IMPACT OF CURRENCY APPRECIATION & CURRENCY SHOCK ON THE REAL SIDE IN A SMALL & LIBERAL ECONOMY

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The Impact of Currency Appreciation and Currency Shock on the Real Side in a Small and Liberal Economy

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Abstract

The paper examines the impact of the currency appreciation (1988-1993) and the sudden and major depreciation (early 1994) on the real side of the Turkish economy by investigating the volume and commodity composition of production, domestic demand and trade. Two patterns are captured and empirically estimated: (i) In a small economy with low barriers to trade, real currency appreciation ('overvaluation') can turn the industry inward-looking. (ii) Exports respond to a sudden depreciation of the currency with a lag (in fact first with a drop, characterized by the J-curve). The estimation of the J-curve gives the timing of the export response.

ملخص

تدرس هذه الورقة أثر ارتفاع قيمة العملة (١٩٨٨-١٩٩٣) وانخفاضها المفاجئ والكبير (أوائل عام ١٩٩٤) على الجانب الحقيقي في الاقتصاد التركي، عن طريق بحث الانتاج والطلب المحلي والتجارة من حيث الحجم والتكوين السلعي. ويتم التقاط نمطين وتقديرهما عملياً: (١) في اقتصاد صغير يتميز بحواجز تجارية منخفضة، فإنه من شأن ارتفاع قيمة العملة الحقيقية (المغالاة في قيمة العملة) أن تحوّل اتجاه الصناعة إلى الداخل، (٢) استجابة الصادرات إلى انخفاض قيمة العملة مبطأة بفترة زمنية (في الواقع، تبدأ الاستجابة بانخفاض في شكل منحنى "J"). ويتم تحديد توقيت استجابة الصادرات عن طريق تقدير منحنى "J".

INTRODUCTION

Turkey liberalized its hitherto highly protective foreign trade regime in the mid 1980s, freed the capital account and finally made the Turkish Lira convertible. Beginning in 1988, up to the end of 1993, the currency appreciated gradually as a result of high interest rates - a by-product of expansionary fiscal policies financed by external and internal borrowing (see Figure 1)[1].

The first part of this paper analyzes the effects of currency appreciation on the volume and commodity composition of production, domestic demand and external trade. This is done by applying a method developed in Erzan and Sari (1994), and Sari (1995a). The model assumes that the import competing industries have differentiated products and compete in a monopolistic fashion with the imported products which are imperfect substitutes, while the export sectors with homogeneous products are subject to perfect competition. Monopolistic competition in the import competing sectors leads internal prices to deviate from world prices. An overvalued exchange rate, and expansionary policies work as tools protecting the import competing industries.

The main tool used in this empirical analysis of changes in the structure of external trade, production and domestic demand is the angles between the import, export, production and domestic demand vectors in the Euclidean space. The analysis shows that the commodity composition of consumption and imports became similar during the five year currency appreciation process, whereas the pattern of exports diverged considerably from the pattern of production. These can be interpreted as indicators of the loss of competitiveness of the export industry. The emphasis of industry was shifted from export-oriented areas to inward-oriented and import competing sectors.

The second part of the paper deals with the consequences of the shock currency depreciation in early 1994, and the following steady currency appreciation bringing the exchange rate to the 1993 pre-crisis level. Neither did the currency shock boost exports with immediate effect, nor did the gradual currency appreciation promptly erode the lagged export boom. The purpose of the "J-curve" analysis undertaken in this part is to determine the lags in export and import responses to changes in the real exchange rate and to determine the impact of the real exchange rate on the real side of the economy over time.

The paper has three messages to the policy makers: (i) a liberal trade and foreign exchange regime does not guarantee the outward-orientation of the economy[2], (ii) a shock currency depreciation does not yield an immediate export boom, and (iii) the continuation of the expansion in exports despite the currency appreciation can be deceiving (short lived).

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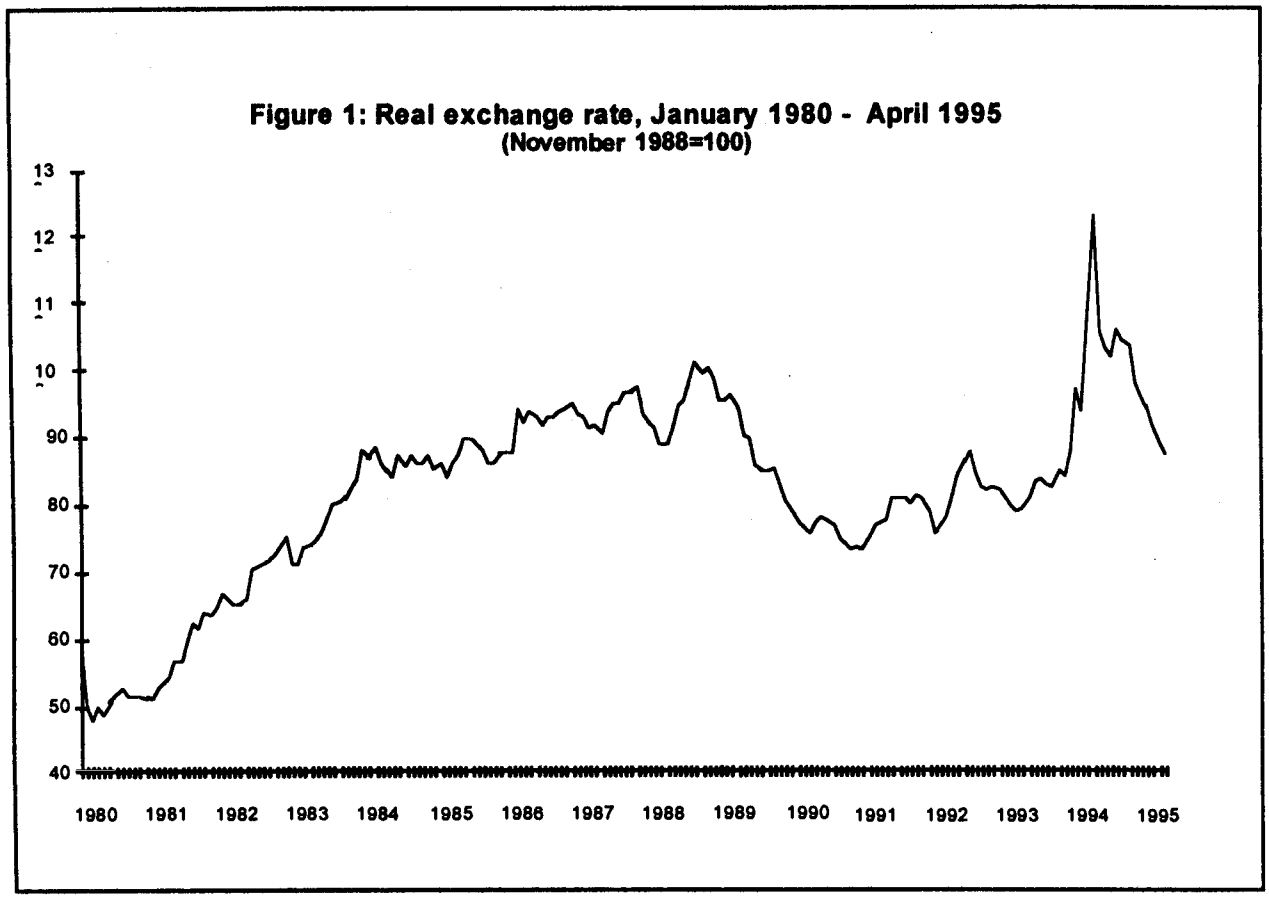
[1]The real exchange rate is computed with respect to a basket of foreign currencies composed of 75 % USA dollars and 25 % German marks. The calculations take into consideration the wholesale price indices in Turkey, Germany and the USA. By definition, a depreciation in TL shows as an increase in the exchange rate.

[2] The terms "outward-orientation" and "export-orientation" are used in the Bhagwati-Krueger fashion. This is the state where there is no bias against exportables or importables.



CHANGES IN THE PATTERN OF PRODUCTION, CONSUMPTION AND TRADE UNDER CURRENCY OVERVALUATION

It is observed that the domestic relative price of the exported goods change as the currency appreciates (Erzan and Sari, 1994). This may happen only if the law of one price does not hold. There are two main approaches related to the behavior of national price levels: (i) the conventional approach, covering both elasticity and absorption approaches, and (ii) the monetary approach of Kravis and Lipsey (1978). The first approach corresponds to the short-run and the second one to the long-run. The prices may deviate from world prices according to the former approach at an expense of a current account imbalance. From the long-run perspective of the monetary approach, the law of one price should hold. Kravis and Lipsey's empirical work show that the purchasing power parity condition does not hold, not even in the long-run (Kravis and Lipsey 1978 and 1983, and Dornbusch 1987).

Exchange rate is interpreted either as the relative price of non-traded goods in terms of traded goods (Dornbusch 1974 and 1987) or as the relative price of domestic goods in terms of foreign goods in a Ricardian framework (Dornbusch, Fischer and Samuelson 1977). Both of these approaches are inadequate to account for the deviations of the relative price of the exported good in terms of the import competing good from the international terms of trade.

Kravis and Lipsey (1983) suggest that the existence of non-tradable goods and/or the non-tradable services embodied in the import good during the delivery from the customs to the final user is the reason for the long-run deviations. The model developed in Erzan and Sari 1994, and Sari 1995a shows that the law of one price may not hold even though there are no non-tradable goods or services, and it introduces an alternative source of explanation to the deviations of national prices from world prices.

The new trade theories, like in Dixit and Norman (1980) and Helpman (1981) decompose trade into the inter-industry trade and intra-industry trade where the former is explained by the Heckscher-Ohlin theory, and the latter by increasing returns, product differentiation and monopolistic competition.[3] However, the possible divergence of the price of the domestically produced good from the prices of its international, imperfect substitutes is eliminated by assumption because of the symmetry condition which simplifies the analysis of intra-industry trade. The models exploring the dynamics of trade flows in the existence of product development and human capital accumulation, for instance, Grossman and Helpman (1989) and Rivera-Batiz and Romer (1991), have the same property as a result of the assumption of no vertical differentiation.

These models mentioned above contain the analytical tools needed for the modeling of an economy with a competitive export sector and a monopolistic, import competing sector with imperfect foreign substitutes.

In Sari (1995a), there are two sectors, the export sector and the import competing sector. The export industry produces a homogeneous good (X) that is sold both in the domestic market and in the international market. In the import competing sector the product is differentiated. It is assumed that two versions of the product exist, i.e., the product of the domestic import competing sector (Y) and the imported good (Y*).

The important results of Sari (1995a) are that the rule of one price does not hold in the import competing sector, and that changes in the exchange rate affect the price of the import competing sector to a smaller extent compared to the price of the export sector. Especially the second finding has important policy implications. Appreciation of currency decreases both P_X and P_{Y*} at the same rate. The rate of decrease in P_Y is smaller. First, domestic demand for X will rise and supply will fall; hence the exports will diminish. Lower price of the imported good will expand imports. The demand curve of the import competing industry will shift to the right because the price of the imported good relative to the price of the import competing industry's product decreases.

If an expansionary policy financed by external borrowing is coupled with currency appreciation, the adverse results become more severe because shrinking production of the export good will not be influenced but imports and the import competing industry's production will expand. Shortly, the outcome will be equivalent to a deterioration in the

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[3] Helpman (1985) studies the latter component in more detail by distinguishing increasing returns scale as industry-wide, national and international.

relative price of the exported good. Resources would be shifted from the export sector to the import competing sector.

What this model shows can be summarized as follows. The monopolistic competition in the import competing industry cum the competitive export sector creates price rigidity in the former sector.[4] This rigidity that causes the internal price ratio to diverge from the international terms of trade has real effects in the case of a currency appreciation. Currency appreciation and expansionary policies financed by external borrowing protects the import competing industries and shrinks the export industries. Obviously, these policies are not sustainable for very long because of the accumulation of external debt.

Empirical Measurement

Goldstein and Khan (1985) offer two empirical models of trade flows based on the regression analysis: the imperfect substitute model and the perfect substitute model. The Sari (1995a) model is a mix of these. However, the large number of sectors and the shortness of the period for which consistent data are available incapacitates the estimation of elasticities. Instead, indicators of relative shifts in the import, export, consumption and production vectors are developed as an alternative tool which is based on the commodity composition of import, export, domestic demand and production - rather than on the relative prices.

The Method

Let us define the commodity space as the n dimensional non-negative real space. Production, consumption, import and export vectors ($\vec{p}$,$\vec{c}$,$\vec{m}$ and $\vec{x}$) are the vectors from the origin to the production, consumption, import and export points, respectively:

$$\vec{p} = \begin{bmatrix} p_1 \\ p_2 \\ \vdots \\ p_n \end{bmatrix}, \vec{c} = \begin{bmatrix} c_1 \\ c_2 \\ \vdots \\ c_n \end{bmatrix}, \vec{m} = \begin{bmatrix} m_1 \\ m_2 \\ \vdots \\ m_n \end{bmatrix}, \vec{x} = \begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{bmatrix}.$$

The angles between these four vectors in the Euclidean space are tools to analyze the extent of intra-industry trade, international competitiveness, import propensity and the trade propensity based on changes in the commodity composition of production, consumption and trade,

If there is no intra-industry trade, i.e., if the elements of export vector, $\vec{x}$, are x_i=max (p_i-c_i,0) and the elements of import vector, $\vec{m}$, are m_i=max (c_i-p_i,0), the angle between $\vec{x}$ and $\vec{m}$ (α_{xm}) is 90°. In other words, the two vectors are orthogonal. On the other hand, if $\vec{x}$ and $\vec{m}$ are equal α_{xm} became 0°. The smaller α_{xm} is, the larger is the extent of the intra-industry trade. α_{xm}, is an indicator of intra-industry trade.

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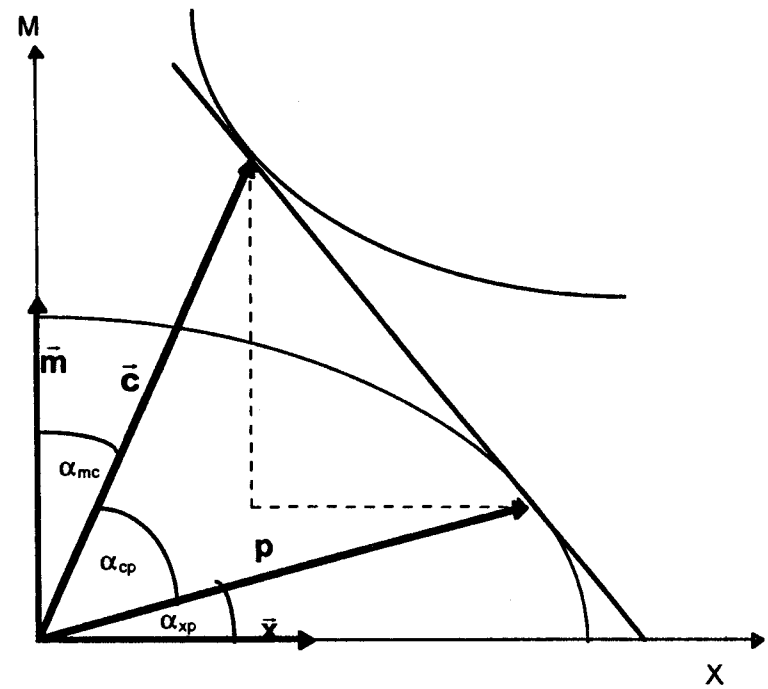
[4] See Katircioglu (1989) and (1990).

The angle between $\vec{x}$ and $\vec{p}$ (α_{xp}) is an indicator of the competitiveness of domestic industries. When α_{xp} gets smaller , either more goods become exportable or more of the existing exportable goods are produced or both. Furthermore, trade increases with α_{xp} , assuming balanced trade and keeping $\vec{c}$ the same as before. This can be seen in the graphical representation of the two-good neoclassical model of a small, open economy in Figure 2.

Figure 2: Import, export, consumption and production vectors in the two dimensional commodity space, production possibilities frontier and indifference map



The angle between $\vec{c}$ and $\vec{m}$ (α_{mc}) is an indicator of the import propensity. Similar to the relation between production and exports, when α_{mc} gets smaller, either more goods become importable or more of the existing importable goods are consumed or both. Keeping the structure of production the same and assuming balanced trade, an increase in α_{mc} implies an increase in trade propensity.

Similarly the angle between $\vec{p}$ and $\vec{c}$ (α_{cp}) is an indicator of the propensity to trade. The larger α_{cp} is, the smaller amount and/or variety of domestically consumed goods is produced domestically.

Empirical Results

Tariff and non-tariff barriers to the international trade were reduced significantly by the mid 1980s and the capital account was liberalized in the second half of the decade. The level of trade barriers was 40 % higher than the world average before the 1980s, and came down to 10 % below the world average by the mid 1980s (Sari 1993). From then on Turkey can be identified as a small, open economy . Hence, this applies to the period of real currency appreciation -between the last quarter of 1988 and the third quarter of 1993. The real exchange rate index (TL per foreign exchange) which was 100 in November 1988 became 83 in the third quarter of 1993.

The effects of gradual appreciation of the Turkish lira during the period 1988 -1993 on the real side of the economy was analyzed using α_{mc}, α_{cp}, α_{px}, α_{mx} explained above. Table 1 shows the changes in α_{mc}, α_{cp}, α_{px}, α_{mx} and the real exchange rate for the period under consideration.[5]

Table 1: α_{mc}, α_{cp}, α_{px}, α_{mx} and the real exchange rate

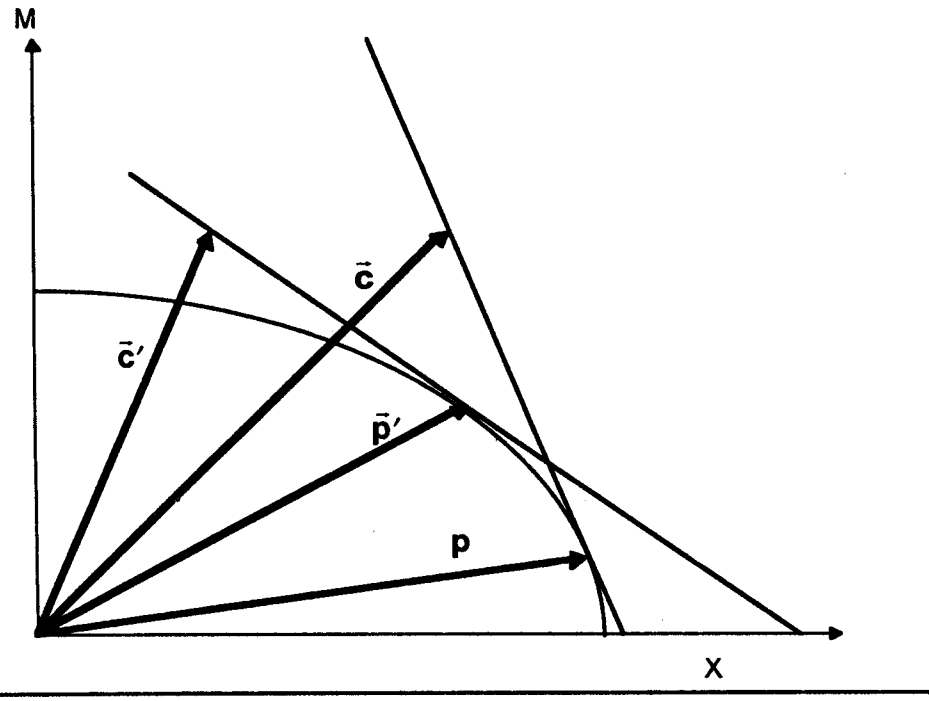
Quarter	α_{mc}	α_{cp}	α_{px}	α_{mx}	Real exchange rate (Nov. 1988=100)
1989:I	35.8°	24.1°	35.6°	63.6°	95.4
1993:III	28.9°	27.5°	44.4°	66.3°	83.0
1993:IV	27.2°	29.4°	42.8°	70.8°	85.5
1994:I	28.4°	26.8°	37.6°	65.2°	98.8
1994:II	36.9°	31.6°	34.2°	61.9°	110.2
1994:III	35.5°	27.0°	34.9°	59.3°	103.8
1994:IV	28.2°	28.3°	32.3°	61.1°	99.0

Throughout the period, 1989:I -1993:III, as a result of the fiscal deficit, the interest rates were considerably above the world averages. The capital inflows attracted by high interest rates had

[5] The data sources, the formulae and an extended table covering the periods 1989:I-1994:IV is given in the Appendix.

two consequences: steady real appreciation and an increasing domestic demand. The production vector rotated away from the export vector and the consumption vector rotated towards the import vector. The commodity composition of consumption diverged from the commodity composition of production.

Figure 3: Impact of a fall in the relative price of the exported good on the commodity composition of imports, exports, consumption and production.



These are equivalent to the results of a fall in the relative price of the exported good. Figure 3 shows the effect of a fall in the relative price of the exported good on the commodity composition of imports, exports, consumption and production in a two-good, neoclassical framework. Both the production and consumption vectors rotate counter-clockwise so that α_{mc} get larger and α_{px}, becomes smaller. The direction of the change in the α_{cp} depends on the elasticities of substitution in consumption and production (ignoring the income effect).

The exporting sectors, e.g., textiles, metal products, etc., are to a large extent competitive (Erzan and Sari 1994). On the other hand, the output of import computing sectors, e.g., consumer durables, the automotive industry, etc., are mostly differentiated products. For them, the market conditions can be characterized as monopolistic competition or oligopoly.

As the Sari (1995a) model predicts, currency appreciation decreased the competitiveness of the domestic industry and consequently, the export industries shrank. Product differentiation and market imperfections allowed the prices in the import competing sectors to diverge from

world prices. High aggregate demand boosted activity in this sector and consequently it expanded. Currency appreciation and amplified aggregate demand worked as a protection of import competing industries at the expense of a widening external debt and shrinking export industries.

SHOCK CURRENCY DEPRECIATION AND THE J-CURVE

In the first half of 1994, Turkey experienced a shock currency depreciation followed by a steady appreciation as shown in Figure 1. The analysis in this part aims at determining the lags in the response of the exports and imports as the real exchange rate changes.

Working on the idea that short run elasticities of exports and imports differ from the long-run elasticities, Spitaeller (1980) argued that the changes in the exchange rate will not be reflected in domestic prices in the short run. He estimated export and import equations for ten countries, using monthly data for the period 1973:01-1978:4. He simulated the path for the domestic prices of exported and imported goods for each country assuming that exports and imports were constant. This resulting graphs of the terms of trade and the balance of payments had a J-curved shape in most cases.[6]

In our analysis, domestic money supply as a ratio of foreign money supply was used as a proxy of the domestic aggregate expenditure relative to foreign aggregate expenditure. So exports and imports were considered a function of this relative aggregate expenditure, the production level of both domestic and foreign economies and the real exchange rate. However, domestic output, money supply and real exchange rate were also interdependent from each other and the current account. Furthermore it was assumed that the adjustment to a shock would not be completed in the short-run, hence there would be lags between the shock to a variable and its impact on other variables. Therefore, the VAR technique was used for the estimation. VAR explains the variation in a variable by the past values of the same variable and the other variables in the equation system.

Econometric Methods Used

Vector autoregression (VAR) is an unstructured econometric method that handles a vector of variables as a function of its lag values. In our analysis, the vector under consideration consists of logarithms of the exports (LNEXP), imports (LNIMP), the industrial production index (LNYTR), real exchange rate (LNRER) and an index of money supply as a ratio of foreign money supply (LNM):

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[6] Goldstein and Khan explains the conditions for the existence of the J-curve in their survey of income and price effects in foreign trade (Goldstein and Khan 1985).

$$y_t = \begin{bmatrix} LNEXP_t \\ LNIMP_t \\ LNYTR_t \\ LNRER_t \\ LNM_t \end{bmatrix}$$

Constant terms and German production index constitute the vector of exogenous variables:

$$x_t = \begin{bmatrix} Constant \\ LNYGER_t \end{bmatrix}.$$

The system estimated is a VAR (p):

$$y_t = \sum_{i=1}^{p}(A_i y_{t-i} + B_i x_{t-i}) + u_t = \sum_{i=1}^{p}(A_i L^i) y_t + \sum_{i=1}^{p}(B_i L^i) x_t + u_t,$$

where A_i's (i=1,...,p) are the 5 x 5 matrixes of coefficients; B_i's (i=1,...,p) are the 5 x 2 matrixes of coefficients; u_t is a vector of five, independently and normally distributed disturbance terms; L is the lag operator. Because all the variables at the right hand side are predetermined, the ordinary least squares estimate of the parameters are efficient. Defining $A(L) = I - \sum_{i=1}^{p}(A_i L^i)$ and $B(L) = \sum_{i=1}^{p}(B_i L^i)$ this system can be written in MA form:

$y_t = A(L)^{-1} B(L) x_t + A(L)^{-1} u_t$.

The coefficient of j'th element of u_{t-i} in the k'th equation is i period ahead, impact of a shock to the j'th variable is on the k'th variable. For example, to see the effect of a one percent increase in the real exchange rate (RER) at period 0 on the value of exports in the 9'th period, we have to look at the coefficient of the 9 period lagged value of the fourth disturbance term in the first equation. However the value of coefficients of this MA system is sensitive to the order of variables in the vector. To deal with this problem, we followed the procedure suggested by Hakkio and (1984). We reordered the variables from the one that is least dependent on others to the one that is most dependent on others.

We first used 12 moths lags. However, extending the lag structure to 18 months did improve some results, although the degree of freedom decreased significantly. Therefore in the unrestricted VAR analysis we used 18 months lags. To increase the degree of freedom, some restrictions should be introduced. For this purpose we used stepwise regression. The process of selecting variables begins by selecting the variable that has the highest explanatory power. Then the variable that contributes most to the explanatory power is introduced. Variables are added until non of the variables excluded has significant effects on the dependent variable. At each step of this selection process the significance of the included variables are also tested, and the ones with insignificant coefficients are excluded.

VAR Results

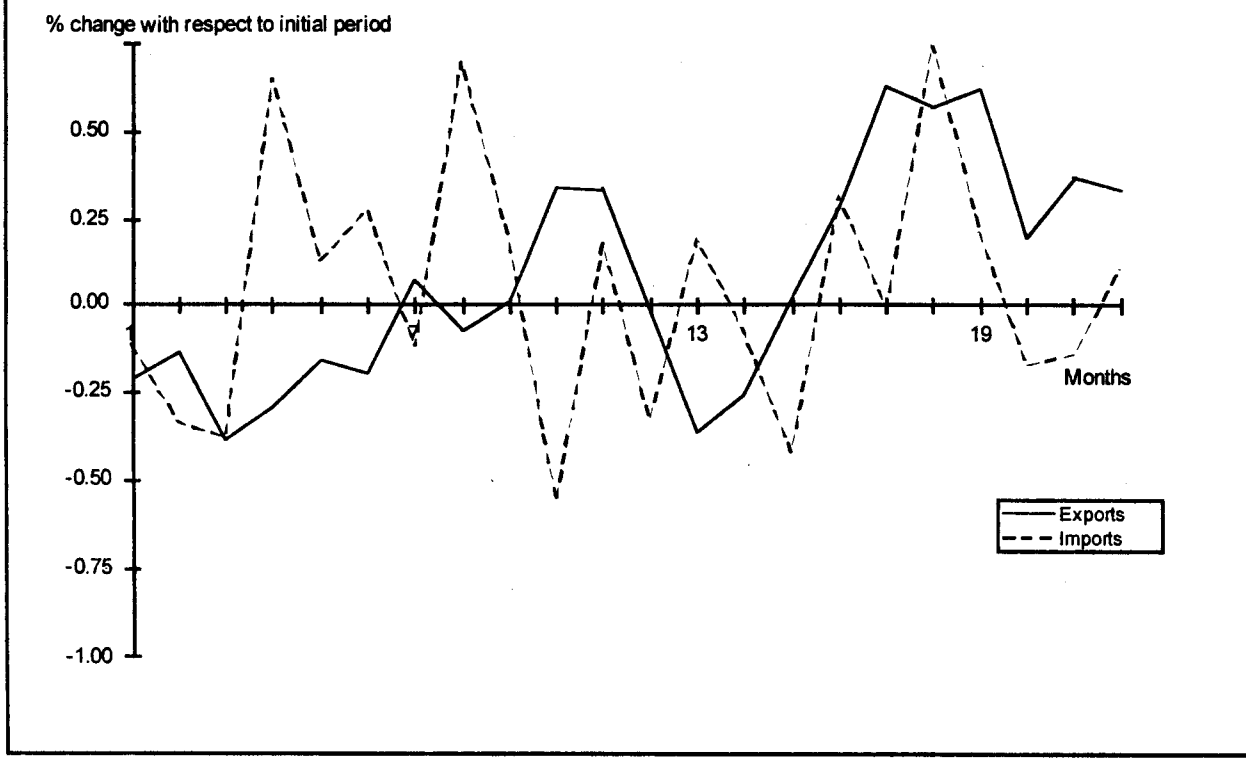
Table 2 summarizes the results of the VAR estimation. Each cell in the table shows the significance level of the lagged values of the explanatory variables in explaining the corresponding dependent variable.

Output is autonomous: it is explained by only its own lagged values. On the other hand, RER is effected by the past values of exports, imports and relative money supply. Money is basically a link to the changes in RER. Exports are determined by only the last values of RER. Imports seemed to be determined outside this system.

Table 2: The significance levels of all lag values of the explanatory variables: The results of unrestricted VAR.

		Dependent variables				
		Output (Tr)	RER	Money	Exports	Imports
Explanatory variables	Output (Tr)	0.00	0.46	0.24	0.77	0.11
	RER	0.55	0.00	0.03	0.06	0.15
	Money	0.63	0.06	0.00	0.28	0.22
	Exports	0.47	0.03	0.14	0.00	0.63
	Imports	0.44	0.04	0.13	0.97	0.21
	Output (Gr)	0.79	0.38	0.27	0.75	0.11

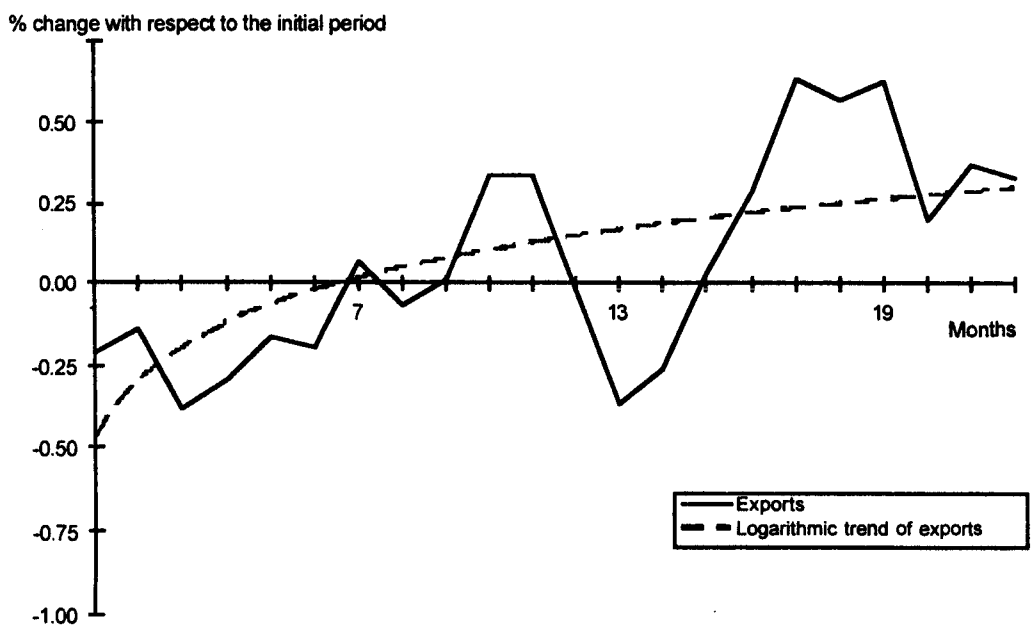
Figure 4: The impact of a 1 % depreciation of the currency on exports and imports over time



The impact of a 1 % currency depreciation on exports and imports is shown in Figure 4. Exports fall in the first months - since the cost of imported inputs increase and the producers cannot immediately switch to domestic sources. Neither is domestic production geared to exportables. About ten months following the currency depreciation exports pick up. Then there is a slump followed by a peak. The adjustment process is completed in about 18 months. In imports there is an immediate decline, yet as there is a high variance, a trend cannot be captured.

Figure 5 fits a logarithmic trend line to the reaction in exports. It is observed that a 1 % currency depreciation results in about a 0.3 percent upward shift in exports over time. Obviously the same analysis is valid, with reverse effects, in the case of a currency appreciation.

Figure 5: Impact of a 1 % depreciation on exports over time and its logarithmic trend



The latest Turkish experience with the currency shock in early 1994 verifies these estimations which cover several cycles. Exports did not pick up until later in the year, and the boom continues despite steady currency appreciation. The bad news is that the delayed effects of this currency appreciation is on the way.

Stepwise Regression Results

As the degree of freedom is considerable low we decided to put some restrictions to the VAR system explained above. We used stepwise regression technique that decreases the number of

explanatory variables.[7] The results are summarized in Table 3. Every cell shows the length of lags of the effects of dependent variable to explanatory variable on the dependent variable. For example, exports affect imports with one month lag and with 4 months lag.

Most interesting result of this analysis concerns imports: Imports depend neither on relative money supply nor the home countries production level. Last four months' exports and RER affect imports, and the foreign production level affects it three quarters later.

Exports respond to the changes in the conditions 3-6 quarters later. The only exception is income that has an immediate impact. RER and money supply are very responsive to all changes in the economy. RER responses to domestic production level and money supply responds to exports (and RER 2 quarters later). The other responses are frequent.

Table 3: The lag structure of the explanatory variables: Results of the stepwise regression (number of months).

		Dependent variables				
		Exports	Imports	RER	Money	Output (Tr)
Explanatory variables	Exports	1, 8, 11-13, 16, 18	1, 4	2, 4, 6, 9, 10, 12, 13	5, 7, 10, 18	7, 11, 13
	Imports	9, 12	1, 3, 12, 13, 15,16, 18	2, 4, 6, 8-11, 17	2, 3, 6, 13	7, 8
	RER	10, 13, 14, 17, 18	2, 4	1, 3, 5, 7-9, 16	6, 8-10, 15	13
	Money	12, 13		1, 3, 8, 10, 11	1, 2, 4, 8-13	10, 14, 15
	Output (Tr)	1, 7, 11, 12		6, 8, 16	2, 7, 11, 12, 17	1, 2, 12, 13, 16
	Output (Gr)	9-11	10-12	11, 16	14	5, 8, 11, 12

A Verification of the J-Curve Results Using the Angles Between Vectors

The method developed in the first part of this paper computing the angles between production, consumption and trade vectors can be used to analyze the effects of the currency shock and the following steady currency appreciation.

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[7]Using both the Dickey-Fuller and Augmented Dickey Fuller tests, the data do not reject the hypothesis of unit-root of each variable, and the hypothesis of co-integration among all variables together. Both VAR and Stepwise regression are asymptotically consistent.

From Table 1, we observe that the TL depreciated in the first and second quarters of 1994. In this period α_{mc} has widened, implying a move in consumption away from imports. In the same period α_{px} became smaller, implying a move in production towards exports. However in the third and fourth quarter of 1994 when the currency appreciated, production continued to move closer to exports. This is due to the lagged response in exports. In the same period consumption immediately reacted to currency appreciation and moved towards imports.

APPENDIX: CALCULATION OF THE ANGLES BETWEEN IMPORT, EXPORT, PRODUCTION AND CONSUMPTION VECTORS, AND THE REAL EXCHANGE RATE

The angle between two vectors **x** and **y** is calculated using the following formula:

$$\alpha_{xy} = \cos^{-1}\left(\frac{\mathbf{x}'\mathbf{y}}{\sqrt{(\mathbf{x}'\mathbf{x})(\mathbf{y}'\mathbf{y})}}\right)$$

The data for production, sales, exports and imports is from the Turkish State Institute of Statistics (SIS). All of the data are detailed sectoral data in 3 digit ISIC. Production value, **p**, is calculated using growth rates from quarterly surveys and 1990 consensus data. Sales are calculated in the same manner. The figures for exports, **x**, and imports, **m**, which were originally classified by SITC rev. 3 are converted into ISIC classification by the SIS. Domestic demand, **c**, is calculated by subtracting exports from the sum of sales and imports.

Real exchange rate is computed for a basket of 75 % US dollars and 25 % German marks against the Turkish lira (i.e. an increase in the exchange rate implies TL depreciation). This was then indexed taking the November 1988 peak as 100. Turkish data are from the Central Bank of Turkey and the SIS; wholesale price indices for the US and Germany are from the IMF, IFS. Quarterly figures are geometric averages of the respective three months.

Appendix Table: α_{mc}, α_{cp}, α_{px}, α_{mx} and the real exchange rate

Quarter	α_{cx}	α_{cm}	α_{cp}	α_{mx}	α_{mp}	α_{xp}	Real exchange rate
1989.1	49.6°	35.8°	24.1°	63.6°	50.2°	35.6°	95.4
1989.2	49.2°	32.5°	22.0°	60.7°	43.7°	34.3°	91.3
1989.3	51.7°	32.6°	19.8°	60.9°	42.1°	38.4°	85.1
1989.4	55.2°	32.4°	27.4°	68.2°	51.2°	38.8°	82.8
1990.1	52.0°	36.7°	23.2°	64.5°	50.4°	36.2°	77.6
1990.2	53.7°	34.8°	24.0°	65.3°	49.7°	38.3°	76.9
1990.3	56.7°	35.6°	24.2°	67.2°	52.0°	41.2°	76.4
1990.4	59.3°	34.6°	26.6°	70.2°	53.0°	41.6°	73.5
1991.1	59.3°	35.7°	25.7°	68.8°	50.8°	40.5°	75.0
1991.2	57.1°	35.9°	24.1°	67.5°	49.8°	39.4°	78.5
1991.3	56.1°	33.1°	23.5°	67.2°	49.8°	42.7°	80.7
1991.4	56.8°	30.9°	26.5°	70.0°	52.4°	40.0°	80.3
1992.1	59.4°	31.8°	25.2°	68.3°	47.9°	40.9°	76.8
1992.2	64.0°	41.7°	36.0°	67.5°	49.7°	40.5°	83.7
1992.3	57.4°	33.6°	23.0°	65.1°	48.1°	42.7°	84.7
1992.4	59.5°	32.1°	26.6°	68.3°	50.4°	41.5°	82.3
1993.1	62.5°	29.9°	25.9°	66.6°	44.5°	43.9°	79.7
1993.2	58.6°	27.1°	25.2°	64.6°	44.5°	42.3°	81.1
1993.3	62.5°	28.9°	27.5°	66.3°	45.7°	44.4°	83.0
1993.4	62.1°	27.2°	29.4°	70.8°	50.9°	42.8°	85.5
1994.1	56.8°	28.4°	26.8°	65.2°	46.1°	37.6°	98.8
1994.2	55.7°	36.9°	31.6°	61.9°	55.1°	34.2°	110.2
1994.3	53.9°	35.5°	27.0°	59.3°	49.9°	34.9°	103.8
1994.4	51.6°	28.2°	28.3°	61.1°	49.2°	32.3°	99.0

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