Financial Determinants of Investment for Turkey

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ABSTRACT

One of the fundamental aims of economic policies is to increase capital accumulation in terms of investment that is necessary to maintain a desirable and sustainable growth rate in the developing countries. The majority of empirical studies show that per capita GDP growth, foreign trade, capital flows, external debt, public sector borrowing requirements, inflation and interest rate are the main determinants of investment rate. Recently, there is an increasing emphasis on the role of the financial sector in this process, since a financial system, in essence, mobilizes saving to investment. In particular, it can be argued that a well-functioning and developed financial system may efficiently mobilize available resources for investment. Therefore, the aim of this study is to investigate whether financial development has contributed to an increase in investment in Turkey. To reach an empirical and firm conclusion, an investment function, including the traditional potential determinants along with financial development, is estimated by utilizing the developments in the time series econometrics in terms of unit root tests that allow structural breaks and co-integration for the period 1970-2009 in Turkey.

Keywords: *VAR; Unit root; Co-integration; Investment; Financial Development; Turkey.*

Introduction

Analysis of data from a large sample of countries has consistently shown that the rate of accumulation of physical capital is an important determinant of economic growth (Levine and Renelt, 1992). Until 1980, Turkey pursued an industrialization strategy based on state-led import-substitution. Under this strategy the economy enjoyed rapid economic growth up to 1976. As a consequence of the rapid expansion of public demand and an investment boom, imports were, however, growing much more rapidly than exports, and the economy became increasingly dependent on foreign borrowing. From 1977 to 1980, growth collapsed virtually to zero, inflation accelerated, and foreign debt continued to increase. Controls on nominal interest rates caused extreme financial depression in this period. Administratively imposed ceilings on deposit and lending rates, credit rationing, and excessive reliance of corporations on credit rather than equity finance and other direct security issues were common characteristics of the pre-1980 financial regime in Turkey (Atiyas and Ersel, 1995).
Investments in the Turkish economy in the period after 1970 have increased consistently. However, during economic crises such as 1980, 1998 and 2001, numerical increase in investment has been observed, but relatively the rate of growth has decreased. In the last 30-year period only in the previous year of 2009 has a decrease in investment occurred. This decline in investment is a matter of concern, given the close connection between the level of investment and the rate of economic growth as documented in recent studies (Ben-David, 1998; Chari, Kehoe & McGrattan, 1997; Barro, 1991; Khan & Reinhart, 1990; Kormendi & Meguire, 1985). It is therefore worthwhile to investigate the factors that determine the level of domestic investment in these countries. This paper investigates the role of financial factors in determining domestic investment and private investment in Turkey. The premise of this study is that financial development facilitates the channeling of resources from savers to the highest-return investment activities, increases the quantity of funds available for investment, and thus mitigates the liquidity constraints faced by entrepreneurs. Thus a large and liquid financial system reduces the overall costs and risks of investment, which stimulates capital accumulation.
The analysis is based on a reduced-form investment model that relates a country's domestic investment to the level of financial development while controlling for other nonfinancial factors. Following a standard practice in time series analysis, the investment equation is specified as a dynamic serial correlation model (see Hsiao, 1986; Anderson & Hsiao, 1982, 1981). To test the effects of financial development on investment, four indicators are used alternatively: credit to the private sector, total liquid liabilities of financial intermediaries, credit provided by banks, and a composite index combining these three indicators.

Theoretical Approaches

Despite the remarkable attention devoted to investment behavior, the literature has not yet produced a full-fledged model of investment applicable to the context of developing countries. Conventional models such as the flexible accelerator proved quite successful in explaining aggregate investment in industrial countries. The main underlying assumptions of these models, however (such as the assumption of perfect capital markets, absence of liquidity constraints, and abstraction from the role of government), are highly questionable in the context of developing economies. Research in the past decades has shifted attention toward the role of financial factors in explaining investment over time and across countries. Studies that emphasize the role of financial determinants for investment in developing countries have revived the original ideas of Schumpeter (1932) about the importance of the financial system in promoting technological progress. These studies also embed the Keynesian view that the ``state of credit" is an important determinant of investment (Keynes, 1937, 1973).

Gurley and Shaw (1955) provided vital impetus to the Schumpeterian and Keynesian insights by tying economic growth directly to financial development. Gurley and Shaw suggested that "economic development is retarded if only self-finance and direct finance are accessible, if financial intermediaries do not evolve" (Gurley & Shaw, 1955, pp. 518-519). One key difference between developed and underdeveloped countries, as Gurley and Shaw argued, is the level of organization and sophistication of financial intermediaries, especially because of their role in facilitating the flow of loanable funds between savers and investors.

McKinnon (1973) and Shaw (1973) offered a theoretical and empirical foundation for the relationship between monetary factors and investment. These authors advanced the hypothesis that investment in developing countries is positively associated with the accumulation of real money balances. The McKinnon-Shaw hypothesis is based on the assumption that limited access to credit in developing countries forces investors to accumulate enough real balances before they can initiate investment projects. This view establishes a positive relationship between real interest rate and investment. Higher interest rates on deposits attract more real balances, which allow them to finance more investment. This contradicts the neoclassical view that higher interest rates increase the user cost of capital and thus reduce investment. Evidence for this neoclassical interest rate (relative price) effect is mixed at best. Recent studies go beyond the McKinnon- Shaw tradition and relate investment to financial development in general by emphasizing the special services that financial intermediaries provide to investors. The financial system is the key to matching financial resources to investors' needs both through short-term credit expansion and, through its maturity transformation function, by channeling saving into long-term credit markets. Financial markets play an important role in allocating investment capital to high return activities (Greenwood & Smith, 1997).

Financial intermediaries have a special function in alleviating information problems, reducing liquidity risk, reducing monitoring costs, and channeling credit to certain classes of borrowers that cannot access nonintermediated forms of credit (Levine, 1997).

This analysis implies that low investment in developing countries may be due to low financial intermediation characterized by a limited range of financial instruments, limited long-term lending, inefficient lending practices (for example, politically motivated lending), direct credit control, and crowding out of private investment by public borrowing for consumption purposes. The emphasis on the role of finance for investment constitutes a major improvement on the traditional view that domestic investment is primarily determined by domestic saving. This traditional view holds that the level of saving determines the interest rate and thus the cost of investment, which in turn influences the demand for new capital. Indeed, a number of studies have documented a close connection between low investment rates in developing economies and low domestic saving (Bayoumi, 1990; Dooley, Frankel & Mathieson, 1987; Feldstein & Horioka, 1980). These studies find that countries with low saving rates also have low investment rates. The positive relationship between domestic saving and domestic investment is often viewed as evidence of imperfect international capital flows and various country-specific institutional and noninstitutional rigidities (see Feldstein & Horioka, 1980). However, this approach, that assumes that saving directly causes investment, has important limitations. First, this view is an equilibrium (static) approach. Second, this view only considers the real side of the saving behavior and regards saving as a residue of income after consumption.

As some authors argue, it is more appropriate to consider saving as a financial phenomenon. Under this view, saving is regarded as a mechanism of supply of funds (directly and indirectly) to the capital markets that channel the funds into the investment process. In that sense, the financial sector benefits from positive externalities from the real sector through the volume of saving. This approach implies an important role of the financial system in the determination of the level of investment.

Empirical studies have shown that a number of nonfinancial factors also affect domestic investment in developing countries. This paper pays particular attention to three categories of factors: factors hypothesized by conventional investment theory (output growth and interest rate); factors related to government policy (government consumption, government borrowing, and inflation); and open-economy factors (trade flows, foreign debt, and black market activities).

Neoclassical investment theory suggests that the growth rate of real output is positively related to investment because it indicates changes in aggregate demand for output that investors seek to meet. Empirical evidence is consistent with this accelerator effect and shows that high output growth is associated with high investment rates (Fielding, 1997, 1993; Greene & Villanueva, 1991; Wai & Wong, 1982). Empirical tests have been less successful in establishing a robust negative relationship between the interest rate and investment. Neoclassical theory suggests that high interest rates raise the cost of capital, which reduces the investment rate.

Government policies affect domestic investment through various channels, too. The first is that government consumption spending may crowd out domestic investment by raising interest rates, by reducing the pool of funds in the markets, and by increasing distortionary taxation on investment activities. It is also possible, however, for government spending to "crowd in" domestic investment through the accelerator channel. The net effect is theoretically unpredictable; it can only be determined empirically. Government borrowing from the domestic financial system is another factor that can reduce investment.

Fischer (1993, p. 487) argues that the inflation rate serves as an indicator of the overall ability of the government to manage the economy. Since there are no good arguments for very high rates of inflation, a government that is producing high inflation is a government that has lost control. Evidently, there is little incentive to invest in a country where the government has lost control over the macroeconomic environment.

Trade flows, external debt, and black market activities also affect the rate of investment in sub-Saharan African economies. Empirical evidence shows that among the many measures of openness, the flow of trade (imports and exports) appears to have the most consistent relationship with investment. Levine and Renelt (1992) find that a positive relationship between investment and trade holds whether trade flows are measured by imports, exports or total trade (imports plus exports). Studies on developing countries in general in particular find a negative relationship between external debt and domestic investment (Jenkins, 1998; Greene & Villanueva, 1991). High debt can depress investment in various ways. First, high debt implies that a higher proportion of domestic output is used to meet debt obligations. This phenomenon, referred to as "debt overhang" (Krugman, 1988), creates a disincentive effect that discourages domestic investment. Second, high debt obligations adversely affect the country's position in international credit markets and can even cause credit rationing. The credit rationing effect can be important. Credit rationing thus amplifies the debt overhang effect in reducing domestic investment. Third, high levels of external debt depress investment by making the macroeconomic environment more uncertain. Chronic trade deficits combined with ill-advised monetary and exchange policies have created a shortage of foreign Exchange. This and other factors have caused black market activities to flourish. High black market premia tend to induce domestic investors to substitute foreign currency hoarding for investment in physical capital. In addition, black market premia may simply be a symptom of overvaluation of national currencies. This by itself can depress investment by reducing foreign demand for domestic products. Black market premia can also be a sign of pervasive price distortions in the economy that adversely affect investment.

Love and Zicchino (2006) applied vector auto regression (VAR) to firm-level panel data from 36 countries to study the dynamic relationship between firms' financial conditions and investment by using orthogonalized impulse-response functions in order to separate the 'fundamental factors' from the 'financial factors.' They found that the impact of financial factors on investment, which indicates the severity of financing constraints, is significantly larger in countries with less developed financial systems. Their finding emphasizes the role of financial development in improving capital allocation and growth and shows that the availability of internal funds is more important in explaining investment in countries with less developed financial systems. Furthermore, the impact of a positive shock to cash flow on investment was significantly higher in countries with a 'low' level of financial development than in countries with a 'high' level of financial development and they found that positive shock to marginal productivity has less impact on investment of firms in countries with low levels of financial development.

Saumitra N. Bhaduri (2005) investigated the impact of financial liberalization on the investment patterns in a developing economy, India. The empirical findings revealed mixed evidence in favor of the hypothesis that the liberalization effort has succeeded in relaxing financial constraint faced by the Indian firms. The sample set consisted of a composite and heterogeneous mix of 362 firms whose annual accounts were reported without any gap for the financial years 1989–1990 to 1994–1995. The small and young firms in the sample experienced a significant increase in financial constraint in the post-liberalization period.

Koo and Maeng (2005) found that firstly, financial liberalization significantly reduced the financial constraints confronted by firms. Secondly, the effect of financial liberalization on financial constraints was stronger for small and non-chaebol firms than large and chaebol firms. This suggested that various liberalization policies implemented in financial markets helped firms to get wider access to external finance. This paper investigated whether financial liberalization affected firms' investments in Korea. They tested for the hypothesis that financial liberalization had an impact on firms' investment behavior.

Scaperlanda and Laurence (1969) studied, by employing the least-squares multiple regression technique, the empirical data from the 1952-66 periods related to U.S. direct investment in the European Economic Community (E.E.C.). While the primary orientation of this study was to evaluate statistically the determinants of direct foreign investment, the findings also have a bearing on the effect of the E.E.C. on the patterns of U.S. direct investment. No statistical evidence was found in support of the tariff-discrimination hypothesis and while the relationship between the size of market variable and U.S. direct investment appeared to have been somewhat affected by the establishment of the E.E.C., the stability of the market-size elasticity between the pre- and post-E.E.C. periods indicated that the E.E.C. has had little impact on the sensitivity of I to changes in Y.

Günçavdı and Bleaney (2005) tested for shifts in aggregate private investment functions for Turkey as a consequence of financial liberalization in the early 1980s. Results for a neoclassical model in error correction form suggested that the short-run dynamics of investment were altered by financial liberalization, with reduced sensitivity to the availability of credit, but with no evidence of increased sensitivity to the cost of capital. Estimation of an Euler equation model indicated that credit constraints remained binding after liberalization. They interpreted this as evidence of significant structural change to private investment functions after financial liberalization, but with credit constraints continuing to operate. They attempted to estimate the impact of financial liberalization on the dynamics of private investment in Turkey by using an error correction version of the standard neoclassical model and also by an Euler equation approach based on the first-order conditions for dynamic profit maximization. In both cases, the results were limited by the use of aggregate data but it was important to test to what extent aggregate investment equations were liable to structural change under financial liberalization.

In the case of the error-correction model, they were able to find statistically significant evidence of structural change. Credit variables became much less important after liberalization, as expected, although cost variables did not become more important. The Euler equation model, on the other hand, displayed no significant structural break associated with financial liberalization. The results for the Euler equation model suggested that credit constraints were binding both before and after liberalization, which would explain why this model does not display structural instability, since the specification depends only on whether the constraint is binding (Güncavdı, Bleaney, 2005, 445;452).

Ndikumana (2006) investigated the effects of financial development on domestic investment in a sample of 30 sub-Saharan African countries. It was based on a dynamic serial-correlation investment model including various indicators of financial development, controlling for country-specific fixed effects and nonfinancial factors of investment. The results indicated a positive relationship between domestic investment (total investment and private investment) and various indicators of financial development. Higher financial development led to higher future levels of investment, implying a potent long-run effect of financial development on domestic investment. The findings implied that financial development could stimulate economic growth through capital accumulation.

Ang (2009) suggested that significant directed credit programs favoring certain priority sectors tended to discourage private capital formation in both countries. Interest rate controls appeared to have a positive impact on private investment, with the effect being more pronounced in Malaysia. While high reserve and liquidity requirements exerted a negative influence on private investment in India, the effect was found to be positive in Malaysia. The empirical evidence showed a significant steady-state relationship between private investment and its determinants. The results suggested that financial repressionist policies, in the form of significant directed credit controls, appear to have retarded private investment in both India and Malaysia. However, contrary to the financial liberalization thesis, interest rate restraints appeared to be an effective device in stimulating private investment in both countries. While high reserve and liquidity requirements tended to have an undesirable effect on private investment in India, they were found to be favorable in Malaysia. Malaysia had lower corruption and better law and order compared to India. In sum, their results tended to support the proposition that some form of financial restraint might have stimulated private investment.

Jongwanich and Kohpaiboon (2008) examined patterns and determinants of private investment in an attempt to understand why levels of private investment in South East Asia have not yet fully recovered, using Thailand as a case study. The private investment equation was estimated during the period 1960–2005. They found that it was capital fund shortages rather than existing spare capacity that hindered short-run investment recovery. In the long run, policy emphasis should have been on promoting a conducive investment climate. The key finding was that private investment in Thailand had borne the brunt of aggregate demand contraction since the outbreak of the Asian financial crisis in 1997. Among the short-run investments, credit shortage was the most important constraint on investment recovery following the crisis. In the long run, private investment was mostly determined by business opportunities and investment costs.

Spiegel (2000) indicated that financial development positively influenced both rates of investment and total factor productivity growth. In summary, they found that different aspects of financial development had positive influences on total factor productivity growth and rates of factor accumulation. While the ratio of private-sector liabilities to income had a fairly robust impact on total factor productivity growth, it entered with its predicted sign only in the accumulation of physical capital, and even then the performance of that variable was not robust to the inclusion of country fixed effects. The indicator of liquid liabilities as a share of income performs similarly, although it was not as robust to the inclusion of fixed effects as the private liabilities ratio in the growth equations.

Morck et al. (1990) tried to question how the stock market affected investment. For their analysis, they investigated the effect of stock returns and the growth in fundamental variables on investment growth in order to see how important the stock market was after controlling for fundamentals. The firm-level regressions showed that movements in relative share prices were associated with fairly large and statistically significant investment changes when fundamentals were held constant, but the incremental R2 from relative stock returns was fairly small. The cross-sectional variability of investment was sufficiently large that relative stock returns could account for only a small part of it. They argued that the explanatory power of relative stock returns for investment was unlikely to be evidence that the stock market provided new information to managers, since managers probably learned little from the market about their own firms' idiosyncratic prospects. They also provided evidence that the relation between relative stock returns and investment was not driven by the costs of external financing. The explanatory power of relative stock returns for investment might be evidence of the market exerting pressure on managers, although it also seemed likely that the market was picking up the effect of imperfectly measured fundamentals.

Gordon (1964) presented the results of empirical work undertaken to test the theory's ability to explain the annual investment of the firm. 23 large chemical corporations were selected and data was obtained to provide the value of each variable for the years 1954 through 1960, thereby providing 161 observations on each variable. This study's conclusions might be summarized as follows: First, a large proportion of the scale deflated variation in investment in the sample was explained by the security flow variable, the investment consistent with maintaining a satisfactory level of security made possible by the period's operations. Second, the correlation with the profitability variable was quite small. While this might be due to lack of influence on the level of investment, it was quite possible that the cause was the limitations of the change in sales as a measure of rate of return on investment.

Methodology

Let us first define d to be the degree of integration of a time series At. More precisely, if At achieves stationary after being differenced d times, it is said to be integrated of order d, denoted by At ~ I(d). Thus, an I(1) variable is a variable that achieves stationarity after being differenced one.

A necessary condition for testing for a long-run relationship between two or more variables is that these variables are I(1), i. e., stationary in first differences. We, therefore, first test for a unit root using the conventional unit root tests such as ADF (see Dickey and Fuller, 1981; Said and Dickey, 1984) and KPSS (Kwiatkowski-Phillips-Schmidt-Shin, 1992) tests. Besides, in order to capture any possible structural shift over the estimation period, we also employ Perron (1997). This test allow for a single break at an unknown time under the alternative hypothesis of trend-stationarity. While it is true that the Perron (1997) test, by virtue of accounting for one structural break, is an advance over standard ADF and KPSS tests, it is argued that the Perron test may lose power when confronted with two or more breaks (see Lee and Strazicich, 2003). To address this problem, there is a procedure devised by LS (2003) which proposes a model that tests endogenously for two or more structural breaks.

If the examined series for the given country are deemed to be I(1), the next step is to establish whether they are cointegrated or not. To this end, we relied on the Johansen & Juselius (1990) co-integration test. If the series are not cointegrated we follow with the Vector Autoregressive (VAR) model. The VAR model, recently, is one of the most used time series analysis. The VAR model is flexible, easy to estimate, and it usually gives a good fit to macroeconomic data. However, the possibility of combining long-run and short-run information in the data by exploiting the co-integration property is probably the most important reason why the VAR model continues to receive the interest of both econometricians and applied economists. Since, there is no constraint in the VAR approach and it gives dynamic relations between the variables, it is used more for the time series (Keating, 1990:453-454). One of the advantages of the VAR approach is that variables are endogenously determined. Secondly, the VAR approach allows the variables depending more than white noise terms or lag of variables. Thus VAR model becomes more flexible than AR models and since the VAR approach includes most properties of data, it offers a strong structure. Moreover, every equation may be solved by OLS (Ordinary Least Squares) because there is no simultaneous terms right side of the equation. As Sims (1980) claims, huge scaled structural models fail to forecast out of sample estimation (Brooks, 2008:291; Greene, 1993:553).

Simply, as y_{1t} and y_{2t} are the variables, the VAR model can be defined as follows (Brooks, 2008:290):

$$
\begin{aligned}
y_{1t} &= \beta_{10} + \beta_{11} y_{1t-1} + .. + \beta_{1k} y_{1t-k} + \alpha_{11} y_{2t-1} + .. + \alpha_{1k} y_{2t-k} + u_{1t} \\
y_{1t} &= \beta_{20} + \beta_{21} y_{2t-1} + .. + \beta_{2k} y_{2t-k} + \alpha_{21} y_{1t-1} + .. + \alpha_{2k} y_{1t-k} + u_{2t} \qquad (1)
\end{aligned}
$$

Current values of variables depend on the k lag of the variables and error terms. Here it is white noise error term and while i=1,2 E (u_{it}) =0 ve E ($u_{1t}u_{2t}$)=0. The assumption of uncorrelated error terms with their lagged values makes no constriction to the VAR model. The reason for this is that by increasing the lag length of the variables autocorrelation problem is achieved (Güloğlu ve Özgen, 2004:96). Lag length is determined by Akaiki Information Criteria (AIC), Schwarz Information Criteria (SIC), Hannan-Quinn Information Criteria (HQ) and Final Prediction Error (FPE). All variables have to be stationary in the VAR approach. But, Sims (1980) and Sims, Stock and Watson (1990) claim that whether variables have unit root or not, differencing procedure needs not to be applied. When differencing procedure is applied, long-run relationship between the variables can be lost (Enders, 2004:270). On the other hand, Fuller (1976) asserts that differencing a series doesn't show an asymptotic efficiency (Günçavdı et al., 2000: 160). Thus, if the series are not cointegrated, VAR approach is used with differencing I(1) variables. In this paper we use both Sims and Fullers approach, and then we write the best one that explains the economic theory. To interpret the VAR results impulse-response function, variance decomposition and granger causality are used.

Data and Formation of Variables

All data are gathered from International Financial Statistics online services reported by the International Monetary Fund (IMF). This publication has annual data for Turkey from 1970 to 2009. The variables used in this paper are:

Total gross domestic investment as a percentage of gross domestic products (GDP) : I_t
Private domestic investment as a percentage of GDP: PI_t
Real per capita gross domestic product : $PGDP_t$
Growth rate of GDP deflator (Inflation) : Inf_t
Discount rate (real interest rate): r
Financial development indicators (see Ndikumana, 2000; Levine, 1997; Demirgüc-Kunt and Maksimovic, 1996; Lynch, 1996 for a discussion of measuring the items of financial development). By following Ndikumana (2000),
Total credit to the private sector as a percentage of GDP **(FD1)**
The ratio of broad money to GDP is used as a measure of size of the financial sector **(FD2)**
The relative importance of banks in the supply of credit is measured by total domestic credit provided by the banking sector as a percentage of GDP **(FD3)**
Claims on government as a percentage of GDP **(FD4)**
A composite index of financial development **(FDindex)**

The formula for the FDindex that is developed by Demirgüc-Kunt and Levine (1996) is adapted to our paper as the following:

$$FDindex = \frac{1}{4}\sum_{i=1}^{4}\left[100*(FD_i / \overline{FD}_i\right] \tag{1}$$

where FDi is an indicator of financial development, $\overline{FD_i}$ the sample mean of indicator i. Since we have four financial development indicators, we use 4 for the maximum number of total symbol.

In this paper, we create two main models dealing with It and PIt. In these models besides real interest rate (r), real per capita gross domestic product (PGDPt), inflation (inf); financial development indicators are changed to each other to see their individual effect on I_t and PI_t, i.e.:

Investment Model (Model A)

I_t = f(r, $PGDP_t$, inf, FD_i) for $1 \le i \le 4$ and i=index (2)

Private Investment Model (Model B)

PI_t= f(r, $PGDP_t$, inf, FD_i) for $1 \le i \le 4$ and i=index (3)

Empirical Results

Unit root test results

To start with the ADF and KPSS tests were applied both on levels and on the first differences of I_t, PI_t, $PGDP_t$, Inf_t, r, FD1, FD2, FD3, FD4 and FDindex. The results are summarized in Table 1.

The tests on the level series (Table 1) unequivocally indicate that all variable are non-stationary for the ADF but KPSS test indicates that PI_t, FD1, FD2, FD4 and FDindex are stationary. In first differences, except Inft and FD2 with KPSS test, all variables are stationary.

Table 1. ADF and KPSS Unit-root Test Results

Variables		ADF		KPSS	
		Level	First Difference	Level	First Difference
		t_ψ	t_ψ	t_ψ	t_ψ
I_t		-2,028	-6,517(*)	0,157	0,053
PI_t		-1,410	-4,592(*)	0,109	0,065
$PGDP_t$		-4,274	-7,519(*)	0,768	0,118
r		-0,021	-5,697(*)	0,175	0,112
Inf_t		-0,729	-6,141(*)	0,179	0,170
FD1		-2,287	-4,907(*)	0,100	0,133
FD2		-3,337	-8,246(*)	0,135	0,500
FD3		-1,154	-4,800(*)	0,148	0,076
FD4		-2,608	-6,854(*)	0,083	0,053
FDindex		-1,699	-5,546(*)	0,120	0,056
Critical Values	%1	-4,211	-4,211	0,216	0,216
	%5	-3,529	-3,529	0,146	0,146
	%10	-3,196	-3,196	0,119	0,119

Note: All regression variables are in logarithm. Asterisks *, **, ***, show significance of 1%, 5% and 10% levels respectively. The critical values are obtained from MacKinnon (1991) for the ADF test and from Kwiatkowski et al. (1992) for the KPSS test. ADF test examines the null hypothesis of a unit root against the stationary alternative. KPSS tests the stationarity null hypothesis against the alternative hypothesis of a unit root.

I.e., Since ADF and KPSS tests are in conflict, as we emphasize in the methodology part, there may be structural breaks. So we apply Perron and LS unit root tests to see more accurate results. Perron (1997) and Lee-Strazicich (2003) tests indicate that regime shifts in all the variables.

Table 2. Perron and LS Unit-root Test Results

Variables		Perron(1997)				LS(2003)			
		Level		First Difference		Level		First Difference	
		TB	t_ψ	TB	t_ψ	TB	t_ψ	TB	t_ψ
I_t		1997	-4,83	2002	-7,54*	1997DT	-3,97	2005DT	-7,78*
PI_t		1991	-5,52**	2002	-5,23	2000D	-3,69	1996DT 2002DT	-6,52*
$PGDP_t$		1996	-5,81*	1997	-9,03*	1983DT	-4,58	1996DT	-8,42*
Inf_t		1992	-3,57	1980	-6,74*	1999DT	-4,53	1979DT 1982DT	-7,91*
r		1986	-2,46	1979	-7,58*	1981DT 2004DT	-4,04	1978DT	-7,32*
FD1		2006	-5,10	1996	-7,06*	1998D 2005DT	-5,91	1994DT 1994D	-5,90*
FD2		2007	-4,57	2008	-4,16	1987DT	-5,17	1979DT	-9,10*
FD3		1987	-4,48	2000	-5,20	1986DT 1992DT	-4,74	1990D	-6,00*
FD4		1989	-4,42	1989	-10,65*	1987DT 1991DT	-4,61	1989D 1992DT	-11,39*
FDindex		1987	-4,52	1989	-6,34*	-----	-4,04	1985D	-6,33*
Critical Values	%1	-6,32		-6,32		-6,28		-6,28	
	%5	-5,59		-5,59		-5,62		-5,62	
	%10	-5,29		-5,29		-5,24		-5,24	

Note: All regression variables are in logarithm. Asterisks *, **, ***, show significance of 1%, 5% and 10% levels respectively. TB shows the structural break time. D is dummy variable and DT is trend dummy. The critical values are obtained from Perron (1997) for the Perron test and from Lee and Strazicich (2003, 2004) for the LS test. Perron and LS tests examine the null hypothesis of a unit root against the stationary alternative.

The results of Perron and LS unit root tests presented in Table 2 provide further evidence of the existence of a unit root when breaks are allowed. The estimated results of unit root tests indicate that all variables are I(1) as the null hypothesis of non-stationary can not be rejected at conventional significance levels.

Co-integration test results

Since it is agreed that all variables are I(1), we start to investigate whether there is a long run relation between the variables in Model A and B. Table 3 shows the co-integration relation of (total gross domestic investment as a percentage of gross domestic products) It with financial development indicators and a list of control variables consisting of inflation, growth rate of real per capita GDP and real interest rate.

Table 3. Johansen Co integration Results Where r=Number of Co-integrating Vectors for Model A

Variables in Co-integrating Vector	Null	Alternative	Trace	%95 Critical Value	$\lambda-\max$	%95 Critical Value
			1 lag		1 lag	
Model with FD1	$r=0$ $r\leq 1$	$r=1$ $r=2$	69,98 42,31	69,81 47,85	27,67 24,47	33,87 27,58
Model with FD2	$r=0$ $r\leq 1$	$r=1$ $r=2$	62,19 40,19	69,81 47,85	21,99 17,79	33,87 27,58
Model with FD3	$r=0$ $r\leq 1$	$r=1$ $r=2$	64,01 39,46	69,81 47,85	24,55 17,84	33,87 27,58
Model with FD4	$r=0$ $r\leq 1$	$r=1$ $r=2$	59,99 30,87	69,81 47,85	29,12 12,12	33,87 27,58
Model with FDindex	$r=0$ $r\leq 1$	$r=1$ $r=2$	60,82 36,99	69,81 47,85	23,83 15,06	33,87 27,58

Table 4 shows the co-integration relation of (private domestic investment as a percentage of GDP) PI_t with financial development indicators and a list of control variables consisting of inflation, growth rate of real per capita GDP and real interest rate.

Table 4. Johansen Co-integration Results Where r=Number of Co-integrating Vectors for Model B

Variables in Co-integrating Vector	Null	Alternative	Trace	%95 Critical Value	$\lambda-\max$	%95 Critical Value
			1 lag		1 lag	
Model with FD1	$r=0$ $r\leq 1$	$r=1$ $r=2$	65,84 39,63	69,81 47,85	26,21 21,30	33,87 27,58
Model with FD2	$r=0$ $r\leq 1$	$r=1$ $r=2$	65,15 39,98	69,81 47,85	25,17 18,68	33,87 27,58
Model with FD3	$r=0$ $r\leq 1$	$r=1$ $r=2$	66,41 42,87	69,81 47,85	23,53 21,69	33,87 27,58
Model with FD4	$r=0$ $r\leq 1$	$r=1$ $r=2$	57,10 33,53	69,81 47,85	23,56 16,10	33,87 27,58
Model with FDindex	$r=0$ $r\leq 1$	$r=1$ $r=2$	62,99 41,01	69,81 47,85	21,98 20,26	33,87 27,58

Thus, since series are not co-integrated in both Table 3 and Table 4, the VAR approach is used with differencing all I(1) variables to make them stationary.

Variance Decomposition Results
Model A

Here, for all models, total gross domestic investment is affected by itself along all 10 periods time. Especially, Model A-FD1 analysis shows that relative to the other models at the end of 10th period effect of total credit to private sector (FD1) is evidently determined (See Appendix-i (Model A)).

Model B

At the end of the 10th period private domestic investment, for all models, is affected from inflation and real interest rate variables as a percentage of 30% (See Appendix-i (Model B)). Especially, in the model with FD3 (domestic credit provided by the banking sector), relative to other financial development items, at the end of 10th period domestic credit's effect is higher on private domestic investment (See Appendix-i (Model B-FD3)).

Impulse Response Analysis

Impulse response functions describe how the economy reacts over time to exogenous impulses, which economists usually call 'shocks', and are often modeled in the context of a vector auto-regression. Impulse response functions describe the reaction of endogenous macroeconomic variables at the time of the shock and over subsequent points in time. Impulse Response Analysis results are given in the appendix-ii by graphs. We investigate the dynamic responses of variables against one unit standard error shocks to the other variables. While dotted lines show the significance bounds, straight line gives the estimates.

Model A

Against the effect of an exogenous shock or innovation in FD1, FD3, and FD4 there exists a positive effect on the total investment in the short term and then at the end of 10th period total investment tends to its mean value. Against the effect of an exogenous shock in FD2 there exists a negative effect on the total domestic investment. As a total effect of financial development items we can analyze the effect of a shock in FDindex. As a result of this a positive effect also occurs on total domestic investment (I_t) in the short term but It again tends to its mean at the end of the 10^{th} period. On the other hand, as an impact to the effect of an exogenous shock in control variables (inflation, real interest rate and real per capita GDP), a negative effect occurs on the total domestic investment in the short term.

Model B

Against the effect of an exogenous shock or innovation in FD1,FD2, and FD4 there exists a positive effect on the private investment in the short term and then at the end of the 10^{th} period private investment tends to its mean value. As an impact to the effect of an exogenous shock in FD3 there exists a negative effect on the private domestic investment. As a total effect of financial development items we can analyze the effect of a shock in FDindex. As a result of this a positive effect also occurs on private domestic investment (I_t) in the short term but It again tends to its mean at the end of 10th period.

On the other hand, against to the effect of an exogenous shock in inflation and real interest rate, there exists a negative effect on the private domestic investment. But, after an effect of an exogenous shock in real per capita GDP, there exists a positive effect on private investment.

Granger Causality Results

The term causality suggests a cause and effect relationship between two sets of variables. Table 5 shows the Granger Causality results of Model A with FD1.

Model A

Table 5. Model A with FD1

Null Hypothesis:	Obs	F-Statistic	Probability
DLNPGDP does not Granger Cause DLNI	37	1.00114	0.37868
DLNI does not Granger Cause DLNPGDP		1.84336	0.17470
DR does not Granger Cause DLNI	37	0.74486	0.48285
DLNI does not Granger Cause DR		0.18083	0.83542
DLNFD1 does not Granger Cause DLNI	37	4.48833	0.01913
DLNI does not Granger Cause DLNFD1		0.60694	0.55117
DLNINF does not Granger Cause DLNI	37	0.78625	0.46415
DLNI does not Granger Cause DLNINF		1.96594	0.15657

In the Table 5 it is seen that total credit to the private sector (FD1) may Granger-cause total gross domestic investment. Since no other Granger cause is found, other tables are given in the appendix-iii.

Model B

Here, inflation and real interest rate may Granger-cause private domestic investment for all Granger causality results for model B. On the other hand, there is not any significant Granger cause between the other variables (See appendix-iii (Model B))

Conclusion

The study is based on Turkish data from 1970 to 2009. The results mainly indicate a positive relationship between total domestic investment and all four indicators of financial development as we create a composite index of financial development items. The results are qualitatively similar for total domestic investment and private investment, with stronger effects of financial factors on private investment than on total domestic investment. The findings also suggest that high financial development is a predictor of future levels of domestic investment. Higher financial development in the 1980s is associated with higher investment levels in the 1990s and 2000s. The results also confirm stylized facts for other determinants of investment. Inflation and real interest rate negatively affect total domestic investment. Domestic investment, however, is negatively affected by real per capita GDP growth (accelerator effect). On the other hand, private investment is positively affected by real per capita GDP growth.

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Appendix-i

MODEL A Variance Decomposition Tables

Variance Decomposition of DLNI:***Model A-FD1***

Period	S.E.	DLNI	DLNFD1	DLNINF	DLNPGDP	DR
1	0.108189	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.114674	91.31028	4.141264	0.614225	0.982688	2.951546
3	0.116760	88.10730	4.600590	3.056185	0.962059	3.273865
4	0.117296	87.56561	4.802083	3.037059	1.091725	3.503523
5	0.117427	87.37640	4.845550	3.127242	1.091581	3.559228
6	0.117456	87.34178	4.843689	3.160769	1.094995	3.558767
7	0.117465	87.33265	4.849448	3.161032	1.096584	3.560289
8	0.117468	87.32892	4.850649	3.162232	1.096610	3.561588
9	0.117468	87.32812	4.850598	3.163013	1.096644	3.561628
10	0.117468	87.32794	4.850696	3.163040	1.096680	3.561647

Variance Decomposition of DLNI:***Model A-FD2***

Period	S.E.	DLNI	DLNINF	DLNPGDP	DR	DLNFD2
1	0.108458	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.115583	90.72336	2.729410	3.081509	3.400433	0.065293
3	0.117364	88.51779	3.847332	3.520241	3.662834	0.451802
4	0.117540	88.43920	3.842494	3.530372	3.721340	0.466594
5	0.117549	88.42730	3.852711	3.529824	3.723527	0.466635
6	0.117552	88.42511	3.854248	3.529811	3.723440	0.467393
7	0.117553	88.42507	3.854273	3.529792	3.723418	0.467443
8	0.117553	88.42506	3.854279	3.529793	3.723430	0.467443
9	0.117553	88.42505	3.854284	3.529793	3.723431	0.467444
10	0.117553	88.42505	3.854284	3.529793	3.723431	0.467444

Variance Decomposition of DLNI: ***Model A-FD3***

Period	S.E.	DLNI	DLNINF	DLNPGDP	DR	DLNFD3
1	0.108065	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.115639	89.56568	3.279691	3.311463	3.312430	0.530732
3	0.116991	87.60536	4.342173	3.892787	3.398263	0.761415
4	0.117374	87.10785	4.333262	3.910996	3.517622	1.130270
5	0.117446	87.01222	4.388973	3.910662	3.516091	1.172049

6	0.117453	87.00204	4.391217	3.912851	3.520461	1.173432
7	0.117453	87.00186	4.391203	3.912857	3.520542	1.173535
8	0.117453	87.00182	4.391203	3.912859	3.520550	1.173564
9	0.117453	87.00181	4.391203	3.912859	3.520550	1.173576
10	0.117453	87.00181	4.391203	3.912859	3.520550	1.173580

Variance Decomposition of DLNI: ***Model A-FD4***

Period	S.E.	DLNI	DLNINF	DLNPGDP	DR	DLNFD4
1	0.108420	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.115961	89.84121	3.438107	3.219958	3.360777	0.139953
3	0.117277	88.01535	4.623120	3.656558	3.555080	0.149895
4	0.117396	87.85444	4.616059	3.655720	3.704141	0.169644
5	0.117410	87.83481	4.628621	3.658869	3.708052	0.169644
6	0.117412	87.83338	4.629506	3.659176	3.708235	0.169705
7	0.117412	87.83337	4.629501	3.659171	3.708251	0.169706
8	0.117412	87.83335	4.629511	3.659171	3.708257	0.169706
9	0.117412	87.83335	4.629513	3.659171	3.708257	0.169706
10	0.117412	87.83335	4.629513	3.659171	3.708258	0.169706

Variance Decomposition of DLNI: ***Model A -FDindex***

Period	S.E.	DLNI	DLNINF	DLNPGDP	DR	DLNFDINDEX
1	0.107382	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.115634	88.22844	3.415930	3.567548	3.338606	1.449480
3	0.116954	86.28256	4.611005	4.194833	3.307889	1.603709
4	0.117296	85.89115	4.591966	4.224296	3.413893	1.878697
5	0.117336	85.84443	4.617251	4.221599	3.425451	1.891273
6	0.117341	85.83787	4.616976	4.225583	3.428218	1.891353
7	0.117341	85.83779	4.616990	4.225597	3.428222	1.891399
8	0.117341	85.83778	4.616989	4.225599	3.428231	1.891403
9	0.117341	85.83777	4.616989	4.225602	3.428232	1.891406
10	0.117341	85.83777	4.616989	4.225602	3.428232	1.891407

MODEL B Variance Decomposition Tables

Variance Decomposition of DLNPI: ***Model B-FD1***

Period	S.E.	DLNPI	DLNFD1	DLNINF	DLNPGDP	DR

1	0.111704	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.131884	72.90510	0.361952	11.97497	0.144374	14.61360
3	0.137132	68.00580	0.997606	16.18442	0.608559	14.20362
4	0.138684	67.20303	1.899030	15.85363	1.005528	14.03878
5	0.139195	66.76867	2.102646	15.95689	1.002418	14.16937
6	0.139354	66.64278	2.097979	16.05452	1.019089	14.18564
7	0.139404	66.62735	2.116462	16.04905	1.030832	14.17631
8	0.139424	66.61298	2.124081	16.05042	1.031342	14.18118
9	0.139430	66.60742	2.123991	16.05463	1.031667	14.18229
10	0.139432	66.60673	2.124521	16.05470	1.032140	14.18191

Variance Decomposition of DLNPI: ***Model B-FD2***

Period	S.E.	DLNPI	DLNINF	DLNPGDP	DR	DLNFD2
1	0.111371	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.134236	70.59143	12.47682	0.038478	15.53199	1.361280
3	0.137751	67.04588	15.11256	0.149176	15.75905	1.933336
4	0.139147	66.73769	14.82891	0.782973	15.52096	2.129465
5	0.139750	66.77630	14.85455	0.790853	15.38871	2.189593
6	0.139950	66.64188	14.96127	0.790099	15.42208	2.184673
7	0.139992	66.60480	14.98001	0.791385	15.43548	2.188322
8	0.140010	66.60431	14.97613	0.794327	15.43307	2.192163
9	0.140019	66.60358	14.97733	0.794818	15.43141	2.192866
10	0.140022	66.60177	14.97888	0.794796	15.43176	2.192788

Variance Decomposition of DLNPI: ***Model B-FD3***

Period	S.E.	DLNPI	DLNINF	DLNPGDP	DR	DLNFD3
1	0.113117	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.132713	73.91439	8.857569	0.283118	16.86352	0.081402
3	0.137096	69.90781	9.850386	0.284117	17.15470	2.802990
4	0.139309	68.45069	9.871808	0.564892	16.61792	4.494690
5	0.139943	67.95800	10.25433	0.565699	16.48073	4.741239
6	0.140037	67.87165	10.34304	0.572337	16.47663	4.736345
7	0.140066	67.86658	10.33949	0.577291	16.47040	4.746241
8	0.140079	67.85956	10.34367	0.578136	16.46838	4.750247
9	0.140082	67.85689	10.34636	0.578120	16.46852	4.750106
10	0.140083	67.85654	10.34638	0.578234	16.46845	4.750396

Variance Decomposition of DLNPI: ***Model B-FD4***

Period	S.E.	DLNPI	DLNINF	DLNPGDP	DR	DLNFD4

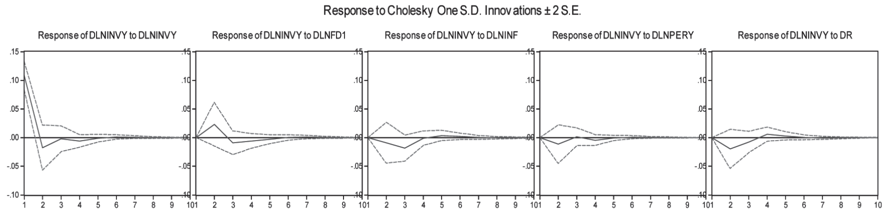
1	0.111575	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.135002	69.47911	12.06639	0.130478	16.39682	1.927210
3	0.139053	65.95623	15.14679	0.157194	16.91693	1.822856
4	0.139725	65.97560	15.04366	0.358112	16.75737	1.865255
5	0.139963	65.89605	15.07943	0.370389	16.77625	1.877879
6	0.140040	65.82322	15.12762	0.370459	16.80167	1.877024
7	0.140055	65.81694	15.13298	0.371933	16.80126	1.876882
8	0.140058	65.81719	15.13232	0.372470	16.80084	1.877178
9	0.140060	65.81617	15.13292	0.372480	16.80122	1.877210
10	0.140060	65.81589	15.13313	0.372491	16.80129	1.877201

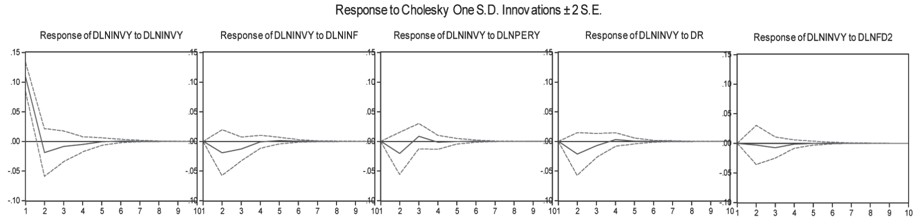
Variance Decomposition of DLNPI: ***Model B-FDindex***

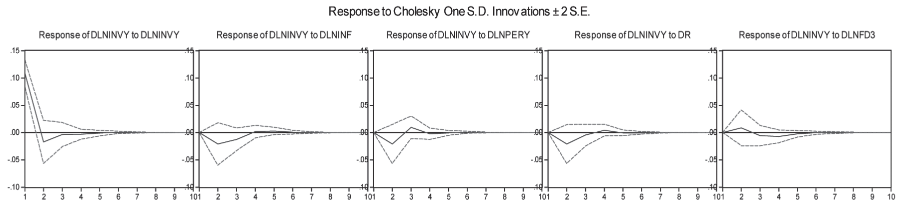
Period	S.E.	DLNPI	DLNINF	DLNPGDP	DR	
1	0.112972	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.133776	72.90162	10.08486	0.190314	16.60307	0.220144
3	0.137682	69.28895	12.04079	0.179788	16.82740	1.663077
4	0.139539	68.46558	11.86915	0.484045	16.41971	2.761518
5	0.140144	68.19073	12.10474	0.483038	16.27832	2.943173
6	0.140245	68.09424	12.19810	0.488077	16.27891	2.940671
7	0.140275	68.08200	12.19796	0.491548	16.27659	2.951904
8	0.140291	68.07689	12.19878	0.492549	16.27285	2.958937
9	0.140296	68.07403	12.20180	0.492521	16.27223	2.959425
10	0.140296	68.07341	12.20225	0.492605	16.27227	2.959468

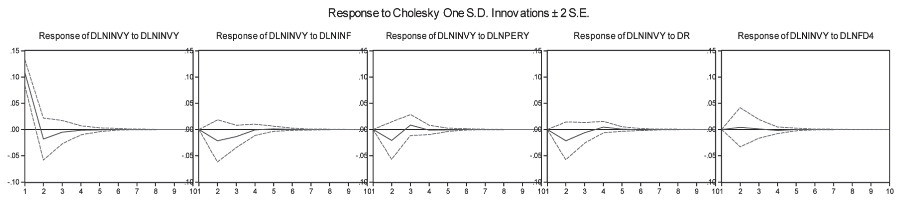
Appendix-ii

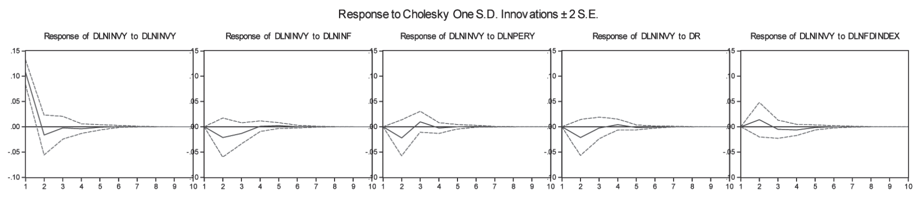
MODEL A Impulse Response Analysis



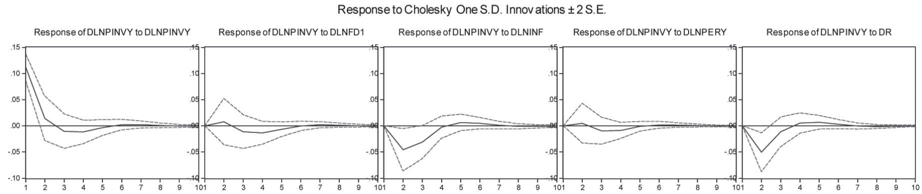


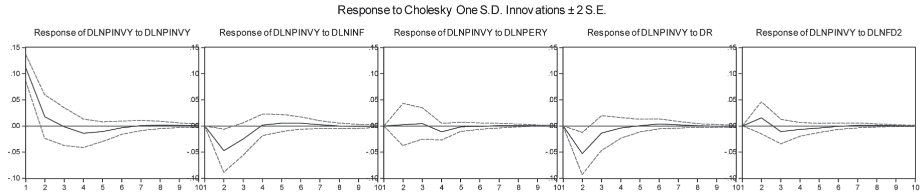


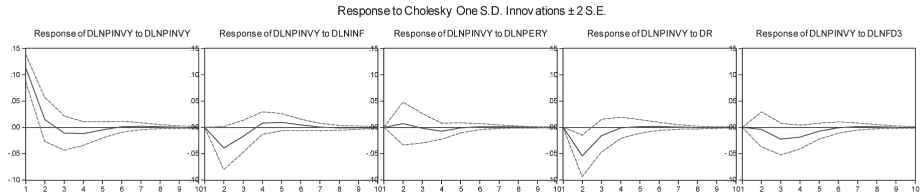


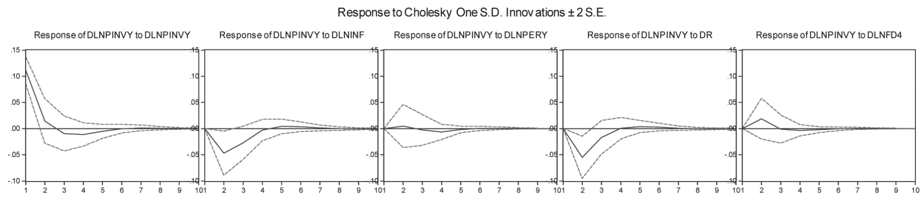


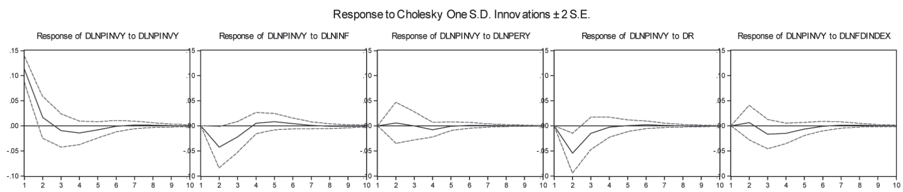
MODEL B Impulse Response Analysis[1]











1 In this analysis "invy" , "pinvy" , "pery" are used instead of "I", "PI", PGDP" respectively.

Appendix-iii

MODEL A Granger Causality Results

Model A – FD2

Null Hypothesis:	Obs	F-Statistic	Probability
DLNINF does not Granger Cause DLNI	38	0.84739	0.36359
DLNI does not Granger Cause DLNINF		4.02848	0.05251
DLNFD2 does not Granger Cause DLNI	38	0.66461	0.42045
DLNI does not Granger Cause DLNFD2		1.04756	0.31309
DR does not Granger Cause DLNI	38	1.48965	0.23043
DLNI does not Granger Cause DR		0.10038	0.75326
DLNPGDP does not Granger Cause DLNI	38	1.44872	0.23681
DLNI does not Granger Cause DLNPGDP		0.43703	0.51289

Model A – FD3

Null Hypothesis:	Obs	F-Statistic	Probability
DLNINF does not Granger Cause DLNI	38	0.84739	0.36359
DLNI does not Granger Cause DLNINF		4.02848	0.05251
DR does not Granger Cause DLNI	38	1.48965	0.23043
DLNI does not Granger Cause DR		0.10038	0.75326
DLNPGDP does not Granger Cause DLNI	38	1.44872	0.23681
DLNI does not Granger Cause DLNPGDP		0.43703	0.51289
DLNFD3 does not Granger Cause DLNI	38	1.41139	0.24282
DLNI does not Granger Cause DLNFD3		0.35330	0.55608

Model A – FD4

Null Hypothesis:	Obs	F-Statistic	Probability
DLNINF does not Granger Cause DLNI	38	0.84739	0.36359

DLNI does not Granger Cause DLNINF		4.02848	0.05251
DR does not Granger Cause DLNI	38	1.48965	0.23043
DLNI does not Granger Cause DR		0.10038	0.75326
DLNPGDP does not Granger Cause DLNI	38	1.44872	0.23681
DLNI does not Granger Cause DLNPGDP		0.43703	0.51289
DLNFD4 does not Granger Cause DLNI	38	0.10555	0.74720
DLNI does not Granger Cause DLNFD4		0.59435	0.44591

Model A – FDindex

Null Hypothesis:	Obs	F-Statistic	Probability
DLNINF does not Granger Cause DLNI	38	0.84739	0.36359
DLNI does not Granger Cause DLNINF		4.02848	0.05251
DR does not Granger Cause DLNI	38	1.48965	0.23043
DLNI does not Granger Cause DR		0.10038	0.75326
DLNPGDP does not Granger Cause DLNI	38	1.44872	0.23681
DLNI does not Granger Cause DLNPGDP		0.43703	0.51289
DLNFDINDEX does not Granger Cause DLNI	38	2.10028	0.15617
DLNI does not Granger Cause DLNFDINDEX		0.51455	0.47793

MODEL B Granger Causality Results

Model B– FD1

Null Hypothesis:	Obs	F-Statistic	Probability
DLNFD1 does not Granger Cause DLNPI	38	0.04863	0.82674
DLNPI does not Granger Cause DLNFD1		0.52332	0.47424
DLNINF does not Granger Cause DLNPI	38	4.31446	0.04519
DLNPI does not Granger Cause DLNINF		3.04715	0.08965

DLNPGDP does not Granger Cause DLNPI	38	0.64549	0.42715
DLNPI does not Granger Cause DLNPGDP		2.09254	0.15692
DR does not Granger Cause DLNPI	38	13.4414	0.00081
DLNPI does not Granger Cause DR		0.63531	0.43079

Model B – FD2

Null Hypothesis:	Obs	F-Statistic	Probability
DLNINF does not Granger Cause DLNPI	38	4.31446	0.04519
DLNPI does not Granger Cause DLNINF		3.04715	0.08965
DLNPGDP does not Granger Cause DLNPI	38	0.64549	0.42715
DLNPI does not Granger Cause DLNPGDP		2.09254	0.15692
DR does not Granger Cause DLNPI	38	13.4414	0.00081
DLNPI does not Granger Cause DR		0.63531	0.43079
DLNFD2 does not Granger Cause DLNPI	38	0.99414	0.32558
DLNPI does not Granger Cause DLNFD2		0.00598	0.93880

Model B – FD3

Null Hypothesis:	Obs	F-Statistic	Probability
DLNINF does not Granger Cause DLNPI	38	4.31446	0.04519
DLNPI does not Granger Cause DLNINF		3.04715	0.08965
DLNPGDP does not Granger Cause DLNPI	38	0.64549	0.42715
DLNPI does not Granger Cause DLNPGDP		2.09254	0.15692
DR does not Granger Cause DLNPI	38	13.4414	0.00081
DLNPI does not Granger Cause DR		0.63531	0.43079
DLNFD3 does not Granger Cause DLNPI	38	0.00060	0.98052
DLNPI does not Granger Cause DLNFD3		1.32403	0.25767

Model B– FD4

Null Hypothesis:	Obs	F-Statistic	Probability

DLNINF does not Granger Cause DLNPI	38	4.31446	0.04519
DLNPI does not Granger Cause DLNINF		3.04715	0.08965
DLNPGDP does not Granger Cause DLNPI	38	0.64549	0.42715
DLNPI does not Granger Cause DLNPGDP		2.09254	0.15692
DR does not Granger Cause DLNPI	38	13.4414	0.00081
DLNPI does not Granger Cause DR		0.63531	0.43079
DLNFD4 does not Granger Cause DLNPI	38	0.04707	0.82950
DLNPI does not Granger Cause DLNFD4		0.03570	0.85122

Model B– FDindex

Null Hypothesis:	Obs	F-Statistic	Probability
DLNINF does not Granger Cause DLNPI	38	4.31446	0.04519
DLNPI does not Granger Cause DLNINF		3.04715	0.08965
DLNPGDP does not Granger Cause DLNPI	38	0.64549	0.42715
DLNPI does not Granger Cause DLNPGDP		2.09254	0.15692
DR does not Granger Cause DLNPI	38	13.4414	0.00081
DLNPI does not Granger Cause DR		0.63531	0.43079
DLNFDINDEX does not Granger Cause DLNPI	38	0.04343	0.83612
DLNPI does not Granger Cause DLNFDINDEX		0.88874	0.35228