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Stock market development, financial development and economic growth in Portugal: Evidence from a Vector Autoregressive model

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Resumo

O sistema financeiro e o crescimento económico estão muito relacionados, sendo este tema alvo de muitas pesquisas nas últimas décadas. Como temos conhecimento, o sistema financeiro pode ser dividido em duas vertentes: mercado de capitais e sistema de crédito bancário. Este estudo tem como finalidade estudar a relação entre mercado de capitais, sistema bancário e crescimento económico para Portugal, utilizando dados trimestrais que estão compreendidos entre 1993 e 2016, que como país europeu é expectável que uma economia mais dependente do sistema bancário. De forma a capturar a questão central do estudo as variáveis testadas foram produto interno bruto, rácio de capitalização do mercado de capitais, rácio do crédito doméstico, investimento e, para variável de controlo é utilizado o índice de preços do consumidor. Após a realização dos testes de raízes unitárias para confirmarmos a ordem de integração das variáveis e a sua análise gráfica concluímos que estas são I(1), sendo que não são co-integradas (Johansen test). Modelo Vector Autoregressive (VAR) é então realizado, bem como, as causalidades de Granger, decomposição da variância e funções impulso-resposta são discutidas no presente estudo. As especificações do VAR revelam normalidade, ausência de auto correlação e de homocedasticidade. Como consequência da entrada para a União Monetária Europeia, ocorrendo a substituição física da moeda, revela-se uma mudança de regime económico, mas também a grande crise for provada. Finalmente foi encontrada uma evidência bidirecional nas causalidades de Granger entre mercado de capitais e crescimento económico. Na verdade, o crescimento económico aparenta ser favorável para o sistema de crédito bancário, uma relação unidirecional foi encontrada desde o crescimento económico para o sistema de crédito bancário.

Palavras-chave

Crescimento Económico; Sistema Financeiro; Capitalização do mercado de capitais; modelo VAR; Portugal

Resumo Alargado

A relação entre sistema financeiro e crescimento económico tem sido alvo de estudo durante um longo período de tempo, sempre houve uma necessidade em compreender de que forma é que esta relação funciona, mas nos últimos 20 anos, e com a série de acontecimentos que tem sucedido um pouco por todo o mundo, esta relação tem ganho preponderância. A maioria da literatura aponta para a existência de relações positivas entre o sistema financeiro e o crescimento económico, embora também surjam algumas exceções.

Nesta dissertação é analisada a relação entre o sistema financeiro (que se divide em dois: mercado de ações e sistema bancário) e crescimento económico em Portugal entre 1993 e 2016, sendo a frequência de dados utilizados trimestral. Sendo expectável que todas as variáveis interajam umas com as outras e causando um efeito de um ajustamento endógeno, é aplicado o uso de um modelo vetor autorregressivo (VAR) a séries temporais. Este tipo de modelo permite analisar as relações dinâmicas das variáveis tratando todas as variáveis como endógenas, avaliando as relações sem a necessidade de diferenciar variáveis endógenas ou exógenas. Para medir o crescimento económico foi utilizada a variável produto interno bruto real, sendo esta variável aceite como indicador para o desenvolvimento económico (King and Levine, 1993). Para medir a capitalização do mercado de ações, e devido à indisponibilidade de dados, foi calculada uma *proxy* (com 99% de explicação da variável real) através das quotas de mercado do PSI20 e da capitalização do PSI20. Para capturar o desenvolvimento do sistema bancário foi calculado o crédito doméstico total, como anteriormente foi utilizado Chaiechi (2012). Foi também utilizado o investimento efetuado no país, este a ser medido através da Formação Bruta de Capital Fixo (Shahbaz et al., 2017). Por fim, como variável de controlo, foi utilizado o Índice de preços do consumidor.

Debruçando-nos um pouco sobre a literatura existente reunimos as relações entre as variáveis, sendo que o desenvolvimento do mercado tem ações tem mantido um papel importante no crescimento económico (Seven and Yetkiner, 2016; Pradhan et al., 2015), a existência de causalidade bidirecional (Berdiev, 2016; Cheng, 2012) ou simplesmente que o crescimento económico tem um impacto positivo no mercado de ações (Puente-Ajovín and Sanso-Navarro, 2015). E desenvolvimento do sistema bancário tem contribuído para efeitos positivos entre o sistema económico e o sistema bancário (Colombage, 2009; Hondroyiannis et al., 2005), influências bidirecionais entre estes dois sistemas (Kılınç et al., 2017; Kahouli, 2015) ou ainda, que o sistema económico tendo um impacto positivo no sistema bancário (Puente-Ajovín and Sanso-Navarro, 2015; Hsueh, 2013). Impactos entre o sistema bancário e o mercado de ações não tem sido muito frequente, mas ainda assim conseguimos constatar que o mercado de ações tem um papel significante e positivo para com o sistema bancário (Krainer, 2014) ou vice-versa

(Pradhan et al., 2017; Arestis et al., 2001) e ainda, que ambos se influenciam um ao outro (Fernández-Amador et al., 2013).

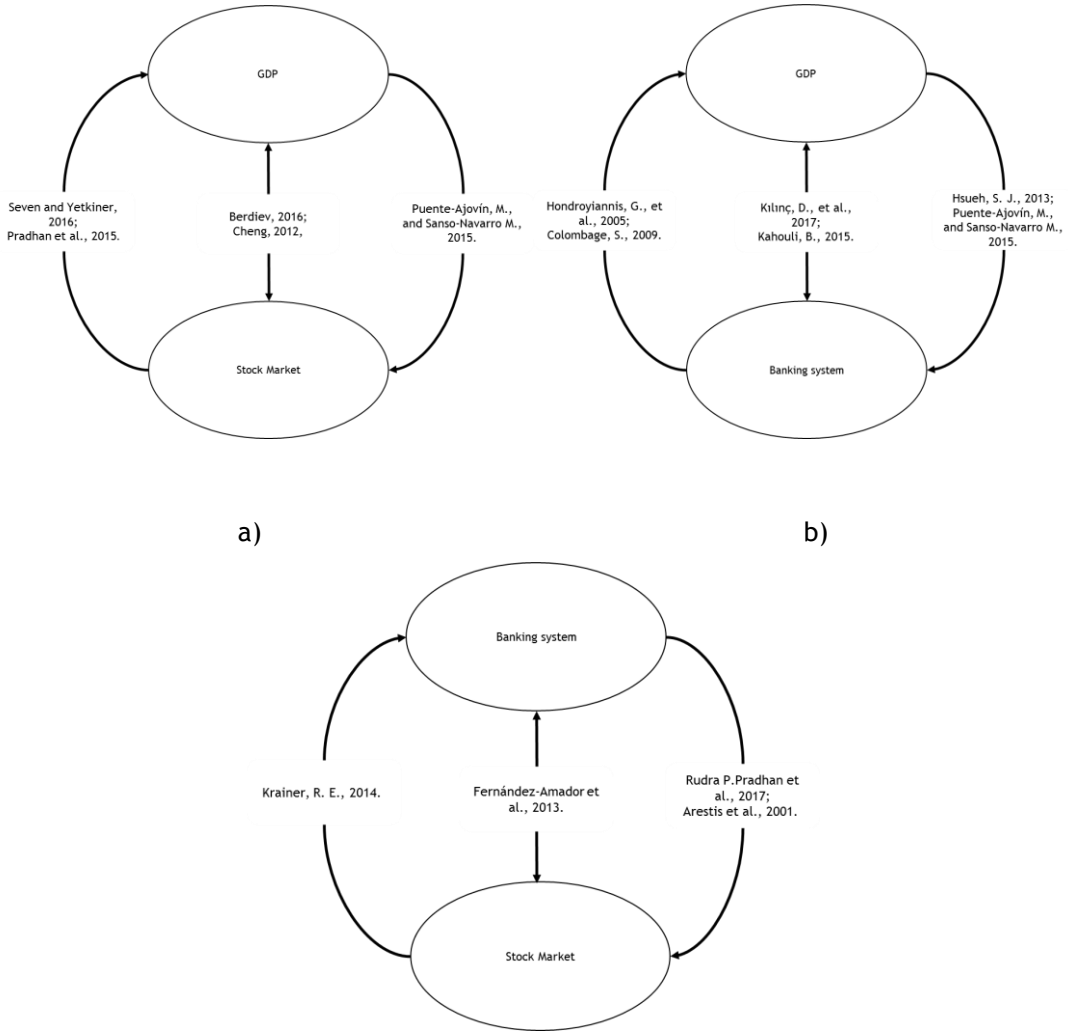

Diagrama 1 a); b) e c).

Neste estudo foi elaborado um modelo, onde a variável de investimento, capitalização do mercado de ações e crédito doméstico total foram divididas pelo produto interno bruto nominal, todas as variáveis foram incluídas como endógenas exceto o índice de preços do consumidor que se revelou como exógena no nosso modelo. Primeiramente, procedeu-se à realização dos testes de dependência seccional, à análise da matriz das correlações e à análise gráfica das variáveis conseguindo então concluir, através destes testes, que os resultados apontam para variáveis com ordem de integração I(1), ainda pelo teste de Johansen concluímos não existem cointegração nas variáveis, podendo com isto avançar para a estimação do modelo VAR.

Testes de especificação ao modelo são realizados de forma a validar o modelo estimado, o teste de normalidade realizado indica-nos normalidade no modelo, pelo teste de autocorrelação e homocedasticidade os resultados indicam ausência de autocorrelação e homocedasticidade.

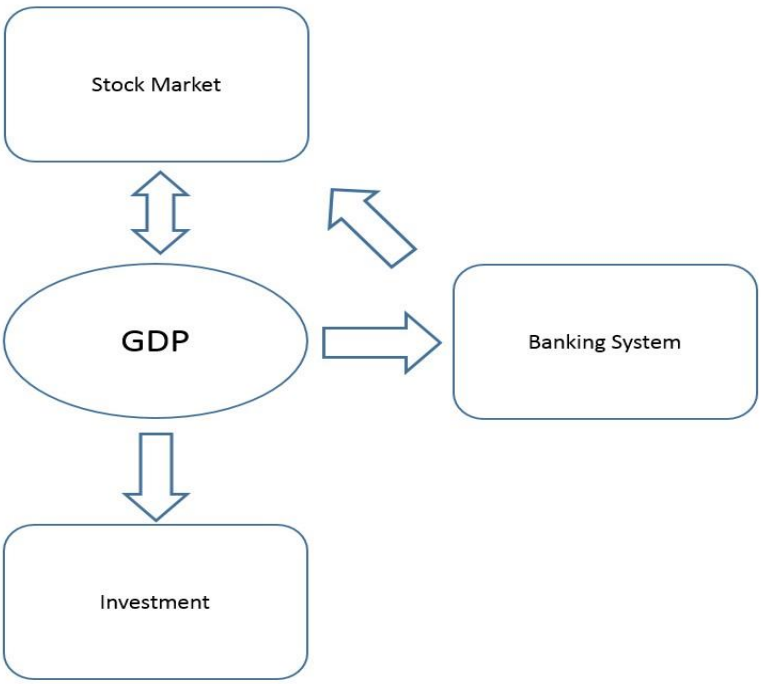

Diagrama 2. Resultados finais entre as relações

Os resultados principais da nossa estimação apontam para uma relação bidirecional e um impacto positivo entre o crescimento económico e o mercado de ações. Foi encontrada uma relação positiva entre o sistema bancário e o mercado de ações, sendo que o inverso não se verificou. Pode-se ainda constatar um efeito positivo que deriva do crescimento económico para o sistema bancário, levando-nos a concluir que o sistema bancário não foi um impulsionador direto para o crescimento económico, mas sim foi um beneficiário desse mesmo crescimento. Não tão relevante, devido à questão central aqui estudada, o crescimento económico tem um impacto positivo no investimento no país.

Olhando para a conjuntura do mundo nos dias que correm, na sua interação entre países, na forma como uma crise num país afeta outros e com os resultados obtidos referentes ao nosso modelo, devemos olhar para o futuro e (re)pensar nas políticas económicas mais adequadas a implementar. Se nos forcarmos no sistema bancário, uma série de alterações podem ser feitas, sendo que entre essas mesmas podemos referir que o sistema regulatório poderia ser melhorado para um sistema mais uniforme, permitindo uma reação mais rápida nos períodos de crise e consegue-se minimizar as repercussões pelos restantes países da Europa. Seria também interessante limitar o tamanho dos bancos para minimizar potenciais problemas no médio/longo prazo e, finalmente, investir de uma forma produtiva. Os decisores de política económica

devem considerar a opção de uma implementação de política fiscal para estimular o investimento, tomarem medidas que facilitem o processo de cotação em bolsa, criação de uma supervisão eficaz de modo a proteger os interesses e direitos dos investidores mas de modo transparente e, por último, dificultar a distribuição de dividendos do PSI20 visto que a quantidade de dividendos distribuído para fora de Portugal é muito grande (por exemplo, China 230.8 milhões de euros, EUA 154.6 milhões de euros, Angola 108.7 milhões de euros).

Abstract

Financial system and economic growth are closely related, since a lot of decades this theme had been the subject of many research. As we know financial system might be divided into two components: the stock market and the banking system. This study tests the relationship between stock market, financial system and economic growth for Portugal, using a quarterly data from 1993 to 2016, which as European country had an economy dependent on bank financing. Meanwhile to reach the central point the variables tested was real gross domestic product, stock market capitalization ratio, domestic credit ratio, investment, and for a control variable is utilized the consumer price index. Performed the unit root test to confirm the integration order and the graphical analysis of the variables is concluded that all are I(1), and they are not cointegrated (Johansen test), Vector Autoregressive (VAR) modeling is carried out, also Granger Causality, variance decomposition and impulse response function are discussed. VAR specification tests express normality, absence of autocorrelation and homoscedasticity. As consequence of the integration in the European Monetary Union, occur the physical replacement of the currency, proves to be an economic regime change but also the subprime crisis was proved. There was found an evidence of Granger bidirectional causality between stock market and economic growth. Indeed, economic growth seems to be favorable to banking system, unidirectional causality running was found from economic growth to banking financing.

Keywords

Economic Growth; Financial system; Stock market capitalization; VAR model; Portugal.

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Acronyms list

VAR	Vector Autoregressive
GDP	Gross Domestic Product
PP	Phillips Perron test
KPSS	Kwiatkowski Phillips Schmidt Shin test
ADF	Augmented Dickey-Fuller test

1. Introduction

The relationship between economic growth and the financial system, whose components are stock market and the banking system, has received considerable attention for decades (e.g. Capasso, 2008; Beck and Levine, 2004; Levine, 1991; Schumpeter, 1982; Keynes, 1973; Goldsmith, 1969). Traditionally, as far as we know, Anglo-Saxon countries use mainly the capital market for corporate financing, while non-Anglo-Saxon countries the banking system is predominant (e.g. Demir and Hall, 2017; Marini, 2005).

As we know in Portugal the distribution of dividends has been generous, so generous to the point of much of the capital generated has not been retained in the country and in this year (2018) dividends distributed was close to what was for Portugal, interestingly Portugal kept EUR 791.3 million vs. 728.2 million euros of the countries which receive more (230.8M, 154.6M, 108.7M, 66.5M, 57.6M, 40.9M, 26.3M, 26.3M, 16.5M for China, United States of America, Angola, Spain, Middle East, United Kingdom, the Netherland, Norway and Algeria respectively).

In fact, the use of long series as well as the control of structural changes might be important in determining the relationship between the financial system and growth given that structural changes may have strongest impacts on a small economy, we will focus on Portugal. This exercise will allow us to verify the interaction of variables during the 1990s and 2000s until 2016 being more specific, a period full of both economic and political change. Considering that Portugal is a non-Anglo-Saxon country, the banking system is expected to play a more significant role in the economy than stock market.

The analysis of the relationship between stock market and economic growth was extended by using a Vector Autoregressive (VAR) modelling, controlling for economic regime change experienced in the Portuguese economy. That change is a consequence of joining the European Economic and Monetary Union (EMU), and it is econometrically controlled by using and exogenous variable, namely a shift dummy. The main questions of this study are: (i) will the banking system therefore be influential in Portuguese economic growth? And (ii) will the stock market play an important role in Portuguese economic growth? Both stock market development and the banking system are expected to play a positive role in economic growth.

Results suggest that the stock market Granger-causes economic growth. However, this Granger causality is not verified from banking system to economic growth. This study allows us to better understand how to act in terms of economic policy for the financial system, focusing on the stock market segment or banking segment.

This study evolves as follows. Section 2 covers the literature review. Section 3 presents the data and model used. The results shown in Section 4 and are discussed in Section 5. Finally, section 6 concludes.

2. Literature Review

Financial system and economic growth are closely related, since a lot of decades this theme had been the subject of many research, recognize the development of financial sectors as a major catalyst that contributes positively to the country's economic growth (e.g. McKinnon, 1973; Shaw, 1973; Goldsmith, 1969; Schumpeter, 1911; Bagehot, 1873), and the evidence becomes stronger and even more convincing after studies from 90's (e.g. Levine and Zervos, 1996; Pagano, 1993; Levine, 1991; Spears, 1991).

Firstly, Bagehot (1893) highlights the importance of the banking sector in promoting economy through the mobilization of productive financial capital, and then Schumpeter (1911) expanded the views, discovering not only a well-functioning financial system that provides various services (e.g. mobilizing savings, evaluating projects, managing risks, monitoring managers and facilitating transactions and encouraging technological innovations) that result in economic growth but also argue that financial services are more important when it comes to dealing with the development of the economy. Moreover, Goldsmith (1969) also concludes that the country's level of financial development and economic growth are positively associated.

Since the emergence of the endogenous growth theory the role of financial development on economic growth has received considerable attention. Theoretical contributions allow us to divide into five categories: Firstly, models that have focused on the allocative role of the financial system (e.g. Wu et al., 2010; Pagano, 1993; Bencivenga and Smith, 1991; Greenwood and Jovanovic, 1990). Secondly, financial markets allow firms to increase liquidity, and hence reduce risks, and thus stimulate growth (e.g. Saint-Paul, 1992; Levine, 1991). Thirdly, financial development provides an exit mechanism and improves the efficiency of financial intermediation (e.g. Ibrahim et al., 2017; Bumann et al., 2013; Arestis et al., 2001; Rousseau and Wachtel, 2000). Fourthly, these markets need new technologies and promote entrepreneurship (e.g. Dutta et al., 2018; Greenwood and Smith, 1997). For last, financial markets have the ability to impact economic growth through changes in incentives for corporate control (e.g. Asimakopoulos et al., 2013; Bertrand et al., 2007; Van Nieuwerburgh, 2006; Demirguc-Kunt and Levine, 1996; Jensen and Murphy, 1990).

The financial system might be divided into two components: the stock market and the banking system. Hence, banking system has to be included always the relationship between stock market and economic growth are studied. The development of the stock market is likely to play an important role in economic growth (e.g. Seven and Yetkiner, 2016; Pradhan et al., 2015; Mishra and Narayan, 2015; Capasso, 2008; Levine and Zervos, 1998; Singh, 1997; Demirguç-Kunt and Levine, 1996). Although, stock market development concept is not clearly defined, four indicators can be used to study stock market development (e.g. Demirguç-Kunt and Levine, 1996): (i) market capitalization; (ii) volatility measured by standard deviation of stock market; (iii) indicators of institutional development; and (iv) regulation indicators. Since the banking

system must be included, it can be measured by the ratio of domestic credit to GDP or the ratio of nominal money supply (monetary aggregate M2) to nominal GDP, to eliminate the pure transaction aspect of narrow monetary aggregates, is accepted the ratio of the difference between M3 and M1 to GDP (e.g. Yilmazkuday, 2011; Rousseau and Watchel, 2002). Other variables are often used for robustness of the model. The most common is inflation (e.g. Bassanini et al., 2001).

In effect, since banking system creation, banks has remained through centuries present in our daily life and it is been utilized in many ways, sometimes has gone well and other times they brought serious problems. Many studies indicate a positive effect of banking system in economic growth (Colombage, 2009; Hondroyiannis et al., 2005;) or that both have influence on each other (Kılınç et al., 2017; Kahouli, 2017) and even though only economic system have influence in banking system (Puente-Ajovín and Sanso-Navarro, 2015; Hsueh, 2013). Fewer studies dealing with banking system and stock market exist, although we may found that stock market have preponderance on banking system (Krainer, 2014) or vice versa (Pradhan et al., 2017; Arestis et al., 2001) and for last both have an effect on each other (Fernández-Amador et al., 2013).

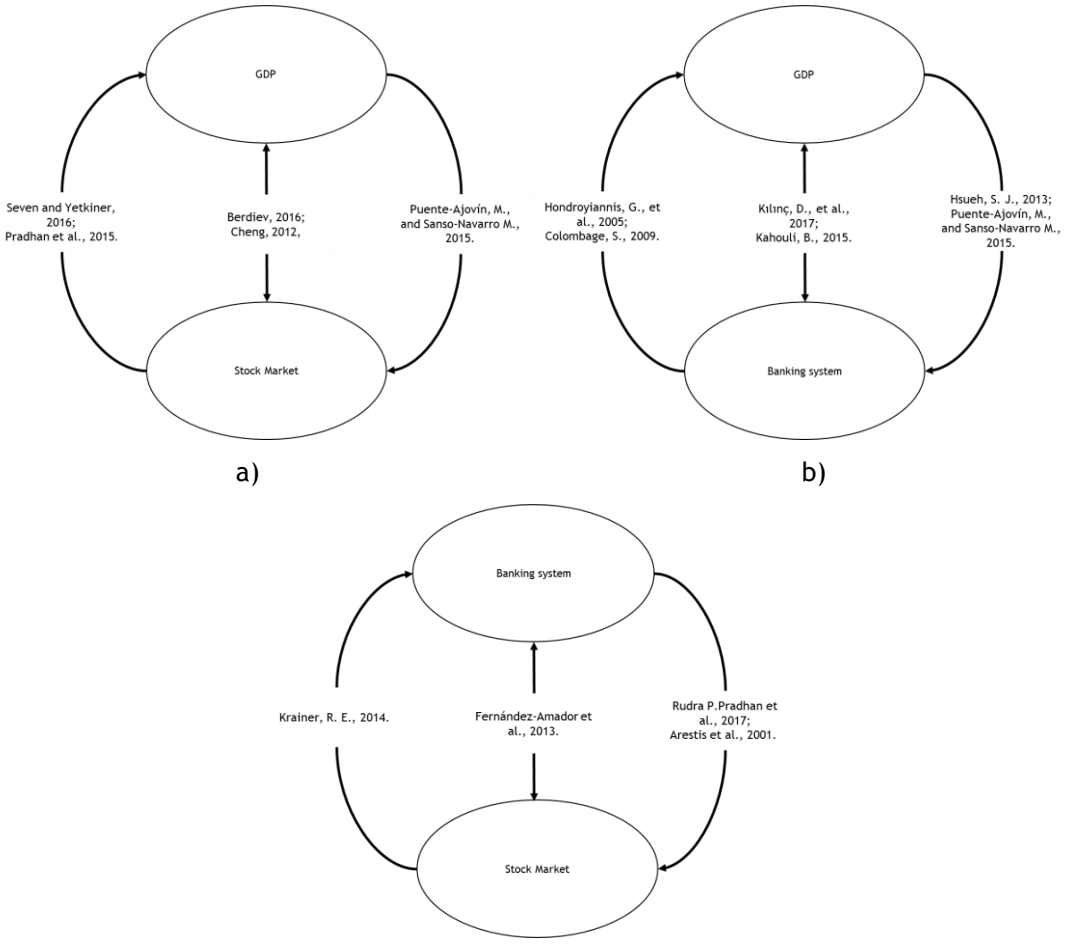

Fig 1 a);b); e c). Relationship between variables

It should be noted that we could find a couple types of relationships: bidirectional relationship between two variables; unidirectional relationship driven from GDP to Stock Market/Banking System or *vice versa* for example. Figure 1a) represent que relationship between Stock Market and Gross Domestic Product (GDP); while 1b) presents the relationship presented between GDP and Banking System; and regarding 1c) shows us how Banking System and Stock Market interact with each other. For a better understanding of the interaction between variables presented in literature we do perform a draft that allow us to understand much better the existent relationships (see Fig. 1).

There are other studies underlining the negative or insignificant impact of financial markets on economic growth, mainly in developing countries (e.g. Kar et al., 2011; Naceur and Ghazouani, 2007). Similarly, Narayan and Narayan (2013) find no evidence that neither the financial sector nor the banking sector contributes to growth for the Middle Eastern countries.

Studies dealing with the financial system and economic growth have been discussed mostly in quantitative terms, through cross-country (e.g. Beck, Demirguc-Kunt and Levine, 2009; Levine and Zervos, 1998; King and Levine, 1993) and time series data (e.g. Pradhan et al. 2014; Zang and Kim, 2007; Luintel and Khan, 1999) and time series (e.g. Gries et al., 2009; Masih et al., 2009; Wold-Rufael, 2009). Causal relationships between stock markets and economic growth have been shown (e.g. Adamopoulos, 2010; Nieuwerburgh et al., 2006). Causality could be from economic growth to stock market, from stock market to economic growth (e.g. Shahbaz et al., 2008) or bidirectional (e.g. Berdiev, 2016; Ndako, 2010; Capasso, 2008; Luintel and Khan, 1999). The analysis of causality was extended to combine the short and long run, as well as strong causality (Bangake and Eggoh, 2011). The level of financial development as a good predictor for future economic growth (e.g. Moshirian and Wu, 2012; Levine, 1997; Levine and Zervos, 1996) and the direction of causality could be central for economic policy decision making.

The empirical analysis of the relationship between financial development and economic growth is very rich and for one hand is good, for other hand is not so good and lead us to an absence of unanimity regarding explanatory variables. Indeed, variables like thresholds of inflation, turnover ratio, credit to private sector, government size, per capita income, trade openness and stock market indicators like size, activity and efficiency are common in the literature (e.g. Demirguc-Kunt et al., 2013; Bordo and Rousseau, 2012; Yilmazkuday, 2011; Bangake and Eggoh, 2011; Huang et al., 2010; Naceur and Ghazouani, 2007; Beck and Levine, 2002). In the empirical model developed here, the variables used are: real gross domestic product; market capitalization ratio; domestic credit ratio; investment ratio; and consumer price index. The respective support of these variables is presented in the next section.

As stated above, attempts have been made to identify the relationships between stock market and economic growth for several countries (e.g. Law et al., 2013; Kendall, 2012; Adamopoulos, 2010; Ndako, 2010; Hondroyiannis et al., 2005). For Portugal, it was expected that the stock

market, as well as the banking system, would play a positive role in economic growth. European countries depend on financial institutions to obtain funds (e.g. Lee, 2012), so banking system must play an important role in the Portuguese economy. On the other hand, Georgantopoulos et al. (2015) concluded that stock market development is not sufficiently significant to cause economic growth. Overall, there are three important points that could potentially play a role in the relationship between the Portuguese stock market and economic growth: (i) integration in the EMU; (ii) the integration of the Portuguese in Euronext; and (iii) the subprime crisis.

The Portuguese integration in the EMU caused a structural shock in the volatility of GDP (e.g. Fuinhas and Marques, 2011). However, in the literature there is a gap regarding the structural change caused by economic regime changes, such as the monetary economic regime change caused by integration in the EMU (e.g. Spiegel, 2009). Also, the level of country development is important, given that it is related to the effect that the stock market has on long-run growth (e.g. Capasso, 2006; Caporale et al., 2004; Durham, 2002). Furthermore, the existence of more developed financial mechanisms in countries with higher income levels contributes to a lower influence of stock markets in the growth of these countries (e.g. Filer et al., 2000). In its turn, Nielsson (2009) refers that if the development of the stock market drives economic growth, then the evolution of the Portuguese stock market with the integration in Euronext should have been materialized in GDP.

3. Methodology

Financial development, as a result of endogenous growth process, is far from new in the literature (e.g. Bose and Cothren, 1997; Greenwood and Jovanovic, 1990). Indeed, it is expected that all variables will interact with each other causing an effect of an endogenous adjustment, and the most well-known method for exploring the dynamic relationship of variables is the vector autoregressive (VAR). This technique treats the variables as potentially endogenous, evaluating the relationships without the prior need to distinguish endogenous from exogenous variables, as required by the simultaneous equations model. In the analysis of the relationship between developed stock markets and economic growth, this technique was used, for example by Tsouma (2009), Ortiz et al. (2007), and Caporale et al. (2004).

3.1. Data

The study uses quarterly data for the time span covering the first quarter of 1993 till the last quarter of 2016, in a total of 96 observations. Table 1 shows the definitions, sources and summary statistics of the variables. As can be seen, the raw data consists of: the nominal GDP; the PSI 20 index; the domestic credit, with the exception of public administration and domestic credit to public administration; nominal gross fixed capital formation (GFCF); and the GDP deflator (base 2011). Econometric software Eviews 10^{+} was used.

Table 1. **Variable definition, sources and summary statistics**

Variable	Definition	Source	Descriptive statistics				
			Obs.	Mean	SD	Min.	Max.
LY	Real gross domestic product logarithm	-GDP, base 2011, Summer Economic Bulletin 2017, Banco de Portugal.	96	4.6124	0.0424	4.5141	4.6605
LS	Stock market capitalization ratio logarithm (market capitalization/GDP)	-Market Capitalization, NYSE Euronext; PSI20 Listing, NYSE Euronext, via BPStat; -GDP, base 2011, Summer Economic Bulletin 2017, Banco de Portugal.	96	0.2351	0.1568	-0.0676	0.6075
LB	Total domestic credit ratio logarithm (total domestic credit/GDP)	-Monetary Survey - Domestic Credit (except Public Administration) and Domestic Credit to Public Administration, Banco de Portugal.	96	0.7378	0.1361	0.4972	0.9346
LI	Investment ratio logarithm (investment/GDP)	-Gross Fixed Capital Formation, Summer Economic Bulletin 2017, Banco de Portugal	96	-0.6643	0.0910	-0.8368	-0.5439
LP	Consumer price index logarithm	-Consumer price index, Insituto Nacional de Estatística	96	2.5975	0.0736	2.4425	2.6883

Notes: Obs: Observations; SD: Standard deviation; Min: Minimum; Max: Maximum.

The variables used are consistent with those adopted by the existing literature, as follows:

Real gross domestic product (LY) – The literature test the relationship between economic growth, being gross domestic product accepted as an indicator of financial development (King and Levine, 1993). In general, the literature indicates that economic and financial development are closely related (Boyd and Jalal, 2012), long-run growth is positively associated with the

development of stock markets (e.g. Levine and Zervos, 1998, 1996; Singh, 1997), and that the liquidity of stock markets is strongly correlated with current and future rates of economic growth (Levine and Zervos, 1998).

Stock market capitalization ratio (LS) – This variable is the ratio of the total value of listed shares (market capitalization) to GDP, both in nominal values. This variable aims to measure the development of stock markets under the assumption that the "size" of the market is positively correlated with existing liquidity (Levine and Zervos, 1996). Other potential measures of the development of stock markets, such as liquidity or diversification of risk, could be used. However, the respective series are unavailable for the Portuguese stock market over this span of time. Market capitalization is available from January 2011, and shows a discontinuity starting July 2014. Considering the way of calculating market indices, and their frequent revisions, they tend to mimic market capitalization. With this in mind, we opted to use a proxy. Indeed, a market capitalization proxy, through the PSI20 price index, was computed. To that undertaking, we use the latest available data about market capitalization and PSI20, namely from January 2009 till September 2010 (20 months), in order to capture the relationship between them. The market capitalization proxy computation evolves in two steps. In the first one, in accordance with Eq. (1), we compute a factor (R) relating the two variables, as follows:

$$R = \sum_{t=1}^{n} PSI20Quote_t \,/\, \sum_{t=1}^{n} PSI20Cap_t, \qquad (1)$$

where *PSI20Quote* and *PSI20Cap* denote the PSI 20 stock quote and market capitalization, respectively. In the second step, in accordance with Eq. (2), the factor R is applied to the observed PSI20, generating the market capitalization proxy (S).

$$St = PSI20Quote_t / R \qquad (2)$$

An appraisal between the observed market capitalization and the proxy was performed, revealing the goodness-of-fit, R^2=0.99 (see Appendix B). In short, the use of the proxy seems appropriate for two reasons. First, it faithfully simulates the coincident period of observed market capitalization series. Second, the proxy allows us to work upon a larger period, which contributes towards enhancing the quality of empirical analysis.

Domestic credit ratio (LB) – This variable is the ratio between the total domestic credit and the nominal GDP, and it is used to capture the development of the banking system. As in Garcia and Liu (1999), and Chaiechi (2012), it is used as a measure of financial development. The use of a variable that considers domestic credit is at least justified by the large amounts of credit that were absorbed by the Portuguese Government, which should have had impacts on GDP.

The use of this variable is recommended in an economy for which high dependency on bank credit is suspected.

Investment ratio (LI) – The investment ratio is use as a control variable, which is frequent in the literature (e.g. Shahbaz et al., 2017; Erdener et al., 2013). The variable is the ratio of investment to GDP, both nominal. The investment is measured by Gross Fixed Capital Formation.

Consumer price index (LP) – The consumer price index is used as a control variable that is seeking nominal effects on the economy. Inflation is a measure commonly used in the literature (e.g. Bassanini et al., 2001) to mirror macroeconomic stability. High inflation can adversely affect financial market operations (Rousseau and Wachtel, 2002). As a consequence, it is advisable to pursue low-inflation targets to exploit the beneficial growth effect of financial development (Huang et al., 2010).

In addition to the variables above, this analysis uses the dummies tool, either impulse or shift, to meet two objectives: namely to control for seasonality phenomena and to control for the idiosyncrasies of the Portuguese economy. The shift dummy variables are used to absorb the effects of structural changes, such as carried out by Fuinhas and Marques (2012), for Portugal. At a first glance, there are three periods that may be relevant to control, as discussed above. The most pronounced effect could come from integration in the EMU, based on several potential shocks, namely: (i) the presence of a structural shock in the volatility of GDP around the year 1998, coinciding with the final evaluation criterion for the participation of Portugal in the EMU (Fuinhas and Marques, 2011); (ii) monetary stability, which is relevant for the integration of stock markets in smaller members of the EMU (Kim et al., 2005); (iii) integration in the EMU, which extends credit access (Fuinhas, 2003); (iv) the impact of joining the EMU on bilateral international commercial bank lending patterns (Spiegel, 2009); (v) the physical replacement of the escudo by the euro, which could have disturbed the function of prices; and (vi) the integration of the Portuguese stock market in Euronext. Besides integration in the EMU, the time span accommodates the subprime crisis of the late 2000s, more specific in 2008 and remained until 2014 (ends up the rescue program imposed by IMF). Moreover, in the second quarter of 2000, GDP data was calculated according to the "new European system of national and regional accounts". This may have led to significant measurement disruption in the GDP series used, which should be controlled for, by using an impulse dummy.

Since the frequency of the series is less than a year (quarterly), good econometric practices recommend control for seasonality. The raw series with monthly frequency were transformed into quarterly frequency, by using the arithmetic mean. Real GDP and the Consumer Price Index are calculated from the base year 2011, and the respective ratios were obtained from quarterly nominal values. As far as the presence of seasonality is concerned, all the variables were graphically examined and further tested through the significance of seasonal dummies. It was

concluded that seasonality is a concern. In accordance, the VAR approach was conducted with seasonal dummies.

In principle, we must consider that the relationships among variables have a long-run equilibrium. As a consequence, the cointegration of those variables is tested. To do so, we must assure that all variables are integrated in order one, I(1). To analyze the order of integration of variables, we worked upon: (i) graphical analyses of the level of variables (Fig. 1) and their first differences (Fig. 2); (ii) autocorrelations (see Appendix A); and (iii) Augmented Dick Fuller (ADF), Phillips Perron (PP) and Kwiatkowski Phillips Schmidt Shin (KPSS) tests (Table 2).

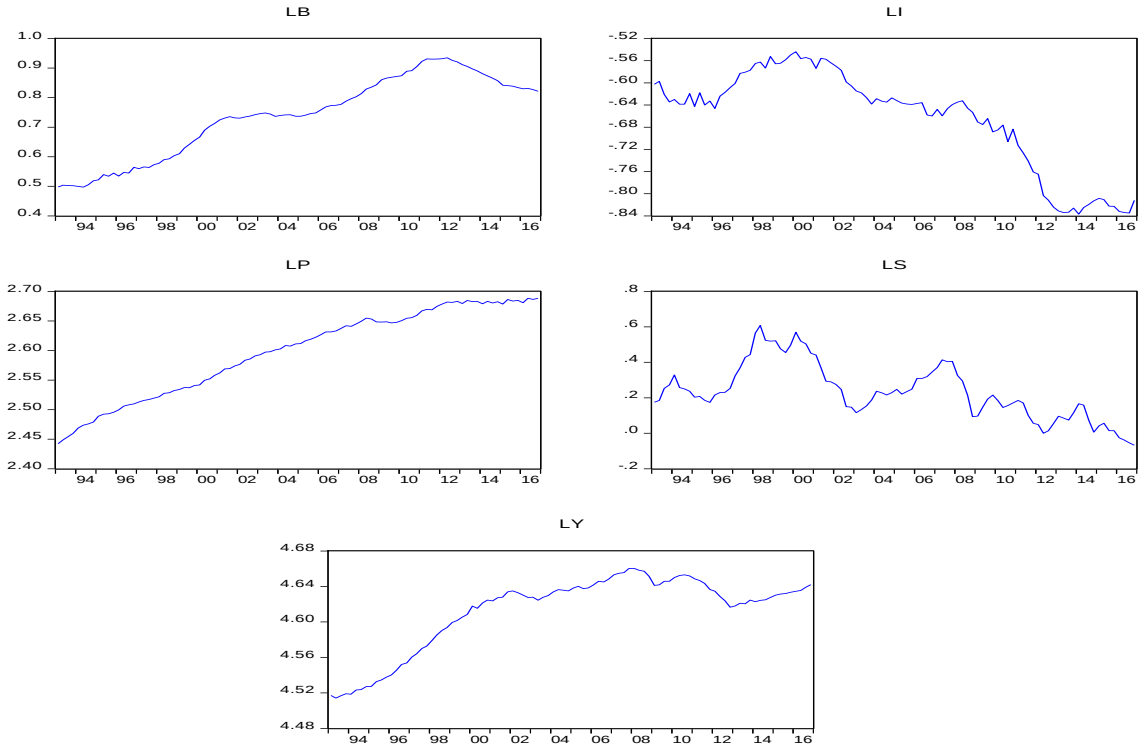

Fig 2. Variables in levels

Fig 3. Variables in first differences

The Fig. 1 indicates the non-stationarity of the variables. If there is no stationarity, there is a possibility that spurious regressions will be produced (Harris, 1995).

Together, Figs. 1 and 2 suggest that all variables are I(1). The correlograms point to the same conclusion. Particularly in the domestic credit ratio, pronounced accelerations and decelerations can be identified until Portugal joins the EMU, in 1999. As discussed earlier, that shock is controlled by including the SD variable in the VAR.

Table 2. Integration order tests

	ADF			PP			KPSS	
	a)	b)	c)	a)	b)	c)	a)	b)
LB	-0.7591	-1.9247	0.7018	0.3660	-1.7458	1.9067	0.1602**	1.1632***
LI	-1.8300	-0.0013	1.2660	-1.3766	0.2939	1.6392	0.2576	0.9126
LP	-0.6281	-3.3145**	3.4703	-0.9101	-4.0122***	7.3256	0.2968***	1.2372***
LS	-2.3291	-1.2315	-1.1890	-2.4247	-1.4493	-0.9848	0.1375*	0.5799**
LY	-1.7830	-2.6712*	1.6637	-0.8742	-2.6543**	1.9956	0.2986***	0.8889***
DLB	-3.1799*	-2.6597*	-2.4348**	-6.6717***	-6.1175***	-5.2603*	0.1344*	0.4408*
DLI	-3.5965**	-3.3779**	-3.3662***	-11.4487***	-11.3097***	-11.0640***	0.0645	0.2929
DLP	-6.4992***	-4.8446***	-2.9139***	-11.3437***	-9.6765***	-6.0401***	0.0504	1.07234***
DLS	-5.0150***	-4.9516***	-4.9327***	-6.6502***	-6.5984***	-6.63***	0.0524	0.1508
DLY	-3.4124*	-2.9970**	-2.6440***	-7.5509***	-6.7477***	-6.1653***	0.0764	0.6187**

Notes: a) represents the test statistic with trend and constant; b) represents the test statistic with constant; c) represent the test statistic without trend and constant; ***, **, and * denote statistical significance at 1%, 5% and 10% level, respectively.

To confirm the integration order, we performed three tests: ADF, PP and KPSS. The PP test is similar to ADF, with the null hypothesis that the variable has a unit root, i.e., the variable is non-stationary. However, the PP test is non-parametric. The KPSS test is a confirmation test, with the null of stationarity. The Schwarz criterion is used in the ADF test with a maximum of 2 lags. In the PP test, the Bartlett kernel spectral estimation method and Newey–West Bandwidth were used, as well as in the KPSS test.

The results of the three tests of integration order (Table 2) prove the same, i.e., all variables are I(1). In order to test the presence of cointegration, we carried out: (i) the Johansen test; (ii) the Engle Granger test; and (iii) the Phillips Ouliaris test. Results suggest that variables are not cointegrated. In order to confirm this conclusion, we also carried out the Park and Hansen instability tests, which reject the null hypothesis of cointegration. In short, it could be concluded that the variables are not cointegrated. This outcome hampers the use of a Vector Error Correction Model (VECM).

3.2. Model

Taking into account that the variables are not cointegrated, we use a VAR model with variables in first differences as follows:

$$X_t = \sum_{t=!}^{k} \Gamma_i * X_{t-i} + C * D_t + \varepsilon_t, \quad (3)$$

where X_t is the vector of the endogenous variables, and D_t is the vector of exogenous variables, Γ_i is the coefficient matrix of endogenous variables, C is the coefficient matrix of exogenous variables, and k is the optimal lag number. The vector of endogenous variables is X_t = [DLY, DLS, DLB, DLI]. The vector of exogenous variables is D_t = [constant,Q_2,SD_1,SD_2,ID_1, ID_2, ID_3, ID_4,

ID_5, ID_6, ID_7, ID_8, ID_9, DLP], where Q_2 controls for seasonality effects, SD_1 and SD_2 controls for the effects of the physical introduction of the euro and the subprime crisis, respectively, DLP is the consumer price index, and ID_1, ID_2, ID_3, ID_4, ID_5, ID_6, ID_7, ID_8, ID_9, controls for the second quarter of 1994, the first and the third quarter of 1998, the third quarter of 2002, the first quarter of 2008, the first and the third quarter of 2009, the first quarter of 2011 and the third quarter of 2014, respectively.

As we can see during the studied period, Portuguese economy stability made us realize that some events need to be controlled in order to mitigate secondary effects beside that sometimes there is non-linearity in variables caused by these events. After what has been said previously, we included in the model the following dummies: exchange rate crisis of escudo lead to a recession period between 1992 and 1994 (followed by unemployment increasing); as in 1994 low growth rates show up again in 1998 (unlike the period understood in those years); in 2002 occur the physical replacement of the escudo by the euro; subprime crisis in 2008 when euro reach highest value against the dollar; Banco Português de Negócios bankruptcy and subsequent nationalization assumed by the government for 2009; in March of 2011 Minister of Finance announces PEC IV new policy measures in order to reduce the budget deficit; and in 2014 Banco Espirito Santo declare record losses taking Banco de Portugal to apply resolution measures leading for ended of bank. The residuals are denoted by ε_t.

The procedures used are: first, the Granger causality tests; second, the variance decomposition; and third, the impulse response function analysis. Granger causality allows us to identify the causal relationship between the series, which, according to Granger (1969), occurs when a particular variable in the present or in the past helps predict future values of another variable. The forecast error variance decomposition allows us to assess how a variable responds to shocks in specific variables, while the impulse response function allows us to analyze the behavior of the variables according to an existing impulse in another variable (*ceteris paribus*). In other words, it demonstrates the effect that a shock in the error term, in a given period, has on the values of current and future endogenous variables.

There is no consensus that a positive change in the market capitalization ratio causes a positive impact on real GDP. In fact, according to Boubakari and Jin (2010), in Portugal a change in stock market development does not result in a significant impact on the country's growth. It is expected that when a positive change occurs in the internal credit ratio (development of the banking system), the impacts will be positive due to better resource allocation and an increase in investment. It is also worthwhile understanding that an increase in investment ratio is expected to reflect a positive impact on real GDP. In contrast, a positive shock in inflation should reflect a negative impact on real GDP. For the market capitalization ratio, a positive change in real GDP is expected to reflect a positive impact, like the occurrence of a positive change in the investment ratio. A negative effect is expected when there is an increase in domestic credit ratio due to the fact that if the banking system is more relevant in the economy,

then the stock market should play a lesser role in it and vice versa. Once again, an increase in inflation should lead to a negative effect on the market capitalization ratio.

4. Results

The results show that, for the analysis of the contribution of stock market on economic growth, the appropriate VAR specification requires considering as exogenous the variables: constant, seasonal dummies, nine impulse dummies, and two shift dummies. On the one hand, it is necessary to control for the physical introduction of euro notes and coins/integration in Euronext and, on the other hand, to control for the evidence of the subprime crisis in Portugal (since the last quarter of 2008). Moreover, the results of VAR also indicate the prevalence of the physical introduction of the euro over the integration in Euronext. Indeed, the shift dummy is highly statistically significant in the GDP equation, with a negative signal, and it is equally negative and statistically significant in the stock market equation.

To carry out the VAR estimation, we proceed by testing the optimal lag structure through the sequential modified LR test, the final prediction error, and the Akaike information criterion. All tests indicate three lags. This short optimal number of lags reveals a parsimonious model, and could be a sign of absence of the omission variable bias. The validity of the estimated VAR model was evaluated through diagnostic tests (see Table 3), namely: normality, by using the Jarque-Bera test, autocorrelation through the LM test, and heteroskedasticity by performing the White test (without cross terms).

Autocorrelation LM test		**Normality Test**					
Lags	LM-Stat	Component	Skweness	Chi-Sq	Kurtosis	Chi-Sq	Jarque-Bera
1	17.29455	DLY	-0.016411	0.004174	2.619528	0.560941	0.565115
2	20.64207	DLS	0.045776	0.03248	2.644395	0.490012	0.522492
3	22.124	DLB	0.147978	0.339411	3.088448	0.030314	0.369726
White heteroskedasticity	Chi-Sq	DLI	0.155287	0.373766	3.423732	0.695752	1.069518
	266.9839	Joint		0.749831		1.77702	2.526851

In short, the VAR specification overcome all relevant diagnostic tests, namely, strong evidence of: (i) normality, both for components individually and taken together; (ii) absence of autocorrelation; and (iii) homoskedasticity.

The results of block exogeneity tests proves that 4 variables could be considered endogenous (see Table 4), which reinforces that the option for the use of a VAR is consistent and one of them, Consumer Price Index was considered exogenous due to the fact that there is no significant in the model. The Granger causality, the variance decomposition, and the impulse response function are shown in Tables 4, 5, and Fig. 3, respectively.

Table 4. **Granger causality/block exogeneity**

	Dependent Variable			
	DLY	DLS	DLB	DLI
DLY	-	5.24803*	5.589655*	14.39221***
DLS	7.271194**	-	0.389908	0.080137
DLB	0.702207	5.779305*	-	9.536872***
DLI	2.370691	0.863789	1.2023	-
All	12.86864**	10.65028*	11.82321*	20.42855***

Notes: "All" denotes the causality test set for all independent variables. ***, **, and * denote significance at 1%, 5%, and 10%, respectively. Wald tests based on x2 statistic with 3 df, except for "All", 12 df.

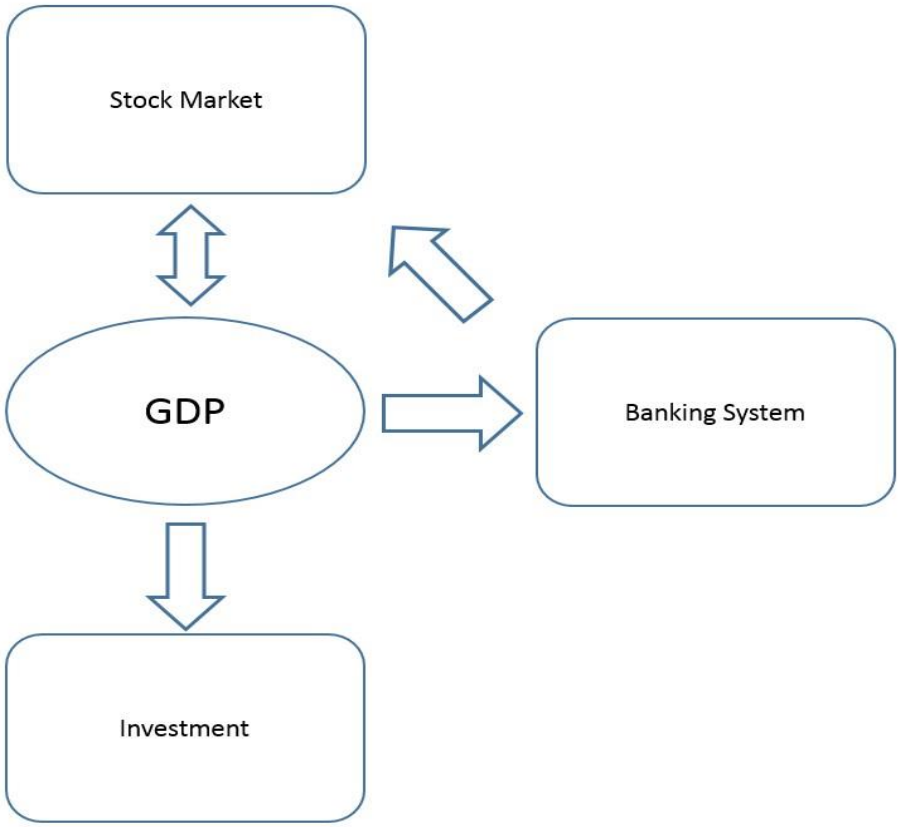

Fig 4. Granger causal relationship among variables

In figure 3 we can verify the causalities between the variables on Granger causality that was detected. Considering that the focus of this analysis is on the effect of banking financing and stock market on economic growth, the variance decomposition was performed for DLB, DLS and DLI, revealing the impacts from shocks on the other variables. The results from table 5 are in line with those obtained from the exogeneity tests. Sincerely, all variables reveal dynamic behavior which is a requirement of endogeneity (see table 5, and Fig. 4). With regard to DLY, after the first-quarter lag, shocks to DLY explain around 68% of the forecast error variance. This impact is reduced to around 57% at the end of the fifth-quarter and stay almost constant until the endo of the ten-quarter. When comparing the shocks to DLS and shocks to DLB, the shocks to DLB explain a larger percentage of the forecast error variance than the shocks to DLs,

except in the end of the second quarter, i.e. 2.4% for DLB and 6.4% for DLS. Shocks to DLI increase with the time, but nor much, jumping from about 28.3 to 29.8% in the explanation of the forecast error variance.

When analyzing the impacts on DLB, a relevant conclusion arises. The shocks to DLY, at the end of ten-quarters, have the greatest percentage in explaining forecast error variance, i.e., about 8.6%. This indicates that in Portugal, bank financing, rather than being a contributor to growth, is a net beneficiary of economic growth. It is worthwhile noting that this main picture remains valid when the order of variables is reversed, which is an additional signal of the robustness of this analysis.

Table 5. **Variance decomposition**

Quarter	SE	DLI	DLB	DLS	DLY
Decomposition of DLB					
1	0.010685	1.085493	98.91451	0	0
2	0.011454	1.158061	96.80167	0.145501	1.894766
5	0.012587	8.694507	83.28224	0.748279	7.274977
10	0.012638	10.36802	79.94949	1.179831	8.502659
Decomposition of DLS					
1	0.032505	1.284929	1.754131	96.96094	0
2	0.036135	1.047456	3.317548	90.18976	5.445239
5	0.037592	1.559562	7.948409	84.55933	5.932698
10	0.038004	2.270049	8.409415	82.80576	6.514773
Decomposition of DLY					
1	0.002701	28.31752	2.589586	0.951108	68.14178
2	0.00283	29.04887	2.38682	6.41495	62.14936
5	0.003006	29.96246	6.360797	6.112775	57.56397
10	0.00302	29.75654	7.087276	6.083066	57.07311

The impulse response-functions to an innovation, both in DLS and DLB, are shown in Fig. 4. In general, the response to an innovation in the stock market is dissimilar to the response to an innovation in bank financing. This dissimilitude is particularly visible in terms of the responses of economic growth.

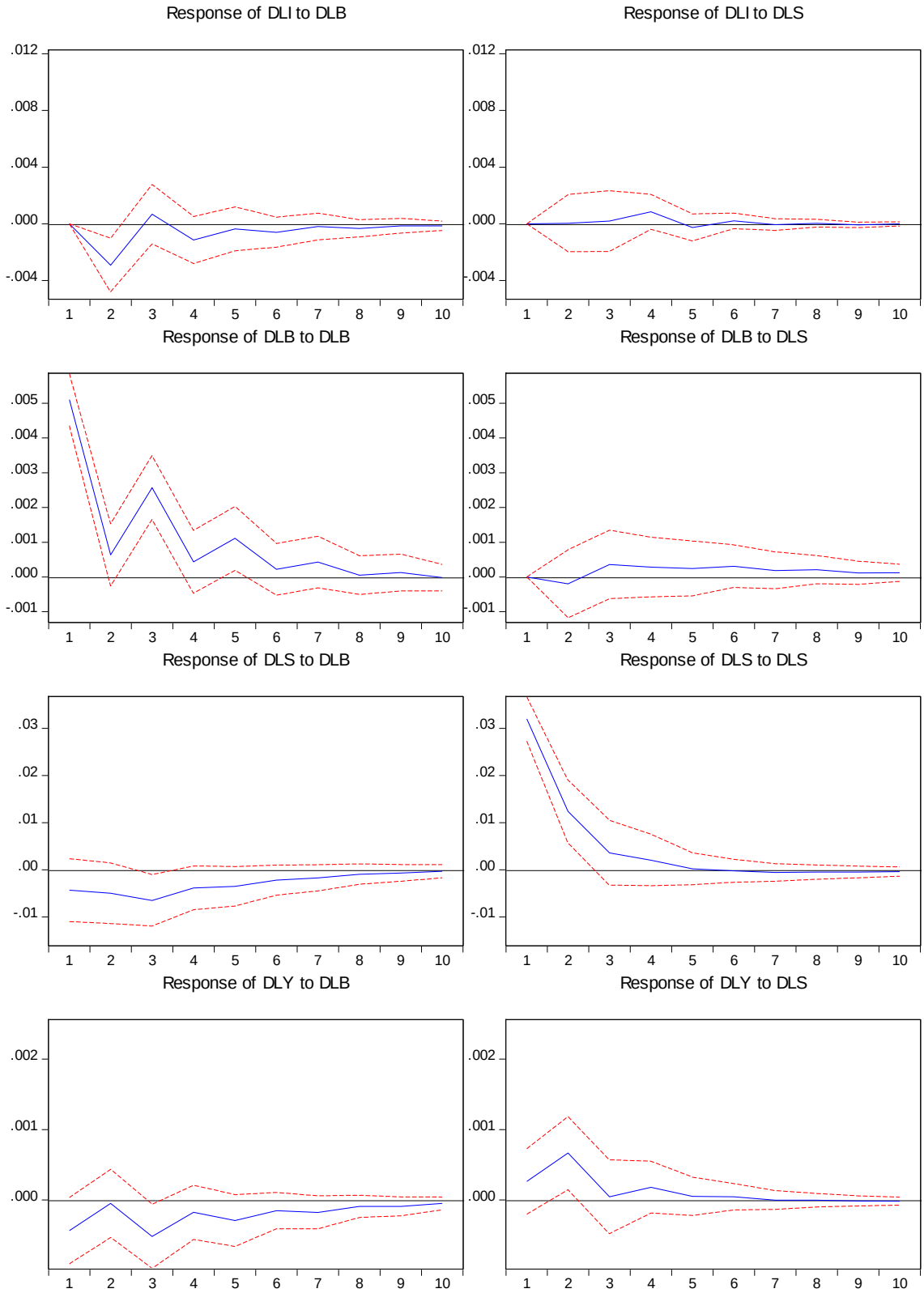

Fig 5. Impulse response function

5. Discussion

This paper focuses on the contribution of two competing systems of financing the economy, stock markets and bank financing, towards economic growth. In designing economic policy for growth, it is crucial to understand this fully. In fact, if economic growth responds differently in face of an innovation in the two systems, then policy makers should focus their action preferentially on the most responsive one.

The competing systems are proved different in terms of Granger causality, variance decomposition and impulse response function. Actually, an innovation in one brings, as expected, a decrease in the relative weight of the other in the system, as can be seen in Fig. 4. The response of bank financing to an innovation in the stock market is more pronounced and faster than the reverse. In general, bank financing is closed in on itself more than the stock market is. This result is largely unexpected. Indeed, as a non-Anglo-Saxon country, in Portugal the use of bank financing by corporations should be widespread. Accordingly, bank lending ought to play a major role in Portuguese economic growth.

There is strong evidence that stock market development causes growth. Moreover, there is also evidence, albeit weak (10% of significance), of feedback, i.e., growth causing development of the stock market (e.g. Smimou et al., 2015). This latter achievement is not consensual in the literature, which usually only identifies the existence of Granger unidirectional causality running from the stock market to economic growth (e.g. Tsouma, 2009). In fact, from the analysis of the variance decomposition and impulse response function, it could be concluded that there may well be a relationship between both variables. In fact, the existence of impacts caused by economic growth on stock market development would not be surprising, given that, as highlighted by Bangake and Eggoh (2011), economic growth significantly affects finance in high income countries.

These findings lead to a set of valuable effects. If policy makers intend to stimulate economic growth, then they should act on the development of the stock market. As the real side of the economy expands, the demand for financial services increases, leading to the growth for financial services (Robinson, 1952). Once economic growth has been verified, what benefits most from this growth is just the bank financing. In other words, it seems that the banking system has not been a driver of economic growth, but it has been the greatest beneficiary of this growth, which is consistent with the increase in consumer credit that occurred in Portugal in the period under analysis. This achievement for bank financing is robust, but not in line with those obtained, for example, by Lee (2012), that the banking system plays an important role in some European countries. In contrast to what Filer et al. (2000) conclude, our results suggest that the existence of a sophisticated banking system does not remove the influence of stock markets.

Regarding the control variables, the effects observed for investment suggest a demand-following hypothesis as observed by Shahbaz et al. (2017). Supporters of the demand-following hypothesis suggest that development of the investment plays only a minor role in growth, and that the investment an outcome or result of economic growth in the real side of the economy. The investment does not Granger causes economic growth, suggesting that investment in Portugal, in this period, was mainly materialized in activities that do not generate multiplier effects. In this period, the loss of competitiveness is well known and well documented, as a result of persistent lower investment rates than its commercial competitors.

6. Conclusion

The effect of the stock market development on economic growth in Portugal (1993–2016), which is a small open economy subject to strong impacts caused by structural changes, is analyzed. A comparison of the effects of the two competing systems of financing the economy – stock market and bank financing – on economic growth is also provided. No cointegration relationship was detected. A VAR model, with exogenous both impulse and shift dummies, was estimated. The VAR model proved to be suitable for handling the analysis of the relative contributions of the stock market and bank financing on economic growth. However, this analysis requires the inspection and posterior inclusion of the Portuguese idiosyncrasies. The absence of these controls could mask relevant causal relationships among variables, leading to erroneous conclusions.

Regarding the two components of the financial system, two behaviors are observed. On the one hand, a positive causal relationship between stock market development and economic growth was detected, and it is, in fact, bidirectional. On the other hand, it appears that the banking system is not driving economic growth, but is a net beneficiary of that growth. In view of this, economic policies ought to be aware that it is stock market development, and not bank financing, that promotes economic growth. The different nature of these two components of the financial system deserves to be the object of further research, including understanding the transmission channels through which financial markets and their segments interact with economic growth.

The control variables enabled facts often associated with the Portuguese reality to be proved. On the one hand, investment did not produce significant multiplier effects. On the other hand, the loss of economic price competitiveness is notorious. Also considered were the Portuguese idiosyncrasies, namely: (i) the break in the GDP series in the third quarter of 2000; (ii) the physical change in currency, from the escudo to the euro, which constitutes an economic regime change; and (iii) the subprime crisis. These facts prove to be mandatory for a full understanding of the transmission channels from finance to the economy.

Looking forward economic policies aimed to improve a more unified regulatory system it will allow a quick reaction to crisis periods and limit the consequences of negative spillovers effects across European Countries, limit the size of banks to minimize potentially problems on the medium-long run and finally invest in a productive way, these policies we think that could be followed for banking system. Regarding stock markets, the decision makers should consider the option of fiscal policy implementation, facilitate stock market listing, protect the interests and rights of investors and efficient supervision of the market, and protect the capital that was generated in the country not being transferred abroad but to be invested in a more productive way in Portugal.

Finally, other variables need to be analyzed for further research, as the incorporation of the banking system rescue budget to better understand the impact of rescue in the economy, or bank credit to the private sector reflects the extent of efficient resource allocation.

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Appendix A. Correlation matrix

In this appendix we present the correlation matrix of variables in the next two tables that is related with our variables.

Table A.1. **Correlation Matrix**

	LY	LS	LB	L I	LP
LY	1	-0.1816	0.8583	-0.2954	0.8556
LS	-0.1816	1	-0.5240	0.8016	-0.5566
LB	0.8583	-0.5240	1	-0.6703	0.9676
LI	-0.2954	0.8016	-0.6703	1	-0.7395
LP	0.8556	-0.5566	0.9676	-0.7395	1

We notice that there is a problem of correlation in the variables transformed to logarithm form but how we gone treat variables in differences that problem disapear and we can continue our estimation.

Table A.2. **Correlation Matrix**

	DLY	DLS	DLB	DLI	DLP
DLY	1	0.2949	-0.0197	0.4902	0.0502
DLS	0.2949	1	-0.1097	0.1729	0.0622
DLB	-0.0197	-0.1097	1	0.1583	0.3305
DLI	0.4902	0.1729	0.1583	1	0.0309
DLP	0.0502	0.0622	0.3305	0.0309	1

Appendix B. Proxy calculation

As pointed out in section 3.1 due to unavailability of data it was necessary a proxy creation through the same process calculation used before by Marques et al. (2013) with interesting result. Our real variable was Stock Market Capitalization only available in the period of 2011Q4-2014Q2 and we employed the Least Squares method for perform the test. After the ratios calculation, our test results (R^2=0.99) indicate us that this variable fit perfectly to our model inclusion and estimation.

Table A.3. **Proxy results test**

Variable	Coefficient	Std. Error	t-Statistic	Prob
C	-2746.515	1682.610	-1.632294	0.1371
Proxy	1.058316	0.032443	32.62048	0.0000
R^2		0.991613		
Adjusted R^2		0.990681		

Notes: Std. Error: Standard Error; Prob: probability.

For compare the Stock Market Capitalization and the proxy performed here are the descriptive statistics of both variables.

Table A.4. **Descriptive statistics**

	Stock Market Capitalization	Proxy
Mean	51708.47	51454.35
Median	51509.96	50848.14
Maximum	64398.10	63067.39
Minimum	42100.41	42013.55
Std. Dev.	7243.482	6815.583
Skewness	0.523576	0.461585
Kurtosis	2.307506	2.278369
Jarque-Bera	0.722367	0.629289
Probability	0.696851	0.730048
Sum	568793.1	565997.9
Sum Sq. Dev.	5.25E+08	4.65E+08
Observations	11	11

Notes: Std. Dev.: Standard Deviation; Sum Sq. Dev.: Sum of squared deviation.