

Emerging Markets and Volatility of Real Exchange Rates: The Turkish Case

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Abstract: Globalisations started to create a domino effect on the emerging markets. This has left South East Asian countries, such as Malaysia and Indonesia in a massive debt. Turkey is an emerging market, and in the past, it has a history of an international debt problem. The possibility of a severe stock market crisis in the Istanbul Stock Market (ISM) may have increased during the crisis in other financial markets. We aim to explore the theoretical and empirical aspects of these issues.

Globalisation in Financial Markets implies that the share of the foreign investors in domestic stock markets has increased. We argue that this might be a key variable for a degree of vulnerability during a Global Financial Crisis. Sudden capital outflow would certainly cause exchange rate, balance of payments and international debt problems. An international debt crisis usually results in loans from International Monetary Fund or in some form of capital control. We use an open economy intertemporal optimising model that seeks to analyse the dynamic effect of capital inflows to other key variables. We also use Turkish data to explore empirical results relating to analytical implications of the model. The main results suggest that an increase in capital flows will cause a rise in net international debt, a fall in real exchange rate and a fall in stock market value. We also confirm these theoretical results for the Turkish data.

1. INTRODUCTION

The main motivation of this paper is to investigate how globalisation influences an Emerging Financial Market (EFM). A financial crisis in one part of the world is very likely to create a domino effect on the other financial markets. The transmission of foreign exogenous shocks to other economies, through financial markets, started to create a serious concern to Newly Industrializing Countries (NICs) with Emerging Financial Markets (EFM). The electronic revolution aided the high speed of capital flows, which is one of the important

sources of economic volatility. Turkey, being among the newly emerging financial markets, would more and more be influenced by such financial turbulences. The important difference between other emerging markets such as Mexico, Thailand and Korea, is that they relaxed controls on currency flows, but continue to control the exchange rate. Turkey is one of the most liberal foreign exchange markets, and the Turkish Lira has been convertible since 1989. Both personal and corporate investors are free to invest in the Istanbul Stock Market (ISM), and all barriers such as quotas have been abolished. In this paper we intend to investigate the degree of volatility in foreign exchange and stock market prices as a result of turbulence in foreign financial markets. Johnson et. al. (2000) created a vulnerability matrix using sets of criteria including macroprudential indicators. Berg et. al. (2000) specifically looked at macroeconomic vulnerability. Their analysis was based on flow variables, with no consideration of stock variables such as indebtedness and wealth effect. Different from others, we argue that the degree of volatility is also closely related to the share of foreign investors in the domestic stock market.

There have been numerous studies after the Asian crisis in 1997. Studies of error correction model (ECM) on advanced economies suggest that an increase in aggregate domestic stock market price tends to have a negative short run and positive long run effect on the domestic currency. However, currency depreciation has a negative effect on stock market prices both in the short and long run. The above relationship might not be valid for the developing countries (Ghosh (2000)). Using data from ISM, we tested the above relationship and compared this with the previous results. Any empirical estimation might be misleading without a theoretical base. The paper constructs an open economy intertemporal optimising model that extends the approach developed by Obstfeld and Rogoff (1995) by considering the dynamics of the real exchange rate in a Ramsey (1928) type continuous-time framework. We follow an approach which gives solid microeconomic foundations to the modelling of macroeconomic dynamics. The model has a representative, utility maximising agent in an environment characterised by a number of intertemporal stock-flow constraints. On the firm side, we consider the behaviour of a representative profit maximising, perfectly competitive firm subject to a standard neo-classical production function. On the other hand, a representative utility maximising domestic agent has a constraint with respect to

net domestic income, which is the combination of stock market and balance of payment constraints. Gazioglu and McCausland (2000) introduce bond financing to this model. In contrast to Obstfeld and Rogoff (1995), we relax the assumption of PPP (purchasing power parity), allowing us therefore to fully integrate the dynamics of the real exchange rate with the dynamics of net international debt, and uniquely, the stock market prices. Though individual borrowing has Ricardian equivalence with respect to the principal agent's decision to borrow from his future income, it does not apply to international borrowing. Our model includes stock market shares partly owned by domestic investors and partly by foreign investors. Debt is created by selling the shares abroad and through wealth effect, we obtain opposite behavioural dynamics for debtor (domestic) and lender (foreign) countries

We first introduce a theoretical framework before using an empirical approach, which includes VAR estimation with impulse responses, assuming linearity and stable equilibrium. In Section 2 we present the model. In Section 3 we present our policy implication from the model. Section 4 presents our empirical results: Section 4.1 explains VAR estimation and impulse response function and Section 4.2 reports empirical results using Turkish data. Finally, in Section 5 we conclude and offer suggestions for further research.

2. The Model

In this paper we aim to investigate volatility of stock market prices and real exchange rate within a dynamic small macro framework. First we introduce the behaviour of firms and households, before proceeding to solve the model.

2.1 Firms

We assume large number of perfectly competitive firms with constant returns to scale, each earning zero long run profit. At each point in time they employ the given stocks of labour and capital, pay them their marginal product, and sell the resulting output. The representative firm's has a budget constraint. The profit maximising, perfectly competitive firm operates subject to a standard neo-classical production function. The quantity of investment is determined

optimally. This is simply the condition that the marginal product of capital is equal to the real return on capital. We also assume a perfectly competitive labour market, which, given the production function above combined with the equation, gives us the equilibrium condition that the marginal product of labour is equal to the real wage. A representative profit maximizing firm also implies optimum capital investment.

2.2 Households

Representative domestic agents maximise time separable utility functions of the form

$$\max_{\{A(t)\}} U = \int_0^{\infty} U[A(t)] e^{-\beta t} dt \quad (1)$$

where A represents domestic aggregate spending, subject to the following three constraints [1]. We deal with each in turn.

Following Obstfeld and Rogoff (1995), the stock market constraint is the following:

$$V^d \dot{X}^d \equiv X^d \dot{V}^d + X^d D^d \quad (2)$$

Equation 2 states [2] that a change in the proportion (X^d) of the value of domestic firms [3] that domestic individuals own (in other words, shares: the value of domestic claims to the entire future profits of domestic firms, V^d), $V^d \dot{X}^d$, is equal to the domestic proportion of the change in the stock market valuation of these shares, $X^d \dot{V}^d$, plus their proportion of dividends, $X^d D^d$.

Secondly and lastly, the balance of payments constraint

$$\dot{H} = \Pi - T + H \left(1 + \frac{\dot{E}}{E}\right) [1 + R^f] \quad (3)$$

The aggregate constraint of stock market and net accumulation of foreign assets, and $-\dot{H}$, (minus represents holding foreign assets, while plus represents indebtedness) can only be accumulated by running a trade surplus, Π is the foreign owned shares of domestic dividends minus the domestic owned share of

foreign dividends and $H \left(1 + \frac{\dot{E}}{E}\right) [1 + R^f]$ is any capital gain from holding foreign

money in terms of

foreign goods (a simple representation is in Gazioglu (1996).)

External balance is also equal to internal balance. In essence, therefore, the right hand side of the constraint represents net domestic ‘income’ (factor earnings, net interest from asset holdings, return on shares) minus ‘consumption’ (private and investment), reflected by the ‘saving’ (net wealth accumulation) on the left hand side. It is the combination of the stock market constraint, (following Obstfeld and Rogoff (1995)) and net international debt (Gazioglu and McCausland (2000)). If the share of foreign ownership of the domestic stock market increases, debt of the domestic economy increases, analogous to selling ‘family silver’. We argue that vulnerability of domestic economy is very sensitive to the share of the foreign investment in the stock market. How severe the foreign shock effects domestic market will be positively related to the share of foreign ownership. The bigger the share of foreign investors in the domestic stock market, the greater will be the vulnerability of the domestic economy in case of foreign financial shocks. The Asian crisis can be argued to be in this category. Whether other emerging financial markets become similarly vulnerable depends on their foreign investors in the domestic market. In section 4.2 we discuss the issue of foreign investment in the Istanbul Stock Exchange (ISE).

2.3 Equilibrium Conditions

Maximising the representative domestic agents time separable utility functions subject to external – internal balance constraint yields the familiar Euler equations, which can be combined to yield the extended Blanchard (1981) arbitrage condition

$$R^d = \dot{V}^d / V^d + D^d / V^d \quad (4)$$

Finally, we have the standard uncovered interest parity condition (UIP) in equation (5)

$$1 + \frac{\dot{E}^e}{E} = 1 + \frac{\dot{E}}{E} = \frac{1 + R^d}{1 + R^f} \quad (5)$$

From equation, since $T_E > 0$ (the Marshall-Lerner condition, where a depreciation improves the trade balance), $T_H > 0$ (wealth effects, where a rise in

international debt is a rise in foreign wealth which improves exports and a fall in domestic wealth which reduces imports, hence improving the trade balance), $T_V > 0$ (since the value of domestic firms reflects their relative productivity, rises in the stock market valuation of domestic firms tends to be associated with an improving trade balance) and $T_k < 0$ (capital outflow will worsen the trade balance), and assuming profit repatriation, effects are small relative to trade effects, therefore, from equation, $\dot{H}_F < 0, \dot{H}_H < 0, \dot{H}_V < 0$ and $\dot{H}_k > 0$.

From equation (4), $\dot{V}^d = V^d R^d - D^d(E, H, V, k)$, since $D_E > 0$ (rise in real exchange rate improves domestic profits and hence dividends), $D_H < 0$ (increases in net international debt, through wealth effects, adversely affect domestic profitability [5]), $D_V > 0$ (the stock market valuation of firms is in effect the valuation of the entire future profit stream and is hence positively related to dividends) [6] and $D_k < 0$ (increased capital inflows spending decreases dividends because of return on capital), R^D starts to fall and advantage of $R^D > R^f$ disappears. Firms respond to it by reducing current dividends, therefore $\dot{V}_F < 0, \dot{V}_H > 0, \dot{V}_V < 0$ [7] and $\dot{V}_k > 0$.

Finally, from equation (4), $R_E > 0, R_H < 0, R_V > 0$ and $R_k < 0$. [8] Hence, from equation (5) [9], $\dot{E}_F > 0, \dot{E}_H < 0, \dot{E}_V > 0$ and $\dot{E}_k < 0, \dot{E}_V > 0$ and $\dot{E}_k < 0$.

Equations, (4) and (5) therefore capture the dynamics of the whole system, and, given the discussion above, may be summarised [10] in matrix form by

$$\begin{bmatrix} \dot{E} \\ \dot{H} \\ \dot{V} \end{bmatrix} = \begin{bmatrix} \dot{E}_F & \dot{E}_H & \dot{E}_V \\ \dot{H}_F & \dot{H}_H & \dot{H}_V \\ \dot{V}_F & \dot{V}_H & \dot{V}_V \end{bmatrix} \begin{bmatrix} E \\ H \\ V \end{bmatrix} + \begin{bmatrix} \dot{E}_k \\ \dot{H}_k \\ \dot{V}_k \end{bmatrix} [k] \quad (6)$$

where the signs of the elements of the matrix are, from the discussion above: $\dot{E}_F > 0, \dot{E}_H < 0, \dot{E}_V > 0$ and $\dot{E}_k < 0, \dot{H}_F < 0, \dot{H}_H < 0, \dot{H}_V < 0$ and $\dot{H}_k > 0, \dot{V}_F < 0, \dot{V}_H > 0, \dot{V}_V < 0$ and $\dot{V}_k > 0$. Now construction of the dynamic model is completed, we continue with policy analysis in the next section.

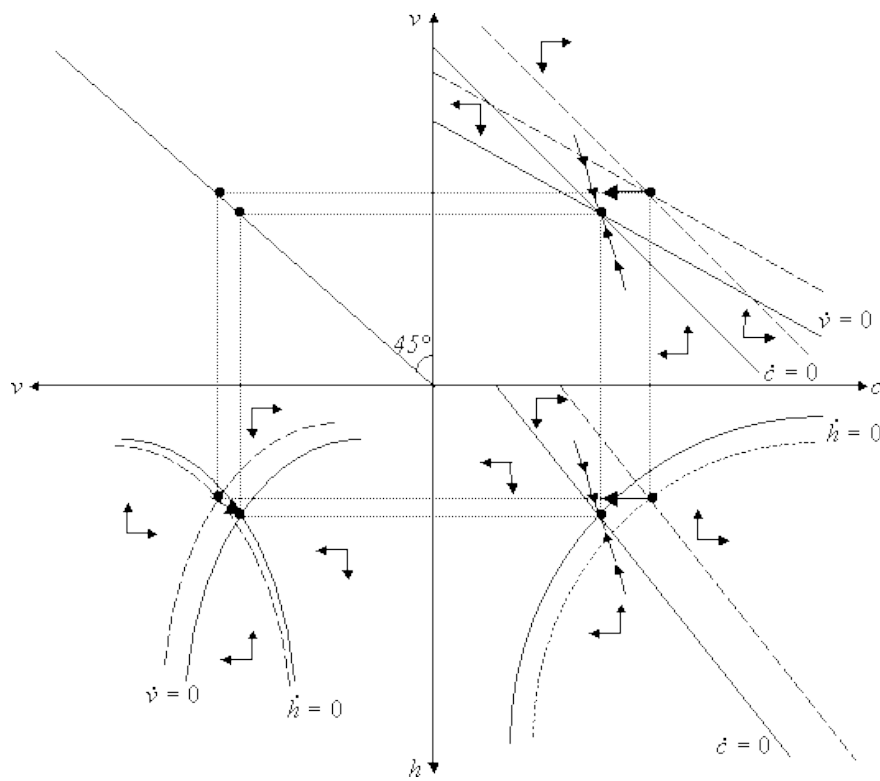
3. Theory Based Policy Analysis

We can decompose the dynamic system represented by equation (6) into three

dynamic sub-systems represented in equations, where variables are redefined in terms of deviations about long run equilibrium. Note that E is the ‘jump’ variable in this model in accordance with the perfect foresight approximation to rational expectations, which is the standard assumption employed in the literature in these models.

The dynamics of these three sub-systems are illustrated in Figure 1 below, which shows the effect of a rise in capital inflow (\mathcal{K}).

FIGURE 1: Effect of the Rise in Capital Inflow



Note: Dashed lines represent the loci corresponding to the initial equilibria.

Long Run Steady State

We now consider the long run effects of an unanticipated rise in capital inflow, represented by a rise in the parameter $(e-h)$. In the bottom right quadrant we illustrate the international debt and real exchange rate $(e-h)$ dynamics. A rise in k shifts both stationary loci leftwards (the original loci are denoted by dashed lines) resulting in a long run rise in net international debt (\bar{z}) and fall in real exchange rate (\bar{e}) . Capital inflows drives down the profitability of future prices, hence stock market prices goes down as indebtedness increase in the long run. In the top right quadrant we illustrate the stock market and real exchange rate $(e-v)$ dynamics. A rise in (k) shifts both stationary loci leftwards, resulting in a long run fall in the stock market value (\bar{v}) and fall in real exchange rate (e) . The top left quadrant is a merely a pictorial device.

Short Run Adjustment

Finally, during the adjustment of the system, we noted that $R^d > R^f$. From UIP this implies the expectation of a rise in real exchange rate. . An alternative way of looking at this is overshooting phenomena in terms of the short run divergence between the returns on the different assets. Saddle-path behaviour towards long run equilibrium is seen in the top right and bottom right quadrants. E is the 'jump variables' in both quadrants. Adjustment in the left quadrant is 'stable cyclical' behaviour toward the long run.

Our theoretical results are in contrast with conventional analysis, which makes it possible to have real exchange rate increase together with a rise in stock market prices. This is due to foreign country being a lender rather than a borrower. The consumers in lender country will have a positive wealth effect with high stock market prices when even real exchange rate increases. For a lender country (foreign country) increase of stock market prices can be

observed when even their currency is falling (appreciating, or fixed exchange rate). . This is very unlikely to be true for a debtor country, which is the domestic country in our model. A domestic country that is debtor will have to have falling (or at least fixed) real exchange rate and falling stock market prices.

4. Empirical Results

The daily data is extracted from IMF data stream for the period 1:1:1990-11:26:1999. Other stock market data is taken from Istanbul Stock Exchange publications.

4.1 VAR Estimation:

This technique is suggested to test formal theories, which imply particular behaviour for the vector auto regression. It aims to learn from the historical dynamics. It is multivariate generalization of the Granger-Sims causality . The hypothesis tested will involve joint restrictions across equations. Therefore, test for rational expectations over identification restrictions can not be done. Furthermore, differencing the variables will not bring any gains in asymptotic efficiency and lead to losing information from the original data. Since trend is random walk, no deterministic trend term is used in VAR estimations.

Impulse Response Functions (IRF):

Dynamic behaviour of a VAR model can be characterised by plotting the IRFs which determines how each endogenous variable responds over time to a shock in that variable and in every other endogenous variables. In this paper we present a theoretical dynamic model, which is the solution of intertemporal decision of a representative individual who makes a decision whether to consume at present or in the future. Therefore which variable precedes the other one has theoretical base, which solves the problem of ordering the equations when impulse responses are considered. Impulse response can only be calculated if the model is in a stable equilibrium. If one period shock is introduced to one of the endogenous variables, it will affect other endogenous variables, this may have a greater affect on the original endogenous variable than it initially did because of feedback effects through other variables.

Plotting the impulse response function will characterise the dynamic structure. One relationship is the effect of foreign capital outflow on exchange rate and stock market prices. This is supported by the empirical causal tests that foreign capital outflows is hardly influenced by other variables such as real exchange rate and real stock market values. An increase in the real exchange rate due to a fall in foreign capital or increasing trade deficit, implies that a fall in domestic wealth (a rise in net international debt) reduces the stock market value of future profits. We report the effect of impulse response on these variables.

Empirical Analysis:

On the subject of the vulnerability of financial markets, previous research (Johnson et. al. (2000), Berg et. al. (2000)) adopted ad-hoc measures. Here we have adopted a theoretical model. One of the main aims of this paper is to argue that the share of the foreign investors in the domestic stock market is an important indicator to measure the vulnerability of the domestic stock market. The theoretical macro-model includes the dynamics of this important indicator. As a case study in Turkey, we use data from the Istanbul Stock Market (ISM). Liberal foreign exchange policies have applied since 1989, so foreign investors are free to buy and sell in ISM.

Table 1 reports monthly foreign investment in the Istanbul Stock Market (ISM or IMKB) since 1995. In 1997 foreign capital flows were twice the 1996 figures in US\$. Furthermore, figures in those 2000 are also 50 percent higher than in 1999. Since 1995, foreign investment has been increasing very rapidly. Table 2 reports yearly figures for the national market since 1986 and foreign investors since 1996 in US dollars. No figures were found for foreign investment before 1995. In most periods the amount of foreign investment is similar to national investors. Importance of foreign investment in the ISM has been high. However, the global stock market crisis in 1997 has not influenced either domestic or foreign investors. Foreign investment has not increased much in 1998. This is because of the world crisis, investors carried on investing in the ISM. Any stock market crisis outside of Turkey is more likely to have a stronger impact on ISM in the future. Hot money moves out as quickly as it moves in. Graph 1 shows that there has been turbulence in both

stock market prices and the real exchange rate between 1993-1995. Before 1992 the real exchange rate had been fairly stable but stock market prices had a downward trend. Stock market prices are turbulent, but overall they are at a high level. Since 1995 there seems to have been upward trend in real stock market prices, while on the real exchange rate settled down to its pre-1993 level. In 1997 the world financial crisis did not affect the amount of investment in the next period. Prices fell sharply to the 1990 level and picked up later. More serious fall was in 1998. However, we do not observe the real exchange rate volatility, except for the period 1993-1995.

Graph 3 reports an impulse response of the VAR model for foreign capital inflows (FORFLP), the real exchange rate (EXCCPI), and real stock market (STOCKP). The response of FORNFLP to a one unit of standard deviation (SD) is as follows: Inflow of capital reduces the real exchange rate for half of the adjustment period, and settles down to a lower real rate in the long run. The real stock market value falls and rises again in the long run. A positive shock to the real exchange rate (as in Graph 3.b) increases the real exchange rate. This implies that capital flows in, to correct further depreciation of the currency. The feedback effect implies that the real exchange rate and capital inflow fall. Furthermore, stock market prices first fall then start to go up after the third week. The response of STOCKP to a unit Standard Deviation (SD) innovations (graph 3.c) is to increase its own value for three weeks and then fluctuates towards a lower value. Capital inflows increase in the first period and start to decrease with fluctuations until the middle of the fourth week. It settles to a higher level in the long run. Real foreign exchange falls (appreciation) towards a lower level. Comparing Graphs 2 and 3, we highlight the importance of foreign international debt dynamics in the dynamic behaviour of the real exchange rate and real stock market prices. Whether debt dynamic is included or not, the response of EXCCPI to one S.D. innovation does not change. However, the response of STOCKP to one S.D innovation has an important influence when foreign debt dynamics is considered in the model. The real exchange rate settles to a lower level in the long run if foreign debt dynamic is included in the model. The policy implication of this is that in the long run, indebted countries move toward a lower real exchange rate (i.e. less competitive exchange rates, which means an overvalued currency than it would otherwise have been). This confirms our theoretical results. However, we

could not confirm our theoretical result that shock on FORNFLP would lead to falling STOCKP (see Figure 3.a). We consider STOCKP movement during the Global Financial Crisis period.

Conclusions:

The paper investigates volatility of capital flows and real foreign exchange during turbulence in the financial markets. Our theoretical model is based on the behaviour of representative utility maximising agents in various intertemporal stock-flow constraints assuming that the home country is a debtor. The model suggests that a trade shock will increase capital inflows leading to real exchange rate appreciation (a fall) and a fall in stock market prices. The difference between the creditor and debtor countries is the positive and negative wealth effect (i.e. 'saving' as net wealth accumulation). We investigated the possible effect of world financial turbulence on the ISM and the real exchange rate in Turkey. Empirical results confirm that capital inflows increase indebtedness and reduce real exchange rate and stock market prices. Capital inflows cause an appreciating exchange rate. This prevents the real exchange rate from depreciating (ie. increasing) further. In other words, with the accumulating debt, the real exchange rate is prevented from depreciating further. This is a negative wealth effect. In summary an inflow of capital (either as a result of turbulence in world financial market or increasing current account deficit) increases net international debt; also a fall in real exchange rate (appreciation), and a deterioration of the domestic trade balance, together with a fall in stock market prices. We have confirmed our theoretical model where wealth effect is the key to the results. This helps us to distinguish stock markets in the emerging and the developed markets.

Our empirical results partly confirm our theoretical results. We found EXCCPI (e) to fall in the long run when FORNFLP shock feeds into other variables. However, STOCKP (v) falls in the long run when the origin of the shock is STOCKP. We consider this to be a period of Global Financial Crisis. Our results indicate that a STOCKP shock to the model is a better representation of the Turkish case. We plan to pursue further research in the issue of non-linearity in the estimation techniques.

Though our model highlights the difference between developed and Emerging Financial Markets and implicitly assumes that the entire economy floats in the stock market. Small businesses and the industry, which are not floating in the stock market, may be an important share of the total economy. In this case vulnerability is not very serious. Further research needs to be done in this area.

Further research is eminent to investigate different periods in order to improve the results. Data might be divided into sub-periods, and crisis and non-crisis periods might be estimated separately. Our estimation method is a linear one. Theoretically, it is possible to have non-linearity in this model. So non-linear estimation techniques might reveal more information of dynamic behaviour of the data. We aim to do further research in this area.

The existence of a strong domestic, especially exporting industry that is not in the ISM, might be an intrinsic defence mechanism of the Turkish economy. This might be one of the reasons why the world financial crisis hit the Turkish Economy mildly in 1997. This is in contrast to the South East Asian countries, where export orientated industry has a close link with the stock market. Further integration of the Turkish industry in the stock market might make the Turkish economy more vulnerable to external shocks. With such a possibility, the country may take two possible routes. One path to take would be further loans from the IMF, with Reform packages. The other one would be capital control. Whichever path a country takes depends on what the policy targets are.

Since the 1997 crisis debates on capital control have been intensified. Frankel et al (2000) comes up with an analytical model, and concludes that negative and positive effects need to be weighed before a country adopts such policies. Further research needs to be done in the light of the theoretical model presented in this paper.

ENDNOTES

[1] A full symbols list is provided in Appendix

[2] See Obstfeld and Rogoff (1996, p.100) for a discrete time formulation.

[3] We assume that there are a large number of homogenous perfectly

competitive domestic firms producing goods for both domestic and foreign consumption. It should be noted that trade in this model takes place not due to comparative advantage but rather due to differences in time preference between countries.

[4] We do not go into the derivation of this, since it is well known that it may also be derived from optimising behaviour: indeed UIP *is* an arbitrage condition equating the forward price of foreign assets (bills and shares) with the spot exchange rate minus the discounted value of the interest foregone by holding foreign assets. We assume the perfect foresight approximation to rational expectations. Thus, ϵ is the only ‘jump variable’ in the model.

[5] We make the standard assumption that the greatest proportion of domestic production is for the domestic market.

[6] A change in this stock market valuation is assumed not to affect internally generated physical capital augmentation.

[7] From equation (4), $\dot{V}_v = R^d - D_v$. We assume initially that $R^d < D_v$, implying the stock market return dominates the return on net government borrowing, therefore $\dot{V}_v < 0$.

[8] We have obtained above the signs of the partial derivatives of D^d , hence, $R^d = \dot{V}^d / V^d + D^d \left(\begin{matrix} + & - & + & - \\ E, H, V, k. \end{matrix} \right)$ from equation (4).

[9] The partial derivatives for R^f will, of course, have the opposite signs to those given for R^d .

[10] Although portfolio shares dynamically adjust to flow disequilibrium, they are, of course, constant in long run equilibrium, hence $\dot{X} = 0$. Furthermore, following Obstfeld and Rogoff (1996), in order to concentrate on the dynamics of domestic net international debt, real exchange rate and the stock market, we assume $\dot{V}^f = 0$.

Sources of Data:

E (e) Nominal (real) exchange rate. TKUDSP : IMF Data stream

V(v) Nominal (real) Turkey-DS General Industrial Price index in the ISE:
IMF data

stream.

K Capital inflows : (TK121...A) TK Private Banks-Foreign Assets

Appendix F - Symbols List

<i>A</i>	domestic consumption
<i>B</i>	real stock of domestic treasury bills
<i>C</i>	domestic competitiveness
<i>D</i>	real dividends
<i>F</i>	real stock of foreign treasury bills
<i>G</i>	domestic government deficit
<i>H</i>	domestic net international debt
<i>I</i>	domestic physical capital investment expenditure
<i>J</i>	sunk costs (minimum \bar{V}^f)
<i>K</i>	domestic physical capital stock
<i>L</i>	portmanteau coefficient representing exogenous effects on revenue
<i>M</i>	portmanteau coefficient representing exogenous effects on costs
<i>N</i>	composite term defined in equation
<i>P</i>	maximum \bar{V}^f
<i>R</i>	real interest rate
<i>T</i>	real domestic trade balance
<i>U</i>	domestic utility
<i>V</i>	stock market value of physical capital
<i>W</i>	real domestic wages
<i>X</i>	domestic share of domestic shares
<i>Y</i>	real domestic income
<i>Z</i>	constant technology parameter
<i>e</i>	(EXCCPI) deviation of <i>E</i> about long run equilibrium
<i>d</i>	domestic (superscript)
<i>f</i>	foreign (superscript)
<i>g</i>	deviation of <i>G</i> about long run equilibrium

h		deviation of H about long run equilibrium
k		FORNFLP capital inflows
kk		installation costs of physical capital investment
q		production function
v	(STOCKP)	deviation of V about long run equilibrium
w		matrix
x		matrix
z		matrix
\mathcal{H}		current value Hamiltonian
Ω	omega	real wealth
α	alpha	real exchange rate elasticity of revenue
β	beta	domestic discount rate
Γ	gamma	wealth elasticity of revenue
ϵ	epsilon	wealth elasticity of costs
μ	mu	real exchange rate elasticity of costs
χ	chi	matrix
λ	lambda	multiplier associated with Hamiltonian \mathcal{H}
π	pi	real profit
θ	theta	stable eigen vector
ρ	rho	negative eigen value

ω	omega 2 matrix
ζ	zeta 2 matrix
δ	delta 2 partial differential operator (subscripts denote partial derivatives)
\sim	equilibrium (used above a symbol)
	signing not unambiguous

Table 1

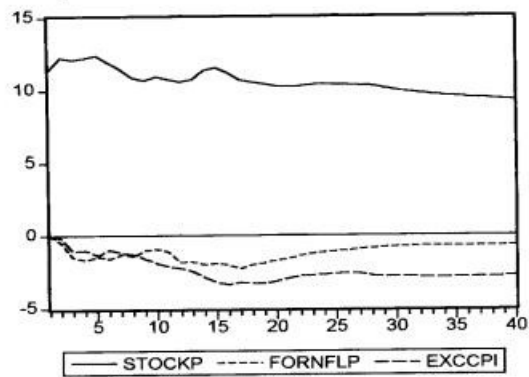
	Foreign Investment in IMKB, Stock Market (Million US\$)					2000
	1995	1996	1997	1998	1999	
January		2.457	4.655	5.718	3.429	14.597
February		2.849	4.564	5.296	5.196	13.362
March		3.029	3.997	5.373	5.554	12.734
April		2.736	3.577	6.864	6.741	15.046
May		2.489	3.793	5.765	5.853	11.39
June		2.965	4.456	6.095	5.555	11.338
July		2.617	4.728	6.589	6.603	11.999
August		2.551	4.938	3.845	5.555	11.188
September		2.79	5.97	3.2	7.001	9.503
October		2.926	5.881	3.068	7.362	
November		3.165	5.465	3.668	8.92	
December	1.93	3.08	6.01	3.7	15.3	
Total		33.654	58.034	59.181	83.069	111.157

Table 2

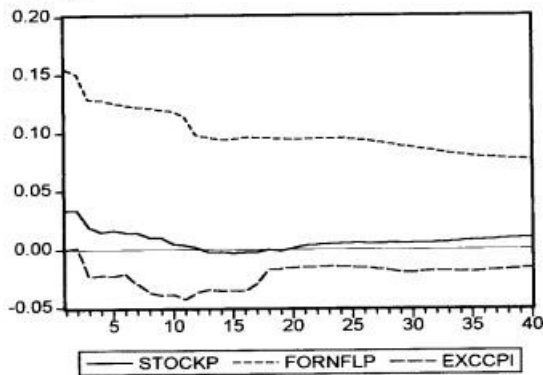
	National Market US\$ millions	Foreign Investors US\$ million
1986	938	
1987	3,125	
1988	1,128	
1989	6,756	
1990	18,737	
1991	15,564	
1992	9,922	
1993	37,824	
1994	21,785	
1995	20,565	
1996	30,329	33,634
1997	61,879	58,034
1998	33,975	59,181
1999	114,271	83,069
2000	92,906	111,157

Graph3: Impulse Responds of the Model

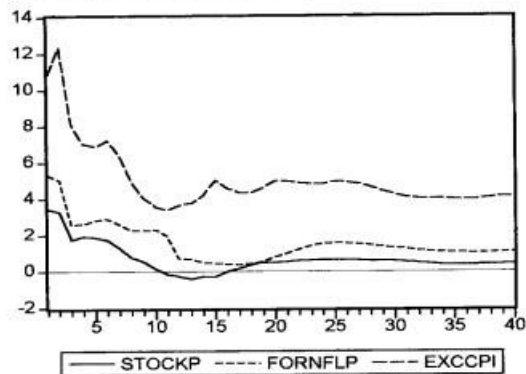
Response of STOCKP to One S.D. Innovations



Response of FORNFLP to One S.D. Innovations



Response of EXCCPI to One S.D. Innovations



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