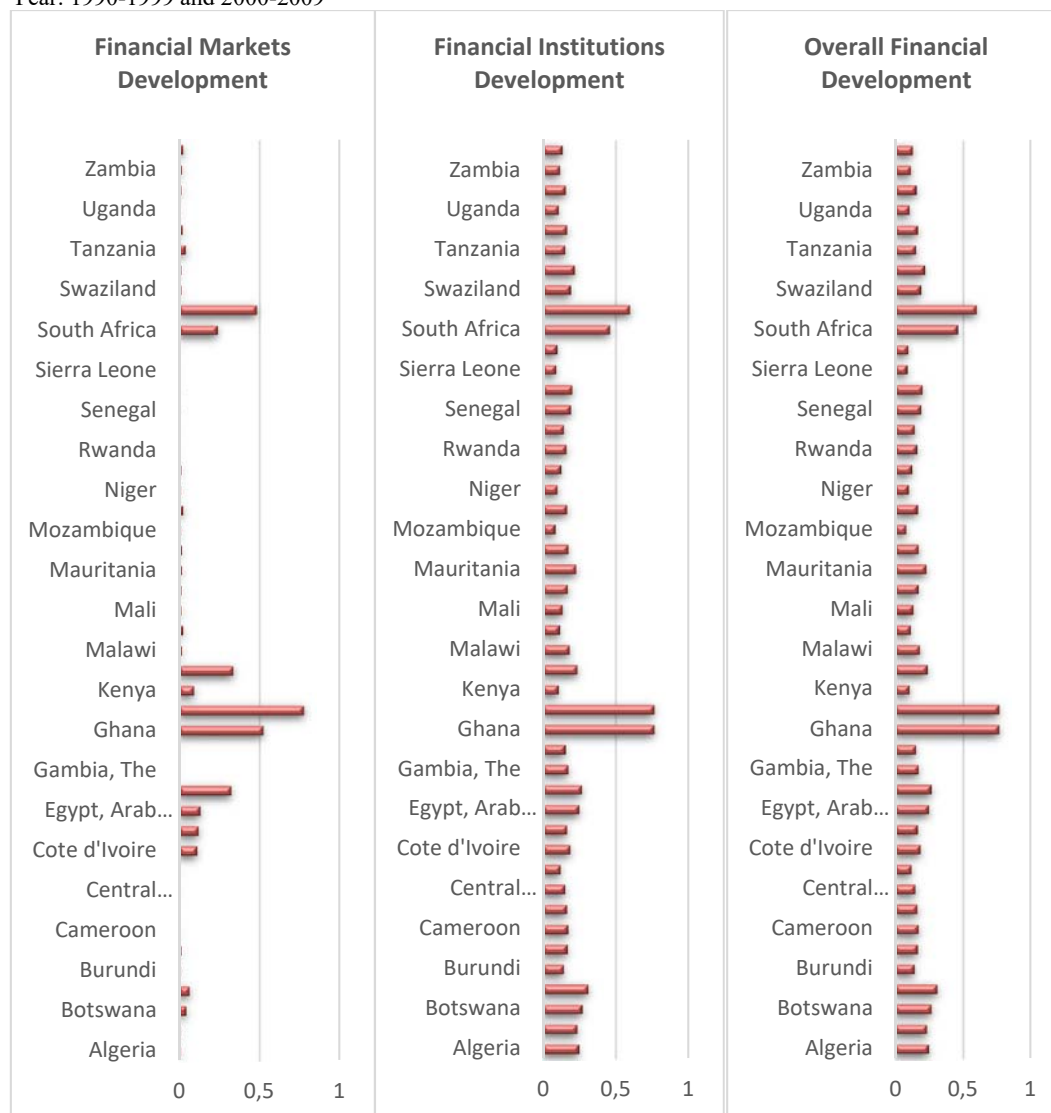


Figure 3 focuses on financial development within the sample African countries during the three decades since 1980 and 2010-2014 period. The two bars for each country show the average financial development in 1990-1999 and 2000-2009 periods. Among the sample countries, Ghana, South Africa, Kenya, Egypt and Botswana have the greatest financial sector development, institutions and markets. Several countries have zero financial markets

development because of their little or non-existence. Unsurprisingly, countries that have no financial markets tend to have the lowest financial institutions development and overall financial development. For example in countries such as Sierra Leone, Niger, Rwanda and Central African Republic, financial markets are non-existent until 2009. Rwanda's stock exchange was later launched on 31st January 2011.

4. Results and finding

4.1. Descriptive statistics

Table 3 shows the summary statistics and the correlation matrix for the data. The average GDP growth in the sample is moderate at 3.5% with wide range and high dispersion (CV is a normalized measure of dispersion of a probability distribution, and it is calculated as the ratio of standard error to the mean) of 4.48. This alludes to the heterogeneous nature of sample, a case further showed by the range in the per capita GDP. The mean per capita GDP is less than \$ 2000, with as low as a per capita income of \$ 115 and a maximum beyond \$10,000.

Financial institutions are on average more developed and less disperse among African countries than financial markets. The average is highest and dispersion lowest for financial institutions index than financial markets index, and the overall financial development index lies in between the two as expected. Openness on average is high while the average level of institutional quality is low and its dispersion high. On the correlation between GDP growth and its covariates, the signs are as per expectations. Initial income is negatively correlated with growth because of the 'catch-up' or convergence hypothesis. All financial development indicators, human capital, investment, openness and institutional quality, and government expenditure are all positively correlated with growth. The magnitudes are equally moderate except for the human capital measure.

Table 3. Summary statistics

Variable	Growth	Income	Human capital	investment	Overall financial development	Financial institutions development	Financial markets development	Institutional quality	Trade openness	Government expenditure
Mean	3.557328	1747.606	5.940065	20.05356	0.150273	0.222823	0.067733	-1.06061	70.6019	5.580453
Max	33.21688	12139.64	37.19728	46.77489	0.78668	0.774968	0.803444	10	229.6381	60.8852
Min	-31.0159	115.7941	0.08859	3.958171	0	0	0	-10	12.876	-68.2379
S.D	4.481586	2222.641	7.336863	7.309797	0.139395	0.14389	0.135446	5.933879	32.45534	10.40167
CV	1.259818	1.27182	1.235149	0.364514	0.927611	0.645761	1.999706	-5.5948	0.459695	1.863947
Correlation										
Growth	1									
Income	-0.1116	1								
Human capital	0.0123	0.4007	1							
Investment	0.2291	0.3265	0.2559	1						
Overall financial development	0.1043	0.3381	0.5049	0.265	1					
Financial institutions development	0.105	0.432	0.5077	0.3834	0.9313	1				
Financial markets development	0.0902	0.1915	0.4191	0.1018	0.9274	0.7462	1			
Institutional Quality	0.198	0.0578	0.111	0.0802	0.3099	0.2616	0.3034	1		
Trade openness	0.1701	0.2879	0.1539	0.419	0.1881	0.2677	0.0789	0.0897	1	
Government expenditure	0.4313	-0.0841	-0.0195	0.151	0.0055	0.0015	0.0228	0.1071	0.1885	1

4.2. Linear panel data result

In this section, we use systems GMM (Arellano and Bover, 1995; Blundell and Bond, 1998) to uncover the independent unbiased effect of finance on growth in Africa and the results are shown in Table 4. The first three columns present result for the basic specification with the three financial development indicators, one for each column.

Table 4. *Linear panel data result*

VARIABLES	I	II	III
Initial income	-0.000291*** (6.50E-05)	-0.000280*** (8.57E-05)	4.01E-05 (6.39E-05)
Human capital	0.0362*** (0.0107)	0.0283* (0.0139)	-0.00227 (0.0114)
Investment	0.0878*** (0.0217)	0.0631** (0.0267)	0.0338 (0.0244)
Overall financial development	5.505*** (0.895)		
Financial institutions development		6.941*** (1.074)	
Financial markets development			3.028*** (0.837)
Institutional quality	0.0231 (0.0257)	0.0263 (0.0288)	0.0471** (0.0226)
openness	0.0198*** (0.00526)	0.0182*** (0.00605)	0.0309*** (0.00571)
Government expenditure	0.00588 (0.0136)	-0.00547 (0.0123)	0.00497 (0.0108)
Constant	-2.386*** (0.335)	-2.395*** (0.362)	-1.648*** (0.376)
Observations	163	163	163
Number of ID	32	32	32
AR(2)	0.411	0.436	0.375
Hansen	0.614	0.734	0.923

Like the linear panel data result, Table 4 shows that financial development is highly significant by all three measures. In all cases financial development is positively and significantly related to growth, however the magnitude is higher for financial institutions than financial markets. This is not surprising given that financial institutions are more developed (mean of 0.22) than financial markets (mean of 0.06). Combined together, the overall financial sector development exerts an even more effect on growth. Other growth covariate are also examined and results show that initial income, human capital and investment are significant determinants of growth. Human capital and investment exert a significant positive impact on growth, while initial income is significantly negatively related to growth.

Serial correlation of the first degree are bound to be present in dynamic models however model diagnostics show that serial correlation of second degree is not a problem in all specifications in Table 4, (P-values > 0.05). Model over-identification restrictions tests of Hansen show that the validity of the over-identification restrictions cannot be rejected in all specifications.

5. Panel Smooth Transition Regression (PSTR) results

Recent advances in econometric techniques coupled with ease in numerical computation has served as a springboard for researchers' interest in heterogeneous economic relationships. Meanwhile, the recent financial crisis has questioned the belief that finance is monotonically good for growth, hence the recent surge in nonlinear finance-growth studies (Eggoh and Khan, 2014; Ibrahim and Alagidede, 2017; Jude, 2010; Law et al., 2013; Samargandi et al., 2013). The extant literature has tried to study the existence of non-linearity as well as study the conditional variables that moderate such nonlinearity. In this section, we estimate a panel smooth transition regression model of finance-growth nexus where finance-growth nexus is conditioned on the level of overall financial development, financial institutions development and financial markets development for African countries.

The PSTR result is shown in Table 5 and comes in three sections: linearity test, test of no remaining heterogeneity, and final PSTR estimation. The first section indicates that finance-growth nexus is non-linear by all three statistics when we condition the nexus on the overall level of financial development, non-linear when conditioned on financial institutions development and financial markets developed by the Likelihood Ratio statistic. Going by the Fisher and Wald Statistics, we cannot reject linearity when we condition finance-growth nexus upon the level of financial institutions and financial markets development.

For probe further, we test for the appropriate number of thresholds in each model using the Fisher, Wald and LR test statistics. The results in the second section of Table 5 highlights that the null of only one threshold/two regimes cannot be rejected in all three models at 10% level of significance, alluding to the point that usually one threshold is sufficient to capture all non-linearities in economic relationships (Gonzalez et al., 2005). In the final section of Table 5, the PSTR estimation output for finance-growth nexus is shown.

Table 5. Linearity, no remaining non-linearity tests and PSTR estimation results

	Financial development		Financial Institution		Financial Market development	
Linearity Test	test stat	p-value	test stat	p-value	test stat	p-value
Likelihood Ratio	6.0134	0.00	12.0335	0.00	4.345	0.00
Wald	6.019	0.007	1.410	0.207	4.289	0.746
Fisher	0.706	0.005	11.59	0.115	0.497	0.835
Test of No Remaining Non-linearity	test stat	p-value	test stat	p-value	test stat	p-value
Likelihood Ratio	9.414	0.224	7.199	0.408	2.135	0.952
Wald	9.146	0.242	7.041	0.425	2.121	0.953
Fisher	0.974	0.453	0.740	0.639	0.216	0.981
PSTR Coefficient Estimates						
Gamma	198.89		5.3808		5.9918	
C	0.0193 [0.010-0.439]		-3.20 [0.0801-0.4049]		-3.4683 [0.000-0.1902]	
	Regime 1	Regime 2	Regime 1	Regime 2	Regime 1	Regime 2
Coefficient	-2.2639*** (-11.67)	2.2644*** (11.66)	2.7516 (0.0597)	-2.7516 (-0.0063)	3.2203 (0.000)	-3.2203 (-0.000)

The result for estimating the PSTR show that a very small threshold value (0.0193) of the overall financial development index is significant (lies within the interval), such that below this level financial development harms economic growth and above it financial development imparts growth positively. The movement from regime 1 to regime 2 occurs at a slope of 198.98, which is considerably high. This therefore means that financial development and economic growth has a U-shaped relationship in African countries when the relationship is conditioned on the level of overall financial development. However, with just 10% of the observation below the threshold and the fact that the current value of financial development in all countries is above this threshold, greater overall financial development in the region is poised to enhance growth. This finding is similar to (Ibrahim and Alagidede, 2017) who find that below a threshold value of 8% and 13.5% of private credit and domestic credit GDP ratio financial development does not significantly impact economic growth and beyond these cut off points finance positively impact economic growth in sub-Saharan Africa.

When we disintegrate the financial system and focus attention on financial institutions and financial markets, our results are interesting. First, they consistently show that the threshold values reached at are both out of band and insignificant, while the conditioned finance-growth nexus is insignificant in both regimes of both models. Furthermore the transition from one regime to another is relatively faster compared to the overall financial development. Given the weak evidence for nonlinearity in these two models (only LR statistics show non-linearity), and results of the final section, we conclude that a robust non-linear nexus cannot be established for finance-growth nexus when conditioned on financial institutions development or financial markets development separately. However, taken the evolution of the overall financial development, we show that finance-growth nexus is not linear such that beyond a threshold values of 0.019 index values financial development impacts growth significantly.

6. Conclusion and recommendations

In the light of a new broad-based measure of financial development based on (Svirydzenka, 2016), this paper attempts to investigate finance-growth nexus for a sample of thirty-three African countries for the period 1980-2014, taking five-year average of variables to smooth-out business cycle effects. The investigation was done in two stages, where the first stage studies linear finance-growth nexus as found in the earlier finance-growth literature. The findings from this analysis show that the overall financial development, financial institutions development and financial markets development significantly enhanced economic growth, even after controlling for other significant growth covariates in the set-up of a dynamic panel regression method.

In second stage of analysis we rely on endogenous threshold model of panel smooth transition regression (PSTR) introduced by (Fok et al., 2005; Gonzalez et al., 2005) to further investigate non-linearity in financial development and growth relationship. The findings from the PSTR show that (i) non-linear and (ii) such non-linearity depends on the overall level of financial development and (iii) The separate evolution of financial

institutions and financial markets does not seem to affect the non-linearities in finance-growth nexus. These results are in line with previous findings for developing countries in (Ibrahim and Alagidede, 2017; Jude, 2010; Law et al., 2013; Samargandi et al., 2013).

Based on the findings in this paper, policy makers in African countries should further pursue financial development from a broad perspective, focusing not just on financial institutions, which dominate the financial sector of African countries, or financial markets, which are nascent in some countries, but keeping an eye on the trajectory of the overall financial sector development to allow growth enhancing financial development. Moreover, given that financial development index is a multidimensional, our result call to policy makers to not just focus on financial deepening but also access and efficiency aspects of the African financial superstructure. This study is silent on the disaggregated effect of individual sub-dimension of financial institutions development and financial markets development. Given the rich nature of the (Sviryzdenka, 2016) data, we leave that to further research.

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