Iranian Economic Review, Vol.14, No.23, Spring2009

Banks, Stock Market and Economic Growth: the case of Iran

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Abstract

The first paper empirically investigates the relationship between banks, stock market and economic growth emphasizing the transmission channels from financial development to growth in Iran using time series methodologies, namely Johansen's co-integration and Granger causality testing procedures in the context of Error Correction Models (ECM). The findings suggest that in our case study banks affect economic growth mainly through the capital accumulation channel. While, it appears that the stock market does cause growth only through the productivity channel. In contrast, the feedback effect, running causality from growth to finance, was found significant only for the stock market development. Generally, these results strongly support the supply-leading view.

Keywords: Bank Development; Stock Market; Economic growth; Causality; Supply-Leading Hypothesis; Demand-Following Hypothesis; Time Series.

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1- Introduction

Since the pioneering contributions of Goldsmith (1969), McKinnon (1973) and Shaw (1973), the relationship between financial development and economic growth has remained an important issue of debate. Numerous studies have dealt with different aspects of this relationship at both theoretical and empirical levels (see Levine, 2005 for a nice survey). At a basic level, several studies have attempted to establish whether financial development leads to improved growth performance. Others have emphasized on identifying the channels of transmission from financial development to growth.

The original contributions to this literature all coincide in suggesting that there is a strong positive correlation between the extent of financial development and growth. They emphasize, however, different channels of transmission. The main focus in Goldsmith (1969) is on the relationship between financial development and the efficiency of investment while McKinnon (1973) and Shaw (1973) emphasize the role played by financial liberalization in increasing savings and, hence, investment.

Research on the relationship between financial development and growth has received a new source of inspiration from the rapidly expanding endogenous growth literature. By focusing on cases where the marginal productivity of capital always remains positive, this literature provides a natural framework in which financial markets affect long run growth and not just transitional growth[1]. Models in this spirit include those of Bencivenga and Smith (1991 and Greenwood and Javanovic (1990). Section 2 provides a brief overview of these theoretical developments.

While empirical researches often find a positive relationship between indicators of financial development and growth, some controversy remains about the channel of transmission from financial development to growth. Some studies find support for the McKinnon and Shaw hypothesis while others conclude that there is no clear relationship between indicators of financial development and savings and investment rates.

1- In neo-classical growth models the most important source of growth, total factor productivity growth is treated exogenously and is thus obviously unrelated to the financial system. These models predicts that financial variables only influence the level of income rather than the growth of income because of the presence of diminishing return to capital.

Recently, a number of studies have investigated the effect of bank development on economic growth for the case of Iran (Al-Yousif, 2002; Al-Awad and Harb, 2005). To the best of my knowledge, none of these papers has sought to investigate the channels of transmission by which financial development affects economic growth. To help shed light on this issue, this paper attempts to re-examine the empirical relationship between financial development and economic growth by emphasizing the various transmission channels by which bank and stock market development can affect growth. To this end, I address two alternative competing hypotheses regarding financial development and economic growth in terms of their causal relationships, namely the supply-leading and demand-following hypotheses. In the first hypothesis, financial development leads to economic growth by two different channels: first, by raising the level of investment and capital accumulation; and second, by raising the productivity of capital. In contrast, in the second hypothesis financial development follows economic growth. As the real side of the economy develops its demand for new financial services appear leading to the growth of financial services.

The empirical investigation in this paper is conducted by employing time series methodologies, namely Johansen's co-integration analysis and Granger causality testing procedures in the context of error correction models because when variables are not stationary, as it is the case in our study, this approach is an efficient way of testing causality relations.

This paper proceeds as follows. Section 2 provides a brief review of the related theoretical and empirical literature regarding financial development and economic growth. Section 3 deals with the econometric methodology and data description. Section 4 outlines the empirical results, while Section 5 summaries and concludes the paper.

2-Financial Development and Economic Growth: Theory and Evidence

2-1- Theoretical Framework

The relationship between financial development and economic growth has received a great deal in the development economics literature. The

debate is not new and can be traced back to at least Shumpeter's (1911) Theory of Economic Development[1]. Later, Gurley and Shaw (1955) pinpointed the credit channel and more particularly the role of financial institutions in the supply of funds to the real activity, and emphasized the idea that differences in financial systems development may explain economic performances across countries. The debate was also largely influenced by the pioneering contributions of Goldsmith (1969)[2] and particularly the seminal contributions of McKinnon (1973) and Shaw (1973), who have stressed the crucial role of public policies in the mobilization of savings destined to investment financing.[3]

Recent theoretical work has incorporated the role of financial factors in models of endogenous growth[4] in an attempt to analyze formally the interactions between financial markets and long-run economic growth (for a survey see Levine, 1997, 2005). It is frequently argued that financial development can affect economic growth either one (or both) of the two channels: first, the development of domestic financial markets may enhance the efficiency of capital accumulation; and second, financial intermediation can contribute to raising the savings rate and thus the investment rate.

Greenwood and Jovanovic (1990), for example, present a model in which both financial intermediation and growth are endogenous. In their framework, the role of financial institutions is to collect and analyze

1-Schumpeter argued that finance does matter for economic development because financial institutions, by searching for successful innovation projects encourage entrepreneurs to produce better and more.

2- Goldsmith offered a more interesting contribution to the debate by defining with more accuracy the role of financial institutions. He concluded that the financial structure in the economy "*accelerates economic growth and improves economic performance to the extent that it facilitates the migration of funds to the best user, i.e., to place in the economic system where the funds will yield the highest social return*" (p.400).

3- McKinnon (1973) and Show (1973) consider that all forms of public control on the financial market achieved by quantitative instruments (directed credits for selected strategic sectors, high reserve ratios) or price instruments (interest rate ceiling) generate a financial repression situation characterized by negative real interest rates, low levels of savings, investments and therefore growth. Consequently, they have underscored the need for financial liberalization, the elimination of all forms of public intervention and freeing the real interest rate.

4- In the traditional literature on growth, emphasis has been placed on the dynamic process that would lead the economy to a steady-state equilibrium in which (per capita) output growth is determined by the exogenous technological progress.

information to channel investible funds to the investment activities that yield highest return. They show that there is a positive two-way causal relationship between financial development and economic growth. On the one hand, the process of growth stimulates higher participation in financial markets thereby facilitating the creation and expansion of financial institutions. On the other hand, financial institutions by collecting and analyzing information from many potential investors, allow investment projects to be undertaken more efficiently and hence stimulate investment and growth.

In Bencivenga and Smith's (1991) model, individuals face uncertainty about their future liquidity needs. Individuals can choose to invest in a liquid asset-which is safe but has low productivity- and/or illiquid asset-which is riskier but has high productivity. In this framework the presence of financial intermediation increases economic growth by channelling savings into the activity with high productivity, while allowing individuals to reduce the risk related to their liquidity needs. Although individuals face uncertain liquidity needs, banks by providing savings from disparate savers can allocate investment fund more efficiently because banks by the law of the large number, face a predictable demand for liquidity. In the absence of financial intermediaries, individuals may be forced to liquidate their investment when they needs arise.

Along similar lines, Levine (1992) analyzes the effects of alternative financial structures on economic growth. In this model, financial institutions raise the fraction of total savings devoted to investment and avoid premature liquidations of capital. Banks, stock markets, mutual funds, and investment banks enhance growth by promoting the efficient allocation of investment through various channels.

2-2- The Empirical Evidence

Theoretical developments regarding the importance of financial development for economic growth have induced many empirical investigations. A line of researches use cross-countries growth regression methods in which the average per capita income/investment/productivity growth rate over some periods is regressed on some measures of financial development and a set of control variables such as education, inflation rate,

trade openness, political instability index and the like. De Gregorio and Guidotti (1995), for example, examine the empirical relationship between long-run growth and financial development. They find that financial development is positively correlated with growth in a large cross-country sample, but its impact changes across countries, and is negative in a panel data for Latin America. Their findings also show that the main channel of transmission from financial development to growth is the efficiency, rather than the volume, of investment. Along similar line, Levine and Zervos (1998) by using cross-sectional data for 47 countries show that stock market liquidity and banking development both positively affect the economic growth, capital accumulation and productivity.

The problem with the cross-sectional approach is that it is based on the implicit assumptions that countries have common economic structures; thereby this fails to explicitly address the potential biases induced by cross-country heterogeneity or country specific effects. Beck and Levine (2004) then investigate the impact of stock markets and banks on economic growth using a panel data set for the period 1976–1998 and applying generalized method of moments techniques developed for dynamic panels. On balance, the results again tend to support the view that stock markets and banks positively influence economic growth.

Some studies use time series modelling to explore the finance- growth nexus. For example, Neusser and Kugler (1998) examine the causality between financial intermediation and economic performance for OECD countries. They point out that financial sector and GDP are co-integrated for many OECD countries; the causal link turns out to be empirically weak for the most of the smaller countries, which may be explained by degree of capital mobility[1]. However, the results suggest a more complex picture than is apparent from cross-sectional evidence. In words, the causal structure varies widely across countries and points at the importance of historical, institutional factors and the flow of international capital.

1- "The theoretical models are typically autarkic and implicitly assume that financial intermediation affects the flow of domestic savings to produce domestic investment…..access to international capital markets creates the possibility to smooth out the path of investment through temporary current account imbalances and may well change the character of domestic financial intermediation. Domestic finance may no longer be essential" (Neusser and Kugler, 1998, p. 645).

Arestis and Demetriades (1996) provide evidence suggesting that the causal link between finance and growth is considerably determined by the nature and operation of financial institution and policies pursued in each country "Two economies with similar financial systems and policies may exhibit different causality patterns between financial development and growth precisely because of differences between their levels of governance".

Kassimatis and Spyrou (2001) use a multivariate time-series methodology to study the effect of stock market and credit market on economic growth for five emerging countries. They find different results for these countries. For example, the result for Chile and Mexico show a negative relation between economic growth and the credit market due to the banking crises in the 1980 and 1990. In South Korea, equity and credit markets both affect economic growth, but not vice versa. In countries where the nature of the stock market has been speculative, like Taiwan, a negative relationship between equity market development and economic development is detected. In financially repressed economies, like India, the equity market does not affect the real sector growth.

Arestis et al. (2001) examine the relative impact of stock markets and banks on long-run economic growth in Germany, the USA, Japan, the UK and France. They find a positive effect of banks and stock markets on economic growth in most of the countries, but the effect of banks are more powerful. The same result is found by Hondroyiannis et al. (2005) for the Greek economy as well.

3- Econometric Methodology and Data

3-1- Econometric Methodology

In this study in order to empirically investigate the relationship between financial development and economic growth, we employ the Granger causality test in the context of the co-integrated VAR. Following the literature, an unrestricted VAR model with deterministic terms can be written as,

$$X_t = \sum_{i=1}^{p} \pi_i X_{t-i} + \delta t + \mu + \varepsilon_t \qquad \text{for } t = 1, \ldots\ldots, T \qquad (1)$$

Where, in this study, $X_t = [y, k, FD]$ is a vector of variables such as GDP per capita, per capita capital stock and indicator(s) of financial development, respectively. As will be explained in the next (data description) section, all variables are in logarithmic form except *FD* which is ratio. π_i are matrices of coefficients; μ and δ are vector of constant and trend coefficients respectively; and ε_t is a vector of white noise error terms.

Here the purpose is to examine the following causality questions. First, does financial development (*FD*) cause *y* through increasing in the capital accumulation (*k*)? Second, does *FD* cause *y* through improvement in the productivity of capital? Moreover, questions of reverse causalities are investigated.

Assuming stationarity of the variables, a Granger non- causality[1] test can be expressed as linear restrictions on a subset of parameters using standard method such as the F-test. However, if the variables are non-stationary the standard test is ineffective as the test statistics, in general, lack standard distribution (Sims et. al. 1990, Toda & Philips 1993). Furthermore, Engle and Granger (1987) show that a VAR model in first difference with co-integrated variables is misspecified; hence, results based on such models may lead to incorrect inferences. As a result, a popular approach of testing for causality in co-integrated VAR emerged in the literature is to re-parameterize the VAR model into the equivalent vector error correction model (VECM) and then to conduct causality tests following the Johansen-type error correction model (ECM) (Hall & Wickens, 1993). In this approach, after determining the order of co-integration we then conduct the causality test in the resulting rank-restricted model. In so doing, a vector error correction (VEC) representation of a *VAR(p)* model in equation (1) is written as follows:

1- Granger non causality can be defined by the assumption:

$$E\left[y_t \middle| y_{t-1}, z_{t-1}, y_{t-2}, z_{t-2}, \ldots\right] = E\left[y_t \middle| y_{t-1}, y_{t-2}, \ldots..\right]$$

It says that lagged values of z_t do not provide information about the conditional mean of y_t once lagged values of y_t (Greene, 2003). In fact, Granger causality is defined as the presence of feedback from one variable to another, while in Granger non causality there is no such as feedback. Granger causality testing is important because suppose that the policy instruments are z and that the target variables of economic policy are y. Without Granger causality from instruments to targets, policy is unlikely to be effective.

$$\Delta X_t = \gamma D_t + \sum_{j=1}^{p-1} \Gamma_j \Delta X_{t-j} + \alpha(\beta' X_{t-p}) + u_t \quad (2)$$

where X_t denotes an $n \times 1$ vector of I(1) variables as defined before. D_t is set of deterministic variables, such as constant, trend, and dummies, u_t is a vector of normally and independently distributed errors with zero mean and constant variance, and the Γ_j's are $n \times n$ short-run coefficients matrices.

The long-run relationship between variables in the model is given by the rows of β' thereby $\beta' x$ form stationary processes. The parameters in α are the weight by which each co-integrating vector enters the equations. They can be interpreted as speed of adjustment-parameters, in the sense that they measure the degree to which each variable adjusts to deviations from the long-run stationary relationship.

Equation (2) is a basic specification for the test of causality. A test of zero restrictions on the α (s) is a test of weak exogeneity in the long-run. Arestis et al (2001) use weak exogeneity tests to examine the issue of long-run causality between the variables in the system. However, the interpretation of weak exogeneity in a co-integrated system as a notion of long-run causality does not preclude being granger causality between variables in short run (Pesaran et al, 2000). Therefore, I consider both long-run and short-run parameters at the same time to conduct the causality analysis. This approach is also used in the empirical literature (see, e.g, Hondroyiannis et al, 2005). In this approach, the testing procedures for the identification of causality relationship when variables are unit roots requires running some restrictions on some parameters on matrices Γ and α. Suppose that vector X includes three variables $\{y, k, FD\}$, the ECM can be modelled as:

$$\Delta y_t = \gamma_1 D_t + \sum_{j=1}^{k} \Gamma_{1j}^{1} \Delta y_{t-j} + \sum_{j=1}^{k} \Gamma_{1j}^{2} \Delta k_{t-j} + \sum_{j=1}^{k} \Gamma_{1j}^{3} \Delta FD_{t-j} + \alpha_1 . \varepsilon_{t-1} + u_{1t} \quad (3)$$

$$\Delta k_t = \gamma_2 D_t + \sum_{j=1}^{k} \Gamma_{2j}^{1} \Delta y_{t-j} + \sum_{j=1}^{k} \Gamma_{2j}^{2} \Delta k_{t-j} + \sum_{j=1}^{k} \Gamma_{2j}^{3} \Delta FD_{t-j} + \alpha_2 . \varepsilon_{t-1} + u_{2t}$$

$$\Delta FD_t = \gamma_3 D_t + \sum_{j=1}^{k} \Gamma_{3j}^{1} \Delta y_{t-j} + \sum_{j=1}^{k} \Gamma_{3j}^{2} \Delta k_{t-j} + \sum_{j=1}^{k} \Gamma_{3j}^{3} \Delta FD_{t-j} + \alpha_3 . \varepsilon_{t-1} + u_{3t}$$

where ε_{t-1} is $\beta' X_{t-1}$ obtained from co-integrating vector(s).

In the framework of the above models, the causality analysis is conducted by testing for zero restrictions of the lagged variables coefficients and the error correction term(s) coefficients. The null hypothesis of Granger non-causality running from *FD* to *y* in presence of *k* is stated as: H_0: $\alpha_1 = 0$ and $\Gamma_{11}^3 = ... = \Gamma_{1k}^3 = 0$. Similarly, the null hypothesis of Granger non-causality running from FD to *k* in presence of *y* is stated as: H_0: $\alpha_2 = 0$ and $\Gamma_{21}^3 = ... = \Gamma_{2k}^3 = 0$. In each case, the Wald statistic will be asymptotically χ^2 distribution with degrees of freedom equal to the number of restrictions.

Using the procedures explained, we can identify the transmission channels from financial development to economic growth. To this end, a procedure analogous to that employed by De Gregorio & Guidotti (1995) and Ghirmay (2006) is used. That is, if financial development *FD* is found to causally affect real output *y* when a capital stock variable *k* is included (controlled for) in the model, it indicates that financial development affects economic growth by changing the productivity of capital. In this way, the productivity effect of *FD* is disentangled from its overall growth effect. In addition, if *FD* causally affects *k* when the output variable *y* is controlled for in the model, it means financial development causally affects *y* through affecting the capital accumulation channel because capital is one of the main factors that affect growth. Moreover, the reverse causality issues, i.e., whether increase in *y* causes *FD* is tested in a similar manner.

3-2- Data Description and Sources

Output is measured by the Non-oil GDP per capita (at constant 1997) because parts of the total GDP in Iran (on average 15%) related to the oil sector which is affected by the oil price and political-related factors. Investment in the oil sector is mostly financed by the government budget and less affected by the domestic financial development. Therefore, in our case the Non-oil GDP may show economic activities better than the total GDP.

Data on capital stock is measured by physical capital per capita in the Non-oil section. Since this data is unavailable, I construct it from the respective real gross investment series using the perpetual inventory method as:

$$K_t = (1-\delta)^t K_0 + \sum_{i=1}^{t} (1-\delta)^{t-i} I_i \qquad (4)$$

where K_t is the capital stock at time *t*, *I* is the level of investment and δ is the capital stock depreciation rate.

Equation (4) shows that to calculate the capital stock it is necessary to know, in addition to the amount of investment, the initial value of the capital stock and the depreciation rate. The depreciation rate is assumed about 5%, on average, in the non-oil sector.[1] Initial capital stock is estimated by following the method used by Filho (2002). The author generates the initial capital stock as

$$K_0 = \frac{1+g}{g+\delta} I_0 \qquad (5)$$

where *g* represents the investment growth.

Financial development is measured by different bank-based and market-based indicators[2] since there is no single, fully satisfactory measure of financial development.

Bank-based indicators

Some researchers traditionally use the *ratio of broad money or liquidity*[3] *(M2) to nominal GDP* as a measurement for financial depth (e.g. Goldsmith, 1969; Mackinnon, 1973). However, there are some problems with this measure of financial development. First, this ratio directly measures the extent of monetization (the ability of the financial system to

1- However, I estimated the depreciate rate based on the methodology employed by Dadkhah and Zahedi (1986). The results also confirms, on average %5 depreciate rate in the non oil sector.

2- Neusser and Kugler (1998) use the financial intermediation GDP as a measure of financial depth which include all activities carried out by banks, security brokers and dealers, investment funds, pension funds and insurance companies. To the extent that the value added represents the contribution of the sector to GDP, it would seem to be a potentially good measure. However, it is largely an input-based measure in an environment often characterized by lack of competition.

3- Liquidity consists of currency hold outside the banking system plus demand and interest-bearing deposit in the bank and nonblank financial intermediaries.

provide liquidity) rather than financial deepening (Asteriou and Price, 1999). Second, as noted by King and Levine (1993b), this type of financial depth indicator does not measure whether the liabilities are those of banks, the central bank or other financial intermediaries where the central bank functions different from the commercial banks. Third, governments strongly influence in banks in many countries and then the saving mobilized is being monopolized by governments.

The second measure is credit to private sector and state-owned (government) enterprises by money deposit banks. That is, *ratio of banks claims on the state-owned enterprises and non financial private sector to GDP*. In fact this measure excludes the credit granted to finance the government deficits; nevertheless, it also has some drawbacks. The banking systems that funnel credit to state-owned enterprises may not be evaluate selecting investment project, pooling risk, and providing financial service to the same degree as the banking system allocates credit to the private sector (King and Levine, 1993a). In fact, governments may pressure banks to channel financial resources to priority sectors, as defined by the government, rather than to the projects with the best risk-return opportunities.

The third measure is credit to private sector. This equals the *ratio of banks claims on the private sector to GDP*.

In this study among the bank-based indicators mentioned above I use banks claim on private sector divided by GDP because it is an appropriate indicator. However, for more sensitivity of results I also use total banks clams on private and state-owned enterprises divided by GDP as alternative measure because credits allocated to state-owned companies construct considerable share of total credits due to the state-dominated feature of the Iranian economy.

Market-based indicators

Theory does not provide a unique concept of stock market development to guide empirical research. Existing models suggest that stock market

development is a many-sided concept, involving issues of market size and market liquidity[1].

Analysts frequently use *market capitalization ratio* as a measure of stock market size and equals the value of listed shares on domestic exchanges divided by GDP. In term of economic significance, the assumption behind market capitalization is that the size of market is positively correlated with the ability to mobilize capital and diverse risk.

Researches also use market liquidity measures. Liquidity generally refers to the ability to easily buy and sell securities because liquidity allows investors to alter their portfolios quickly and cheaply, it makes investment less risky and facilitating longer-term, more profitable investment. A comprehensive measure of liquidity would quantify all the costs associated with trading such as the time costs and uncertainty of finding a counterpart and settling the trade. Usually two relevant measures are used for the market liquidity in the literature: *Value Traded* and *Turnover*.

Value Traded equals the value of total shares traded on the domestic stock market divided by GDP. It captures trading relative to the size of economy. Whereas, *turnover* equals the value of total shares traded on the domestic stock market divided by market capitalization. It measures trading relative to the size of stock market. High turnover is often used as an indicator of low transaction costs. A small, liquid market will have high Turnover but small Value Traded.

In this study amongst the market-based indicators mentioned above I use market capitalization ratio because it is a stock variable and the comparison with the bank-based index is more meaningful in the case of time series analysis (Hondroyiannis et al., 2005). Summary definitions of all variables used in this study are given in Table 1.

1- Regulatory and institutional are other factors that may influence the function of stock markets. For example, mandatory disclosure of reliable information about firms and financial intermediaries may enhance investor participation in equity markets.

Table1: Description of variables

Variable name	Description
Financial development indicators:	
RDCR	Ratio of total banks claims on private sector and state-owned enterprises to GDP
RPSCR	Ratio of banks claims on private sector to GDP
MCR	Capitalization ratio: ratio of the total value of listed shares to GDP
Other variables:	
y	Logarithm of real non-oil GDP per capita
k	Logarithm of real non-oil capital stock per capita

The source of most macroeconomic data, except capital stock is the Iranian Central Bank (I.C.B) which can be found in the bank website [*http://www.cbi.ir*]. Market capitalization ratio is computed based on the data obtained from Tehran Stock Exchange (TSE) which also can be found in the TSE website [*http://www.tse.ir*].

The data frequency is quarterly and covers the period 1990-2006. The choice of the period is based on the availability of time series data for all variables since there is no data for the Iranian stock market before 1989, and then we are not able to continue our analysis using the annual data. To afford this, the quarterly data spanning 1990:1-2006:4 is used.

4- Empirical Results and Discussion

Before conducting causality analysis using the procedures mentioned in the previous section, it is necessary to carry out some pre-tests, specifically, unit root and co-integration tests. Therefore, I begin by carrying out unit root tests, and then perform the co-integration tests and estimate long-run relationships and finally conduct causality tests based on the ECM models.

4-1- Unit Root Tests

I use Augmented Dickey Fuller (ADF) to test the presence of unit root for each variable. The results of ADF unit root test for the variables are reported in Table 2. The results based on the ADF test show that all variables are integrated of order one I(1).

Table 2: The ADF unit root tests of variables using quarterly data (1990:Q2-2006:Q4)

Description	Variable name	ADF		Conclusion at the 5% level
		levels	difference	
Log of real non-oil GDP per capita	y	1.43	-8.18	I(1)
Log of real non-oil capital stock per capita	k	1.72	-2.21	I(2)
Banks claims on private sector to GDP	RPSCR	1.25	-8.23	I(1)
Market capitalization ratio	MCR	-1.26	-4.46	I(1)

Note: The critical values at the 5% critical values for Models no intercept, with intercept, and intercept and trend are -1.97, -2.93, and -3.53, respectively. The corresponding 10% critical values are -1.61, -2.60, and -3.20, respectively.

4-2- Banks and Stock Market Development, and Economic Growth

Having verified that the variables are integrated of the same order, I(1), now I can perform co-integration tests. I use both the trace and maximum eigenvalue tests developed by Johansen (1988) to examine the existence of the long-run relationship between variables. The model includes four variables: a bank-based financial development measure (RPSCR), a market –based financial development measure (*MCR*), an output indicator (y) and capital stock per capita (k).

It is worth noting that in the testing procedures, the determination of the lag length of the VAR is carried through an extensive diagnostic test of the residuals. I select lag length using a specific-to-general approach of increasing the number of lags in the VAR until the Lagrange Multiplier test of serial correlation in the residuals fails to reject the null hypothesis. As shown in Table 3, the test statistic which has $\chi^2(d)$ distribution with degree freedom of d is $\chi^2(16) = 11.23$ [0.79]. This indicates that VAR(2) has no serial autocorrelation. Therefore, I choose lag=2 as an appropriate lag.

The results of co-integration test reported in Table 3 suggest a single co-integrating vector based on the trace and eigenvalue statistic. Therefore, long-run relationship between real output, banks development,

capital accumulation receives statistical support for the case of Iran over the period under examination.

The long-run relation is estimated by employing the Johansen maximum likelihood approach. Furthermore, for the statistical significance of variables in the co-integrating vector I use the likelihood ratio test. These results are reported in the down part of Table 3.

In order to have an economically interpretable relation, I use just identifying approach. Therefore, to identify the co-integrating relationship I restricted the coefficient of the real GDP to equal one. The identified co-integration vector shows a positive and significant relationship between the real GDP per capita and banking system development as well as a positive and significant capital stock per capita effect in the Iranian economy. The model also includes a trend showing the effect of exogenous technological changes over time and other development in the banking system, e.g., the payment system.

Table 3 Banks and stock market development, and economic performance: long-run estimation (Johansen co-integration analysis)

I(1) Variables(*y , k , RPSCR, MCR*)
Sample period: 1990:Q1-2006:Q4

Lag length of $VAR = 2$

Autocorrelation test based on Lagrange Multiplier at the 2nd order: $\chi^2(16) = 11.23$ [0.79]

H_0: $rank = r$	*Traces*	*Critical value at 5%*	*Max-eigen value*	*Critical value at 5%*
$r \leq 0$	80.2	63.8	38.5	32.1
$r \leq 1$	41.9*	42.9	21.7*	25.8
$r \leq 2$	20.2	25.8	13.1	19.3
$r \leq 3$	7.0	12.5	7.0	12.5

Estimated co-integrating vector

Normalized on LNOGDPP	LNOCAPP	RPSCR	MCR	Trend
Coefficient	0.377+	0.016	0.042+	0.003
Standard error	0.165	0.018	0.013	0.001
LR	2.4(0.11)	0.5(0.48)	4.5(0.03)	n.a.

Definition of variables:

y = Logarithm of non-oil real GDP per capita, *k* =Logarithm of real capital stock per capita in the non-oil section, RPSCR= ratio of total banks claims on private sector to GDP, and *MCR*= capitalization ratio.

Asterisk* shows the hypothesis cannot be rejected at the 5% level.

+ shows significance at the 5% level based on the likelihood ratio LR test statistic.

Figures inside parenthesis indicate *p*-value

In order to analyze the causality issue as well as distinguish the transmission channels from financial development to growth, I conduct the Granger causality tests based on the error correction models (ECM) specified in Equation systems (3) in the previous section. Two main channels as suggested in the literature are tested: the capital accumulation and the productivity channels. To this end, the following causality questions are tested:

- Does stock market and bank development cause economic growth through improvement in the productivity of capital?
- Does stock market and bank development cause economic growth through an increase in the capital accumulation?
- Does economic growth cause stock market and bank development?

The results of causality tests related to the above hypotheses by employing the standard Wald test in the context of the error correction models (ECM) are reported in Table 4. It must be noted that in the testing procedure, the specification of the ECM pass a series of diagnostic tests, including serial correlation and heteroskedasticity tests.

As shown in Table 4, during the period under consideration the null hypothesis that "banks' development does not Granger cause economic growth when the capital stock is controlled for in the model" is rejected at the 5% level. Also, the null hypothesis that "banks' development does not Granger cause the capital stock growth in the presence of *y*" is rejected at the 5% significant level. This evidence implies that banks' development affects economic growth through increasing both the capital accumulation and productivity channels in the Iranian.

The results of causality tests using the market based indicator are also reported in Table 4 Based on these results, the null hypothesis that "stock market development does not Granger cause economic growth when the capital stock controlled for in the model" is rejected at the 5% significant level. Furthermore, the null that "*stock market development does not Granger cause the capital stock growth*" is not rejected at the 5% significant level. This evidence implies that for the case of Iran, the empirical evidence supports that the stock market development affects economic growth through increasing the productivity of capital but evidence for increasing the capital accumulation is not found. This result may be because of the fact that the

Iranian financial system is a bank-based system and the size of the stock market is small compared with the banks; therefore, not much investment is financed in the stock market. On the whole, these results provide evidence that supports the supply-leading view, saying that financial developments promote economic growth.

The findings in this paper are consistent with those in Al-Yousif (2002) where he found some support for the causality between banking development and economic growth for the case of Iran. However, my findings of a significant effect of banking development on output are in sharp contrast to those of Al-Awad and Harb (2005) where they found no evidence of co-integration and causality between financial development and economic growth in the Iranian economy. This contrast is maintained by the empirical approaches pursued in this study. It is, thus, possible that the apparent insignificant effect of banking development on growth shown might be due to their failure to address accurate indicators for the financial development and output that is suitable for Iran. Their model includes four variables: real GDP, real government spending, real narrow money M1 and ratio of private credit to monetary base as an index for the financial development. They used real GDP as an output indicator while parts of GDP in Iran (on average 15%) related to the oil section and it is not affected by the financial development, so in this case the non-oil GDP may be show economic activities better than the total GDP. Moreover, the Iranian economy experienced some shocks such as the 1979 revolution, the imposed war with Iraq (1980-1988). Therefore, unstable situations were happened as a result of the war and revolution whereas their model does not take into account this issue.

In this paper I also carry out the reverse causality analysis to test the demand-following view. In so ding, the null hypothesis that "economic growth does not Granger cause banks' development" is rejected only marginally. However, the null hypothesis that "*economic growth does not Granger cause the stock market development*" is rejected at the 5% significant level and indicates that economic growth does affect the stock market development measured by the capitalization ratio. Therefore, based on the results during the period under consideration, empirically we find strong support for the demand-following view in the stock market. This finding is consistent with some evidence in Levine (1997), supporting the

fact that as economies develop, stock markets become larger, as measured by market capitalization relative to GDP.

Table 4: Banks and stock market development, and economic growth: causality tests

hypothesis:	*Wald test statistic*	*Results at the*	
		5% level	*10% level*
Productivity channel			
RPSCR does not cause economic growth	$\chi^2(3)=10.5$ [0.01]	Rejected	Rejected
MCR does not cause economic growth	$\chi^2(3)=9.8$ [0.01]	Rejected	Rejected
Capital accumulation channel			
RPSCR does not cause capital growth	$\chi^2(3)=8.2$ [0.04]	Rejected	Rejected
MCR does not cause capital growth	$\chi^2(3)=5.3$ [0.14]	Not rejected	Not rejected
Reverse effects			
economic growth does not cause *RPSCR*	$\chi^2(3)=6.3$ [0.09]	Not rejected	Rejected
economic growth does not cause *MCR*	$\chi^2(3)=8.1$ [0.04]	Rejected	Rejected

Definition of variables:

RPSCR= ratio of total banks claims on state-owned enterprises and private sector to GDP;

MCR= capitalization ratio.

Numbers in square brackets are probability values.

5- Summary and Conclusions

This paper has employed the Johansen method and Granger causality procedures in the context of error correction models to investigate empirically how banking system and the stock market development affect economic growth and vice versa in Iran over the period 1990-2006. It also examines two main transmission channels through which financial development affects economic growth: capital accumulation and the productivity of capital.

The findings suggest that there is a long-run relationship between banking system, the stock market development, and real GDP in Iran during the period under consideration. The causality test results indicate that empirically banks affect economic growth mainly through raising the capital accumulation and the productivity of capital. Furthermore, it appears that the stock market empirically does affect growth only through the productivity

channel. In general, these results strongly support the supply-leading view, implying that financial development promotes economic growth. Therefore, the main policy message of the paper findings is that financial development matters for the economic growth in Iran.

Finally, the feedback effect, running causality from growth to finance, was found significant for the stock market development; that is, as the economy grows it follows development in the stock market. This finding is consistent with evidence in Levine's (1997) study, supporting the fact that as economies develop, stock markets become larger, as measured by market capitalization relative to GDP.

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