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FINANCIAL LIBERALIZATION AND INVESTMENT IN FINANCIAL AND PHYSICAL ASSETS: THE CASE OF TURKEY

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FİNANSAL SERBESTLEŞTİRME FİNANSAL VE SABİT VARLIKLARA YATIRIM: TÜRKİYE ÖRNEĞİ

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PREFACE

This study examines the validity of the McKinnon-Shaw hypothesis for the case of Turkey with the help of a simple model of investment behaviour. I would like to thank to my family, my supervisor Associate Prof. Dr. Öner Günçavdı, and my friends for their support and help.

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ABBREVIATIONS

OECD : Organization for Economic Co-operation and Development.
GDP : Gross Domestic Product.
GNP : Gross National Product.
SPO : State Planning Organization.
FX : Foreign Exchange.
PSBR : Public Sector Borrowing Requirement.
2SLS : Two-stages least squares.
OLS : Ordinary least squares.
ADF : Augmented Dickey Fuller.
Q : Quarter.
L : Lag operator.

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FİNANSAL SERBESTLEŞTİRME FİNANSAL VE SABİT VARLIKLARA YATIRIM: TÜRKİYE ÖRNEĞİ

ÖZET

McKinnon-Shaw tezine göre, finansal serbestleştirme sonrası yatırımın etkinliği ve miktarı aşağıdaki mekanizma ile artacaktır: (1)Finansal serbestleştirme reel faiz oranlarını artıracaktır, reel faiz oranlarındaki artış yurtiçi tasarruflarda artışa sebep olacaktır.(2)Artan yurtiçi tasarrufların kompozisyonunda finansal varlıkların lehine bir değişiklik sözkonusudur.Başka bir deyişle, mali piyasalar derinlik kazanacaktır.(3)Mali piyasalar, serbestleştirme sürecinde yaratılan fonların sabit yatırımların finansmanında kullanılmasına aracılık edecektir (4)dolayısıyla finansal serbestleştirme sonrasındaki yatırımlar, finansal baskının olduğu duruma göre daha verimli olacaktır.

Çalışmamızın amacı, McKinnon-Shaw tezinin geçerliliğini basit yatırım davranışını öngören bir model yardımıyla Türkiye durumu için değerlendirmektir. Çalışmada, Mckinnon ve Shaw'un öngördüğü finansal serbestleştirme sonrası sabit varlık yatırımlarına yönelik kredi piyasasındaki olumlu genişlemenin, yatırım portföyündeki sabit varlıklardan finansal varlıklara olan kaymaya baskın gelip gelmediği sorusu Türkiye deneyimi için araştırılmaktadır.

Elde ettiğimiz ampirik sonuçlara göre, Türkiye deneyiminde mali piyasalarda finansal derinleşme sağlanmış fakat finansal serbestleştirme sonrası artan reel faiz oranları yatırım porföyünde sabit varlıklardan finansal varlıklara doğru kaymaya sebep olmuştur. Başka bir ifadeyle, finansal varlıklardaki artış, sabit varlıklardaki düşüşü getirmiştir. Ayrıca, çalışmadaki ampirik bulgular mali piyasaların serbestleştirme sonucu yaratılan fonları sabit yatırım finansmanına aktarmakta başarısız olduğunu göstermektedir. Dolayısıyla finansal serbestlik deneyiminin Türkiye sonuçları, McKinnon-Shaw tezini desteklememektedir.

FINANCIAL LIBERALIZATION AND INVESTMENT IN FINANCIAL AND PHYSICAL ASSETS: THE CASE OF TURKEY

SUMMARY

According to McKinnon-Shaw hypothesis after financial liberalization, both the quantity and the quality of investment will increase by the following mechanism: (1) financial liberalization will increase the real interest rates and hence raise domestic savings. (2) There is a change in the composition of increased domestic savings in favor of financial assets. In other words, financial deepening will take place. (3) The financial system will channel this flow to the fixed capital investments, and (4) the investment projects financed through the liberalized market will be on the average more productive compared to the regime of financial repression.

The aim of our study is to evaluate the validity of the McKinnon and Shaw hypothesis for the case of Turkey with the help of a simple model of investment behavior. Focusing on the quantity of investment, we investigate the question of whether the positive effect on the credit market proposed by McKinnon and Shaw was offset by the negative effect of a portfolio shift from capital goods and public bonds (real assets) to financial assets in the Turkish experience.

Our empirical results indicate that the deepening of the financial system was achieved in the Turkish experience. However, the increase in the real interest rate, following to financial liberalization, led to a portfolio shift from capital goods to financial assets. That is to say, the increase in the financial assets was accompanied by the decrease in the real assets. Moreover, our empirical findings suggest that the liberalized financial system failed to channel the growing funds to the finance of the fixed capital investment. Therefore, we conclude that the case of Turkey did not conform to the McKinnon-Shaw hypothesis.

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1. INTRODUCTION

1.1. Introduction and Objective of the Study

The liberalization of financial markets has taken place in the countries of the developing world, especially since the mid-1980s. This liberalization has aimed to establish a market-based fund allocation. There has been an expectation that financial liberalization would allocate the resources efficiently, and thus help economic development. The genesis of this theoretical argument is provided by the two seminal works by McKinnon (1973) and Shaw (1973).They suggest that the higher real interest rates, following financial liberalization, will stimulate savings. The higher saving rates will promote both the efficiency and the level of investment, leading to higher economic growth.

On the other hand, the McKinnon-Shaw hypothesis has always been criticised on both macroeconomic and microeconomic bases. There are a number of empirical studies carried out to assess the McKinnon-Shaw hypothesis. The aim of our study is to evaluate the validity of the McKinnon-Shaw hypothesis for the case of Turkey with the help of a simple model of investment behaviour.

According to the McKinnon-Shaw hypothesis, the rise in the interest rates following financial liberalization will increase the supply of credits to finance private investment. McKinnon (1973) and Shaw (1973) implicitly assume that the principal constraint on investment is the quantity rather than the cost of the financial resources. Therefore, financial liberalization is expected to increase the level of investment due to the presence of liquidity constraints on private investment decision. (Morisset,1993). Focusing on the quantity of investment, we investigate the question of whether the positive effect on the credit market proposed by McKinnon and Shaw was offset by the negative effect of a portfolio shift from capital goods and public bonds (real assets) to financial assets in the Turkish experience.

The study is organized as follows. Section 2 is devoted to the review of the relevant literature. Section 3 provides the background on the financial liberalization in Turkey. Section 4 develops the theoretical model. Section 5 presents the empirical findings and section 6 concludes.

2. LITERATURE REVIEW

2.1 Financial Liberalization Thesis and Its Critics

Until the early 1970s economists in accordance with Keynesian and Neoclassical theories believed that low interest rate would promote investment spending and growth. Therefore, policy makers in developing countries commonly adopted low interest rate policies. McKinnon and Shaw (1973) challenge this conventional wisdom seriously. They focus on the effects of financial repression, which is symbolised by low or negative real interest rates, on savings and investment levels in developing countries.

In the case of financial repression, government and central bank regulations, which include interest rate ceiling, the imposition of reserve requirement on the commercial bank and compulsory credit ceilings with or without subsidized interest rates, distort the operation of financial markets. This distortion reduces the flow of funds to the formal financial sector which, in turn, leads to lower levels of saving, investment and growth compared to otherwise would be the case (Warman and Thirlwall, 1994).On the other hand, McKinnon (1973) and Shaw (1973) assume that higher real interest rate resulting from financial liberalization would stimulate savings and increase the volume of credits extended by the financial system and in turn the level of investment.

Warman and Thirlwall (1994, 629) point out that financial liberalization is a necessary condition for economic development and a faster pace of economic growth in countries where there is financial repression according to the influential models developed by McKinnon (1973) and Shaw (1973).

Financial liberalization not only leads to an increase in the level of investment but also improves investment efficiency. McKinnon (1973) and Shaw (1973) point out that there are several ways through which financial liberalization increases investment efficiency. Shaw (1973, 10) states "in a repressed economy savings flow

mainly to the saver's own investments: self-finance prevails", and "savings may go into inventories." (Shaw, 1973, 71)

In other words, provided that the real rate of return on money is low or negative, most of the physical capital of the economy will be embodied in inventories of finished and semi-finished goods which are not intended for production and consumption. (Balassa, 1990)

Another effect of financial liberalization on investment efficiency is that below equilibrium interest rates affect the capital-intensity of investment. Due to financial repression, firms that can easily use the subsidised funding will be likely to invest in relatively capital-intensive projects. Then, "investment flows to capital-intensive production even though capital is scarce and labor is plentiful" (Shaw, 1973, 11). Higher profitability of the capital-intensive projects and encouragement of the substitution of capital for labor rationalize such an investment policy of the firms carried out under financial repression.

McKinnon (1973) and Shaw (1973) also consider that the importance of curb markets would weaken following financial liberalization due to the fact that the increased organised intermediation in the economy take the place of curb markets. The shift from informal financial markets to formal markets would be beneficial because of higher efficiency in the formal markets. McKinnon (1973, 78) cites the study of Chilean curb markets as an example. 'Money lenders operate on a small scale and do not compete with each other as they do not have detailed knowledge of a broad market.'

Moreover, Shaw (1973, 127) notes that maturities and diversification of the menu of financial assets would extend following financial liberalization. Consequently, the lengthening of the financial maturities improves investment efficiency.

Finally, according to McKinnon (1973) and Shaw (1973), 'credit rationing effect' is one of the ways through which financial liberalization improves investment efficiency. Shaw (1973, 84) suggests that there is 'credit rationing among borrowers because of the excess demand for funds at less than equilibrium interest rates sometimes according to dictates of monetary or other authorities, sometimes according to preferences of the financial intermediaries.' Such non-market forms of

clearing cause the rationing of loans by public authorities and banks rather than interest rates. Because lending by government authorities or influenced by them responds to governmental preferences whereas financial intermediaries focus on reducing risk, the efficiency of investment will increase after liberalization. (Balassa, 1990)

Fry (1997) summarises the effects of the interest rate ceilings on the economy in four ways. First, while low interest rates encourage current consumption, they discourage future consumption. Therefore, interest rates may not produce socially optimum level of saving. Second, lenders in the economy may engage in relatively low-yielding direct investment rather than lending through depositing money in the bank. Third, bank borrowers who can obtain the funds at less than equilibrium interest rate will choose relatively capital-intensive projects. Fourth, there are entrepreneurs with low-yielding projects who would not want to borrow at the higher market-clearing interest rate. Hence, banks' selection process contains a random component and some investment projects will produce yields below the market-clearing interest rates. Therefore, it can be said that if the real interest rate is not allowed to clear the money and credit markets, both quantitative and qualitative repression of investment take place.

McKinnon and Shaw hypothesis has always been criticised on both macroeconomic and microeconomic bases. While macroeconomic criticisms of the financial liberalization thesis concentrate on output, inflation and growth, microeconomic criticisms focus on failures in the financial markets caused by informational asymmetries such as moral hazard and adverse selection in developing countries. Critiques of the financial liberalization thesis on macroeconomic basis mainly come from Post-Keynesian and Neo-structuralist school.

Post-Keynesian school emphasizes the fundamental Keynesian view that investment determines saving and what is important is not prior saving, but the prospect of profit (Warman and Thirlwall, 1994). Post-Keynesians focus on growing financial instabilities after liberalization, the negative effect of increased interest rates on government budget deficit and mainly on the effective demand. According to them, after the liberalization the marginal propensity to save will increase, causing a fall in the aggregate demand. The fall in aggregate demand not only causes profit rates and

thus investment to fall but also results in investors being pessimistic about the future. Investors` pessimism about the future will constitute additional negative effect on investment and demand. (Yülek, 1998)

Davidson (1986) and Asimakopoulos (1986), representatives of this type of reasoning, argue that provided that banks are able to generate credits without having to raise their deposits, then an increase in financial saving may not affect the amount of total credit given to the private sector. In other words, the total amount of credit is influenced not only by supply of loans but also by demand, incentives to invest.

The other Post-Keynesian economists, Arestis and Demetriades (1999) criticize the basic assumptions of the liberalization theorist that there are perfect competition and perfect information among market participants, and they conclude that liberalization in the financial markets has negative effects on output due to increased financial instabilities in liberalized financial markets.

Neo-structuralist school makes another critique of the financial liberalization thesis. Like Post-Keynesian school, Neo-structuralist school argues that there is a potential decrease in aggregate demand following the financial liberalization. Moreover, they give emphasis to the dissimilarity between the formal money market and the informal market.[1]

The studies by Van Wijnbergen (1983) and Taylor (1983) are representatives of such a line of thinking. They set up Tobin type portfolio framework for household sector asset allocation. In their model, households hold three types of assets, namely, gold or currency, time deposits, and curb markets loans. When the interest rates on time deposits increases, households will substitute time deposits for gold or cash and curb market loans. In their study, they criticize one of the implicit assumptions of McKinnon and Shaw hypothesis. McKinnon and Shaw assume that this portfolio shift resulting from the increased interest rates on time deposits comes out of unproductive assets (gold and cash). Van Wijnbergen (1983) and Taylor (1983) argue that this may not be the case since it is not clear that deposits are closer substitutes to the unproductive assets (gold and cash) than to the curb markets loans. They conclude that if the substitution between the curb market loans and time deposit

[1] The terms 'curb market' and 'informal market' are used synonymously.

outweighs the substitution between currency and time deposits, then the funds allocated to the curb market will shift to the official banking sector. In this case the total supply of credit may decrease. Because the official banking sector is subject to reserve requirement, but the curb market is not.

Considering the microeconomic aspect, Fazzari et al.(1988) show that there is a problem of informational asymmetry between the buyers and the lenders in the credits market. Consequently, lenders have to add extra premium to the interest rates to eliminate the risks caused by asymmetric information. As a result, firms with liquidity constraints are obliged to resort mostly to internal funds to take on investment spending. Putting it differently, internal and external funds are not perfect substitutes for firms under financial constraints due to the extra finance premium.

2.2. The Empirical Literature Review

According to the McKinnon-Shaw hypothesis, financial liberalization would raise real interest rates and hence stimulate savings, increase the volume of credits extended by financial system, and financial system would channel the funds to the fixed capital investments. The investment projects financed by financial markets after financial liberalization would be on the average more productive compared to the previous regime of financial repression. Therefore, we should expect growth performance of the economy to improve.

There are a number of empirical studies which vary in terms of both empirical approach and country coverage. However, the results derived from these studies are ambiguous on the relationship between real interest rates and saving rates, between financial liberalization and saving rates, and between financial development and economic growth.

This section is devoted to empirical studies concerning financial liberalization thesis. In Section 2.2.1, studies carried out to show the relationship between saving and real interest rates are examined.

2.2.1. Saving and Real Interest Rates

McKinnon-Shaw hypothesis assumes that real interest rates affect the flow of saving positively. However, the econometric evidence yields ambiguous conclusions on the relationship between saving rates and real interest rates.

For instance, Giovannini (1985) investigates the effect of changes in real interest rate on domestic saving in developing countries and he concludes that consumption does not respond to changes in the real interest rate in the majority of eighteen developing countries. If this is the case, then one should expect that the response of aggregate saving to changes in the real interest rate is negligible.

On the other hand, the results derived from the study by (Gupta, 1987) offer little support for the hypothesis that the positive substitution effect of real interest rates on savings outweighs the negative income effect in the study of twenty-two Asian and Latin American countries for 1967-1976 period.

Fry (1988) examines the relationship between interest rate and financial intermediation for ten Asian developing countries by regressing the real stock of real money on the national saving rate, per capita real expected income, the lagged value of broad money and the twelvemonth time deposit rate of interest less the expected rate of inflation. He finds that the relationship between real money stock and real interest rate is positive and statistically significant at the 1% significance level.

Lanyi and Saraçoğlu (1983) investigate the relationship between interest rate and the growth of the money supply (M2) for twenty-one countries by regressing the rate of growth of the broad money supply on interest rates. The results of their study show a positive statistically significant correlation between the rate of growth of the broad money supply and real interest rate.

Warman and Thirwall (1994) test whether rising real interest rates stimulate more saving and investment and thus improve economic growth for Mexico for the 1960-1990 period by making distinction between financial saving and total saving. The findings of the study show that financial saving is positively correlated with real interest rates, but there is no evidence that high real interest rates produce higher total saving, investment and economic growth.

Moreover, Gibson and Tsakalotos (1994, 594) review the empirical literature on the link between savings and the real interest rate. They point to inconclusive nature of the relationship between interest rates and savings.

2.2.2. Financial Liberalization and Saving

In the empirical literature, there is no consensus on the hypothesis that financial liberalization causes an increase in the saving rate. In some of the studies financial liberalization appears to lead to a decline in the saving rate, weakening the McKinnon-Shaw line of thought, whereas in others the effect of financial liberalization on the saving rate supports McKinnon-Shaw hypothesis. The relevant part of the literature is examined in this section.

Jappelli and Pagano (1994) examine the effects of capital market imperfections on aggregate saving and growth by using a simple overlapping-generations model for OECD countries over the period 1960-1987. They conclude that financial deregulation has led to a decrease in national saving and growth rates in OECD countries.

Reinhart and Tokatlidis (2001) investigate the effects of financial liberalization on saving, capital flow and foreign direct investment for 14 developed and 36 developing countries. The evidence they present suggests that in some regions saving increases following financial liberalization. However, saving declines in the majority of the cases.

Bandiera et al (2000) provide an empirical examination of the total effect of the financial reform on aggregate private saving for Chile, Ghana, Indonesia, Korea, Malaysia, Mexico, Turkey and Zimbabwe. They set up a financial liberalization index by using different reform measures, namely, interest rates, credit allocation, bank ownership, prudential regulation, security markets deregulation, and capital account liberalization for each country. Their results suggest that there is no evidence about the positive effect of the real interest rate on saving. In contrast, the relationship between real interest and saving rates in most cases is significantly negative. Moreover, the effect of financial liberalization index on saving is ambiguous. While there is a negative and significant relationship in the cases of both Korea and Mexico, the relationship turns out to be positive and significant in the

cases of Turkey and Ghana. In overall, their results can not provide support for the hypothesis that financial liberalization will stimulate saving.

Loayza et al (2000) investigates the income and substitution effects of real interest rates on savings. They conclude that the effect of the real interest rate on the private saving rate is negative and that financial liberalization has a negative direct impact on the private saving rates.

2.2.3. Financial Liberalization and Economic Growth

McKinnon-Shaw hypothesis assumes that the higher saving rates, following financial liberalization, would finance a higher level of investment, resulting in higher economic growth. Therefore, this section is devoted to the review of the empirical evidence on the effects of financial liberalization on economic growth.

The cross section study for twenty-five Asian and Latin American countries by (Gupta, 1984) supports that higher interest rates have an adverse impact on economic growth. On the other hand, Gupta (1986) investigates the long-term impacts of changes in nominal interest rates and inflation rates on economic growth by using dynamic multiplier analysis for India and Korea and he finds that according to the long term multiplier, higher interest rates have a favorable impact on economic growth in the case of both India and Korea. The study by Lanyi and Saraçoğlu (1983) confirms the findings for India and Korea.

In the study of sixty-four developing countries, Khatkhate (1988) finds that the countries with below-average real interest rates do not differ from the countries with above-average real interest rates on the average growth rate.

Fry (1988) investigates the effects of interest rates on investment efficiency for Turkey. His study shows that in the case of Turkey the incremental output-capital ratio is positively related to the real deposit rate and that the real deposit rate variable is found significant at the 1% significance level. In the study of the Asian Development Bank for Malaysia, Nepal, Pakistan, Taiwan, India, Korea, Singapore, and Thailand, it is also found that the incremental output-capital ratio is positively related to the real deposit rate which is statistically significant at the 5 % significance level.

According to the study by Lanyi and Saraçoğlu (1983), there is a positive, statistically significant (at 1% significance level) relationship between the rate of growth of GDP and the interest rate. Moreover, Polak (1989) finds the strong correlation between the rate of economic growth and the median rate of interest in the study of forty countries for the period 1965-1985. In the relevant literature empirical studies investigating the direction of the causality between financial development and economic growth can be found.

McKinnon (1973) and Shaw (1973) assume that the causality is running from financial development to economic growth. On the other hand, Patrick (1966) suggests that the direction of the causality is subject to change in the course of economic development. In his view, financial development is a necessary condition for continued economic growth. However, as the causality is running from financial intermediation to economic growth at the early stages. At the later phases of the real growth, the direction of the causality changes because there is a growing demand for financial services.

Jung (1986) attempts to test the direction of the causality by using Granger method. He concludes from his research on nineteen developed and thirty-seven developing countries over the fifteen year period that in most of the cases the causality is unidirectional and running from financial development to economic growth. There is little evidence that supports the reverse causal direction in the less developed countries.

However, the results derived from the study by Fritz (1984) carried out for the Philippines provide support for Patrick's hypothesis. In other words, financial intermediation causes economic growth at the early stage of economic development; however the causality is running from economic growth to financial liberalization at the later stage.

3. FINANCIAL LIBERALIZATION IN TURKEY

3.1. The History of Financial Liberalization in Turkey

Having done literature review related to financial liberalization, we are in a position to examine the movement of financial liberalization in Turkey.

The Turkish economy for the 1972-1979 period was characterized by the deepening of the industrialization based on inward looking import substitution strategy. In the early 1970s the Turkish economy experienced high growth rates and low rates of inflation and current account surpluses thanks to an inward looking import substitution strategy. On the other hand, this strategy also created an industry that fed from three sources: First, the protectionist trade regime with the help of which industrialists captured oligopolistic profits and rents created from a protected domestic market. Second, the existence of a public enterprise system, providing artificially low priced intermediates, made possible the private industrial enterprises to reduce the input costs. Third, undervalued foreign currency provided industrialists with a cheap finance of fixed capital investments in manufacturing. (Yeldan and Borotav, 2001) Putting it differently, during this period, industrialists relied heavily on subsidies provided by the state and the bureaucracy rather than markets. Therefore, policy and politics became important in the accumulation process.

The debt crisis of 1977 resulted from both internal and external pressures. External pressures were initiated by the first oil crisis of 1974. Due to increasing dependence on imports of oil, the sharp increase in the price of oil following the first oil crisis caused deterioration in Turkey's terms of trade. At the same time, the government did not devalue the Turkish lira in accordance with the development in the terms of trade, leading to the real appreciation of the Turkish lira. The consequent current account deficit was financed initially with the help of foreign exchange reserves, after the depletion of the reserves it was financed by short-term borrowing. The ratio

of the short-term debt to total external debt which was 8.3% in 1973 increased to 54% in 1977.Therofore, it became increasingly difficult to finance import and debt-service payment. As a result, in the 1978–1980 period average growth rate of economy was 0.5 % and Turkish economy experienced 71.1 and 105.7 percent inflation rate in 1979 and in 1980 respectively. (Sancak, 2002)

Turkey introduced a macroeconomic stabilization and a liberalization program on 24 January 1980 following the foreign exchange crisis of 1977-1980, which was accompanied by civil unrest and political instability. The aim of the program was not only to recover the current situation, but also to change Turkey's development strategy that Turkey had followed for decades. The new strategy made necessary to move towards an outward oriented market type model. As a part of the program Turkey entered a process of financial liberalization in 1980. "The motive behind financial liberalization was to restore growth and stability by raising saving and improving economic efficiency." (Yeldan and Boratav, 2001, 3)

Before 1980, financial sector in Turkey had been highly repressed. The real interest rates were subject to nominal interest rate ceilings, which resulted in negative real interest rate. There was an extensive system of directed credits. The central bank did not carry out the function of a standard central bank. In contrast, it served as a "development agency". In this period reserve requirements were high, capital was immobile and the exchange rates were fixed. (Yülek, 1998)

The first step in the Turkish financial liberalization was the lifting of the upper limit on interest rates in July 1980. "After the first liberalization attempt of July 1980, the oligopolistic banking sector first responded by fixing deposits rates at low levels. Later, increased competition from unhealthy financial units in the form of small banks and bankers led to skyrocketing of rates" (Yülek, 1998, 9). However, high and rising interest rates soon led the banks and bankers to experience liquidity problems. As a result, many bankers who offered very high real interest rates through Ponzi financing method, together with six banks collapsed in the financial scandal of 1982.

In January 1983 nine banks were authorized to determine deposit rates. Banks reduced deposit rates since they expected that inflation would continue to slow down. In contrary to their expectations, the inflation rate speeded up leading to negative real deposit rates. In such a situation, unwillingness of large banks in maintaining the real

interest rate positive resulted in a second intervention in December 1983. This time, central bank was authorized to determine the interest rates. Therefore, the first attempt of the liberalization of deposit rates ended with failure. Interest rates were set by the central bank until mid-1987. In July 1987, liberalization of one year deposit rates took place. However, in February 1988, central bank put the ceiling on one year deposits. Due to the increased currency substitution particularly in the second half of 1988 resulting from the accelerated inflation rate, interest rates were liberalized one more time in October 1988. But, this time instantaneous increase in the interest rates caused the central bank to set up a ceiling on one year deposits again in November 1988. February 1991 represents the next liberalization date which lasted until the 1994 crisis. (Yülek, 1998) In other words, "the policy pendulum moved between re-regulation and de-regulation up till the late 1980s; but the trend, although gradual, was definitely towards the establishment of a liberalized domestic financial system." (Yeldan and Boratav, 2001, 5)

Moreover, the important decisions were made in terms of introduction of new markets, institutions and financial instruments, and the liberalization of foreign exchange market and capital movements in 1980s.The developments can be summarised as follows:

The Capital Market Board, supervisory and regulatory agency in the securities market, was established in 1983. The Istanbul Stock Exchange became operative in 1986. New banking law, providing supervisory and prudential measures, became operational in 1986 and a bank supervision unit was established within the Central Bank. The interbank money market in which the central bank played an intermediary role was launched in April 1986.

After 1980 government securities have been extensively used to finance budget deficits. They were auctioned on the weekly basis in May 1985. There was a growing demand for government bonds and treasury bills because they had some tax advantages and the banks were obliged to hold 65% of their public deposits and 12% of their liabilities in the form of government securities. Another important date related to the introduction of new financial instruments is July 1992 when procedures in terms of repo and reverse repo operations and the issue of asset backed securities were published in the Official Gazette. (Yülek, 1998)

Moreover, in 1989 Medium Term Rediscount Credit (MTRC) through which the central bank provided medium and long term rediscount facilities to bank credits given to agricultural and industrial sector was abolished and high reserve requirements were reduced to 15% progressively in the 1985-1986 period.

The year of 1984 in which residents were allowed to hold foreign currency denominated deposits and banks were allowed to keep foreign currency abroad is very important in terms of foreign exchange deregulation.

Finally, capital movements were liberalized in 1989 and the full convertibility of Turkish lira was utilized at the beginning of 1990.

TableA.1 in AppendixA presents the important dates in Turkish financial liberalization process.

3.2. EFFECTS OF FINANCIAL LIBERALIZATION

This section examines the effects of Turkish financial liberalization on saving, private investment, and economic growth respectively.

3.2.1 Saving

According to financial liberalization thesis, positive real interest rates are assumed to stimulate savings, leading to higher levels of investment and economic growth.

In this section, firstly we try to find an answer to the question of whether the Turkish experience supports McKinnon and Shaw hypothesis in terms of the course of saving. Secondly, we examine the concentration of domestic savings in the financial system for post-liberalization period in order to evaluate whether financial deepening is realized or not.

Figure 3.1 enables us to examine the course of domestic saving, defined as a ratio to GNP, in the pre- and post- liberalization periods.

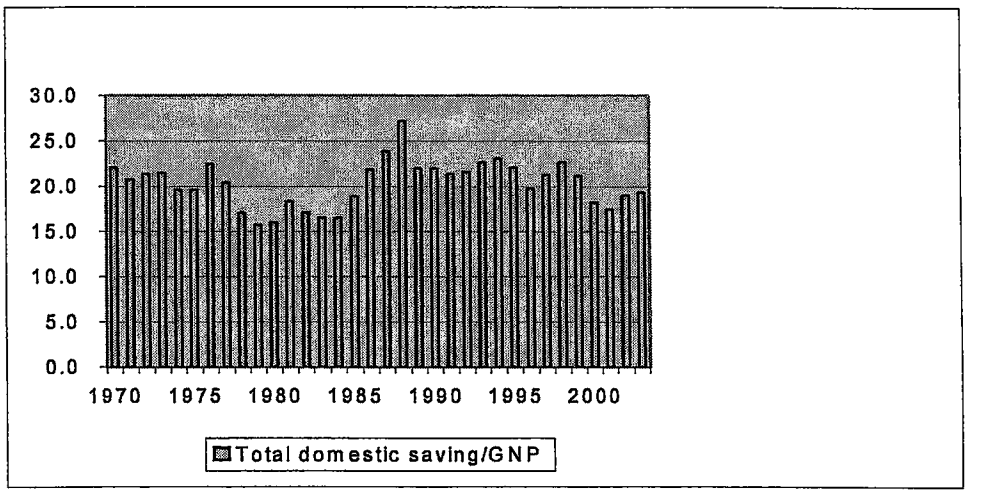

Figure 3.1 Total Domestic Saving/GNP (1970-2003)
Source: SPO, Main Economic Indicators, January 2004

Figure 3.1 shows that there is not a striking jump in the saving rate in the first half of the 1980s. We observe that the deterioration in domestic saving rate in the late 1970s was not recovered until 1986. Compared to the first half of the 1980s, domestic saving rates were considerably higher in the second half. While the average domestic saving rate for the 1980-1985 periods was 17.5%, this rate increased to 23.4% in 1986-1990. Figure 3.1 indicates that after 1990 the saving rate did not reach its level in 1990 except for 1993, 1994 and 1998. The average saving rate was 20.9% in the 1991-2002 period.

Yülek (1998) examines the course of domestic saving as a ratio to GNP in the pre- and post-liberalization periods (1970-1994) and he states that all in all, after the liberalization period, there is a slight increase in the saving rate. However, he points out that it is not easy to eliminate the effects of the other relevant economic variables on saving. Therefore, it would be problematic to conclude that the slight increase in the saving rate after 1980 results from financial liberalization by making such a partial analysis.

On the other hand, results of the econometric studies investigating the effect of the interest rate on the saving rate in Turkey for the post-liberalization period suggest ambiguous conclusions.[2]

Sak and Özatay (2002, 7) state that:

> "In analyzing the results of financial liberalization measures, two issues have to be distinguished following McKinnon(1973) and Shaw(1973).First, the primary objective is to concentrate domestic savings in the financial system.....Second, economic growth culminates from the efficient allocation of resources by the financial system."

Having shown the ratio of domestic saving to GNP in Figure 3.1, our next concern is to find an answer to the question of whether financial deepening in the Turkish financial sector was achieved through the change in the composition of domestic savings in favor of financial assets.

Table 3.1: Monetary Indicators

Period averages	1970-1979	1980-1989	1990-2002	1980-2002
Total Financial Assets/GNP	23.3	29.9	64.3	49.3
M2/GNP	21.5	21.7	20.2	20.9
M2Y/GNP	21.5	23.5	35.7	30.9

Source: SPO, Main Economic Indicators, January 2004

Table 3.1 indicates that there was a considerable increase in the financial assets as a ratio to GNP in the post-liberalization period. It should be also noted that the average money supply M2[3] as a ratio to GNP in pre-liberalization period (1970-1979) is higher than in post-liberalization period (1980-2002). The ratios for pre- and post-liberalization periods were 21.5% and 20.9 % respectively.

On the other hand, as can be seen from Figure 3.2, M2Y, which is the aggregate comprising foreign exchange deposits also, as a ratio to GNP, had an increasing trend for the post-1985 period.

While the average ratio of M2 to GNP was in post-1985 period 20.6 %, for the same period the ratio of M2Y to GNP took the value of 33.5%. Therefore, it is important to note that the share of foreign currency deposits in the money supply increased substantially in the post -1985 period.

[2] Rittenberg (1988) finds a significant coefficient for the real interest rate. However, Uygur (1993) finds an insignificant interest elasticity coefficient.
[3] M2 aggregate includes time deposits, demand deposits and currency in circulation.

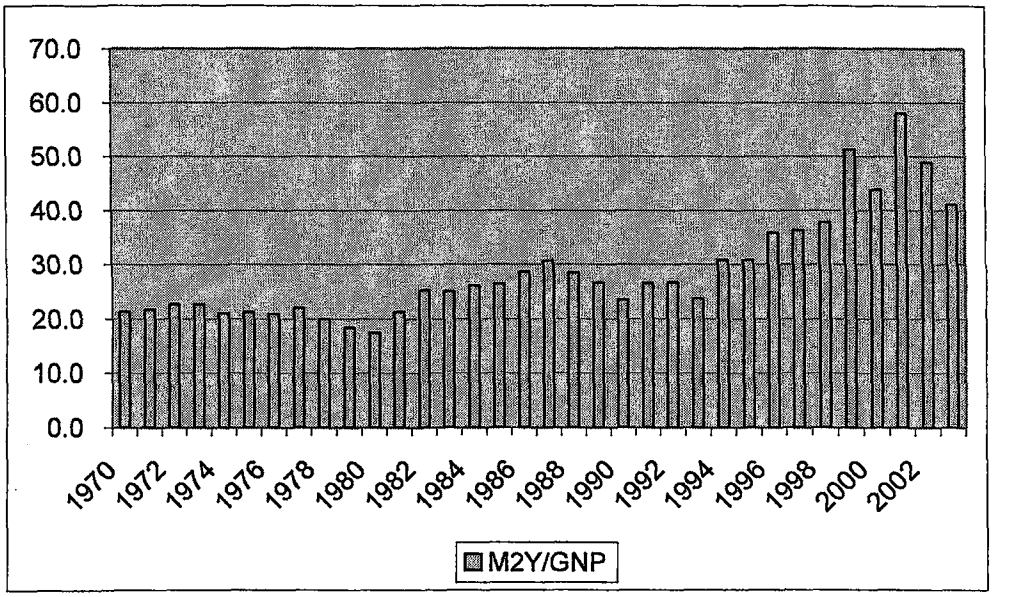

Figure 3.2 M2Y/GNP (1970-2003)
Source: SPO, Main Economic Indicators, January 2004

Table 3.2 shows the composition of total financial assets for both pre- and post-liberalization periods.

Table 3.2 Financial Assets to GDP Ratios, 1970-1999 (period averages)

	1970-1979	1980-1989	1990-1999	1980-1999
1. Bank deposits	19.3	24.9	30.8	27.8
1.1 TL deposits	19.3	21.9	16.3	19.1
1.2 FX deposits	0.0	3.0	14.5	8.7
2.Securities	5.4	7.0	20.6	13.8
2.1 Government	4.2	4.8	16.3	10.6
2.2 Private	1.2	2.2	4.3	3.2
Total financial assets outstanding	24.7	31.9	51.4	41.6

Source: Özatay, F., and Sak G., 2002. Financial Liberalization in Turkey: Why Was the impact on Growth Limited, *Emerging Markets Finance and Trade*, 38(5), 6-22.

Table 3.2 confirms that the share of FX deposits in total deposits increased in the post-liberalization period. In other words, the dolarization of the financial savings took place while financial liberalization deepened the financial sector in Turkey. Moreover, Table 3.2 indicates that government securities mostly accounted for the increasing share of securities in the financial assets for the post-liberalization period.

This reflects the financial liberalization's effect on the public sector's balance in terms of increased public sector borrowing requirement (PSBR) (Sak and Özatay, 2002).

In fact, financial liberalization led PSBR to increase for the post-liberalization period (See Figure3.3). PSBR/GNP rose from an average 5 % in the first half of 1980s to about 9 % in the first half of 1990s. In the post-1990 period, this ratio stayed high about 10 % per annum.

Yülek (1998, 23) states:

> "Direct effect of financial liberalization on the public sector balance was to increase its borrowing costs. Inability to increase the revenues commensurably kept PSBR growing and soon turned the situation into a vicious circle."

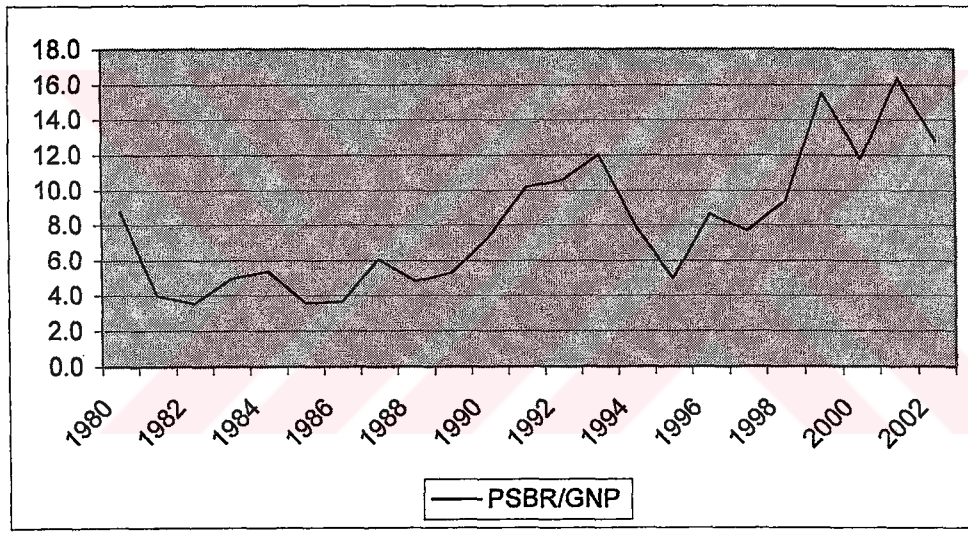

Figure 3.3 PSBR/GNP

Source: SPO, Main Economic Indicators, January 2004

Moreover, it is important to note that the government's increasing deficit led to significant crowding out of the private sector in the financial sector. Domestic public debt to broad money ratio (M2Y) stayed very high in the post-1985 period. This is a clear reflection of increasing public sector dominance in the financial sector (Civcir, 2003).

According to financial liberalization thesis, the economic growth effect of financial liberalization is dependent on the financial intermediation process. In other words, financial sector was assumed to allocate resources efficiently to encourage the growth of the real sector.

Having concluded that financial liberalization deepened the financial system in Turkey, we can examine the course of the credit stock for the pre- and post-liberalization periods in the following part in order to evaluate whether increased financial intermediation took place in Turkish experience.

In examining the ratio of bank deposits to GDP (See Table 3.2), it is important to note that the banks play a dominant role as financial intermediaries in the Turkish financial system. Therefore, it makes sense to evaluate Turkish banking sector following financial liberalization. Özatay and Sak (2002) examine the developments in the balance sheets of the commercial banking sector in Turkey during the financial liberalization period. They conclude that after financial liberalization, total assets of the banking sector increased both in real terms and as a ratio to GDP and the similar trend can be observed in bank deposits. But, there was not a symmetrical development in the credit volume. They indicate that the credit volume as a ratio to GDP, on average, is lower in the 1980-1989 period than in 1970-1979 period while the average ratio in the 1980-1999 took the value of that of pre-liberalization period (1970-1979). In addition, both the ratio of total credit to total deposits and the ratio of total credit to total assets decreased during the liberalization period.

In sum, although the deepening of the financial system was achieved through the change in the composition of domestic savings in favor of financial assets in Turkey experience (See Table 3.2), there was a problem in the credit creation process. We observe that the effect of this deepening on credit growth was very slight.

3.2.2 Private Investment

Figure 3.4 suggests that financial liberalization did not lead to an increase in the private investment as proposed by the McKinnon-Shaw hypothesis. The ratio of private investments to GNP in the 1980-1984, on the average, took the value of 11%, but the ratio was 16% in the 1973-1979 period. The private investment/ GNP ratio, on the average, increased in the period of 1985-1994 over the 1980-1984.While the average ratio was 11% in 1980-1984 and 15% in 1985-1994. It took the value of 18% in the 1985-2001 period.

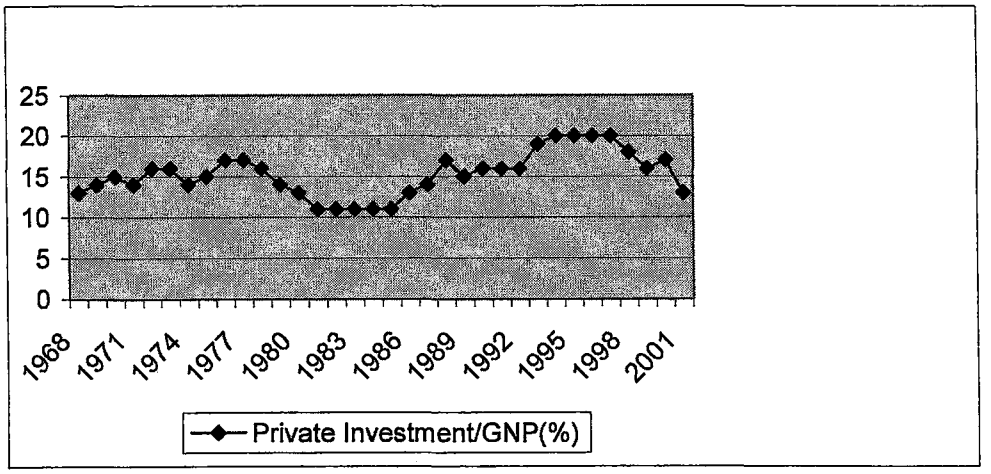

Figure 3.4 Private Investment/GNP (1968-2001)
Source: SPO, Main Economic Indicators, January 2004

Yülek (1998, 24) notes that:

> "The major reason in the stagnation of private investment after 1980, in spite of relatively increased private saving, is high real yields on financial assets which reduces the attractiveness of physical investments in the short run. Theoretically, the yield on financial assets and physical assets should be equalized after controlling for risk. However, in the Turkish case, the growing needs of the public sector introduced a wedge between the returns of the financial and physical assets."

There were significant changes in the composition of private investments in the post 1980 period. Figure 3.5 shows the share of the three productive sectors, namely, agriculture, manufacturing, and mining in total private investments. Both agriculture and manufacturing had a decreasing trend. Although the major trend was a increase in mining. On the whole, there was a decline in the share of the productive sector investments.

On the other hand, Figure 3.6 shows the decline in the productive sector investments accompanied by an increase in transport and communication, tourism and housing investments.

In sum, we observe that financial liberalization did not result in a significant increase in the overall private investments /GNP ratio. However, it is important to note that there were important changes in the composition of private investments.

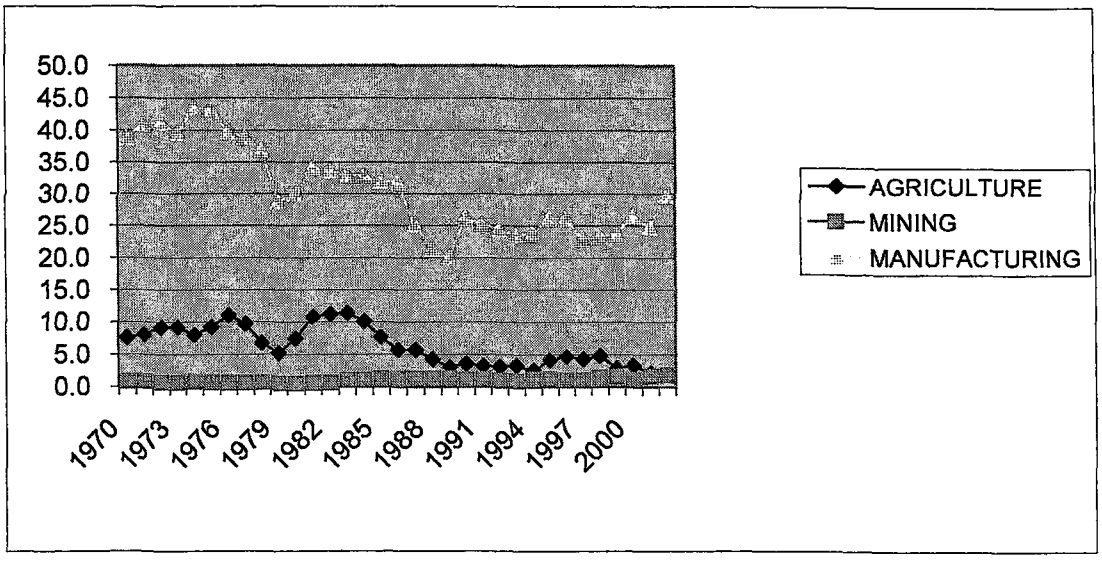

Figure 3.5 The Share of the Productive Sectors in Total Private Investment
Source: SPO, Main Economic Indicators, January 2004

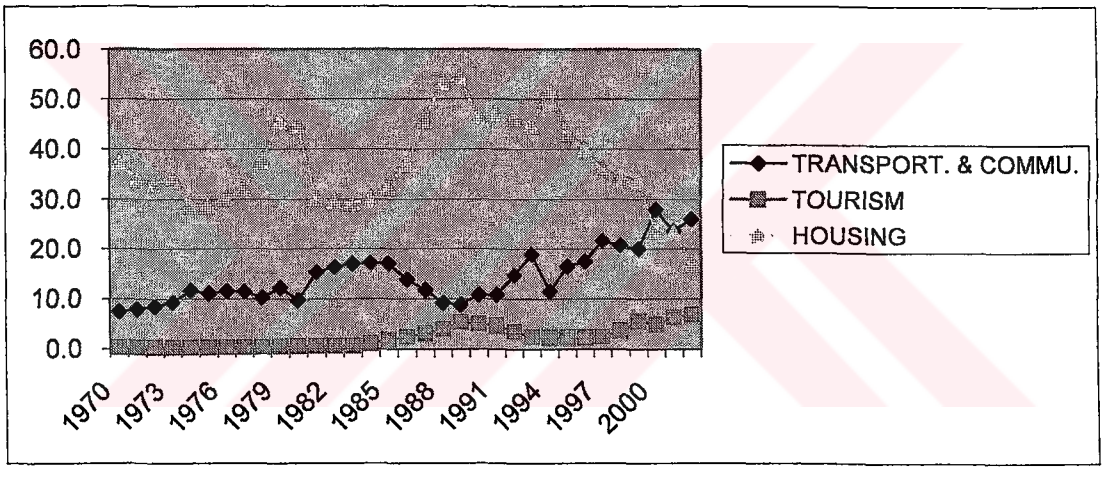

Figure 3.6 The Share of Transport and Communication, Tourism and Housing Investments in Total Private Investment
Source: SPO, Main Economic Indicators, January 2004

3.2.3 Economic Growth

We should expect the growth performance of the economy to improve, following financial liberalization, in line with McKinnon-Shaw hypothesis. Table 3.3 presents growth performance of the economy in the pre- and post- liberalization periods.

Table 3.3 Growth Performance of the Economy

	Real Growth Rate (%)
Pre-liberalization Periods	
1970-1979	4.8
1970-1976	6.3
1977-1980	0.2
Post -liberalization Period	
1981-1989	4.8
1990-2002	3.4
1990-2002 (*)	5.4

Source: SPO, Main Economic Indicators, January 2004
Note: (*) The crises years of 1994 and 2001 are excluded.

It can be observed from Table 5 that the average annual growth rate in the 1970-1979 period was the same as the average rate in the 1981-1989 period. On the other hand, the rate for 1970-1976 period (excluding the crises years of 1977-1980) was much higher than the average rate both in 1981-1989 period and in 1990-2002 period. Even we exclude the crises years of 1994 and 2001 in which Turkey experienced –6 % and -9.5 % growth rates respectively. Average annual growth rate did not reach its levels in the 1970-1976 period.

To sum up, growth performance of Turkish economy does not support McKinnon-Shaw hypothesis in the post liberalization period.

In section 3.2, we have investigated the impact of financial liberalization on saving, private investment, and economic growth. However, one should be cautious that it is problematic to interpret the results obtained in above sections as a measure of the impact of financial liberalization only. Because the financial liberalization process which started as a part of 24 January 1980 stabilization and adjustment program were accompanied by other economic reforms such as fiscal, international trade, and foreign exchange rate, in such a case it is almost impossible to separate the effects of financial components of the reform package.

4. THE MODEL

McKinnon-Shaw hypothesis assumes that a rise in the interest rates following financial liberalization will increase the supply of credit to finance private investment. In this section we investigate whether the positive effect on the credit market following financial liberalization proposed by McKinnon (1973) and Shaw (1973) is offset by the negative effect of a portfolio shift from capital goods and public bonds to financial assets with the help of our theoretical model. It should be noted that the similar model specification was used by (Morisset, 1993) to test the same proposition for Argentina in the 1961-1982 period.

4.1. A Simplified Portfolio Model

Our simple portfolio model is based upon the theoretical arguments suggested by (Brainard and Tobin, 1968). We assume that the private sector holds three types of assets, namely: real domestic money, real domestic assets, and real foreign assets. Real domestic assets[4] include the amounts of physical capital and public bonds held by the private sector. The net accumulation of the assets is assumed to be constrained by the availability of internal and external financial sources. These sources are domestic private savings, net real domestic credits available to the private sector and external debt. Therefore, in our model the private sector has the following budget constraint.

$$S_t^p + \Delta L_t^p + \Delta S_t^f = \Delta m_t + \Delta d_t + \Delta f_t \qquad (4.1)$$

where,

S_t^p = Real private savings,

[4] Morisset (1993,136) notes that "the demand for capital goods and government bonds are determined simultaneously, because the rates of return on both assets are generally indexed in the developing countries with high and variable inflation

ΔL_t^p = Changes in net real domestic credits to the private sector extended by the banking system,

ΔS_t^f = Changes in gross real private external debt,

m_t = Real domestic money,

d_t = Real domestic assets,

f_t = Real foreign assets.

Tobin and Brainard (1968) suggest that the demand for the asset is primarily determined by the rate of return on the asset, disposable income, the rates of return on the alternative assets and wealth held in the beginning of the period.

However, in our model, the demand for each asset is assumed to be a function of real income, expected inflation rate, the return on money, the return on foreign assets, the changes in gross real private external debt and the changes in net real domestic credits to the private sector extended by the banking sector.

For the sake of simplicity, the amount of private savings is taken as predetermined. In addition, the changes in gross real private external debt (ΔS_t^f) and the changes in net real domestic credits to the private sector extended by the banking sector (ΔL_t^p) are included into our demand functions in order to take into account the presence of liquidity constraints on private sector's demands for assets. We expect an increase in the accumulation of assets with an increase in the availability of internal and external financial sources. Moreover, the higher expected inflation rate, the lower the money demand will be as the real value of the cash balances declines.

The demand functions can be specified as follows:

$$\Delta m_t = f(\mathrm{Y}, \pi^e, \mathrm{R}, \mathrm{R2}, \Delta L_t^p, \Delta S_t^f) \quad (4.2a)$$

$$\Delta d_t = g(\mathrm{Y}, \pi^e, \mathrm{R}, \mathrm{R2}, \Delta L_t^p, \Delta S_t^f) \quad (4.2b)$$

$$\Delta f_t = h(\mathrm{Y}, \pi^e, \mathrm{R}, \mathrm{R2}, \Delta L_t^p, \Delta S_t^f) \quad (4.2c)$$

where,

Y = Real income,

π^e = Expected rate of inflation,

R = Real rate of return on money,

R2= Real rate of return on foreign assets.

The model (4.1), (4.2a), (4.2b) and (4.2c), which is based on theoretical arguments proposed by Tobin, suggests that when the real interest rate increases which, in turn, raises the rate of return on domestic money, we should expect a shift in the portfolios of the private investors from domestic assets to monetary asset.

On the other hand, according to McKinnon-Shaw hypothesis, investment is positively related to the real rate of return on money balances. Therefore, an increase in real interest rate is expected to stimulate the demand for money, thus, increasing the financial sources of the banking system to finance private investment. In other words, a rise in real interest rate leads to an increase in the quantity of the investment through saving channel. Because in McKinnon- Shaw hypothesis, it is implicitly assumed that the principal constraint on investment is the quantity of financial resources rather than the cost of the financial resources.

In order to incorporate McKinnon-Shaw hypothesis into our model, the volume of domestic credits to the private sector extended by banking system is specified as follows:

$$\Delta L_t^p = \Delta m_t - \Delta \mathrm{Re}_t - \Delta L_t^g \qquad (4.3)$$

where,

$\Delta \mathrm{Re}_t$ = Changes in real reserves of the banking sector,

ΔL_t^g =Changes in domestics credits to the public sector extended by banking system.

The equation (4.3) points out that an increase in money demand, ceteris paribus, is expected to affect the volume of domestic credits available to the private sector in a positive manner. The equation (4.3) also takes into account the negative effect of the

reserve requirement of the banking sector and crowding out effect of public sector's borrowing requirement on the domestic credit market.

The specification of the equation (4.3) enables us to modify our model in accordance with McKinnon-Shaw hypothesis.

Proposition 1: The effect of an increase in real interest rate on the domestic asset demand becomes ambiguous. In other words, the following partial derivative may take positive or negatives values.

Proof:

$$\frac{d\Delta d_t}{dR} = \frac{\partial \Delta d_t}{\partial R} + \frac{\partial \Delta d_t}{\partial \Delta L_t^p} \frac{\partial \Delta L_t^p}{\partial R} \tag{4.4}$$

We can derive the following partial derivative from equation 4.3 with the help of implicit function rule.

$$\frac{\partial \Delta L_t^p}{\partial R} = \frac{f_3}{1 - f_5} \tag{4.5}$$

Substituting (4.5) into (4.4) yields,

$$\frac{d\Delta d_t}{dR} = g_3 + g_5 \frac{f_3}{1 - f_5} \quad \prec \text{ or } \succ 0 \tag{4.6}$$

While the first term in equation (4.4) represents the substitution effect proposed by Tobin. The second term represents the positive McKinnon and Shaw effect. On this theoretical ground, the impact of a higher real interest rate, resulting from financial liberalization, on domestic assets depends whether McKinnon-Shaw effect outweigh the negative effect of a higher real interest rate on domestic assets demand suggested by Tobin.

In the next section, we present the demand for capital accumulation by the private sector.

4.2. The Model of Investment

A number of empirical studies indicate that investment plays an important role in economic growth. In this respect, what determines the private investment in developing countries has been matter of considerable concern to policymakers. However, we face some problems when establishing an investment function for a developing country. Firstly, there is difficulty in the observation of the stock adjustment mechanism, and secondly it is not easy to establish a production function empirically, which provide the functional form of the desired amount of capital. In addition to these problems, we can not measure the scarcity of the capital by the apparent interest rates in developing countries due to their capital markets that are either small or not well-functioning. (Tun Wai and Wong, 1982)

For the reasons discussed above, in a number of studies[5], private investment for developing countries is specified in accordance with modified flexible accelerator model. Such models incorporate several constraints and structural characteristics of developing countries with the help of the definition of the partial adjustment mechanism. Therefore, in our model the investment function for the private sector is formulated in this line in order to take into account some special characteristics of a developing country.

Firstly, we write the partial adjustment equation for gross investment in steady state:

$$\Delta I_t^p = \beta \, (I_t^{p^\circ} - I_{t-1}^p) \tag{4.7}$$

where $I_t^{p^\circ}$ is defined in terms of $K_t^{p^\circ}$, using the capital accumulation equation:

$$I_t^{p^\circ} = [\, 1 - (1-\sigma)\, L \,]\; K_t^{p^\circ} \tag{4.8}$$

$$K_t^{p^\circ} = \partial \, Y_t^\circ \tag{4.9}$$

[5] See , for example, Tun Wai and Wong (1982), Morisset (1993), Blejer and Khan (1984)

where,

∂ = The capital-output ratio,

σ = The rate of depreciation,

Y_t^* = The expected level of output.

The speed of adjustment mechanism, given by β, is assumed to be linearly determined by internal and external funds available for the private sector to finance investment (ΔL_t^p and ΔS_t^f) and public sector investment (I_t^g)

Therefore, in our model, adjustment coefficient can be written as follows:

$$\beta = \beta_0 + \frac{\beta_1 \Delta L_t^p + \beta_2 \Delta S_t^f + \beta_3 I_t^g}{I_t^{p^*} - I_{t-1}^p} \qquad \beta_1, \beta_2 \succ 0 \qquad (4.10)$$

We can capture the effects of liquidity constraints on private investment through (ΔL_t^p and ΔS_t^f). Equation (4.10) indicates that an increase in funds available for the private sector will, in general, encourage the real private investment. In other words, the lower the amount of such funds, the more time it takes to adjust the actual stock of capital towards optimal level. Moreover, we assume that the speed of capital adjustment is influenced by public sector investment. Güncavdi (1996, 135) points out the crowding-in effect of public spending as follows:

"There are a number of reasons to believe that public spending has a positive effect on private investment. First, if economic resources are not fully utilized, an increase in public spending would increase the level of investment through the Keynesian multiplier effect and raise the profitability of the production of the private sector by augmenting the demand for output produced by that sector. Second, public spending on social and economic infrastructure capital formation would also have a positive effect on the private sector through the elimination of some supply-side bottlenecks...Third, public investment in certain areas such as transportation, communication, energy, health etc would generate externality effects on the private sector, and increase total factor productivity."

On the other hand, he also points out that the opposite effect may take place. For example, if the government finances public investment by borrowing from the domestic financial market, then this will cause the interest rate to increase or to

decrease the volume of the credit available to the private sector which, in turn, crowds out private investment.

Having substituted the equations (4.7), (4.8) and (4.9) into (4.10), we come up with the following investment function for the private sector:

$$I_t^p = \beta_0\, \partial\, [1-(1-\sigma)\,\mathrm{L}]\, Y_t^{\circ} + \beta_1 \Delta L_t^p + \beta_2 \Delta S_t^f + \beta_3\, I_t^g + (1-\beta_0)\, I_{t-1}^p \qquad (4.11)$$

Proposition 2: Provided that the parameters β_1, β_2 are positive in equation (4.10) which means that a rise in the resources available to the private sector increases the speed of adjustment, then the effects of an increase in the real interest rates on private investment seems to be unambiguously positive.

Proof:

$$\frac{dI_t^p}{dR} = \frac{\partial I_t^p}{\partial \Delta L_t^p}\,\frac{\partial \Delta L_t^p}{\partial R} \qquad (4.12)$$

We have already taken the partial derivative of ΔL_t^p with respect to R in (4.5), then

$$\frac{dI_t^p}{dR} = \beta_1\, \frac{f_3}{1-f_5} \succ 0 \qquad (4.13)$$

Putting it differently, the equation (4.13) suggests that an increase in the real interest rate will stimulate financial savings which, in turn, raises the amount of bank credits available to the private sector. The rise in the resources available to the private sector affects the speed of adjustment positively and, thus, private investment.

However, our present model fails to take into account the possible crowding-out effect of the public sector on domestic credit markets and, thus on private investment. Therefore, we introduce the public sector into our model in order to capture the possible crowding-out effect in the next section.

3.3. The Introduction of The Public Sector

The introduction of the public sector into our model takes into account an important channel through which crowding-out of domestic credits to the private sector takes place in many developing countries. The financial liberalization may increase the public sector's demand for banks credits which, in turn, causes the funds available for the private sector to decrease. Therefore, the change in domestic credits to the government extended by the banking sector is specified as follows:

$$\Delta L_t^g = Df_t^g - \Delta b_t - \Delta S_t^g \qquad (4.14)$$

where,

ΔL_t^g = Changes in the domestic credits to the public sector extended by banking sector,

Df_t^g = Fiscal deficit,

Δb_t = Sales of the public bonds to the private sector,

ΔS_t^g = Changes in public external debt.

Like Morisset (1993), we assume that the quantity of bonds is solely determined by the private sector's demand for bonds. Morisset (1993, 141) notes that:

'The authorities can administer the public bonds market by two different instruments: interest rate ceilings and controls on the flow supply of bonds. If either the interest rate on public bonds or the flow supply of bonds is treated as an exogenous variable, the other becomes endogenous.'

In other words, we assume that the interest rate on public bonds is fixed and that the private sector's demand for public bonds determines the quantity of public bonds. Then, the private sector's demand for public bonds:

$$\Delta b_t = \Delta d_t - I_t^p \qquad (4.15)$$

It should be noted that such a specification suggests that the crowding-out results from a shift in the portfolio of private investors rather than a change in the government behavior.

Morisset (1993,) states that:

'As the demands for money and capital goods increase, the private sector's willingness to purchase government bonds is reduced, constraining the public sector to finance its deficits with more credits from the central bank.'

Proposition 3: The presence of public sector may change the positive effect of financial liberalization on the private investment which is suggested by Proposition 2.

Proof :

$$\frac{dI_t^p}{dR} = \frac{\partial I_t^p}{\partial \Delta L_t^p} \frac{\partial \Delta L_t^p}{\partial R} \tag{4.16}$$

$$\frac{\partial \Delta L_t^p}{\partial R} = \frac{f_3 + g_3}{h_6 - \beta_1} \prec \succ 0 \tag{4.17}$$

$$\frac{dI_t^p}{dR} = \frac{\beta_1 (f_3 + g_3)}{(h_6 - \beta_1)} \prec \succ 0 \tag{4.18}$$

(4.17) and (4.18) indicate that the presence of public sector may change the positive effect of financial liberalization on bank credits available to the private sector and, thus on investment.

4.3. The Complete Model

Table 4.1 summarizes our complete model. Our model is made up of eight equations (including the four identities). In the next section, we investigate the question of whether the positive effect proposed by McKinnon and Shaw outweighs both the crowding out of domestic credits and the shift from real domestic assets to monetary assets.

Table 4.1 The Complete Model

# of equations	*Identities and Structural Equations of The Model*
(4.1)	$S_t^p + \Delta L_t^p + \Delta S_t^f = \Delta m_t + \Delta d_t + \Delta f_t$
(4.2a)	$\Delta m_t = f(\mathrm{Y}, \pi^e, \mathrm{R}, \mathrm{R2}, \Delta L_t^p, \Delta S_t^f)$
(4.2b)	$\Delta d_t = g(\mathrm{Y}, \pi^e, \mathrm{R}, \mathrm{R2}, \Delta L_t^p, \Delta S_t^f)$
(4.2c)	$\Delta f_t = h(\mathrm{Y}, \pi^e, \mathrm{R}, \mathrm{R2}, \Delta L_t^p, \Delta S_t^f)$
(4.3)	$\Delta L_t^p = \Delta m_t - \Delta \mathrm{Re}_t - \Delta L_t^g$
(4.11)	$I_t^p = \beta_0 \partial [1-(1-\sigma)\mathrm{L}] Y_t^* + \beta_1 \Delta L_t^p + \beta_2 \Delta S_t^f + \beta_3 I_t^g + (1-\beta_0) I_{t-1}^p$
(4.14)	$\Delta L_t^g = Df_t^g - \Delta b_t - \Delta S_t^g$
(4.15)	$\Delta b_t = \Delta d_t - I_t^p$

5. THE EMPRICAL TEST

The model developed in the preceding section is employed to test the validity of the McKinnon-Shaw hypothesis for the case of Turkey over the period 1990Q1-2003Q4[6]

5.1. The Data

Table 5.1 presents the sources of our data that are used in our econometric analysis.

Table 5.1 Sources of the Data

Variables	Sources of the data
Δm_t	**real domestic money:** Central Bank, *Monetary Aggregates* , M2, Billions TL
Δb_t	**Public bonds:** Central Bank, *Domestic Debt Position*, Billions TL
I_t^p	**Private investment:** Central Bank, *GNP at Fixed (1987) Prices (Expenditure) Gross Fixed Capital Formation, Private Sector* , Billions TL
Δf_t	**Real foreign asset:** Central Bank, *Monetary Aggregates* , FX Deposits, Billions TL
ΔL_t^p	**Changes in net real domestic credits to the private sector extended by the banking system:** Central Bank, *Banking Sector-Domestic Credit Stock* , Billions TL
ΔS_t^f	**Changes in gross real private external debt:** Central Bank, *Outstanding External Debt*, $ Millions
Y	**Real income:** Central Bank, *Gross National Product GNP(production) at fixed at 1987 (With Buyers Prices)*
π^e	**Expected rate of inflation:** Central Bank, *Wholesale prices index(1987=100)*
R	**Ex-ante domestic real interest rate on deposits:** Central Bank, *Interest Rates on Deposits, Weighted Averages of 3-Month Deposit*
I_t^g	**Public investment:** Central Bank, *GNP at Fixed (1987) Prices(Expenditure) Gross Fixed Capital formation, Public Sector,* Billions TL
R2	**Interest rate on FX Deposits:** Central Bank, *Interest Rates on FX Deposits-Weighted , USD 3 Month*

[6] Since it is 1986 that most of the financial markets and instruments became available. It is more plausible to use the time period starting with the year of 1986. However, we use the time period starting with the year of 1990 because of data availability considerations.

The important points in terms of our data can be summarized as follows:
First, all the variables have been deflated by the wholesale price index (1987=100). Second, we measure the expected rate of inflation (π^e) on the basis of perfect expectation hypothesis. Third, the variable R, ex-ante domestic real interest rate on deposits, is calculated by the formula ((1+ I) / (1+π^e)) - 1 where I is the nominal interest rate. Fourth, the demand for the monetary assets (Δm_t) is defined as the changes in the in the stock of money M2[7]. Fifth, FX deposits held by the private sector in the Turkish banking system is used to measure foreign asset holdings by the private sector and we define the expected rate of return on foreign assets with the interest rate on FX deposits, denoted by (R2). Moreover, since real income series (Y) exhibits seasonal pattern (see the graph of the real income series before and after the seasonal adjustment in Appendix B); we have removed these cyclical seasonal movements from a series by using moving average method (multiplicative). Seasonally adjusted real income series is used in our estimation.

5.2. Methodology

Systems can be estimated using a number of multivariate techniques that take into account the interdependencies among the equations in the system. In our study, the technique of two-stage least squares (2SLS) is employed for the estimation of our equation system.Gujarati (1995, 700) claims that 'the basic idea behind the 2SLS is to replace the endogenous explanatory variables by a linear combination of the predetermined variables in the model and use this combination as the explanatory variable in lieu of the original endogenous variable.'

Before we can estimate a simultaneous equations model, we must determine if it is identified. This is basically a comparison of the number of predetermined variables versus the number of endogenous variables.
Pindyck and Rubinfield(1991, 292) state that :

[7] M2 is broad money includes all Turkish lira (TL) denominated currency in circulation plus demand and time deposits. (Foreign currency deposits are excluded).

"....Once a structural model has been specified, we must check immediately to see whether we can obtain knowledge of the structural parameters once the reduced form has been estimated. We say that an equation an equation is unidentified if there is no way of estimating all the structural parameters from the reduced form. An equation is identified if it is possible to obtain values of the parameters from the reduced –form equation system. An equation is exactly identified if a unique parameter value exists and overidentified if more than one value is obtainable for some parameters."

To assess the identifiability of a structural equation, one may apply the so-called order and rank conditions of identification. The order condition states that if an equation is to be identified, the number of predetermined variables excluded from the equation must be greater than or equal to the number of included endogenous variables minus one. (Pindyck and Rubinfield, 1991) On the other hand, the order condition is only a necessary condition for identification. The rank condition is both a necessary and sufficient condition for identification. "Implementation of the rank condition is not usually feasible for anything other than very small systems. However a necessary condition for identifiability is easy to derive and apply. (Dinardo, and Johnston, 1997, 311).In practice, the order condition is likely to be satisfactory rule of thumb for identification.

To present to the order and rank conditions, Gujarati (1995, 665-667) introduce the following notation:

M= number of the endogenous variables in the model

m=number of the endogenous variables in a given equation

K=number of predetermined variables in the model

k=number of predetermined variables in a given equation

The Order Condition of Identifiability: In a model of M simultaneous equations in order for an equation to be identified, the number of predetermined variables excluded from the equation must not be less than the number of endogenous variables included in that equation less 1, that is,

$$K-k \geq m-1$$

If K-k= m-1, the equation is just identified, but if K-k > m-1, it is overidentified.

The Rank Condition of Identifiability: In a model containing M equations in M endogenous variables, an equation is identified if and only if at least one nonzero determinant of order (M-1)(M-1) can be constructed from the coefficients of the variables(both endogenous and predetermined) excluded from that particular equation but included in other equations of the model.

It is important to note that applying the order conditions of identification to the structural equations (4.2a), (4.2b), (4.2c), (4.11) in our system we conclude that every equation is overidentified.

2SLS, especially designed to handle overidentified equations, is a single-equation method to estimate coefficients. In other words, each equation in the system is estimated separately in two stages. The first stage involves estimating an OLS regression of each variable in the model on the set of instruments. The second stage is a regression of the original equation, with all of the variables replaced by the fitted values from the first-stage regressions. Moreover, this method is quite robust against multicollinearity and specification problems.

On the other hand, 2SLS does not generate consistent estimators when the equation to be estimated contains a lagged dependent variable and the error term is serially correlated. Fair (1984) proposes the procedure to correct for autocorrelation in the context of 2SLS.

Fair (1984, 208-210) states that:

"A convenient way of dealing with serially correlated error terms is to treat the serial correlation coefficients as structural coefficients and to transform the equations with serially uncorrelated error terms. This introduces non-linear restrictions on the coefficients, but otherwise the equations are like any others with serially uncorrelated errors. It will be useful to consider the transformation first because once it has been done, little more needs to be said about serial correlation.....With respect to testing for serial correlation, it is well known that the Durbin-Watson (DW) test is biased toward accepting the null hypothesis of no serial correlation if there is a lagged dependent variable in the equation. Since many equations in macroeconometric models have lagged dependent variables, the DW test is of limited use. My response to this problem is to estimate the equations initially under the

assumption of serial correlation (usually first-order) by some consistent techniques (usually 2SLS).From this one can test the hypothesis that the serial correlation coefficient are zero, which is simply a t-test on each coefficient."

5.3.Testing for Unit Roots

This section presents unit root test for the variables of interest. In this study, Augmented Dickey-Fuller test (ADF), developed by Dickey and Fuller (1979), is used to investigate the presence of a unit root. Table 5.2 reports Augmented Dickey-Fuller test statistics

Table 5.2 ADF Unit Root Test Results

Variables	ADF test calculated	1% Critical Value	5% Critical Value
Δm_t	-6.14*	-2.60	-1.94
Δd_t	-4.62*	-2.61	-1.94
Δf_t	-3.51*	-2.61	-1.94
ΔL_t^p	-5.19*	-2.60	-1.94
ΔS_t^f	-4.78*	-2.60	-1.94
Y	-3.26	-4.13	-3.49
π^e	-5.67*	-3.55	-2.91
R	-4.19*	-3.55	-2.91
R2	-2.36(-4.96)	-3.55(-2.60)	-2.91(-1.94)
I_t^p	-2.61(-3.44)	-3.56(-2.61)	-2.91(-1.94)
I_t^g	-2.28(-3.72)	-3.56(-2.61)	-2.91(-1.61)

Notes: (1) All the test results can be found in the Appendix C (2) * means significant at 1% level. (3) While values in the parenthesis show ADF test statistics in first difference of the series, the others present the unit root tests in the level

The test results suggest that the hypothesis of a unit root in the level for all variables except for I_t^p, I_t^g and R2 can be rejected at both 1% and 5% significance level.

On the other hand, the variables I_t^p, I_t^g and R2 are nonstationary in levels but stationary after first differencing.

Nonstationary variables pose special problems for conventional inference procedures from OLS regressions (Dinardo, and Johnston, 1997, 317). Hsiao (1997) investigates the question of whether the similar problem occurs in the context of 2SLS regressions. He concludes that:

"Nothing needs to be changed in applying the conventional 2SLS estimator formula to estimate the unknown parameters and formulate Wald type test statistics. One gets the same point estimates and asymptotic covariance matrix. The resulting Wald type test statistic remains asymptotically chi-square distributed .In other words; nonstationarity and cointegration do not call for new estimation methods or statistical inference procedures. One can just follow the advice of Cowles Commission in constructing and testing structural equation model ..... For empirical structural model builders, the message is clear –one still needs to worry about the issue of identification and simultaneity bias, but one needs not to worry about the issues of nonstationarity and cointegration. All one needs to do in structural model building is to follow the conventional wisdom."

Although the variables I_t^p, I_t^g and R2 are I(1) time series ,meaning that they become stationary after first differencing, we use all the variables in the level in our estimation on the basis of the study of Hsiao (1997).

5.3. Empirical Findings

This section discusses the results of the 2SLS estimation[8]. Table 5.3 presents 2SLS estimates for Turkey in the 1990Q1 - 2003Q4 period. Findings from the estimations are as follows:

First of all, we adjust our 2SLS estimates to account for serial correlation by adding AR (Autoregressive) and MA (Moving Average) terms to our equation specifications which is suggested by Fair (1984).

[8] In our study, E-views 4.1 is used as a regression software package

P-values of the serial correlation coefficients in the equations (4.2b), (4.2c) and (4.11) indicate that we can reject the hypothesis that the serial correlation coefficients are zero at 5 % significance level, verifying the presence of serial correlation.

Table 5.3 2SLS Estimates of The Model for Turkey (1990Q1 - 2003Q4)

Equations	
(4.2a)	Δm_t = -28.6 + 0.0004Y –0.82 π^e + 0.70R –0.47R2 + 0.05 ΔL_t^p
	(0.20) (0.53) (0.17) (0.002) (0.51) (0.81)
	-0.14ΔS_t^f
	(0.33)
	R^2 =0.42 DW=1.5
(4.2b)	Δd_t =502.3+ 0.04Y + 23.9 π^e -15.7 R –54.6 R2
	(0.16) (0.09) (0.08) (0.01) (0.02)
	+14.1 ΔL_t^p -12.5 ΔS_t^f -0.48 AR(1)-0.85AR(2)-0.45AR(3)
	(0.01) (0.06) (0.01) (0.000) (0.02)
	R^2 =0.69 DW=1.97
(4.2c)	Δf_t = 0.64 - 0.0007 Y – 0.21 π^e +0.39R + 1.03R2
	(0.96) (0.07) (0.48) (0.01) (0.05)
	+ 0.01 ΔL_t^p +0.08 ΔS_t^f +0.30AR (1)- 0.71AR (2)
	(0.91) (0.62) (0.01) (0.000)
	R^2 =0.49 DW=2.14
(4.11)	I_t^p =1379.7 + 0.13Y2 +15.07ΔL_t^p +6.48 ΔS_t^f -0.39 I_t^g +0.81 I_{t-1}^p
	(0.000) (0.02) (0.000) (0.23) (0.000) (0.000)
	-0.99AR(2) +0.81MA(2)
	(0.000) (0.000)
	R^2 =0.89 DW=2.12

Notes: (1) The figures in parentheses are the P- values. (2) σ takes the value of 0.05 in equation (4.11) and the variable Y2 is equal to [Yt- (0.95*Yt-1)] (3) All the estimation output can be found in the Appendix B.

Having modified our original equation specification in order to take account of the serial correlation by adding appropriate AR and MA terms, the autocorrelation and partial autocorrelation functions of the residuals for the equations (4.2b), (4.2c) and (4.11) (See Appendix D) indicate that there is no serial correlation in the residuals.

Since, if there is no serial correlation in the residuals, the autocorrelations and partial autocorrelations at all lags should be nearly zero and all Q-statistics should be insignificant with large p-values. That is to say, serial correlation has been eliminated through the transformation, adding appropriate AR and MA terms to our original specification.

Second, the estimated coefficients of R are statistically significant at 5 % significance level in the equations (4.2a), (4.2b) and (4.2c). The positive sign of the coefficient of R in the equation (4.2a) and (4.2c) seems to be consistent with the partial analysis we have made in section (3.2.1). It is indicated in Table3.1 that there was a considerable increase in the financial assets as a ratio to GNP in the post-liberalization period. On the other hand, the estimated coefficient of R in the equation (4.2b) is negative. These results suggest that the increase in the real interest rate led to a portfolio shift from capital goods to foreign assets and monetary assets.

Third, in our theoretical model, the changes in gross real private external debt (ΔS_t^f) and the changes in net real domestic credits to the private sector extended by the banking sector (ΔL_t^p) are included into our demand functions in order to take into account the presence of liquidity constraints on private sector's demands for assets. Although the positive estimated coefficients of (ΔL_t^p) in the assets demand functions (both financial and real assets) are consistent with our theoretical expectations, p-values indicate that except for domestic asset demand function, the coefficients of (ΔL_t^p) are statistically insignificant. On the other hand, the negative sign of the estimated coefficients of (ΔS_t^f) in the monetary and domestic assets demand functions does not confirm our a priori theoretical expectation. Moreover, all estimated coefficients of (ΔS_t^f) in our assets demand functions are statistically insignificant at the 5% significance level.

Fourth, we have incorporated expected inflation into our model with the expectation that the higher expected rate of inflation leads to a portfolio shift towards indexed assets, namely; capital goods and bonds. The estimation results suggest that the expected rate of inflation has a positive effect on the real asset demand (see equation

4.2b) albeit statistically significant at 10 % significance level and a negative statistically insignificant effect on financial assets demand (see equation 4.2a and 4.2c). Therefore, we conclude that economic agents switch into real assets when the inflationary expectation is strong.

Fifth, the estimated coefficients of y are statistically significant at 10 % significance level in equations (4.2b) and (4.2c) but insignificant in equation (4.2a).

Sixth, while the estimated coefficient of rate of return on foreign assets (R2) is statistically insignificant in equation (4.2a), it is significant in both equation (4.2b) and equation (4.2c). Furthermore, the sign of the estimated coefficient is positive in equation (4.2c) and negative in equation (4.2b) as we expected. It should be also noted that there is a positive and statistically significant relationship between the real foreign asset demand (Δf_t) and the real interest rate (R). This relationship indicates that the dolarization of the financial savings took place in the post-liberalization period.

Finally, the estimation of real private investment function suggests that the public investment has a negative effect on the private investment. In other words, our estimation result does not support the complementary relationship between private and public investment in Turkey. Furthermore, in our theoretical model, we try to capture the effects of the liquidity constraints on private investment through (ΔL_t^p) and (ΔS_t^f).The positive signs of the estimated coefficients of (ΔL_t^p) and (ΔS_t^f) in equation (4.11) are those that were anticipated. This positive correlation is a sign of the presence of the liquidity constraint on Turkish private investment. The p-values indicate that the estimated coefficient of (ΔL_t^p) is statistically significant but that of (ΔS_t^f) is not. It is important to note that the estimated effect of a variation in flow supply of credit (ΔL_t^p) on private investment seems to be consistent with our analysis in section (3.2). Because we conclude in section (3.2.1) that although the deepening of the financial system was achieved through the change in the composition of domestic saving in favor of financial assets in Turkey , there was a problem in the credit creation process. In addition, section (3.2.2) suggests that financial

liberalization did not lead to an increase in Turkish private investment. Therefore, we conclude that problems in the financial intermediation are one of the reasons in the stagnation of the private investment in the post-liberalization period. Our estimation results shed light on the positive relationship between the private investment and the amount of the domestic credits available to the private sector.

6. CONCLUSION

In line with McKinnon-Shaw hypothesis, it is assumed that after financial liberalization we should expect both the efficiency and level of investment to increase by the following mechanism: (1) financial liberalization will increase the real interest rate and thus raise domestic savings. (2) There is a change in the composition of increased domestic savings in favor of financial assets. In other words, financial deepening will take place. (3) The financial system will channel this flow to the fixed capital investments, and (4) the investment projects financed through the liberalized market will be on the average more productive compared to the regime of financial repression.

In this study, focusing on the quantity of investment, we have investigated the question of whether the positive effect on the credit market proposed by McKinnon and Shaw was offset by the negative effect of a portfolio shift from capital goods and public bonds (real assets) to financial assets in the Turkish experience with the help of a simple structural model.

Our estimation results can be summarized as follows: The deepening of the financial system was achieved in the Turkish experience. However, the increase in the real interest rate led to a portfolio shift from capital goods to monetary assets. That is to say, the increase in the financial assets was accompanied by the decrease in the real assets. Moreover, the liberalized financial system failed to channel the growing funds to the finance of the private investment. Our estimation results provide the evidence that the dolarization of the financial savings took place in the post-liberalization period.

Since our empirical findings indicate that the negative effect in terms of the real private investment outweighs the positive effect suggested by the McKinnon-Shaw hypothesis. We conclude that the case of Turkey did not conform to the McKinnon-Shaw hypothesis.

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APPENDIX A

TableA.1 presents the important dates in the Turkish financial liberalization process

Table A.1: Chronology of Liberalization

	Financial Markets	**Interest Rates**	**Forex and Capital account Policy**
1980	Private sector bond issue requirements (Aug.)	Ceilings on interest rates increased (Jan.)	Devaluation of TL against major currencies (Jan.)
1981	Capital Market Law (July)	Ceilings on interest rates abolished	Daily adjustments in forex rates started (May)
1982	Capital Market Board established (Sep.)		
1983	Secondary Markets Regulation (Oct.)Prototype Banking Law (July)	Large banks were authorized to set deposit rates (Jan.) Central Bank was authorized to set the deposit rates (Dec.)	
1984	Special Finance Institutions started operations.Treasury Bills started to be issued on a continuous basis Income Sharing certificates started to be issued.		Major liberalization of foreign currency holdings (decrees 28&30) (Jan.&July)
1985	Banking Law (May) Auction system started for government paper (May)		
1986	ISE reopened (Jan.) Interbank money market started (April)Open Market Operations started (June)		
1987	Firms were allowed to issue CP	Interest rates on one-year deposits liberalized	
1988		Ceilings on deposit interest rates were raised and ceiling was set on one-year deposits (Feb.)Ceilings on deposit rates were liberalized (Oct.) Ceilings were reinstituted (Nov.)	
1989	Central Bank Medium Term Rediscount Facility abolished Variable interest rate deposits started (May.)		Liberalization of capital movements (decree 32) (Aug.)
1990			Second step to convertibility. Liberalization of capital movements (amendment to decree 32) (March)
1991	Bond market started in the auspices of ISE (May)	Deposit interest rates liberalized (Feb.)	
1992	Regulation on Repo, reverse Repo and Asset Backed Security issues (June)		
1993	Repo and reverse Repo Operations started at ISE (Feb.)		
1994		Interest rates set by the Central bank after the crises	

Source: Yülek (1998, 10)

APPENDIX B

TableB.1, TableB.2, TableB.3 and TableB.4 present 2SLS estimation results for equations (4.2a), (4.2b), (4.2c) and (4.11) respectively.

While FigureB.1 shows the real income series before the seasonal adjustment, FigureB.2 shows the real income series after the seasonal adjustment.

where,

CRM = Δm_t

CDO= Δd_t

CRF =Δf_t

YSA = Y

SONR = R

R2 = R2

CPC = ΔL_t^p

CPB =ΔS_t^f

INF = π^e

PIN = I_t^p

PUIN = I_t^g

Y2= [Y_t - (0.95* Y_{t-1})]

TableB.1 Estimation Results for Equation (4.2a)

Dependent Variable: CRM
Method: Two-Stage Least Squares
Date: 05/26/04 Time: 12:35
Sample(adjusted): 1990:4 2003:4
Included observations: 53 after adjusting endpoints
Instrument list: YSA(-1 TO -2) SONR(-1 TO -2) CPC(-1 TO -2) CPB(-1 TO -2) INF(-1 TO -2) R2(-1 TO-2)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-28.69860	22.45090	-1.278283	0.2076
YSA	0.000425	0.000682	0.622864	0.5365
SONR	0.704520	0.222492	3.166491	0.0027
R2	-0.470985	0.711213	-0.662227	0.5111
CPC	0.053826	0.230275	0.233747	0.8162
CPB	-0.146849	0.150938	-0.972909	0.3357
INF	-0.821246	0.593750	-1.383150	0.1733

R-squared	0.420478	Mean dependent var	2.732506
Adjusted R-squared	0.344888	S.D. dependent var	14.22583
S.E. of regression	11.51424	Sum squared resid	6098.575
F-statistic	2.694880	Durbin-Watson stat	1.516322
Prob(F-statistic)	0.025136		

TableB.2 Estimation Results for Equation (4.2b)

Dependent Variable: CDO
Method: Two-Stage Least Squares
Date: 05/17/04 Time: 23:21
Sample(adjusted): 1991:1 2000:2
Included observations: 38 after adjusting endpoints
Convergence achieved after 11 iterations
Instrument list: INF(-1TO -2) R2(-1TO-2) SONR(-1 TO -2) CPC(-1 TO -2)
YSA(-1 TO -2) CPB(-1 TO-2)
Lagged dependent variable & regressors added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	502.3428	356.4402	1.409332	0.1697
INF	23.93693	13.34339	1.793916	0.0836
R2	-54.62702	22.94299	-2.380990	0.0243
CPC	14.19387	5.412813	2.622272	0.0140
CPB	-12.56905	6.583364	-1.909214	0.0665
YSA	0.045102	0.025745	1.751878	0.0907
SONR	-15.77315	6.254881	-2.521735	0.0176
AR(1)	-0.481807	0.176824	-2.724777	0.0110
AR(2)	-0.852835	0.104201	-8.184548	0.0000
AR(3)	-0.453496	0.184727	-2.454956	0.0206

R-squared	0.694517	Mean dependent var	72.42253
Adjusted R-squared	0.596326	S.D. dependent var	781.0470
S.E. of regression	496.2410	Sum squared resid	6895143.
F-statistic	7.407377	Durbin-Watson stat	1.975885
Prob(F-statistic)	0.000019		
Inverted AR Roots	.02+.93i	.02 -.93i	-.52

TableB.3 Estimation Results for Equation (4.2c)

Dependent Variable: CRF
Method: Two-Stage Least Squares
Date: 05/17/04 Time: 23:07
Sample(adjusted): 1990:4 2003:4
Included observations: 53 after adjusting endpoints
Convergence achieved after 14 iterations
Instrument list: YSA(-1TO-2) SONR(-1 TO-2) R2(-1 TO-2) CPC(-1 TO-2) CPB(-1 TO -2) INF(-1 TO-2)
Lagged dependent variable & regressors added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.648190	14.65807	0.044221	0.9649
YSA	-0.000799	0.000435	-1.836684	0.0730
SONR	0.396362	0.154128	2.571641	0.0136
R2	1.036747	0.526577	1.968844	0.0553
CPC	0.013637	0.128360	0.106243	0.9159
CPB	0.080384	0.162921	0.493393	0.6242
INF	-0.215518	0.304403	-0.708003	0.4827
AR(1)	0.308557	0.121529	2.538962	0.0147
AR(2)	-0.713168	0.113674	-6.273797	0.0000

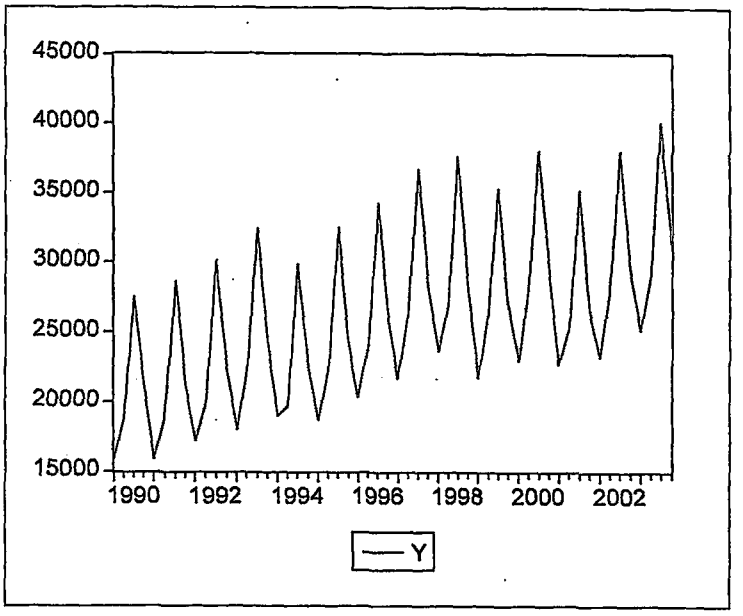
R-squared	0.497483	Mean dependent var	4.087653
Adjusted R-squared	0.406116	S.D. dependent var	15.42477
S.E. of regression	11.88692	Sum squared resid	6217.151
F-statistic	6.305697	Durbin-Watson stat	2.145163
Prob(F-statistic)	0.000020		
Inverted AR Roots	.15+.83i	.15 -.83i	

Table B.4 Estimation Results for Equation (4.11)

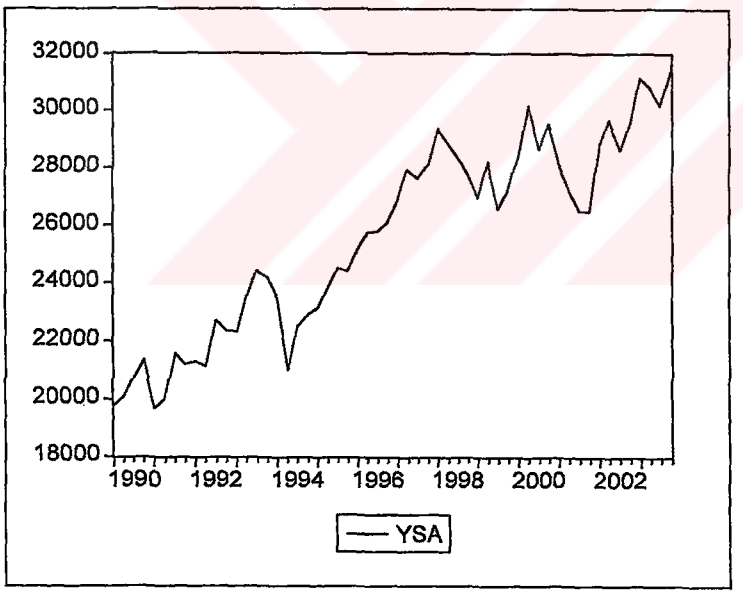
Dependent Variable: PIN
Method: Two-Stage Least Squares
Date: 05/26/04 Time: 14:42
Sample(adjusted): 1991:1 2003:4
Included observations: 52 after adjusting endpoints
Failure to improve SSR after 7 iterations
Backcast: 1990:3 1990:4
Instrument list:
Lagged dependent variable & regressors added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1379.768	315.3205	4.375765	0.0001
Y2	0.130684	0.054790	2.385191	0.0214
PUIN	-0.396296	0.088096	-4.498461	0.0000
CPC	15.07787	2.708523	5.566823	0.0000
CPB	6.482905	5.333071	1.215604	0.2306
PIN(-1)	0.818349	0.060136	13.60822	0.0000
AR(2)	-0.999225	0.032224	-31.00861	0.0000
MA(2)	0.816542	0.156134	5.229748	0.0000

R-squared	0.891971	Mean dependent var	5147.963
Adjusted R-squared	0.874784	S.D. dependent var	1244.352
S.E. of regression	440.3242	Sum squared resid	8530957.
F-statistic	43.73738	Durbin-Watson stat	2.123117
Prob(F-statistic)	0.000000		



FigureB.1 The Real Income Series



FigureB.2 The Real Income Series After The Seasonal Adjustment

APPENDIX C

Appendix C presents Augmented Dickey-Fuller test results for the variables, namely, Δm_t, Δd_t, Δf_t, ΔL_t^p, ΔS_t^f, Y, π^e, R, R2, I_t^p, I_t^g, respectively.

where,

CRM = Δm_t

CDO= Δd_t

CRF =Δf_t

YSA = Y

SONR = R

R2 = R2

CPC = ΔL_t^p

CPB =ΔS_t^f

INF = π^e

PIN = I_t^p

PUIN = I_t^g

Null Hypothesis: CRM has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.145472	0.0000
Test critical values:	1% level	-2.600485	
	5% level	-1.946996	
	10% level	-1.612334	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CRM)
Method: Least Squares
Date: 05/26/04 Time: 16:45
Sample(adjusted): 1990:3 2003:4
Included observations: 54 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CRM(-1)	-0.853607	0.139205	-6.145472	0.0000
R-squared	0.415946	Mean dependent var		0.357756
Adjusted R-squared	0.415946	S.D. dependent var		18.61328
S.E. of regression	14.22469	Akaike info criterion		8.166208
Sum squared resid	10724.41	Schwarz criterion		8.203043
Log likelihood	-219.4876	Durbin-Watson stat		1.957529

Null Hypothesis: CDC has a unit root
Exogenous: None
Lag Length: 5 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.626246	0.0000
Test critical values:	1% level	-2.615910	
	5% level	-1.947682	
	10% level	-1.612573	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CDC)
Method: Least Squares
Date: 05/26/04 Time: 16:16
Sample(adjusted): 1991:4 2003:4
Included observations: 49 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CDC(-1)	-1.605933	0.347099	-4.626246	0.0000
D(CDC(-1))	0.689721	0.309448	2.229102	0.0306
D(CDC(-2))	0.499731	0.291553	1.713659	0.0956
D(CDC(-3))	0.417792	0.239451	1.744896	0.0843
D(CDC(-4))	0.691102	0.172522	3.831983	0.0004
D(CDC(-5))	0.407364	0.140542	2.898619	0.0059
R-squared	0.795480	Mean dependent var		-16.60371
Adjusted R-squared	0.760536	S.D. dependent var		1153.235
S.E. of regression	564.5744	Akaike info criterion		15.68956
Sum squared resid	13224767	Schwarz criterion		15.92021
Log likelihood	-379.9196	Durbin-Watson stat		1.953703

Null Hypothesis: CRF has a unit root
Exogenous: None
Lag Length: 2 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.511460	0.0007
Test critical values:	1% level	-2.610192	
	5% level	-1.947248	
	10% level	-1.612797	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CRF)
Method: Least Squares
Date: 05/26/04 Time: 16:38
Sample(adjusted): 1991:1 2003:4
Included observations: 52 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CRF(-1)	-0.738955	0.210414	-3.511460	0.0010
D(CRF(-1))	0.257458	0.162460	1.585056	0.1196
D(CRF(-2))	0.326193	0.142765	2.284514	0.0267
R-squared	0.644572	Mean dependent var		0.307694
Adjusted R-squared	0.625983	S.D. dependent var		19.51466
S.E. of regression	13.43564	Akaike info criterion		8.085553
Sum squared resid	8946.309	Schwarz criterion		8.202232
Log likelihood	-207.3512	Durbin-Watson stat		2.112928

Null Hypothesis: CPC has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.195109	0.0000
Test critical values:	1% level	-2.600485	
	5% level	-1.946996	
	10% level	-1.612334	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CPC)
Method: Least Squares
Date: 05/26/04 Time: 16:46
Sample(adjusted): 1990:2 2003:4
Included observations: 54 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CPC(-1)	-0.695363	0.122848	-6.195109	0.0000
R-squared	0.397202	Mean dependent var		0.352037
Adjusted R-squared	0.397202	S.D. dependent var		20.05419
S.E. of regression	15.52688	Akaike info criterion		8.441813
Sum squared resid	14127.56	Schwarz criterion		8.478648
Log likelihood	-226.9290	Durbin-Watson stat		2.018276

Null Hypothesis: YSA has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.261185	0.0938
Test critical values:	1% level	-4.139839	
	5% level	-3.496692	
	10% level	-3.178893	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(YSA)
Method: Least Squares
Date: 05/26/04 Time: 16:51
Sample(adjusted): 1990:2 2003:4
Included observations: 55 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
YSA(-1)	-0.339276	0.104055	-3.261185	0.0020
C	7021.930	2102.411	3.339842	0.0016
@TREND(1990:1)	66.95837	21.72458	3.081434	0.0037
R-squared	0.169001	Mean dependent var		212.0791
Adjusted R-squared	0.137665	S.D. dependent var		992.3457
S.E. of regression	921.4039	Akaike info criterion		16.64268
Sum squared resid	44147227	Schwarz criterion		16.85217
Log likelihood	-451.3238	F-statistic		5.317750
Durbin-Watson stat	1.886547	Prob(F-statistic)		0.007920

Null Hypothesis: D(YSA) has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.649767	0.0000
Test critical values:	1% level	-2.609490	
	5% level	-1.946996	
	10% level	-1.612934	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(YSA,2)
Method: Least Squares
Date: 05/26/04 Time: 16:53
Sample(adjusted): 1990:3 2003:4
Included observations: 54 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(YSA(-1))	-1.061932	0.138819	-7.649767	0.0000
R-squared	0.524664	Mean dependent var		15.50192
Adjusted R-squared	0.524664	S.D. dependent var		1482.146
S.E. of regression	1021.838	Akaike info criterion		16.71494
Sum squared resid	55340126	Schwarz criterion		16.75177
Log likelihood	-450.3033	Durbin-Watson stat		1.934790

Null Hypothesis: INF has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-5.679011	0.0000
Test critical values: 1% level	-3.555023	
5% level	-2.915522	
10% level	-2.595565	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INF)
Method: Least Squares
Date: 05/26/04 Time: 16:55
Sample(adjusted): 1990:2 2003:4
Included observations: 55 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF(-1)	-0.776467	0.136726	-5.679011	0.0000
C	10.05275	2.100448	4.786009	0.0000

R-squared	0.378909	Mean dependent var	-0.231436
Adjusted R-squared	0.368578	S.D. dependent var	8.918305
S.E. of regression	7.092173	Akaike info criterion	7.005306
Sum squared resid	2301.179	Schwarz criterion	7.078500
Log likelihood	-150.6459	F-statistic	32.25117
Durbin-Watson stat	1.892575	Prob(F-statistic)	0.000001

Null Hypothesis: SQNR has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=10)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.194910	0.0016
Test critical values: 1% level	-3.555023	
5% level	-2.915522	
10% level	-2.595565	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SQNR)
Method: Least Squares
Date: 05/26/04 Time: 16:57
Sample(adjusted): 1990:2 2003:4
Included observations: 55 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SQNR(-1)	-0.502348	0.119755	-4.194910	0.0001
C	24.61847	6.120202	4.022493	0.0002

R-squared	0.248263	Mean dependent var	-0.041517
Adjusted R-squared	0.235098	S.D. dependent var	12.43917
S.E. of regression	12.62821	Akaike info criterion	7.945445
Sum squared resid	8452.153	Schwarz criterion	8.018639
Log likelihood	-216.4997	F-statistic	17.59727
Durbin-Watson stat	1.931042	Prob(F-statistic)	0.000104

Null Hypothesis: R2 has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic based on SIC, MAXLAG=10)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.366826	0.1566
Test critical values: 1% level	-3.557472	
5% level	-2.915588	
10% level	-2.596116	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(R2)
Method: Least Squares
Date: 05/26/04 Time: 16:59
Sample(adjusted): 1990:3 2003:4
Included observations: 54 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
R2(-1)	-0.103141	0.043578	-2.366826	0.0216
D(R2(-1))	0.553382	0.117765	4.699109	0.0000
C	0.253197	0.120191	2.106355	0.0405

R-squared	0.321426	Mean dependent var	0.059259
Adjusted R-squared	0.294917	S.D. dependent var	1.199847
S.E. of regression	1.008098	Akaike info criterion	2.852003
Sum squared resid	51.01014	Schwarz criterion	3.002525
Log likelihood	-76.08477	F-statistic	12.07850
Durbin-Watson stat	1.737740	Prob(F-statistic)	0.000061

Null Hypothesis: D(R2) has a unit root
Exogenous: None
Lag Length: 1 (Automatic based on SIC, MAXLAG=10)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.686803	0.0000
Test critical values: 1% level	-2.608524	
5% level	-1.947119	
10% level	-1.612867	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(R2,2)
Method: Least Squares
Date: 05/26/04 Time: 17:03
Sample(adjusted): 1990:4 2003:4
Included observations: 53 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(R2(-1))	-0.691494	0.133207	-4.988809	0.0000
D(R2(-1),2)	0.317531	0.133157	2.384994	0.0208

R-squared	0.326074	Mean dependent var	-0.009434
Adjusted R-squared	0.312850	S.D. dependent var	1.209122
S.E. of regression	0.999833	Akaike info criterion	2.874467
Sum squared resid	50.57694	Schwarz criterion	2.948937
Log likelihood	-74.17369	Durbin-Watson stat	2.065164

Null Hypothesis: P/N has a unit root
Exogenous: Constant
Lag Length: 4 (Fixed)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.610348	0.0976
Test critical values: 1% level	-3.555430	
5% level	-2.915522	
10% level	-2.595565	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(P/N)
Method: Least Squares
Date: 05/26/04 Time: 17:26
Sample(adjusted): 1991:2 2003:4
Included observations: 51 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
P/N(-1)	-0.201225	0.077091	-2.610348	0.0123
D(P/N(-1))	0.218809	0.137522	1.591450	0.1194
D(P/N(-2))	-0.242268	0.140970	-1.718574	0.0926
D(P/N(-3))	0.126355	0.132684	0.952451	0.3465
D(P/N(-4))	0.421692	0.135573	3.110506	0.0033
C	1060.994	404.0726	2.625752	0.0118

R-squared	0.515789	Mean dependent var	28.94706
Adjusted R-squared	0.459765	S.D. dependent var	806.1504
S.E. of regression	592.4942	Akaike info criterion	15.71669
Sum squared resid	15797221	Schwarz criterion	15.94396
Log likelihood	-394.7755	F-statistic	9.210158
Durbin-Watson stat	1.794324	Prob(F-statistic)	0.000005

Null Hypothesis: D(P/N) has a unit root
Exogenous: None
Lag Length: 4 (Fixed)

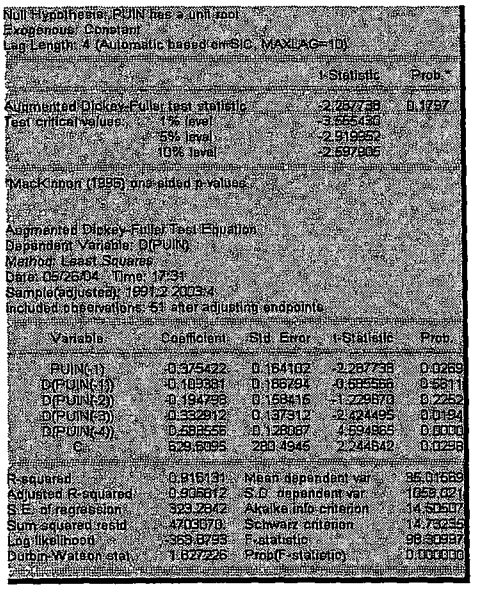
	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.447164	0.0009
Test critical values: 1% level	-2.612033	
5% level	-1.947520	
10% level	-1.612650	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(P/N,2)
Method: Least Squares
Date: 05/26/04 Time: 17:29
Sample(adjusted): 1991:3 2003:4
Included observations: 50 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(P/N(-1))	-1.132510	0.328621	-3.447164	0.0012
D(P/N(-1),2)	0.257442	0.306917	1.166506	0.2494
D(P/N(-2),2)	0.001724	0.265348	0.006500	0.9948
D(P/N(-3),2)	-0.050537	0.184773	-0.273506	0.7857
D(P/N(-4),2)	0.358135	0.142006	2.521731	0.0215

R-squared	0.737628	Mean dependent var	-11.41000
Adjusted R-squared	0.714306	S.D. dependent var	1121.921
S.E. of regression	599.6703	Akaike info criterion	15.72628
Sum squared resid	16182199	Schwarz criterion	15.91648
Log likelihood	-388.1319	Durbin-Watson stat	2.256922



Null Hypothesis: PUIN has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic based on SIC, MAXLAG=10)

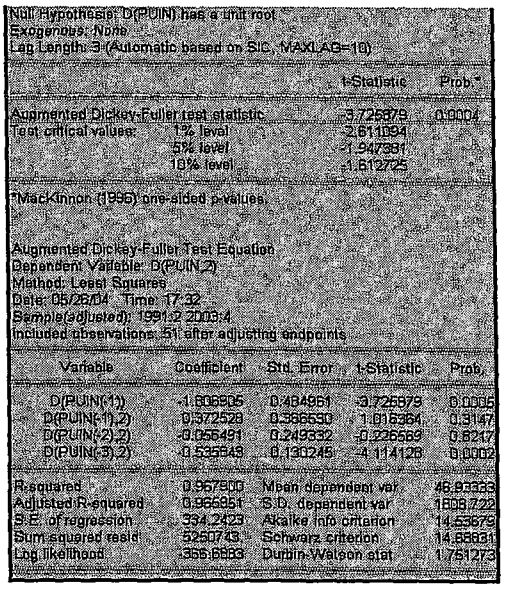
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.257738	0.1797
Test critical values:	1% level	-3.565430	
	5% level	-2.919952	
	10% level	-2.597905	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(PUIN)
Method: Least Squares
Date: 05/26/04 Time: 17:31
Sample(adjusted): 1991:2 2003:4
Included observations: 51 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
PUIN(-1)	-0.375422	0.164102	-2.287738	0.0269
D(PUIN(-1))	-0.109381	0.186794	-0.585569	0.5611
D(PUIN(-2))	-0.194799	0.158415	-1.229870	0.2252
D(PUIN(-3))	-0.352912	0.137912	-2.424495	0.0194
D(PUIN(-4))	0.698556	0.126067	4.594865	0.0000
C	529.6095	288.4946	2.244542	0.0298

R-squared	0.816131	Mean dependent var	35.01569
Adjusted R-squared	0.935812	S.D. dependent var	1059.021
S.E. of regression	323.2942	Akaike info criterion	14.50507
Sum squared resid	4703070.	Schwarz criterion	14.79235
Log likelihood	-363.8793	F-statistic	98.90997
Durbin-Watson stat	1.827226	Prob(F-statistic)	0.000000



Null Hypothesis: D(PUIN) has a unit root
Exogenous: None
Lag Length: 3 (Automatic based on SIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.726579	0.0004
Test critical values:	1% level	-2.611094	
	5% level	-1.947381	
	10% level	-1.612725	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(PUIN,2)
Method: Least Squares
Date: 05/26/04 Time: 17:32
Sample(adjusted): 1991:2 2003:4
Included observations: 51 after adjusting endpoints

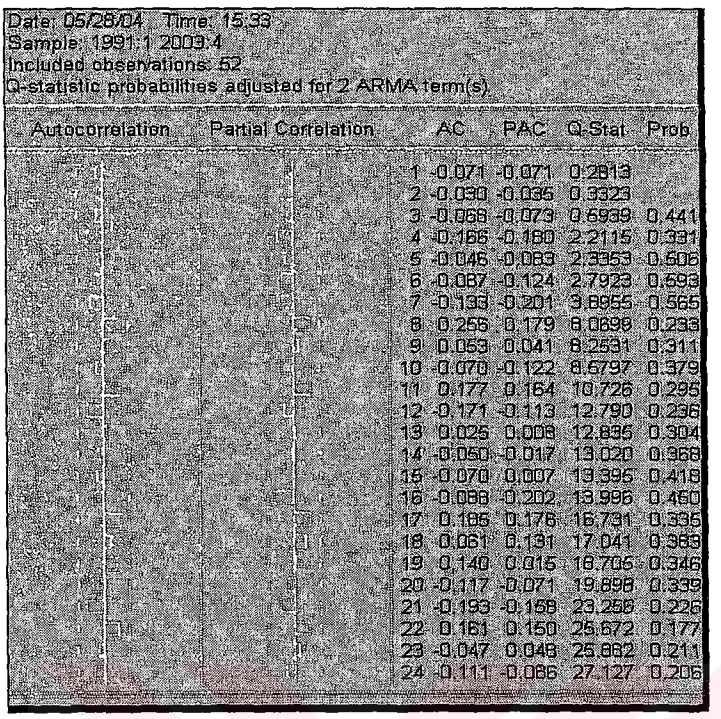
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(PUIN(-1))	-1.606905	0.484951	-3.726579	0.0006
D(PUIN(-1),2)	0.372529	0.366530	1.016364	0.3147
D(PUIN(-2),2)	-0.056491	0.249332	-0.226569	0.8217
D(PUIN(-3),2)	0.535548	0.130245	4.111429	0.0002

R-squared	0.957800	Mean dependent var	46.83333
Adjusted R-squared	0.955851	S.D. dependent var	1808.722
S.E. of regression	334.2423	Akaike info criterion	14.53679
Sum squared resid	5250743.	Schwarz criterion	14.68831
Log likelihood	-366.6683	Durbin-Watson stat	1.751273

APPENDIX D

TableD.1, TableD.2, TableD.3 and TableD.4 show the autocorrelation and partial autocorrelation functions of the residuals for the equations (4.11), (4.2a), (4.2b), and (4.2c) respectively.

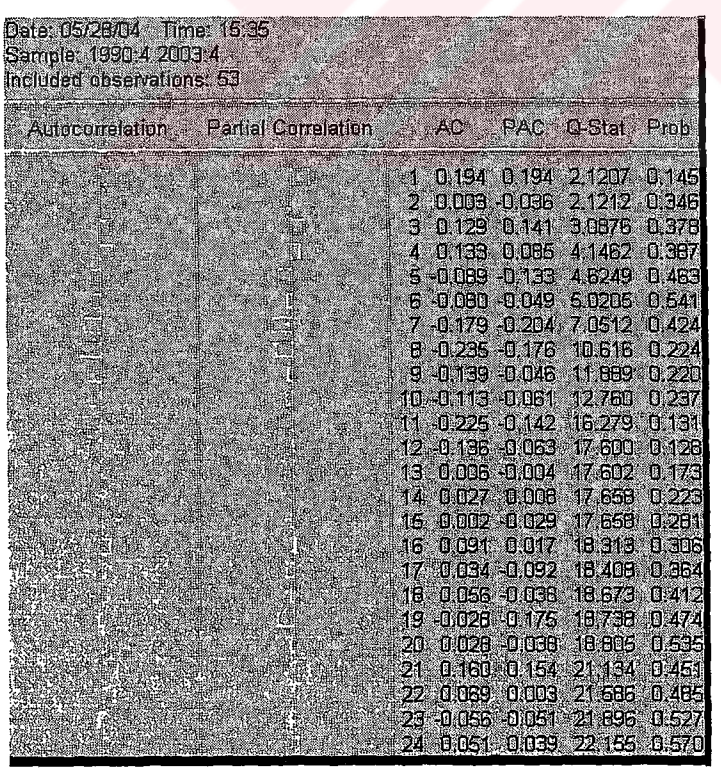
TableD.1 The Autocorrelation and Partial Autocorrelation Functions of The Residuals for Equation (4.11)



Date: 05/28/04 Time: 15:33
Sample: 1991:1 2003:4
Included observations: 52
Q-statistic probabilities adjusted for 2 ARMA term(s)

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.071	-0.071	0.2813	
		2	-0.030	-0.035	0.3323	
		3	-0.068	-0.073	0.6939	0.441
		4	-0.166	-0.180	2.2115	0.331
		5	-0.046	-0.083	2.3353	0.606
		6	-0.087	-0.124	2.7923	0.693
		7	-0.133	-0.201	3.8955	0.565
		8	0.256	0.179	8.0899	0.233
		9	0.053	0.041	8.2591	0.311
		10	-0.070	-0.122	8.5797	0.379
		11	0.177	0.164	10.726	0.295
		12	-0.171	-0.113	12.790	0.236
		13	0.025	0.008	12.835	0.304
		14	-0.050	-0.017	13.020	0.368
		15	-0.070	0.007	13.395	0.418
		16	-0.098	-0.202	13.996	0.460
		17	0.185	0.176	16.731	0.335
		18	0.061	0.131	17.041	0.383
		19	0.140	0.015	18.706	0.346
		20	-0.117	-0.071	19.898	0.339
		21	-0.193	-0.169	23.258	0.226
		22	0.161	0.150	25.672	0.177
		23	-0.047	0.049	25.862	0.211
		24	-0.111	-0.086	27.127	0.206

TableD.2 The Autocorrelation and Partial Autocorrelation Functions of The Residuals for Equation (4.2a)



Date: 05/28/04 Time: 15:35
Sample: 1990:4 2003:4
Included observations: 53

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.194	0.194	2.1207	0.145
		2	0.003	-0.036	2.1212	0.346
		3	0.129	0.141	3.0876	0.378
		4	0.139	0.085	4.1462	0.387
		5	-0.089	-0.133	4.6249	0.463
		6	-0.080	-0.049	5.0205	0.541
		7	-0.179	-0.204	7.0512	0.424
		8	-0.235	-0.176	10.616	0.224
		9	-0.139	-0.046	11.869	0.220
		10	-0.113	-0.061	12.760	0.237
		11	-0.225	-0.142	16.279	0.131
		12	-0.136	-0.063	17.600	0.128
		13	0.006	-0.004	17.602	0.173
		14	0.027	0.008	17.659	0.223
		15	0.002	-0.029	17.659	0.281
		16	0.091	0.017	18.313	0.306
		17	-0.034	-0.092	18.408	0.364
		18	0.056	-0.036	18.673	0.412
		19	-0.026	-0.175	18.738	0.474
		20	0.026	-0.038	18.805	0.535
		21	0.160	0.154	21.134	0.451
		22	0.069	0.003	21.686	0.485
		23	-0.056	-0.051	21.896	0.527
		24	0.051	0.039	22.155	0.570

TableD.3 The Autocorrelation and Partial Autocorrelation Functions of The Residuals for Equation (4.2b)

Date: 05/28/04 Time: 15:42
Sample: 1991:1 2000:2
Included observations: 38
Q-statistic probabilities adjusted for 3 ARMA term(s)

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.015	-0.015	0.0094	
		2	0.031	0.031	0.0504	
		3	-0.081	-0.080	0.3351	
		4	-0.298	-0.303	4.2957	0.038
		5	-0.111	-0.133	4.6690	0.096
		6	0.091	0.093	5.1718	0.160
		7	-0.013	-0.048	5.1800	0.269
		8	0.315	0.221	10.192	0.070
		9	0.059	0.038	10.369	0.110
		10	-0.251	-0.282	13.788	0.055
		11	-0.037	-0.033	13.865	0.085
		12	-0.284	-0.157	18.563	0.029
		13	-0.111	-0.109	19.334	0.036
		14	0.013	-0.167	19.345	0.056
		15	0.088	-0.004	19.836	0.070
		16	0.087	-0.086	20.359	0.087
		17	0.180	0.047	22.704	0.085
		18	-0.151	-0.050	24.448	0.068
		19	-0.093	-0.128	25.139	0.067
		20	-0.038	-0.057	25.300	0.076
		21	-0.117	-0.086	27.028	0.076
		22	0.015	-0.166	27.051	0.103
		23	0.187	-0.016	29.876	0.072
		24	0.136	0.021	31.668	0.060
		25	0.068	-0.085	32.784	0.065

TableD.4 The Autocorrelation and Partial Autocorrelation Functions of The Residuals for Equation (4.2c)

Date: 05/28/04 Time: 15:56
Sample: 1990:4 2003:4
Included observations: 53
Q-statistic probabilities adjusted for 2 ARMA term(s)

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.077	-0.077	0.3337	
		2	-0.065	-0.071	0.5725	
		3	-0.022	-0.039	0.6004	0.439
		4	-0.238	-0.246	3.8379	0.147
		5	0.068	0.013	4.0441	0.257
		6	-0.117	-0.160	4.6914	0.299
		7	0.039	0.005	4.9897	0.417
		8	-0.014	-0.103	5.0026	0.543
		9	-0.010	-0.010	5.0093	0.659
		10	0.009	-0.081	5.0143	0.756
		11	-0.106	-0.111	5.7985	0.760
		12	-0.157	-0.266	7.5441	0.673
		13	0.060	-0.015	7.8050	0.731
		14	-0.014	-0.142	7.8198	0.799
		15	-0.160	-0.089	9.7765	0.712
		16	0.074	-0.056	10.205	0.747
		17	-0.006	0.033	10.205	0.807
		18	0.106	0.026	11.136	0.801
		19	-0.067	0.015	11.782	0.813
		20	-0.050	-0.099	12.062	0.847
		21	-0.091	-0.071	12.756	0.861
		22	-0.040	-0.096	12.904	0.881
		23	-0.025	-0.129	12.966	0.910
		24	0.023	-0.076	13.021	0.933

ABOUT THE AUTHOR

Zahide Eylem Gevrek was born in 1974 in İzmir. She attended to İzmir Özel Türk Science High School. In 1998, she received her Bachelor of Science degree in Economics from Middle East Technical University. She worked as an internal auditor at Koçbank and as product developer at Plato Information Communications Services Inc. that specializes in broadcasting of financial data and providing services to all parties involved in the financial markets. Since September 2001, she has been working as a teaching and research assistant at Istanbul Bilgi University, Department of Economics.