A Comparative Study of the Effect of Financial Development on Economic Growth under Asymmetric Information

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Abstract: This paper studies the relationship between the development of financial sector and the real growth of an economy under asymmetric information, because real growth depends on the financial structure development, so that countries with more developed financial structure enjoy a higher growth rate than other countries. This study introduces the economic growth rate as the measure for real sector development, and the variables such as the stock market value to GDP as measures of financial sector development. The standard deviation logarithm of the stock exchange stock price index and bank credit proxy to the private sector are used as the measures of asymmetric information in financial and monetary markets. Using the panel data for selected developed and developing countries during 1993 -2008, the target model is estimated. The results indicate that the financial market is more effective than the monetary market in developed countries. The financial structure of developed countries is also different from that of developing countries, and this is due to the high degree of symmetric information in the former countries, but the monetary market is more powerful than the financial market in developing countries.
[Khan Anwar Kamal. **A Comparative Study of the Effect of Financial Development on Economic Growth under Asymmetric Information.** *Rep Opinion* 2026;18(2):18-30]. ISSN 1553-9873 (print); ISSN 2375-7205 (online). http://www.sciencepub.net/report. 03. doi:10.7537/marsroj180126.03

Keywords: financial development; economic growth; asymmetric information; panel data

JEL: O16, O40, D82, C23

1. Introduction

Currently, a large part of the economic literature confirms that the long-term economic growth and prosperity of a country, in addition to other important factors, also relate to the degree of financial development in that country. Generally, financial development affects the economic growth through accumulating and mobilizing capital resources and optimal allocation of these resources. In other words, indicators of financial development affect the capital accumulation indicators and their productivity, and these indicators, in return, affect the economic growth. Development of financial systems leads to a more appropriate allocation of resources, and ultimately to faster economic growth through the expansion and diversification of the country's financial markets.

Studies show that the level of financial markets development, especially the stock market and banks, and the effect they have on financing companies and on selecting the method to do so ultimately leave a significant effect on the economic growth (Taghavi et al., 2011, pp. 38-39). Advanced financial markets, including advanced industrial countries' financial markets, control a considerable amount of financial capital of the related economy. Because the real growth depends on the development of financial structure, countries with developed financial structure have a higher growth rate than others. Foundations of this theory were introduced by three great economic researchers in the 1970s: George Akherlof, Michael Spence and Joseph Stiglitz. They concluded that the development of financial structure in a transparent economic environment occurs given that there is symmetric information in the competitive market. The basis of this assumption is that all participants in the market are fully aware of all prices and information, but if due to asymmetric information of exchange parties, the market fails to perform its main task, and acts inefficiently, "market failure" will occur.

Information is considered the core of market efficiency in today's world and the stock exchange. The speed of information dissemination and symmetric information also

play major critical roles in the market efficiency. Therefore, the more efficient the market is, and the more symmetric the information is, the greater the market security is. And a higher economic growth can be achieved by channeling investments towards production. Asymmetric information occurs when market agents do not have the same information, and one agent has more information than the other. This problem occurs in the monetary market when the bank does not have enough information on the credit risk of its customers (loan applicants). Thus, allocating bank credits in this situation is clearly not efficient, and the closer the price is to the supply and demand equilibrium in a market, the more efficient the allocation is. So, competent people receive loans. Obviously, to overcome the problem of asymmetric information, it is necessary to collect and disclose information, thus the increased number of market agents (banks) leads to correcting the rate of bank credits and preventing adverse selection, if they are accompanied with the release of information and the reduced asymmetric information. Therefore, it can be said that financial development occurs completely and adequately in the symmetric information environment, and this can lead to the emergence of economic development.

Many empirical studies have shown that there is a strong relationship between financial markets and the level of investment and capital accumulation. Financial markets operating under asymmetric information not only can generate business fluctuations, but also can help expand them. Thus, it can be said that there is a direct positive relationship between symmetric information and the economic growth rate (Zicchino, 2002, 23). Countries' experiences suggest that financial development in the advanced industrial countries occurs mainly outside the banking sector; therefore, the basis of financial development lies in the non-banking sector. But financial development in developing countries is mainly based on correcting banks' performance, and occurs in the banking sector (Nazifi, 2004, 104). To examine the relationship between financial development and economic growth under asymmetric information, the researcher looked in this study for an answer to the question that whether financial development affects economic growth under asymmetric information. To find the answer to this question, the following three hypotheses were tested.

1. Symmetric information has no effect on economic growth.
2. Development of financial structure has no effect on economic growth.
3. Selected developed and developing countries have the same financial structures.

In what follows, first empirical studies, theoretical principles and literature review are presented, and then the model for the effect of financial development on economic growth under asymmetric information is explained for the selected developed and developing countries. Next, the estimation results of this model, and in the end, conclusions and suggestions are presented.

2 Research Background

Over the past few years, numerous studies have been conducted in the developing and developed countries, and they all have tried to measure the effect of financial development on economic growth and development. The hypothesis considered in most studies was that the improvement in financial development indicators was a necessary condition for the economic growth and development. Some of local and international studies will be discussed here:

2-1 Foreign studies

Barnebeck, et al. (2003) in the article "Financial Liberalization, Financial Development and Economic Growth in LDCs" examined the relationship between these three variables using panel data generalized method of moments (GMM) for 95 countries during 1960-1995. They studied the issue that asymmetric information markets were not generally constrained Pareto efficient markets, and the increased banking competition after financial liberalization due to the existing poor and unsustainable infrastructures did not necessarily produce the financial intermediation efficiency. Empirical evidence showed that the first claimed impression that the growth occurred due to financial development was not sufficiently supported by the econometric studies. For this study, financial liberalization did not necessarily improve resource allocation. Asymmetric information problems continued, and financial liberalization increased the possibility of costly systemic crises.

Soliman and Howless (2003) studied the relationship between stock market development and economic growth in Chile, Korea, Malaysia and the Philippines using VAR models. In this study, the hypothesis that financial development generated higher economic growth in endogenous growth models by affecting the

investment level and enhancing the investment productivity had been tested. The results showed that the expansion of the stock market increased the economic growth in all four countries by raising the investment efficiency and productivity.

Capasso (2004) in his study "Financial Markets, Development and Economic Growth: Tales of Informational Asymmetries" explained the financial system in the economic system based on microeconomic theoretical foundations. He studied recent advances in this literature, and showed that the amount of asymmetric information in credit markets and the level of heterogeneity between borrowers (typically firms) and lenders (typically workers or savers) determined the nature of the financial system. Differences in the obtained amount and in the level of information distribution provided various financial contracts which affected and were affected by capital accumulation and growth. He concluded that adverse selection could lead to credit rationing and the reduced amount of funds allocated to the investment, or it could increase monitoring, and therefore, reduce the amount of investment by monitoring costs. It was also clear that simple or more complex forms of moral hazard could motivate agents to establish new forms of contracts and guarantees; the development of stock markets was an important example. His article showed that the financial markets development was a multidimensional and complex process that was very difficult to explain it completely. More research is needed to determine the characteristics of the relationship between financial development and economic development.

Zicchino (2002) in his article "Financial Structure and Economic Activity under Asymmetric Information" analyzed the dynamic relationship between firms' financial conditions and the investment level using firm-level panel data from 36 countries in the period of 1988-1998 to empirically verify this claim that the access level to internal cash resources in investment decisions of firms operating in underdeveloped countries was financially important. He concluded that the effect of a positive shock on cash or cash flow in the underdeveloped and developed countries was significantly different financially. This result revealed the relationship between financial development and economic growth. Since the investment level of firms with limited access to external financing was affected by a shock to internal resources, the capital accumulation was financially less in the underdeveloped countries which led to a slower economic growth.

Guiso et al. (2004) used Granger causality and instrumental variables in the period of 1981-1991 to examine the relationship between "Financial Market Integration and Economic Growth in the EU". They suggested that in terms of qualitative indices, the access to loans and the securities market and the quality of banking services, countries close to the European Union (EU) had equal or lower ranks than the least developed countries of the EU in terms of financial system. In general, the effect of financial integration on the growth of European manufacturing industry ranged between 0.6- 0.7 (0.1- 0.2% of GDP growth, assuming no effect on the non-manufacturing sector output). Different overall effect on the growth in different countries and sectors reflected the heterogeneity of the EU countries in terms of the integration of economic sectors and the level of financial development. It was predicted that countries with relatively weaker financial structure (e.g. Belgium, Denmark, Greece and Italy) gained the maximum benefit, and countries (e.g. the UK, Sweden and the Netherlands) already reached a high level of financial development, gained the minimum profit. Countries such as Austria, Belgium, Greece, Italy, Spain and Sweden gained more profit from domestic financial development.

Chien-Chung et al. (2009) in their paper "The Asymmetric Impact of Financial Intermediaries Development on Economic Growth" analyzed the asymmetric effect of financial intermediaries on the range of growth distribution by instrumental variable quantile regression. His results were based on a sample of seventy-one countries in the period of 1960-1995. These results showed that differences in financial intermediary development would generate differences in the quantiles of growth distribution, so financial development had a positive effect on the overall growth distribution. However, the degree of effect in countries with higher growth levels was higher.

2-2 Local studies

Kolahi (2001) in his article "About Nobel Prize in Economics of 2001 for the Theory of Asymmetric Information" studied the foundations of this theory that were qualitatively introduced by three great economic researchers in the 1970s - George Akherlof, Michael Spence and Joseph Stiglitz. He raised several questions

in this paper, including why was the interest rate for loans high in developing countries? Why did buyers of second-hand cars prefer to buy them from dealers than the sellers themselves? Why did firms tend to pay shareholders' profit as soon as possible, even if they were subject to heavy taxation on the increased capital? And finally, in the contracts between the rich people and poor farmers, why did the rich not tolerate the total risk of harvest? Mentioned questions were examples of familiar but strange phenomena that each required a separate challenge in economic theory. Economic Nobel Prize winners developed the economic theory discussing the economic theory with the realistic assumption of asymmetric information. He concluded that the analysis of Akerlof, Spence and Stiglitz on markets with asymmetric information formed a fundamental issue in modern microeconomic theory.

Motameni (2008) in his article "Studying the Relationship between Financial Development and Economic Development in Iran" tried to examine this relationship by Granger causality. The data used in this study were GDP and non-government sector debt to banks in the period of 1961- 2006. Although data indicated improved financial development in recent years, the state of Iranian financial development was not desirable in comparison with other countries in the region. The results showed that economic growth improved financial development in the Iranian economy, while the statistical evidence did not confirm a reverse causal relationship.

Shirzour (2010) in his article "Studying the Information Efficiency of Stock Exchange by Variance Test Method" studied the information efficiency of the stock market and that how much the stock market had been successful in playing its role. This was a 269 weeks study in which the weak efficiency was assessed by random walk hypothesis test, with the exception that the variance ratio test - one of the strongest tests - was used for it. The reason for using this test was that it was more updated and flexible than other tests. Using this test, he concluded that days of the week played no important role in the Tehran stock market, and a special day could be considered as a good indicator to reflect weekly returns of stock. In this study, the rates of return of each Wednesday were used as a proxy for weekly returns. The results showed that the Tehran stock market had poor information efficiency, so it was not a market with unusual returns.

3 Literature review

Financial development refers to a situation in which the provision of financial services by financial institutions increases, and all community members benefit from a wide selection of services. Economic growth also implies the increased production or national income per capita. If the production of goods or services increases in a country by any means possible, it can be said that the country has experienced economic growth. More than two decades ago, Goldsmith (1969), McKinnon (1973), Shaw (1973) and other researchers analyzed the relationship between financial development and economic growth.

Financial development is one of the policies recommend by many economists to achieve economic development. Joan Robinson says the financial system follows the real sector of economy, economic growth produces the demand for certain types of financial compositions, and the financial system automatically meets this demand. According to macroeconomic theories, the accumulation of physical capital is considered one of the necessary conditions for national economic growth. Therefore, the optimal use of the labor force in the production process depends to a large extent on the amount of available capital, and capital accumulation plays a main role in determining the increased level of total output and output per worker. Similarly, as the production and productivity in the national economy began to increase, the progress of society is consistent and appropriate with the investment in this regard. In other words, we can say that a country's financial development plays a key role in the economic development of that country. Because capital accumulation is one of the most important sources of ongoing economic growth of a country, the process of capital formation, and thus the financial development can be accelerated by financial markets (King and Ross, 1993, pp. 513-542.)

Developed financial markets such as financial markets of developed countries control a considerable amount of related financial economic resources. These markets encourage savings and converting savings to investment for the capital formation, and thus play an important role in accelerating the economic growth.

Financial markets in which capitals can effectively live and grow are divided into two parts: monetary market (including the banking sector, i.e. bank-based financial development) and capital market (including stock market and

bonds, i.e. securities based financial development).

Monetary market, by definition, is a market for the exchange of money and other financial assets which are the close substitutes for money with maturity less than one year. The monetary market can also be called as a market for short-term financial instruments which has these characteristics: low risk of non-payment, liquidity and high nominal value.

Based on the classification of financial market and regarding the maturity assets, the capital market refers to the market for traded financial instruments with a maturity of more than one year and assets without a defined maturity. This section of the financial market plays a more important role in collecting savings and meeting investment needs of production units. Capital market is much broader and more instrumentally diverse than the monetary market.

One of the assumptions of perfect competition market is complete information. This means that all participants in the market have full access to all relevant information and prices, and firms know the prices for all goods that they could possibly produce and the production technology for these goods and the price at which they can purchase inputs. On the other hand, all individuals are aware of the purchasing costs of all goods, and prices at which they can sell their resources and, in particular, their labor. Under these circumstances, prices are determined by supply and demand, and ultimately the price difference disappears quickly, and only a single price is offered for each commodity across the market. This is the market equilibrium point, and the condition of the producer and consumer is better at this price.

Symmetric information means that exchange parties have equal information about the quality of exchanged commodity and the terms of trade in the market. Asymmetric information refers to a state in which one of the exchange parties has less information than the other one about commodities or the market situation, in other words, the information is heterogeneously distributed between all users. According to North (1990), the more we move from a traditional society to a modern society, the more the degree of symmetric information increases, because the more a society is advanced, the more the labor and specialization are divided. In other words, the more efficient a market is, the better prices reflect the full available information. As a result, the market security will be greater, and people's confidence in the market will increase. This leads to absorbing wandering capitals, and directing them towards production and increasing national production and income. And this will finally lead to improved economic conditions.

In economic literature, the asymmetric information is usually divided into two main groups: adverse selection and behavioral risk. The first group includes issues in which one exchange party is unaware of the other party's information, while that information could affect the former decision. This group is known as keeping the information secret, and this leads to the adverse selection (Zicchino, 2002, 6). The second group refers to situations where the actions of one exchange party are hidden from the other side; however, they affect the welfare of the latter. This group is known as keeping actions hidden and this leads to behavioral risk (Zicchino, 2002, 30).

In general, the asymmetric information is considered in two sections: capital market (stock market) and monetary market (the banking system). In the capital market, when investors have different information about the securities or market mechanisms, they will have different knowledge of one situation, in other words, the asymmetric information exists there. A significant asymmetry makes experts to expand the market scope, so that the stock trading would lose its boom as far as all may stop trading.

Based on theoretical analyses and empirical evidence, increased asymmetric or unequal information is related to the reduced number of traders, high transaction costs, low liquidity of securities and low volume of transactions. This, in general, leads to a decrease in social benefits resulting from the transaction. The market success means that prices continuously reflect the new information from the transaction. Therefore, a market that can process information is called efficient. In an efficient market, prices reflect a correct assessment of the available information at any time (Beaver, 1981, 243-252).

In the bank loan market, asymmetric information occurs when the bank does not have enough information on the credit risk of its customers (loan applicants). In this system, banks providing credits and applicants are on two sides. Under asymmetric information, banks cannot distinguish between creditworthy applicants who repay credits on time and the non-creditworthy applicants. Lack of adequate knowledge about applicants leads to having no distinction system for individuals, and usually non-creditworthy clients are preferred. Thus, the needs will be

unmet, and bad loans will also increase. Therefore, asymmetric information has two outcomes: (A) No distinction between creditworthy and non-creditworthy applicants which leads to the exclusion of many creditworthy applicants from receiving loans, and instead a part of non-creditworthy applicants receive loans. (B) Not repaying the received loans on time adds to the problem of bad loans, and a large amount of requests for receiving loans remain, because they are not answered due to banks' fear that they are from non-creditworthy clients. Therefore, the loss of those who could not receive loans is greater than the bad loans for an economy. Perhaps these people would have used the received loans for producing goods and services, and since they could not receive the credits, the country's economic system has stagnated, and no economic growth has occurred.

4 Methods and materials

4-1 Research methodology (panel data model)

Panel data is one of the new and applied subjects in econometrics, because this method provides a very rich information environment for the development of estimation techniques and theoretical results for the researcher (Abbassinejad and Habibi, 2005, 101). In panel data, the economic unit (e.g. a family, a firm or a country) is measured and assessed for a period of time. On the other hand, panel data has spatial and temporal dimensions (Gujarati, 2006, 1141). In fact, this estimation method is a combination of time series methods and cross-sectional data. Panel data model is generally as follows.

$$Y_{it} = \alpha + \beta X_{it} + u_{it} \quad (1)$$

Where i= 1,2,…,N represents cross-sectional units (e.g. countries), and t= 1,2, ...,N represents the time. Y_{it} is the dependent variable for i cross-sectional unit in t year, and X_{it} is the nonrandom independent variable for i cross-sectional unit in t year, and u_{it} is the error term of the model.

4.2 Likelihood ratio test

This test, in fact, compares the maximum likelihood logarithms of restricted and unrestricted patterns. The restricted model assumes the homogeneity of variance or the equal and independent distribution of disturbance terms, while the unrestricted model assumes that there is no similar variance of disturbance terms between cross-sectional units (heteroskedasticity). Likelihood ratio is defined as $\lambda = \frac{L(H_0)}{L(H_1)}$ in which $L(H_0)$ is the restricted maximum likelihood value, and $L(H_1)$ is the unrestricted maximum likelihood function value. By converting λ, LR test statistic is obtained as follows.

$$LR = -2\ln\lambda = -2[\ln L(H_1) - \ln L(H_0)] \sim (J) \quad (2)$$

LR statistic has x^2 asymptotic distribution with degrees of freedom for the number of constraints (*J*), so if the value of LR statistic is larger than the critical value of $x^2_{\alpha}(J)$, H_0 hypothesis will be rejected 100% at the significant level.

4-3 Pattern specification

In this study, the target model is introduced by generalizing Zicchino model (2002) in the context of panel data for both selected developed and developing countries as follows. In this regard, the effect of financial development on economic growth is studied under asymmetric information; therefore, the difference between developed and developing countries' financial structures is understood.

$$\text{Ln}\, GGDP_{it} = {}_0 + \alpha_1 SMS_{it} + \alpha_2 VOT_{it} + \alpha_3 CTP_{it} + \alpha_4 \ln SQRT_{it} + e_{it} \quad (3)$$

i means the target country, and t is the period of time.

4-4 Variables and statistical data used in the study

Studied countries were selected in such a way that included different countries with various development levels. These countries were selected from member countries of the Organization for Economic Cooperation and Development (OECD) and the Organization of Islamic Conference (OIC). These selected countries were also members of the World Federation of Exchanges (WFE). Therefore, developed countries included Australia, the United States, Austria, Germany, Israel, Italy, England, Japan, South Korea, Switzerland, Canada, Greece, New Zealand and Luxembourg, and developing countries included Indonesia, Iran, Turkey, Malaysia, Poland and Mexico. It should be considered that Iran has also become a full member of this Federation since 1992, and has been always active in its assemblies and meetings. It has tried to achieve the target measures, and become more familiar with the members of the Federation covering the major global capital market actors, and pave the way for the internationalization of the Iranian stock market. Therefore, memorandums of understanding have been signed so far between

the Iranian stock exchange and stock exchanges in Indonesia, Malaysia, Poland, Mexico, Turkey, Bahrain, South Korea, Taiwan and Cyprus. Also, because a group of developing countries were not members of the WFE, and that there was no complete time series statistics for some of these countries in the studied period, these countries were selected.

Data variables used in this study were taken from the statistics reported by the World Bank and WFE.

The model variables are as follows:

InGGDP: is GDP growth rate to fixed prices as an indicator for the economic growth, and it can be said that GDP measures the final value of all goods and services produced within a country in a given period (Khataie, 1999, 452).

SMS: The ratio of stock market value to GDP, or total value of stock index or the market capitalization to GDP ratio is introduced as one of the major measures by the World Bank to measure the development of each country's stock market, and includes total issued shares in a country's stock market in a given year. This index is expressed in relation to GDP, and represents the size of a country's stock market to its whole economy (Khataie, 2008, p. 455).

In other words, the total number of each company's shares is multiplied by the trading day's closing price to obtain the market value per share. If the value of total stock market is concerned, the total market value of each company represents the total stock market value.

P_{il}: The closing price of each company "on each trading day" in the stock market

q_{ij}: The total number of company's shares that is obtained by the company's capital divided by a nominal value per share.

$P_{il} * q_{ij}$: The stock market value of each company

$\sum_{l,l=1}^{n} P_{il} * q_{i}$: Total stock market value

l: Represents company

j: Represents the company's total number of shares

t: Represents time

VOT: The ratio of traded shares value in the stock market to GDP, or the index of traded shares value in the stock market (value-traded ratio). This index is expressed in relation to GDP, and shows securities are easily bought and sold; in other words, it expresses the depth of financial market based on securities (shares) in the country. The larger the ratio is, the easier the securities' trading is. To calculate this index, the number of traded shares for each company on each trading day is multiplied by the last price traded to obtain the value of traded shares for each company. If the total value of traded shares for each company is obtained, in fact, the traded shares value of the total stock market will be achieved.

P_{it}: Last price traded of each company "on each trading day" in the stock market

q_{it}: The number of each company's shares that investors trade on each trading day

$P_{it} * q_{it}$: The value of traded shares of each company

$\sum_{i=1}^{n} P_{it} * q_{it}$: The total value of traded shares in the stock market

i: Represents each company's shares

t: Represents time

The closing price will be calculated real time at any time of transactions which is in fact calculated based on the average price per share to the base volume. This price can be higher or lower than the last transaction.

CTP: is the ratio of banking sector credits paid to the private sector to GDP. In this index, these credits are measured compared to the total size of the economy. This index is formed under the assumption that financial systems that provide more credits to private companies, insist more on investigating and controlling companies, providing risk management services, mobilizing savings and facilitating transactions than financial systems that give their concentrated credits to state or state-owned companies. High bank credits may indicate a country's developed banking system, and this leads to economic growth.

In this study, CTP variable was considered from two aspects: as the indicator of financial development and as a proxy for the symmetric information level in the banking system. The reason for this selection was that in the real world because banks did not have enough information on the credit risk of their customers for paying credits to them, therefore, credit allocation would not have the necessary justice and coordination due to the absence of symmetric information in this environment. Since banks could not separate credits applicants' related information, applicants were not differentiated, and as a result, not only credits were not given to the competent people, but also this factor increased bad loans. Therefore, examining this factor could be used as a proxy for the symmetric information level in the economic studies.

In this study, two VOT and SMS indices, among financial development indices, were used as the indicators showing the behavior of exchange, and CTP index to represent the bank's

performance. Since these three indicators of financial development were measured to GDP, they were not expressed as logarithms.

lnSQRT*I*: is the standard deviation logarithm of the stock price index. In the target model, this variable was used in the studied countries as a proxy for showing the symmetric information level in the financial market. Stock price index represented the total market price changes calculated as a weighted average. The following factors were used to calculate it.

Pi_t: the price of i company at t time

qi_t: Number of issued shares of i company at t time

D_t: The base number at t time which was equal to $\Sigma pi_o qi_o$ at the origin time

pi_o: Price of i company at the origin time

qi_o: Number of issued shares of i company at the origin time

n: The number of companies subject to the index

Formula by which the index was calculated is as follows:

$$\frac{\sum_{i=1}^{n} P_{it} q_{it}}{D_t} * 100 = \text{Stock price index} = \frac{\sum_{i=1}^{n} P_{it} q_{it}}{\sum P_{io} q_{io}} * 100 \quad (4)$$

As can be seen, the stock price index covered all companies listed on the stock exchange. The increased number of companies listed on the stock exchange positively affected the stock price index. Since companies were required to provide transparent information in the short-term intervals (monthly, seasonal) to enter the financial market, then as a greater number of companies entered the exchange market, the exchange information significantly increased. As the information increased, the traded prices would be closer to their real state, so the economic transparency would also increase. It can be said then that the calculation of the standard deviation of the stock price index that showed the index price dispersion in an interval could be used as a relative measure for the symmetric information in the financial market. Statistically, as n increased, standard deviation of the stock price index decreased, i.e., the information dispersion decreased. This left a positive effect on the economic growth. In this study, in order to obtain the standard deviation of the stock price index, the 4-year moving standard deviation formula was used as follows:

Moving standard deviation =

$$\sqrt{1/4 \sum_{j=0}^{3} (X_{i,t-j} - \sum_{k=0}^{3} X_{i,t-j}/4)^2} \quad (5)$$

X = stock price index

5 Analyzing results

5-1 Stationary diagnostic test for the data

Before estimating the effect of financial development on the economic growth under asymmetric information, it was necessary to test the stationary state of all variables used in the estimates for both groups of countries. That was because non-stationary variables, whether in the time series or in panel data, caused false regression problem. But unlike what is conventional in the case of time series data, the Dickey-Fuller and the augmented Dickey Fuller (ADF) tests could not be used for the stationary test for panel data, so it was necessary to test the stationary state of mass variables. For this purpose, the Levin, Lin and Chu (LLC) test was only used for panel data whose results for all model variables are presented in Tables (1) and (2). These tables show the results of the collective unit root test including the trend on the variables used in the estimate.

Table 1: Results of the unit root test on the model variables in the selected developed countries

variable	statistic	probability
Lnggdp	-3.2356	0.0006
Sms	-3.5408	0.0002
Vot	-3.1606	0.0008
Ctp	-2.1848	0.0145
Lnsqrti	-2.5048	0.06

Source: researcher's calculations

Table 2: Results of the unit root test on the model variables in the selected developing countries

variable	statistic	probability
Lnggdp	-2.9850	0.0014
Sms	-2.3907	0.008
Vot	-2.1489	0.015
Ctp	-2.6498	0.004
Lnsqrti	-1.2701	0.09

Source: researcher's calculations

The null hypothesis of the Levin, Lin and Chu test showed variables were non-stationary. Therefore, if the calculated statistic value was larger than the value of the conventional confidence level, the non-stationary null hypothesis would be rejected. The results of Table (1) - the calculated statistic values and the probability of their acceptance - indicated that the null hypothesis for the selected developed countries was rejected at 99% level based on non-stationary variables for economic growth variables, the ratio of stock market value to GDP and the ratio of traded shares value in the stock market to GDP. The ratio variable of the banking sector credits paid to the private sector to GDP and the standard deviation of the stock price index were rejected at 95% level. All variables affecting the economic growth were stationary. Results of Table 2 showed that the null hypothesis for the selected developing countries was rejected at 99% level based on non-stationary variables for the economic growth variables, the ratio of stock market value to GDP and the ratio of banking sector credits paid to the private sector to GDP. Variables of the standard deviation of the stock price index and the ratio of traded shares value in the stock market to GDP were rejected at 95% level. Therefore, variables were stationary.

5.2 Analyzing the effect of financial development on economic growth under asymmetric information

For selecting between panel data and collective data, first variables were tested. An integration of F Limer statistic was used for this. In this test, the null hypothesis of equal intercepts (pooled data) was against the opposing hypothesis of heterogeneous intercepts (panel data). Considering the F value reported in Table 3, the F statistic values in developed and developing countries were respectively larger than the critical values of F(5,82)= 2.29 and F(13,206)= 1.80, therefore, the null hypothesis was rejected with a maximum error of 5%. Thus, panel data could be used to estimate both groups of countries.

After estimating the panel data model, the most important question was: were the cross-sectional effects fixed or random? Generally, there are two methods to estimate panel data models: fixed and random effects methods. Special tests determine which of the two methods should be used for a sample data. The Hausman test is one of the most common tests. The Hausman test's null hypothesis says the model has random effects. The test statistic chi-square is $\chi^2(4)$. According to the Hausman test results in Table 3, the test statistic values in developed and developing countries were larger than the critical value of $\chi^2(4)= 9.487$, therefore the null hypothesis was rejected with a maximum error of 5%, and the fixed effects model was accepted.

Table 3: F Limer statistic and the Hausman test for the economic growth model under asymmetric information

test	statistic
F test (developed countries)	F(13.206)= 6574.47
F test (developing countries)	F(5.82)= 5047.39
Hausman test (developed countries)	$\chi^2(4)= 103.38$
Hausman test (developing countries)	$\chi^2(4)= 112.5007$

Source: researcher's calculations

According to results of the Hausman test and F Limer statistic, model (3) was estimated in both studied countries using fixed effects to examine the effect of financial development on the economic growth under asymmetric information. To ensure any heteroskedasticity was removed, fixed effects model was estimated using generalized least squares (GLS).

In both groups of countries, however, this test could not be used for selecting between the two homoscedasticity and heteroskedasticity models, since the likelihood statistic value was negative. But since

LR test statistic was negative, the unrestricted model had less likelihood than the restricted model. Therefore, homoscedasticity was preferred over heteroskedasticity, and this verified the homoscedasticity model. Accordingly, the fixed effects model from the Hausman test was selected as the appropriate model.

Table 4: results of confirmed homoscedasticity model in the studied countries

countries	likelihood function logarithm		likelihood ratio statistic
developed	restricted	unrestricted	-521.42
	-515.0117	-254.2994	
developing	-218.9365	-147.3853	-143.1023

Source: researcher's calculations

Since there was an autocorrelation problem in the estimation model (3) for both studied countries, and that the test was done on the fixed effects model error confirmed by the Hausman test for the selected developed and developing countries, and its values of F(1,13) = 5.805 and F(1,5)= 125.75 were respectively larger than the critical statistic values of the Table in the error level of 5% F(1,13) = 4.67 and F(1,5) = 6.61, so the null hypothesis of this test suggesting that there was no first-order autocorrelation between model errors was rejected. Therefore, to remove the first-order autocorrelation between the errors, the first-order autocorrelation and Wooldridge tests were used whose estimated results are presented in Tables 5 and 6.

Table 5: results of estimating economic growth in developed countries

independent variables	model (3)		
	coefficient	t statistic	probability
Sms	0.083	4.07	0.000
Vot	0.614	3.85	0.000
Ctp	0.129	2	0.048
Lnsqrti	-0.012	-2.04	0.042
R^2=0.713			

Source: researcher's calculations

Table (6): results of estimating economic growth in developing countries

independent variables	model (3)		
	coefficient	t statistic	probability
Sms	-0.0480	-1.62	0.110
Vot	0.1035	3.57	0.001
Ctp	0.1438	3.63	0.001
Lnsqrti	-0.009	-0.39	0.06
R^2=0.54			

Source: researcher's calculations

The results of estimates were studied separately for variables available in the model first in developed countries and then in developing countries.

5-3 Analyzing results

Ratio of stock market value to GDP (sms): this index, as the financial development variable representing the stock market or market capitalization, was positive significant in developed countries. The index value represented that one unit increase in the stock market value led to 0.083% increase in developed countries' economic growth during the studied period. The results obtained were in accordance with theories' expectations, experimental results and research objectives. The positive relationship between the stock value index and economic growth showed that these countries had developed stock markets. Developed stock market meant more liquidity, and it provided the long-term financial needs for the economic projects and activities which were strongly related to the economic growth. This reduced the capital cost (both domestic and foreign) which was vital for the investment. As seen, there was a negative, though not statistically significant, relationship between the ratio of stock market value to GDP and economic growth in developing countries. So, it

seemed that developing countries' stock markets did not have large scopes, and failed to act proactively.

Ratio of traded shares value in the stock market to GDP (vot): There was a positive significant relationship between this measure and the economic growth in the target countries during the studied period, so that a unit increase in the traded shares value index led to 0.061% and 0.1% increase in the economic growth in developed and developing countries, respectively. In developed countries, this meant that the stock market was very active and dynamic. Since traded shares value was affected by shares prices and the volume of traded shares, prices were a green light for the optimal allocation of production factors, and also the number of traded shares increased. This led to the entry of a successful and an effective stock market in the economic growth. However, as the results showed, the size of this coefficient was higher in developing countries, and this was due to the considerable increase in the number of companies listed on the stock market in the last years of the studied period that led to the increased volume of traded shares in the stock market.

The ratio of banking sector credits paid to the private sector to GDP (ctp): is one of the measures for the financial development of ratio of banking sector credits paid to the private sector to GDP, in other words, it is customers' credit rating, so it is used as a measure to evaluate the symmetric information level in the banking system. Based on the results, there was a significant positive relationship between banking sector credits paid to the private sector to GDP and the economic growth in developed countries, so that a unit increase in the size of the index led to 0.12% increase in the economic growth in the studied period. This meant that there was a same-direction relationship between banking sector credits paid to the private sector and the economic growth, and this was one of the important factors affecting these countries' economic growth. Since this measure was a proxy for the asymmetric information in the banking system, the symmetric information in the banking sector of these countries could also contribute to their economic growth. In the selected developing countries, this variable also had a positive significant effect on the economic growth, and a unit increase in this index led to 0.14% increase in the economic growth. Then it could be said that since developing countries' economies faced with a vast public sector, strengthening the private sector through this index would have more effect on the economic growth. On the other hand, since this measure was considered as a proxy for the symmetric information level in the banking system, this showed that there was a positive significant relationship between the increased symmetric information level in the banking sector and developing countries' economic growth. This meant the more information was symmetric in the monetary market, and especially in the credits section as one of the most important sections of the banking system, the more successful banks were, and credit resources were optimally and fully allocated.

The standard deviation of the stock price index (lnsqrti): is the standard deviation coefficient of the stock price index used as a proxy for the symmetric information level (to quantify the asymmetric information variable) in the financial market. It was significant negative in developed and developing countries. This meant that a unit increase in the symmetric information level led to -0.012% and -0.009% reduction in these countries' economic growth, respectively. This meant that as the standard deviation of the stock price index increased, the economic growth decreased. This was compatible with empirical studies and existing theories in the economy. As the results showed, the standard deviation of the stock price index in developed countries was less than that of developing countries. This meant that since developed countries' financial markets resembled more to a perfect competition market, they had more symmetric information, and these markets' participants with homogeneous information might enter into or exit the markets freely.

Based on coefficients of all variables and their significance and considering the coefficient of determination model, explanatory variables included in the model could explain about 0.71% and 0.54% of the economic growth changes in developed and developing countries, respectively.

6 Conclusions and recommendations

This study aimed to examine the relationship between the development of financial sector and the real sector of economy under asymmetric information in the selected developed and developing countries (1993-2008) based on panel data. According to the results, all variables were consistent with theoretical expectations.

Based on the results, the standard deviation of the stock price index used as a proxy for the symmetric information level in developed countries' financial market was statistically effective on the economic growth at 95% confidence level, and the degree of symmetry was -0.012. It can be said that the standard deviation of the stock price index increased negatively, and it left a positive effect on the economic growth. This meant that information was specialized in this market, and all economic agents homogenously benefited from this information. Thus, people could better do resources and time allocation and achieve a higher productivity in an effective market by having access to more information. Also based on the results, this index had a significant negative effect on developing countries' economic growth, but since the coefficient was -0.009, these countries had a greater coefficient than developed countries. This indicated that the symmetric information in developing countries' financial markets was lower, because these markets had not much developed in producing, gathering and processing information in these countries. In developed countries, gathering and processing information for channeling investment funds to investors was done more. This paved the way for higher efficiency, and led to a further increase in the economic growth.

Also according to the results, the index ratio of banking sector credits paid to the private sector to GDP which was a proxy for the asymmetric information in the banking system (monetary market) was statistically significant in both groups of studied countries, and had a positive effect on the economic growth. But since this coefficient values were 0.14 and 0.12 in the selected studied developing and developed countries, respectively, the symmetric information in the monetary market, compared to financial market, had a more considerable effect on the economic growth in developing countries. According to the results, the development of financial market (stock market) and monetary market (banking system) was effective on the selected developed countries' economic growth. So it can be said that in developed countries, financial and monetary sectors mobilized savings and facilitated financing by reducing transaction costs and providing access to information. This led to more investment and ultimately to faster economic growth. But in developing countries, since the financial market had not much developed, financial systems based on the performance of financial market (stock market) played a lesser role in the diversification, risk management and dissemination of information. Thus, monetary market was preferred over financial market in the continued economic growth. According to the results, the size of vot coefficient in developing countries was larger than that of developed countries, since in the studied period, financial crises occurred in developed countries, and these countries had channeled their capital to developing countries' stock markets, and this increased the volume of traded shares.

6-1 Recommendations

1. Financial development usually occurs with the purpose to expand the stock market against the banking system, however, considering weaknesses in developing countries' stock markets, on the one hand, and these countries' widespread banking system, on the other hand, it is suggested that in order to increase banks' efficiency, banking credits be directed to entrepreneurial and knowledge-based projects, so that the economic growth increases due to high returns to investment in this area. This also paves the way for the formation and growth of stock market as soon as possible.
2. Considering that the symmetric information increases capital efficiency through integrating stock and market price, it is recommended that by providing a symmetric information environment, whether in the banking system or in the capital market sector, the financial structure be changed from the uniaxial to biaxial (based on both financial and monetary markets) in all countries, particularly developing countries, because the development of a country's financial structure occurs if these two axes interact properly. Therefore, a one-dimensional view, especially as an alternative, to these two systems is not systematic and logical.

More attention and efforts should be given to countries, especially developing countries, for developing financial markets and making them effective, and as a result, allocating resources more efficiently and increasing the investment's efficiency. The financial development can only lead to the economic growth and the increased symmetric information, if it can pave the way for optimally allocating resources, and increase capital efficiency.

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