EFFECTS OF MACROECONOMIC DYNAMICS ON STOCK RETURNS: THE CASE OF THE TURKISH STOCK EXCHANGE MARKET

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This study analyses the effects of macroeconomic dynamics on the Turkish Stock Exchange Market by using a time varying parameter model with GARCH specification. Our methodology allows us to observe the varying effects of different macroeconomic variables on stock returns during the last decade. It is found that the financial crisis in 1994, together with unsuccessful stabilisation attempts, led to a structural break on the impact of macroeconomic developments on the stock exchange performance.

1. INTRODUCTION

Stock exchange markets in emerging countries are generally characterised as unstable and shallow. These two features lead to the fact that macroeconomic dynamics still have the potential to play a very important role on stock market performances. The Istanbul Stock Exchange market (ISE henceforth) is no exception in this context. The low volume of trade and limited publicly available information combined with the unstable and shallow nature of the ISE result in an oversensitivity of stock returns to macroeconomic developments. Therefore, it is not surprising to see many studies dedicated to analysing the impact of macroeconomic factors on stock returns for the Turkish economy. One common feature of these studies is that the time-varying effects of the macroeconomic variables on stock returns are often neglected. However, triggered with intensified capital account liberalisation and structural adjustment attempts in the last two decades, many emerging markets, including the Turkish economy, witnessed radical changes both in their macroeconomic and financial structures.

Several financial crises experienced in this period further affected the economic environment. As a result, the relationship between macroeconomic factors and stock returns did not stay intact. Instead, they were reshaped frequently. Therefore, a new methodology, which would allow us to track down these changing relationships, should be developed.

This paper takes the above discussion as its starting point and analyses the time-varying effects of several macroeconomic variables on the ISE performance within the context of a time-varying parameter model with Generalised Autoregressive Conditional Heteroscedasticity (GARCH) specification. As will be discussed in the following sections, such a methodology can reveal the rapidly changing interactions between macroeconomic factors and stock returns, which many of the previous studies did not account for.

The estimation results in this paper show that the relationship between stock returns and several macroeconomic variables changed significantly over time. The case of foreign exchange rates is especially striking: while we observe that the currency appreciation affects stock returns positively until the financial crisis in 1994, the situation is totally reversed afterwards. Excluding the 1994 financial crisis and the following year, the industrial production is found to affect the stock exchange performance positively. Finally, while we observe a positive relation between secondary market rates and stock returns, which dies out right after the financial crisis, we show that the interbank interest rates and stock returns are negatively associated, a result that is consistent with Muradoğlu (1992).

The next section presents a brief literature review about the effects of macroeconomic variables on stock returns, with a special emphasis on the findings regarding the ISE. Then, the estimation methodology along with the employed data are introduced. Estimation results are discussed in the fourth section. The final section concludes.

2. LITERATURE REVIEW

According to the International Finance Corporation (IFC), all markets in the developing countries are treated as emerging. The World Bank defines the developing countries as those having a per capita GNP below 7620 US dollars in 1990 prices. In this context, the Istanbul Securities

Exchange (ISE) can be viewed as an emerging market. After intensive efforts to establish a modern infrastructure beginning from the mid-1980s, the ISE has finally become the world's twenty-third largest stock exchange market (www.ise.org/about). However, the continuously unstable nature of the economic and financial environment, together with the shallow characteristic of the ISE, still cause stock returns to respond strongly to macroeconomic factors.

One common result drawn from the previous studies, such as Muradoğlu and Metin (1996) and Balaban et al. (1996), is that the ISE is vulnerable to both macroeconomic and political conditions. These findings are consistent with other studies such as Balaban and Kunter (1997) and Muradoğlu et al. (1999, 2001) which all report that efficiency, either in its weak or semi-strong form, has not been achieved for the ISE.

At this point, it is also important to mention some of the studies that analyse the effects of macroeconomic variables on stock returns. While Muradoğlu and Önkal (1992) find that monetary and fiscal policy instruments affect stock prices significantly, in a later study, Muradoğlu et al. (2001) report that the influence of monetary expansion and interest rates disappears over time. In fact, the latter study also finds that the variables explaining stock prices might change over time, which is an argument that reflects the spirit of this paper. Finally, Muradoğlu et al. (1999) examine the relationship between macroeconomic variables and risk-return relationships by using a GARCH-M model. Changes in the determinants of risk as well as the relationship between risk and stock returns before, during and after the financial crisis of 1994 in the ISE are investigated. They find that currency in circulation, foreign exchange rates of the US dollar and overnight interest rates play significant roles in explaining the behaviour of stock returns. Before the crisis, their results suggest that the depreciation of the exchange rate and higher interest rates, which are regarded as important indicators of political and economic instability, increase volatility in the stock market. Moreover, there is a negative and significant relationship between interest rates and stock returns during this period. During the crisis, none of the macroeconomic variables seem to have significant coefficients. After the crisis, they again find the same negative relationship between stock returns and interest rates. As a result, their study also implies that the relationship between macroeconomic dynamics and stock returns did not

stay intact. Most recently, Kutan and Aksoy (2003) examine the effect of inflation on stock returns and interest rates for Turkey. Previous studies about this effect indicate that Turkey's inflation has increased more than stock returns and interest rates, implying that real returns to investors declined. By using different sector indexes, they find that the Fisher effect appears to hold only for the financial sector which, at the same time, serves as the best hedge against expected inflation. As a side note, it is also reported that public information arrival plays an important role for the stock market.

Consequently, the message derived from all of these previous studies is clear: Macroeconomic factors are still vital and have time-varying degrees of influence in explaining stock returns. Therefore, there is still room for further research which would take these points into account.

3. DATA AND METHODOLOGY

3.1. Unit roots and testing for the order of integration

In order to explain the effect of macroeconomic variables on stock returns, we employ the ISE composite index, consistent with previous studies. The macroeconomic factors include the currency in circulation (a fraction of M1) as a measure of economic liquidity, foreign exchange rates of the US dollar both as a cost-side disturbance and a sign of competitiveness in the international markets, interpolated industrial production as the supply-side disturbance, the benchmark interest rates of the secondary market as a proxy for both political risk and expected inflation and, finally, the overnight interest rates. The sample consists of weekly data and the period between 28.06.1991 and 24.03.2000 is taken into consideration. The beginning date is chosen with respect to data availability. The period considered ends right before the anticipation that the exchange-rate-based stabilisation programme had serious flaws and a huge economic crisis would likely follow. All of the data set is obtained from the database of the Central Bank of the Republic of Turkey (CBRT).

3.1.1. Stationarity Tests

To analyse the univariate time series properties of the data, the Augmented Dickey Fuller (ADF) test is used. The results of the tests for

the unit roots and the order of integration are presented in Table 1. The first column of Table 1 displays the unit root test results for each variable. The second column repeats the same exercise for the first differences of the variables, which are found to be non-stationary in levels.

Table 1: Results of Unit Root Tests

Series	ADF Test Statistics (level)	ADF Test Statistics (First difference)
L (Stock Returns)	0.108387	-4.633235*
L (Exchange Rate)	-0.674392	-5.574693*
L (Currency in Circulation)	0.685408	-5.704278*
L (Industrial Production)	-4.403944*	
Interbank Rates	-4.633235*	
Secondary Rates	-3.714942*	

Notes: 1) L denotes the natural algorithm of variables.
2) Critical values for the ADF test statistics are obtained from Fuller (1976, Table 8.5.2).
3) * means that the series is stationary at 1% significance level.

3.1.2. Discussion on Macroeconomic Variables

At this point, it is also important to discuss the idea behind the use of these five macroeconomic variables. Before that, it is worth mentioning that the stock returns, Rt, are obtained as:

$R_t = \ln P_t - \ln P_{t-1},$ where P_t is the value of the ISE composite index for week t.

Industrial production is selected as a measure of current domestic macroeconomic activity. It can be claimed that using weekly data for the national output produces weak results. However, it is certain that the stock exchange performance is sensitive to output dynamics. Therefore, we decided to include such a measure. Since the industrial production index is not available on a weekly basis, we decided to interpolate the monthly index. We used a conventional quadratic approach where our methodology fits a local quadratic polynomial for each observation of the low frequency series. Then, we used this polynomial to fill in all observations of the high frequency series associated with the period. The quadratic polynomial, on the other hand, is formed by taking sets of three adjacent points from the source series and fitting a quadratic so that either the average or the sum of high frequency points match with the low frequency data actually observed. For most points, one point before and one point after the period currently being interpolated are used to provide the three points. For end points, the two periods are both taken from the one side where data are available.

Industrial production is found to affect the stock returns positively and significantly in many studies such as Fama (1981), Kaul (1987), Balvers et al. (1990), Cochrane (1991) and Lee (1992). These studies mostly stress the positive effect of industrial production on stock returns through increasing the expected cash flow.

Overnight interest rates and the interest rate for the secondary market are all available on a weekly basis. There is a dense literature on the relationship between interest rates and stock returns. However, similar to the literature on exchange rates, the results presented below are mixed. While Hashemzadeh and Taylor (1988) find that an increase in interest rate motivates the representative investor to change the

structure of his portfolio in favour of bonds, Shiller and Beltratti (1992) favour a positive relationship by arguing that changes in interest rates could carry information about certain changes in future fundamentals such as dividends. Finally, Barsky (1989) explains the positive relationship between interest rates and stock prices in terms of a change in the risk premium. For example, a drop in interest rates could be the result of an increased risk and/or precautionary saving as investors substitute risky assets such as stocks for safer ones including treasury bills or real estate.

As mentioned above, apart from the overnight interest rate, the secondary market interest rate is taken as a proxy for both inflation risk premium and political risk. Political risk includes possible populist policies that could increase the inflation risk and worsen the ISE performance. In addition, an increase in political uncertainty brings debt restructuring into the investors' mind which, in turn, increases the default risk. Finally, increased political uncertainty carries an additional liquidity risk which would also affect the ISE performance negatively. It may be questioned whether the overnight interest rates and the secondary rates could be highly correlated which would cause a multicollinearity problem. However, the correlation between the variables is found to be fairly low.

The foreign exchange rate of the US dollar (change in the price of the US dollar in terms of the Turkish Lira) is computed as:

$E_t = \ln D_t - \ln D_{t-1}$, where D_t is the Turkish lira value of the US dollar for week t.

Although the exchange rate dynamics are often thought to play an important role in explaining stock returns, the results are mixed. While Geske and Roll (1983), Pettinen (2000) and Malliaropulos (1998) find that the depreciation of the domestic currency is expected to increase stock prices through an increase in the competitiveness of the exportables in the world trade market, Ajayi and Mougoue (1996) show that currency depreciation has negative effects on the stock market both in the short and long run. They argue that the inflationary effects of the domestic currency depreciation may exert a moderating effect in the short run, and unfavourable effects on imports and asset prices will induce bearish trends in the long run.

Finally, the growth rate of the money stock (currency in circulation) is defined as:

$$M_t = \ln M_t - \ln M_{t-1}$$

Bulmash and Trivoli (1991) show the effects of business cycle movements on the relationship between stock returns and money growth. Pearce and Roley (1983) also show that stock returns are closely related to several measures of money stock. Finally, Serletis (1993) investigates the same relationship and finds that monetary variables and stock prices do not cointegrate, and concludes that the stock market is efficient for developed countries.

Consequently, the regressors to be employed in this paper were also used in previous studies which focused on the impact of macroeconomic variables on stock exchange markets for both developed and emerging markets. In this paper, we take one step further and analyse the relationship from a time-varying perspective, which would account for the changing interactions between stock returns and macroeconomic dynamics.

3.2.   Methodology

Introduced by Bollerslev (1986), a Generalised Autoregressive Conditional Heteroscedasticity (GARCH) specification allows the conditional variance to change over time, as a function of past errors together with the lagged values of conditional variance. While Bollerslev et al. (1992) note that such a methodology is appropriate especially for financial data, GARCH models have also been employed to model several macroeconomic variables such as inflation, interest rates and foreign exchange rates in studies including Engle et al. (1987), Kendall and MacDonald (1989) etc.

The above-mentioned studies do not impose a time-varying specification for the regressor matrix. However, the varying degrees of interaction between regressors and the dependent variable can best be observed within the context of a time-varying parameter model. Therefore, there will be significant gains if a GARCH specification, which is appropriate for high-frequency financial data, can be incorporated into a time-varying parameter framework. To our knowledge, Evans (1991) is

the earliest attempt that combines these two methodologies. In this paper, we follow his methodology and specify the model as:

$$R_{t+1} = X_t \beta_{t+1} + e_{t+1} \qquad where \quad e_{t+1} \sim N(0, h_t) \qquad (1)$$

$$\beta_{t+1} = \beta_t + V_{t+1} \quad where \quad V_{t+1} \sim N(0, Q) \qquad (2)$$

$$h_t = h + \sum_{i=0}^{m} \phi_i e_{t-i}^2 + \sum_{i=1}^{n} \gamma_i h_{t-i} \qquad (3)$$

where R_{t+1} represents stock returns, and the vector of explanatory macroeconomic variables X_t at time t is defined as $X_t = [E_t, M_t, IP_t, I_t, S_t]$. E_t, M_t, IP_t, S_t, and I_t represent the change in the price of the US dollar in terms of TL, growth rate of money, industrial production, interest rates of the secondary market, and overnight interest rates, respectively.

It may also be questioned whether an endogeneity bias may emerge between stock returns and explanatory variables. However, the shallow characteristic of the ISE, combined with its sensitivity to macroeconomic developments, lead us to treat regressors as pure informational variables. In other words, it can be conveniently assumed that stock returns have almost no impact on macroeconomic dynamics.

e_{t+1} in the first equation is normally distributed with a time varying conditional variance of h_t, which is used as a measure of volatility and which can be influenced by both its own lagged values as well as the past values of the error terms.

The time-varying coefficients β_{t+1} are allowed to follow random walk and V_{t+1} are the normally distributed shocks to the parameter vector with a homoscedastic covariance matrix Q. Finally, ϕ_i and γ_i are the time-varying parameters of h_t.

Equations (1), (2) and (3) characterise a time-varying autoregressive process with an ARCH specification for shocks to stock prices. In

addition, the last equation describes the GARCH process of shocks to the stock returns.

Also, the random walk assumption about the evolution of the parameters, which is characterised in equation (2) bears explanation. The structural changes in variations mostly occur due to changing views or additional information about the structure of the economy. Then, it would be impossible to predict any future changes in the movements of β_{t+1}. Therefore, a random walk assumption can easily be justified.

To see the variations in the structure, we use the Kalman Filter algorithm used as an estimation method in time-varying parameter models. It is a recursive algorithm, meaning that the parameters are updated based on recursive innovations. As described in Chow (1984), updating equations in Kalman Filter can be written as:

$$R_{t+1} = X_t E_t \beta_{t+1} + \eta_{t+1}, \tag{4}$$

$$H_t = X_t \Omega_{t+1|t} X_t^T + h_t \tag{5}$$

$$E_{t+1} \beta_{t+2} = \beta_{t+1} + \left[\Omega_{t+1|t} X_t^T H_t^{-1} \right] \eta_{t+1} \tag{6}$$

$$\Omega_{t+2|t+1} = \left[I - \Omega_{t+1|t} X_t^T H_t^{-1} X_t \right] \Omega_{t+1|t} + Q \tag{7}$$

where $\Omega_{t+1|t}$ is the conditional covariance matrix of β_{t+1}, given information available at time t. The conditional variance of stock returns H_t depends upon both h_t and the conditional variance of $X_t \beta_{t+1}$ which is $X_t \Omega_{t+1|t} X_t^T$, formulated in equation (5). Equation (6) shows the innovations in updating the estimates of β_{t+1} used for forecasting future stock returns.

Finally, equations (6) and (7) represent the updating of the conditional distribution of β_{t+1} over time in response to new information about stock returns. In other words, the last two equations show the innovations in updating the estimates of β_{t+1} and the conditional covariance matrix.

4. EMPIRICAL RESULTS

The regression results of the time-varying parameter model with GARCH specification can be seen in Table 2. The number of lags is chosen with respect to both Akaike and Schwarz Information Criteria. The R^2 value is 0.55, which is fairly high. Moreover, the estimated standard deviations regarding the regressors are low. Finally, the forecast errors are estimated. As can be seen from the last row of Table 2, even when the periods of crises are not excluded, the forecast errors have a mean of 0.04 and a standard deviation of 1.74. All of these regression diagnostics imply that the employed model can successfully explain the impact of macroeconomic variables on stock returns.

Table 2: Regression Results

Variable	Estimated Standard Deviation
Exchange Rate	0.27
Currency in Circulation	0.13
Industrial Production	0.01
Interbank Rates	0.09
Secondary Rates	0.01
R-Square = 0.55	
Mean of the Forecast Error: 0.04	Std. Deviation of Forecast Error: 1.74

Figure 1 consists of the time varying coefficients regarding the regressor matrix that has been employed to explain the impact of macroeconomic variables on the stock exchange market performance. The following subsections discuss each of these effects separately.

4.1. Foreign Exchange Rate

It can be clearly seen from Panel A that the financial crisis in 1994 and the following recovery period caused a structural break to the relationship between exchange rate and stock returns. While we observe that the currency depreciation led to a drop in stock returns before 1994, the relationship turned out to be the opposite afterwards. Muradoğlu et al. (1999) focus on the effects of foreign exchange rates on stock returns for the first phase of the 1990s. They view the depreciation of the domestic currency as a loss of economic and political stability, which would increase the volatility in the stock exchange market and decrease stock returns. Several suggestions for the opposite effect of exchange rates on stock returns for two distinct periods can be proposed[1].

First, while the depreciation of the domestic currency leads to an increase in the prices of imported capital goods, reducing profit margins and stock returns, it also increases the competitiveness of the firms operating in the stock exchange market and results in higher stock returns. It is a well-documented fact that there has been a dramatic increase in the number of firms and industries that began to operate in international markets as a result of the increased liberalisation attempts in the second half of the 1990s. The competitiveness of these firms may have become a dominant factor for this particular period.

Therefore, the gains from this increased competitiveness as a result of the currency depreciation could outweigh the costs stemming from more expensive imported capital goods. Second, the fact that the ISE was much shallower in the first phase of the 1990s made it extremely sensitive to capital flows. The appreciation of the Turkish Lira surely attracted foreign capital, some of which were invested in the stock exchange market and increased stock returns. However, in the second half of the 1990s, short-term capital flows were mainly used in the increased debt financing requirement of the government, which also led to excessively high real interest rates. Therefore, the short-term capital flows attracted as a result of the over-valued Turkish Lira did not have an important effect on stock returns. Finally, one has to mention the

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[1] However, it should always be kept in mind that different sectors could be affected in varying degrees by a currency depreciation and the overall effect may depend on the composition of the firms in the ISE.

impact of the 1997 Asian crisis on the ISE. As stated in the 2002 Report of the Central Bank of the Republic of Turkey, during the Asian crisis, the demand contraction in the Turkish economy, coupled with the currency depreciation, resulted in lower prices for exported goods which, in turn, increased the demand for these exportables. As a result, the increased competitiveness of the export sector became a very dominant factor and affected the stock exchange performance much more positively compared with the previous periods.

4.2.   Currency in Circulation

Panel B of Figure 1 displays the effect of currency in circulation, which can be viewed as a proxy to see the stance of monetary policy in the economy. It is expected that the change in monetary policy affects stock prices mainly through changes in income. It is clear from the graph that there is almost no relation between the two variables. Two suggestions can be proposed at this point: First, the money-income relationship could be broken down for the observed period. Second, and more importantly, M1 may not be the proper monetary policy instrument to consider for this particular case. In this context, this variable is defined as $(1+r) / (1+e)$ where r is the interest rate and e is the depreciation of the domestic currency, both of which are employed among regressors in our study.

4.3.   Industrial Production

Panel C indicates that the industrial production affects stock returns mostly positively, excluding the period which begins with the 1994 financial crisis and ends with the beginning of the 1997 Asian crisis. The positive relationship between the two variables can be explained as follows: Increased production leads to higher revenues and profits for the firms, together with a high volume of cash flows which, as a result, raises stock returns. However, one has also to explain the insensitivity of stock returns to changes in the industrial production between the two crises. One possible reason is the asset price bubbles observed in this period, which makes stock returns invariant to changes in the real sector. A second and related reason is that, for this particular period, while the ISE was in a financial recovery period and dominated by the developments in the financial sector, industrial production dynamics were mostly governed by the changes in capacity utilisation ratios,

which would explain the relative insensitivity of stock returns to changes in the real economy. This explanation is also in line with Kutan and Aksoy (2003) which report that the financial sector represented in the ISE served as the best hedge against expected inflation for the period considered.

4.4. Interest Rates

The effects of the benchmark interest rates of the secondary market on the stock exchange market can be seen in Panel D. There is a positive relation between the two variables until the 1994 financial crisis and the relationship dies out afterwards. Such a finding is also supported in Muradoğlu et al. (2001) which report that the influence of interest rates on stock returns disappears over time. There are two other possible explanations of this observation. The first one includes inflation and the political risk premium along with the portfolio channel. Assuming that the second-hand interest rates increase with the inflation risk premium and political risk, investors will have a shift in their portfolio in favour of stock exchange markets. The second explanation deals with the insensitivity of stock returns to secondary rates after the financial crisis. As mentioned above, the second half of the 1990s can be characterised by the increasing debt financing requirement of the government. The interest rates were mostly governed by the debt structure of the government and the real interest rates were enormously high to attract short-term capital. Both foreign and domestic investors did not see investment in the ISE as an alternative to holding Treasury Bills in their portfolios. As a result, the portfolio channel, which can be used to explain the positive relation between secondary rates and stock returns, became no more valid in the second half of the 1990s.

Panel E of Figure 1 shows the effect of interbank interest rates on stock returns. Consistent with Muradoğlu (1992), we observe a negative relationship between the two variables, possibly because both can be regarded as close substitutes. The only exception is the 1994 financial crisis period. Actually, Muradoğlu et al. (1999) report that interbank interest rates appear with a negative sign in the stock return equation before, during and after the crisis. There is one point that bears attention: Just before the 1999 stabilisation programme started, investors anticipated that stock returns would increase at the initial phase of the programme due to positive expectations. This period was also

characterised by high interbank rates as a result of the debt financing requirement of the government, which can explain the seemingly positive relation between interest rates and stock returns just before the stabilisation programme took place.

5. CONCLUSION

The literature regarding the effects of macroeconomic environment on stock returns is dense and controversial. The portion of the literature that focuses on the Turkish economy case is no exception in this context. One reason which may explain this controversy is that most of these studies do not account for the time-varying degrees of interaction between macroeconomic factors and stock returns. However, it is a well-documented fact that, with the increasing pace of globalisation and financial liberalisation, many emerging markets have gone through substantial structural changes in their economy. Therefore, it will be useful to assume that the relationship between these variables did not stay intact through time.

This study takes the above discussion as its starting point and analyses the impact of macroeconomic variables on stock returns within a time-varying parameter model with GARCH specification. Such a methodology allows us to pin down the changing dynamics between macroeconomic factors and the stock exchange performance. Actually, the results show that dynamics changed dramatically over time. The financial crisis that was experienced in 1994 and the following recovery period seem to account for this structural change in the dynamics. At the same time, the increasing volume of short-term capital flows as a result of financial liberalisation and the debt financing requirement of the government, which were both experienced in the second half of the 1990s, are other factors that may have caused this radical change.

We find that while the depreciation of the domestic currency led to a decrease in stock returns before and during the financial crisis in 1994, the relationship turned out to be just the opposite afterwards. The increased competitiveness of the firms as a result of the depreciation seems to dominate the increased price of imported capital goods. The currency in circulation, on the other hand, does not seem to have an important impact on stock returns. A better monetary policy instrument (net financial arbitrage for example) can be developed in this context.

Excluding the financial crisis period, industrial production is found to affect stock returns positively for most of the period considered. The increasing profit margins combined with favorable cash flows may account for this relationship. Finally, the effects of both secondary market rates and interbank interest rates are considered. Although the secondary rates affect stock returns positively until the 1994 crisis, the relationship dies out afterwards. The increasing debt financing requirement of the government in the second half of the 1990s may have broken down the relationship between the two variables. The interbank interest rates, on the other hand, decrease stock returns if, again, the financial crisis in 1994 is excluded.

There are two policy implications to be drawn from the findings of this paper. First, macroeconomic factors, especially the foreign exchange rate and industrial production are still vital in explaining the stock exchange performance of the Turkish economy. One should account for these factors to have a broader perspective about the dynamics of the ISE. Second, and more importantly, the relationship between stock returns and macroeconomic factors does not seem to be stable over time. The Turkish economy is still experiencing dramatic structural changes that also reshape the financial environment. Policymakers should take this fact into account during the implementation of their policies.

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TIME VARYING COEFFICIENTS OF
MACROECONOMIC VARIABLES
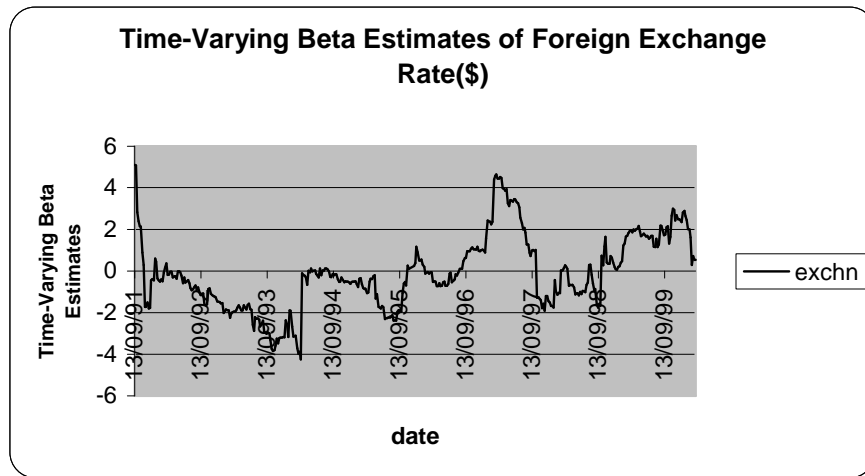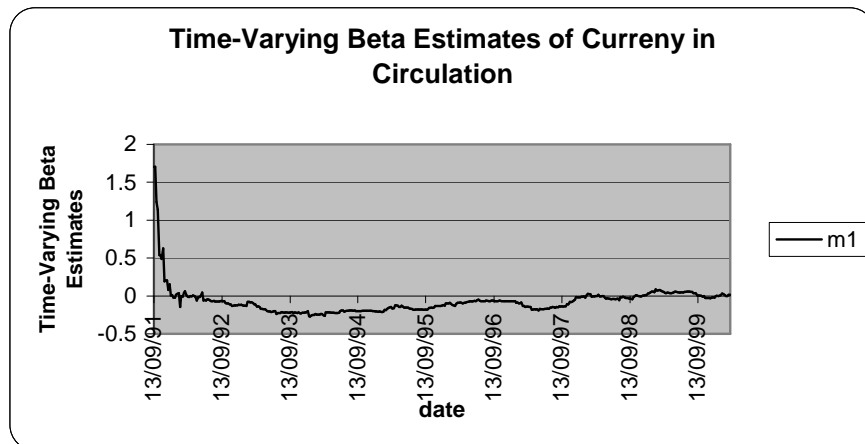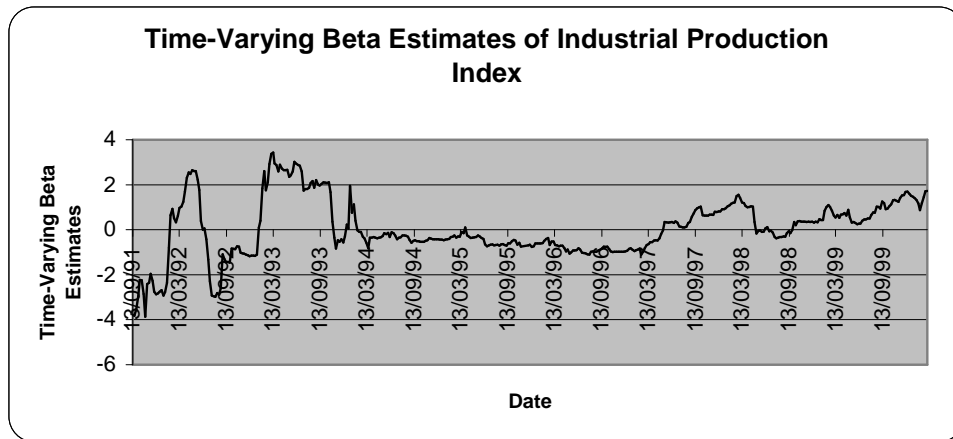
Figure A: Foreign Exchange Rate of the US Dollar

Time-Varying Beta Estimates of Foreign Exchange Rate($)

Figure B: Currency in Circulation

Time-Varying Beta Estimates of Curreny in Circulation

Figure C: Industrial Production Index

Time-Varying Beta Estimates of Industrial Production Index

Figure D: Secondary Market Interest Rates

Time-Varying Beta Estimates of the Secondary Market Interest Rates
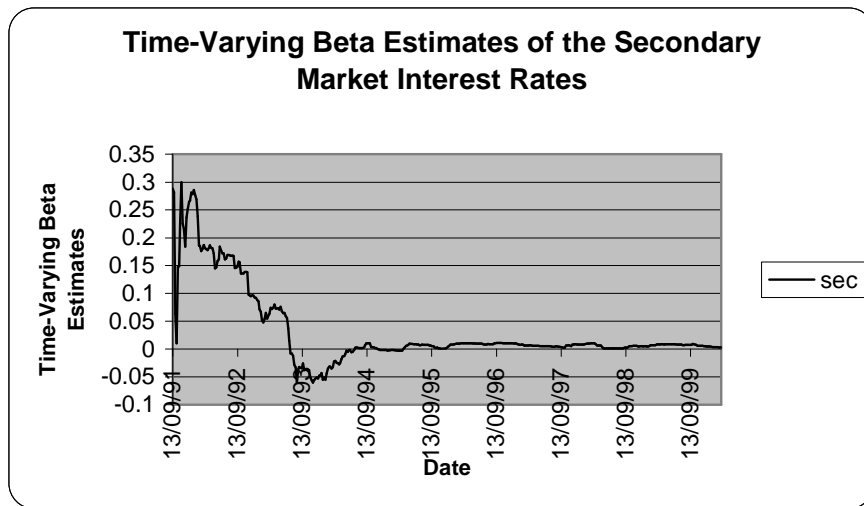
Figure E: Interbank Interest Rates