Quantitative Measurement of Financial Development in Central and Eastern Europe

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Abstract. *In this Article, I will first look at the main theoretical approaches financial development and how to quantify it, and in the second part I will measure quantitative financial development in the countries of Central and Eastern Europe for the period 2007-2017. For quantitative measurement, I built an index composed of variables that measure the size and depth of the banking, stock market and insurance markets. In this regard, we used as variables for quantifying financial development in quantitative terms: domestic credit to the private sector by banks, market capitalization and international debt issues, the volume of general insurance premiums, the volume of life insurance premiums, all relative to GDP.*

Keywords: Financial development, measurement methods, quantitative measurement, measurement index

JEL Classification: E44; G2; O16

1. Introduction

The concept of financial development has begun to take shape since the beginning of the 18th century, with the first theories and research that have tried to describe it, and so far, when we can talk about a lot of research on financial development and its effects.

Studies on the impact of financial development have generated much debate and controversy, so financial development has become the focus of many studies, as it is considered one of the major determinants of macroeconomic performance, such as economic growth, stability and economies. These different concepts highlight the significant role in studying financial development, especially as a result of the implications for growth.

In 2009, Hasan and its collaborators stated that "in order to achieve meaningful and interpretive results, both quantitative and qualitative aspects of financial development, such as cost performance, industry size and market efficiency, were analyzed."

Financial development, through its systems, influences the allocation of resources in space and time. For example, Ross Levine in his work "Financial Development and Growth: Theory and evidence" said that "the emergence of banks improves the acquisition of information about firms and their managers and will undoubtedly change the allocation of credit"(Ross Levine, 2005). Similarly, financial contracts that make investors more confident that firms will repay them are likely to influence the way people allocate their savings. Thus, we see that financial institutions play an essential role throughout the economy, providing information and solutions for efficient allocation of capital and stimulating investment.

The contribution of financial sector development to economic growth through capital accumulation and technological progress, mobilization and pooling of savings, raising savings rates, producing information on investments, facilitating and encouraging foreign capital flows, has also been emphasized, as well as optimizing the allocation of

capital. In addition, by extending access to finance, it helps to reduce poverty and inequality for the poor and vulnerable by reducing their vulnerability to shocks due to risk management and increasing investments that have generated sources of income.

Financial development also has a significant impact on small and medium-sized enterprises, through the opportunity to access finance. They account for over 99% of all business in the European Union, which is why they play a major role in economic development, especially in emerging economies. The aim of this work is to measure the financial development quantitatively, in order to make a comparison between the countries of Central and Eastern Europe over a period of 10 years. This quantitative measurement is often used for empirical studies on the impact of financial development on macroeconomic performance.

The paper is organized in 5 sections: in the first section I approach the literature, in section 2 I will present the role of financial development in economic growth, followed by section 3, where the methods for measuring financial development are found. In Section IV, I will explain the method used to measure financial development by various indices. And in the last section, I will analyze the trend of quantitative measurement, I will make comparisons between countries and hierarchies of states over different periods.

2. Literature review

Over time, attempts have been made to define financial development and its definition is not static, but varies from author to author. For example, Shaw (1973) defined financial development as 'accumulation of financial assets at a faster rate than accumulation of non-financial assets'. Stiglitz and Weiss said that "a well-developed financial market is channeling a country's economies to target investment" (Stiglitz and Weiss, 1983). They argued that the financial development of a country would attract foreign investment, which would help to achieve better macroeconomic performance. Thus, Stiglitz and Weiss were among the first to hypothesize a positive influence of financial development on economic growth. A few years later, King and Levine (1993), Levine (1998), Levine et al. (2000) and others try to identify the link between the level of financial development and the rate of economic growth. According to these authors, "financial development tends to increase output and stability by improving information asymmetry, facilitating more efficient and fluid allocation and accumulation of capital and allowing further risk-sharing and portfolio diversification."

In 1997, Ross Levine reinforced the idea that financial development reduces the costs of obtaining financial market information, contracting and transaction information through financial instruments, markets and financial intermediaries, and does not completely eliminate those costs. As a result, it emphasizes the role of financial development in reducing the specific costs of the financial market, not eliminating them. Over time, it has become clear that the process of obtaining information, performing contracts and conducting transactions creates opportunities for the emergence of certain types of financial contracts, markets and intermediaries, thus favoring the development of new possibilities. Moreover, Ross Levine states that "capital accumulation and technological innovation are the elements that link financial development to growth. Rresearchers Das and Khasnobis,find that the allocation of credit through the financial system functions as a channel between the financial sector and the real sector, a channel that can be used to finance fixed capital investments and working capital requirements (Pranab Kumar Das, Basudeb Guha -Khasnobis , 2008), creating an interdependent and positive relationship between these sectors. In 2006, Kposar outlined a new definition of financial development, inspired by that of the Department for International Development. According to its version, a financial system is developing when there is an accumulation of financial assets, there is an increase in the range of financial instruments, there is an improvement in efficiency and competition in the

financial sector, not least when the population is growing with access to financial services.

Over time, 3 types of relationships have emerged between financial development and economic growth. For example, King and Levine in 1993 supported the idea of a direct and positive impact of financial development on economic growth, as did other authors such as Beckmann, 2007; Kosmidou et al., 2012Other empirical studies support a "double causality" between these two Hussein (1996), so an interdependence between financial development and economic growth. And other studies, such as those conducted by San and Teh in 2013; Deidda and Bassamin, 2001, found no connection between financial development and economic growth, supporting the concept of independence between them. Among studies showing a direct link between financial development and economic growth, some conclude that financial development will positively affect economic growth so that an increase in financial development indicators leads to economic growth in one country (Yağmur Filiz, 2017. Lonzo and Kabwe, 2015; Kenougios and Samitas, 2007; Wachtel; RESTIS and Demetriade, 1997; King and Levine, 1993). In 2000, Wulger argued that "there is a strong theoretical presumption that the development of the financial sector not only enhances the growth benefits associated with financial globalization, but also reduces vulnerability to crises." As a result, it relies on the idea that well-developed domestic financial markets are essential in the efficient allocation of foreign financial flows to competing investment projects (Wurgler, 2000). Despite studies that have tried to highlight the positive effects of financial development on economic growth, studies such as Arwhen, et al. (2015) and Cecchetti and Kharroubi (2015), which show that excessive development of the financial sector may affect real economic growth.

The effect of financial development has also received a lot of attention, when many international economists discussed the effect of "global excess economies" on global imbalances – a situation where excessive economies in several emerging economies have financed the disorder of several advanced economies, Such as the United States and European countries.

In 2018, in a study by Hiroyuki ITO and Masahiro Kawai on quantitative and qualitative quantification of financial development and its impact on macroeconomic performance, outlines the idea that further financial development may also expose savings to high-risk and high-return financial instruments, leading to aggressive risk taking, boo-depression cycles and increased volatility.

3. Ways to measure financial development

In assessing the development of the financial sector and determining the impact of financial development on macroeconomic performance, a good quantification of financial development is needed. In support of quantifying global financial development, the World Bank's Global Financial Development Database has developed a comprehensive but relatively simple conceptual framework. This framework identifies four sets of dimensions that characterize a financial system, namely: Market depth; market accessibility; market efficiency and market stability.

These dimensions are then measured for the two major components of the financial sector, namely financial institutions and financial markets:

• **Depth**

Financial depth or depth captures the financial sector relative to the economy. This dimension refers to the size of banks, other financial institutions and financial markets in a country, but which does not aim to identify in quantitative terms this sector, but to be taken together and compared with a measure of economic output. Among the first indicators used to determine the financial depth, were used: the ratio between total

bank credit and gross domestic product. However, in 1993, Ross Levine stated that "private firms are more likely to stimulate growth by assessing corporate risk and control capabilities than loans to government or state-owned enterprises" (Levine). The most commonly used indicator for determining the financial depth of an economy has now become the ratio of domestic credit to GDP, as private credit excludes credit to governments, government agencies and public enterprises. It also excludes credit from central banks. Today, the following indicators are most used to characterize the depth of financial institutions: credit from the private sector to GDP, assets of financial institutions in GDP, M2 in GDP, deposits in GDP, gross value added of the financial sector in GDP. (www.worldbank.org)

And in the case of financial markets, depth can be characterized by: Market capitalization and domestic debt instruments outstanding in GDP relative to GDP, private debt instruments relative to GDP, public debt securities relative to GDP, international debt securities relative to GDP, market capitalization relative to GDP GDP, shares traded at GDP.

• *Accessibility*

This dimension takes into account the degree to which individuals and firms have the opportunity to use financial services. The database that captures this dimension, available at www.worldbank.org, contains indicators that capture companies' access to securities markets.

According to the indicators available on the World Bank, the accessibility of financial institutions can be characterized by: percentage of people with a bank account (user survey), percentage of credit line companies (all companies), percentage of credit line SMEs, number of accounts per thousand adults (commercial banks), branches per 100,000 adults (commercial banks). And financial markets can be characterized by: Percentage of market capitalization outside the top 10 companies, the percentage of the value traded outside the 10 largest companies, the yields of government bonds (3 months and 10 years), the ratio of domestic debt to total debt, Ratio of private to total (domestic) debt, ratio of new corporate bond issuance to GDP.

• *Efficiency*

In general terms, efficiency refers to the result obtained by the means used to achieve it. In the case of financial development efficiency, the ability of institutions to provide sustainable, low-cost financial services is taken into account. In other words, the efficiency of the financial sector expresses how well financial intermediaries can facilitate financial transactions at the lowest possible cost.

The efficiency of financial institutions can be characterized by: Net interest margin, distribution of the loan on deposit, interest-free income from total income, overhead costs (percentage of total assets), profitability (return on assets, return on equity), Boone indicator (or Herfindahl statistics or H). The efficiency of the financial markets is characterized by: Turnover rate for the stock market, price timing (co-payment), liquidity costs/transactions, quoted share of supply-demand for government bonds, etc.

• *Stability*

Most definitions of financial stability refer to the absence of episodes in which the financial system does not work, ie the absence of crises.

The value of financial stability is best understood in times of financial instability, when it is absent. During these periods, asset prices differ from intrinsic value, and banks are reluctant to finance profitable projects. Thus, in times of instability it may generate hyperinflation or the collapse of the stock market.

According to the literature and indicator rankings provided by the World Bank, the stability of financial institutions is characterized by: Z, which explicitly compares amortization (capitalization and returns) with risk (return volatility) to measure a bank's

solvency risk; capital adequacy indicators, asset quality ratios, liquidity ratios, others (net capital position in foreign currency, etc.)

The stability of financial markets is characterized by: Volatility (standard / average deviation) of the stock price index, the insurance index (stock price, sovereign bonds, vulnerability to manipulation of earnings, price / earnings ratio, short-term and total bonds ratio (domestic, international), the index of sovereign bonds, etc.

In 2018, Hiroyuki ITO and Masahiro KAW, with a quantitative and qualitative classification of financial development measurement, as highlighted in 2006 by Kpodar, carry out in-depth research emphasizing the importance of measuring financial development and its impact on economic growth. In quantitative measurement, the same feature is found in the World Bank's Global Financial Development database, namely the size of financial markets. The most used sub-indices to determine the size of the financial market are domestic credit to the private sector by banks, the total value of traded shares, the capitalization of the private bond market, the volume of life insurance premiums and the volume of general insurance premiums, debt issuance. corporate bonds, all related to GDP. By means of these sub-indices, the authors try to capture the depth and depth of the financial markets. However, as Beck (2015) argues, high levels of private credit as a share of GDP do not necessarily mean high levels of financial development. This was argued by him by the mere fact that the use of private credit differs from country to country, just as the income levels are different and the level of income influences the meaning of private credit. "In low- or medium-income countries, bank assets tend to be more composed of low-risk assets, such as government bonds and corporate loans, not loans to small- and medium-sized enterprises (SMEs) or consumers. For higher income countries, SME or consumer loans play a greater role. In high-income countries, banks' balance sheets are more diversified." (Beck 2015).

4. The methodology and data used to measure the quantitative measurement of financial development

For the quantitative measurement of financial development, we have created an index consisting of variables that capture the size and depth of different types of financial markets, namely banking, stock, bond and insurance markets. To measure quantitatively a country's financial development we have built a "DevFin _quantity" index. DevFin_quantity is an index composed of size indicators of banking, equity, bonds and insurance markets. The first main component is domestic credit to the private sector by banks, stock market capitalization, international debt issues, life insurance premium and the volume of non-life insurance premiums, all of which are normalized by nominal GDP.

In this subsection, I will explain the construction of the quantitative measure of financial development and the underlying sub-indices. By making the compromise between data availability and detail, we are building 2 indices for quantitative measurement for financial development: DevFin_quantity1 and DevFin_quantity2. They differ depending on the variables included in the calculation and the availability of data. Of course, the availability of data differs between the two variables, as can be seen in Table 1.

Table 1. Composition of DevFin_quantity

Variables	Fin_quantity1	Fin_quantity2
1.bank credit to the private sector (cpsb)	x	x
2.capitalizarea market (mc)	x	x
3.total value of traded shares (tvts)	x	
4.capitalizarea the private bond market (cpbm)	x	

5.international debt issues (idi)	x	x
6.corporate bonds issues (cbi)	x	
7.volume of life insurance premiums (li)	x	x
8 volume of non-life insurance premiums (gi)	x	x
Number of countries sampled	5	10
Period analyzed	2007-2011	2007-2017

Source: own processing based on the World Bank

'DevFin_quantity1' is the quantitative measure of financial development and is based on 8 variables, i.e. credit to the private sector by banks (cpsb); market capitalization (mc) the total value of the traded shares (tvts); the capitalization of the private bond market (cpbm); international debt issues (idi); corporate bond issues (cbi); the amount of life insurance premiums (li); And the volume of non-life insurance premiums (gi), all of which are related to GDP. This index of eight variables is calculated for 5 countries only and for the period 2007-2011 only, as no data is available for all 10 countries and for the period 2011-2017, data taken from word Bank (www.bankword.org).

'DevFin_quantity2' consists of 5 variables, i.e.: Credit to the private sector by banks (dcpsb); market capitalization (smkc); international debt issues (int_debt), The amount of life (life) insurance premiums and the amount of non-life insurance premiums all in relation to GDP. The variables that compose DevFin_quantity2 are available for more countries than DevFin_quantity1 and cover all 10 countries for the period 2007-2017, with data taken from word Bank (www.worldbank.org).

First, all variables used to build DevFin_quantity (1 and 2) are first normalized using the formula:

$$X\_nit = \frac{Xit - Xi,min}{Xi.\max - Xi.min} \qquad (1)$$

In order to determine the level of financial development for each country, we have used the following calculation formula in quantitative terms:

$$Devfin\_quantity1 = \frac{cpsb + mc + tvts + cpbm + idi + cbi + li + gi}{8} \qquad (2)$$

$$Devfin\_quantity2 = \frac{cpsb + mc + idi + li + gi}{5} \qquad (3)$$

I will interpret the results obtained by using these calculation methods using the method of comparing economic results. For comparisons over time, I will perform the analysis between the actual results for the period 2007-2017, respectively 2007-2011. For comparisons in space, I will analyze the results obtained by the 10 countries in Central and Eastern Europe. These mixed comparisons, which are based on the combination of comparisons in time and space, where comparisons are made between countries for the same period analyzed, will allow me to rank these countries in terms of the level of quantitative financial development.

5. Quantitative measurement of financial development in Central and Eastern Europe

In this subsection I will analyze the financial development obtained by the Central and Eastern European states from the perspective of the two indices (DevFin_quantity1 and DevFin_quantity2). Given that each index is composed of a different number of

variables, depending on the information available, it leads to a different level of development for the same country in the same period. We will see below that, from a quantitative point of view, financial development tends to be lower when calculated using the DevFin_quantity 1 method.
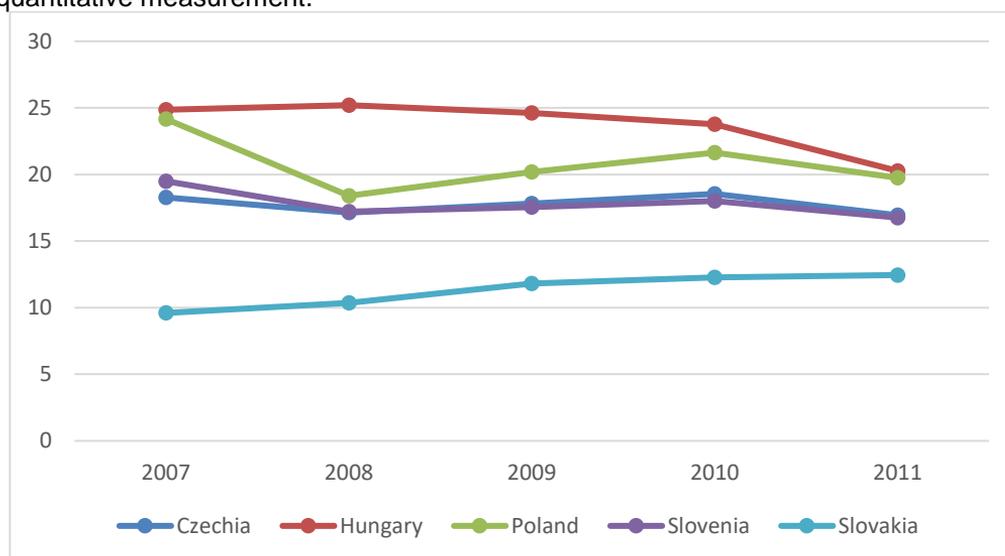
Table 2. Quantitative measurement of financial development: Deviation_quantity 1

Country/year	2007	2008	2009	2010	2011
Czechia	18,28	17,13	17,82	18,54	16,94
Hungary	24,85	25,20	24,61	23,78	20,27
Poland	24,16	18,40	20,18	21,64	19,76
Slovenia	19,49	17,22	17,55	18,01	16,76
Slovakia	9,60	10,35	11,82	12,27	12,45

Source: own processing based on the World Bank

Figure 1 shows the financial development obtained by the 5 Member States, for the period 2007-2011, for which all the data necessary for the construction of the DevFin_quantity1 and DevFin_quantity2 indices are provided. If we were to compare the financial development for each state in terms of the result obtained when we use DevFin_quantity1 and DevFin_quantity2, we see that different levels of this are obtained. Most states, with the exception of Hungary, achieve a much lower level of financial development if we use the DevFin_quantity1 method (all variables) specific to the quantitative quantification of financial development.

For example, Slovakia achieves the lowest level of financial development compared to the other states included in the analysis, if we use the DevFin_quantity1 variant, and when we calculate the financial development according to DevFin_quanity2, it manages to obtain a much better position. Poland and Slovenia are in the same situation, achieving a lower level of financial development if we look at all the variables specific to quantitative measurement.

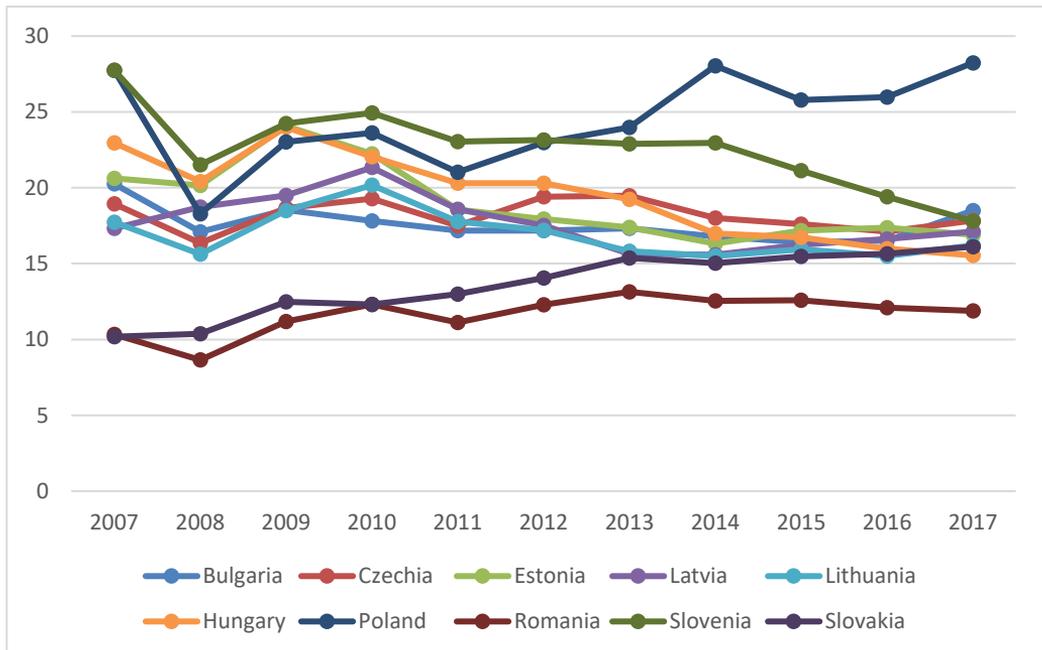**Figure 1. Quantitative measurement of financial development: DevFin_quantity1**
Source: own processing based on the World Bank

In the Czech Republic, in 2007, it managed to take advantage of the activity in the stock and bond market, and since 2008, by decreasing the share of these variables in the total GDP, DevFin_quantity1 reduces the level of financial development. Hungary is the only country with a much better level of financial development if it uses the DevFin_quatity1 method, which emphasizes that the total value of traded shares and the capitalization of private and corporate bonds have made a significant contribution to the country's financial development.

Table 3. Quantitative measurement of financial development: Deviation_quantity 2

Country/year	2007	2008	2009	2010	2011	2013	2014	2015	2016	2017
Bulgaria	20,25	17,10	18,53	17,82	17,18	17,31	16,79	2015	16,51	18,50
Czechia	18,93	16,35	18,67	19,28	17,50	19,48	18,01	16,40	17,12	17,83
Estonia	20,64	20,16	24,08	22,23	18,55	17,39	16,32	17,60	17,37	16,90
Latvia	17,33	18,73	19,49	21,33	18,57	15,65	15,58	17,17	16,62	17,10
Lithuania	17,74	15,62	18,49	20,17	17,77	15,80	15,51	16,25	15,50	16,21
Hungary	22,95	20,40	23,99	22,05	20,29	19,24	16,99	15,94	15,99	15,54
Poland	27,75	18,28	23,02	23,61	21,03	23,98	28,04	16,72	25,98	28,23
Romania	10,19	8,65	11,19	12,32	11,11	13,14	12,55	25,78	12,10	11,87
Slovenia	26,03	21,50	24,24	24,94	23,04	22,89	22,95	12,58	19,40	17,80
Slovakia	20,25	17,10	18,53	17,82	17,18	17,31	16,79	21,12	16,51	18,50

Source: own processing based on the World Bank

Figure 2. Quantitative measurement of financial development: Deviation_quantity 2
Source: own processing based on the World Bank

For example, if we measure the level of financial development only from the perspective of domestic credit to the private sector by banks, in the last decade, Estonia, Slovenia and Latvia seem to have reached the "highest" level of financial development.

However, once the depth of other types of financial markets is taken into account, only Slovenia has reached a high level of financial development in terms of quantity. Apart from the banking sector, the other two economies do not have deep financial markets in Slovenia. This example clearly shows that high levels of domestic lending to the private sector by banks do not necessarily reflect a high level of financial development. According to Figure 4, we see that in 2007-2009 Hungary managed to record a level of financial development among the highest, even if it obtains average values on the premium variables included in the calculation of financial development and a total value of international debt issues with a high level.

From 2013 to 2017, Poland stands out with the highest financial development in Central and Eastern Europe. Analyzing the previous graphs, we noticed that this state obtains average values of the analyzed variables, being distinguished by results superior to all states only in the ranking of stock market capitalization. Thus, we deduce that the level of financial development should not be viewed only from the perspective of the banking market but a combination of all financial markets.

Using the latest graphical representation, we can draw the conclusion about the purpose of this paper, namely to rank the CEE countries according to the level of financial development. As a result, in the period 2007-2012 Slovenia achieves the highest level of financial development, followed by Hungary, Estonia, Poland, Latvia, Bulgaria, the Czech Republic and Lithuania. At the lower limit are Romania and Slovakia. In the period 2013-2017, the ranking changes, with Poland occupying the leading position, followed by Slovenia, the Czech Republic, Bulgaria, Hungary, Estonia, Latvia, Lithuania, Slovakia and Romania.

6. Conclusions

According to the literature, we come to the idea that a modern economy without a financial sector is almost inconceivable, because this sector makes it possible to channel funds and make optimal use of financial resources.

Thus, According to Kenourgios and Samitas (2007) and the ideas promoted by Nnanna and colleagues (2004), we can conclude that financial development could improve the efficiency of resource allocation. This improvement would be justified by better mobilization of savings, a reduction or better management of financial risks, an opportunity to choose more productive investments by diversifying the portfolio and collecting information on the various investment projects. Therefore, a developed financial sector can lead to higher economic growth (Kenourgios and Samitas, 2007; Nnanna et al., 2004; Varoudakis, 1994).

However, in order to assess the development of the financial sector and quantify its impact, it is necessary to measure it, which can be done quantitatively and qualitatively. In the study conducted on the quantification of financial development from a quantitative point of view, we obtained different levels of it, depending on the chosen methodFrom the perspective of the DevFin_quanity 1 method, applied for 5 states, the highest level of financial development in the period 2007-2011 is registered by Hungary, followed by Poland. However, if we analyze the financial evolution using DevFin_quantity 2, the highest level of financial development for the period 2007-2011 is obtained by Slovenia, followed by Poland. As a result, we can conclude that the use in the calculation of financial development and variables: the total value of traded shares, the capitalization of the private bond market and corporate bond issues, led to a reduction in the level of financial development for the analyzed states.

The quantification of financial development using the DevFin_quantity 2 index allowed the ranking of Central and Eastern European countries for the period 2007-2017 in terms of the level of financial development recorded. In the period 2007-2012 Slovenia has the highest level of financial development, and since 2013 the leader is Poland.

Thus, we see that Poland reaches one of the highest levels of development both from the perspective of the DevFin_quantity 1 method and from the perspective of the DevFin_quantity 2 method, which indicates a development of the capital market. During 2007-2017, the lowest value of financial development is recorded by Romania, being influenced by a growing level of external debt, a reduction in the volume of loans to the private sector and the presence of the underdeveloped insurance market, both the insurance market as well as non-life insurance are among the busiest insurance markets in Central and Eastern Europe in terms of the volume of insurance premiums.

If until recently empirical work was usually based on standard quantitative indicators available for a long time, for a wide range of countries, in the last decade, the preference of studies on the qualitative analysis of financial development has begun to be accentuated. Many economists, including Hasan and his collaborators, consider it more useful to measure it qualitatively. In order to obtain a more relevant result, it is recommended to measure this sector from a qualitative point of view. As a result, a further quantification of financial development in Central and Eastern European countries and the calculation of indices that take into account both qualitative and quantitative aspects of financial development can be a continuation of the analysis. Based on these indices, the effects of financial development on economic growth can then be assessed with the help of econometrics.

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