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Aggregate Imports and Expenditure Components in Turkey: Theoretical and Empirical Assessment

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Abstract – *After the economic turmoil in 2001, the Turkish economy quickly recovered, and exhibited distinguished economic performance in successive years without any interruption. This success can be considered as a product of favourable international economic conditions, sound macroeconomic reforms, the beginning of the accession talks with the EU and political stability with a single party government. All these favourable conditions have allowed the Turkish economy to not have experienced any financial restraints in financing this distinguished economic performance. While increased expenditure, particularly in consumption and investment, together with high foreign demand for Turkish production, appear to have played an important role in these growth rates, the economy has begun to experience a large surge in imports and current account deficits in response to an increase in domestic expenditure. The purpose of this paper is to examine the role of macroeconomic components of aggregate expenditure in determining import demand in Turkey. Along with the empirical assessment, the paper also suggests a theoretical model of import demand, which is built upon a utility maximization of a country subject to budget constraints. The empirical model derived as a dynamic form of linear expenditure system was estimated with quarterly data from the Turkish economy for the period of 1987-2006. The results show that consumption and expenditure are two important demand components in determining imports in the long run whereas only the growth rates of consumption and investment are dominant factors in the short run. Public expenditure appeared to have no significant impact on import demand in Turkey.*

Keywords: Aggregate Imports, Linear Expenditure System, Turkey, Error-Correction Model.

1. INTRODUCTION

After experiencing the worst economic crises of its economic history in 2001, the Turkish economy has quickly recovered, and has achieved high rates of uninterrupted economic growth for five successive years. Following a 7 % contraction in Gross Domestic Product in 2001, the economy grew by 7%, on average, between the 2002-2006 period (*see* www.tcmb.gov.tr). According to many international observers, favourable international conditions, which can be characterised by high international liquidity for a developing country with resource

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gaps, sound macroeconomic reforms, the beginning of accession talks with the EU, and finally political stability with a single party government have accounted for this distinguished performance of the Turkish economy in recent years. Accordingly improved confidence in the Turkish economy has led international investors to direct their short term and long term financial investment into Turkey. Although this excessive amount of capital inflow allows the economy to close the resource gaps caused by high economic growth rates, it can also account for increased domestic absorption and overvaluation of domestic currency[1] which has inevitably lead the economy to encounter large current account deficits. This however increases the fragility of the economy and constitutes major concern among policy makers and economists in Turkey. Following a 2.3 % of GNP surplus in 2001, the economy began to experience huge current account deficits with the ratio of 5.2 % in 2004, and 6.3% in 2005, and finally 8.3% in 2006 (SPO, 2007). Imbalances of this magnitude are traditionally alarming for a country like Turkey, and urge policy makers to immediately implement contractionary policy measures.

Turkey has occasionally encountered the problems of current account imbalances, most of which ended up with balance of payment crises and consequently forced the implementation of macroeconomic stabilisation and adjustment policies (*see* Celasun and Rodrik, 1989). Controlling imports has been shown to be the crucial component of conventional stabilisation policies. Foreign exchange rate adjustment (expenditure switching) and reductions in domestic absorption (expenditure reduction) with appropriate fiscal and monetary measures are, in turn, two inevitable policy instruments that have been mostly used in curbing import bills.

Previous empirical research shows that the demand for imports in Turkey is much more responsive to changes in aggregate demand than foreign exchange adjustment (Tansel and Olgun, 1987 and Günçavdı and Ülengin, 2006).[2] In particular, Günçavdı and Ülengin (2006) note that a foreign exchange rate adjustment policy alone would be insufficient in curbing the monthly demand for imports, and should also be accompanied with a sound demand management policy in order to control domestic aggregate expenditure. This empirical finding is

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[1] Another important reason for improvement in confidence is the determination of the government regarding disinflation programme. This is extremely important because Turkey suffered from high and very persistent inflation for almost 30 years. After a number of unsuccessful attempts to curb it, the Central Bank has finally opted to adopt the inflation-targeting policy as a new monetary policy.

[2] Togan and Olgun (1987) and Günçavdı and Ülengin (2006a) are two different empirical studies on the determinants of Turkish import demand. Using an annual data and covering the period of 1960-1985, the former found the income and relative price elasticity of imports 1.42 and 0.47 respectively. A recent study Günçavdı and Ülengin (2006a) utilises a montly data set for a relatively recent period, namely 1981M1-1996M12, and found similar results with 1.64 for the income elasticity and 0.39 for the price elasticity of import demand.

additionally supported by the outcome of the latest market-based adjustment of the New Turkish Lira (NTL) in June 2006, and it appeared that a depreciation of almost 30 % of the NTL against the US Dollar helped very little to correct current account imbalances prevailing in the economy.[3] This experience suggests that correcting balance-of-payment inequalities is to be closely related to the level of aggregate expenditure. However the evidence available from input-output data in Turkey also shows that each macroeconomic component of final demand has a specific import content, and different compositions of expenditure correspond to different aggregate propensities to import (Günçavdı and Küçükçifçi, 2001). Table 1 shows the shares of macroeconomic components of aggregate expenditure in recent years. It is clear that the shares of investment and exports drastically increased while the share of consumption expenditure remained relatively stable. This can be considered as the product of increased confidence in the Turkish economy and over liquidity in the global markets. However it seems that economic growth in the world as well as the export markets of Turkey also helped the Turkish economy improve the capacity for exports, which has become highly dependent on the importation of intermediate goods (see Günçavdı and Küçükçifçi, 2001 and Günçavdı et al. 2005). In order to design a successful demand management policy it, in turn, becomes crucial to know the marginal propensities of each macro component of aggregate expenditure to import. The aim of this research is, therefore, to examine whether or not the demand for imports shows different responses to each components of aggregate expenditure.[4]

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[3] This surge in import bills is not only a cyclical matter, but it also refers to a structural change in domestic production in Turkey. Imports constitute the major components of domestic final and intermediate demand, and are affected very much by the level of domestic aggregate expenditure. This issue became evident particularly after liberalising foreign trade in 1982 onwards. Easing foreign exchange constraints and the lower prices of imported intermediate goods in international markets inevitably have led Turkish industries to raise the use of imported intermediate goods in production. Studies of the Turkish economy consistently showed that the present structure of domestic production is heavily dependent on the use of imported intermediate goods and has increased during the liberalisation period (*e.g.* Güllük-Şenesen and Şenesen, 2004). Besides, import competition has become an important issue for many industries after liberalising foreign trade, and Günçavdı and Küçükçifçi (2006b) indicates that it has accounted for almost 13 percent losses of total domestic output in the period of 1990-1998.

[4] The answer for this question, in fact, possesses great importance in choosing appropriate macroeconomic policy options between expenditure reduction and expenditure switching policies mainly for two reasons. The first is related to designing an appropriate macroeconomic policy to correct current account imbalances. Macroeconomic policies implemented to curb import expenditure may have different impacts on each component of aggregate imports, and the result in current account imbalances is closely related to the import contents of each aggregate expenditure. As seen in Figure 1, the imported intermediate goods are accounted for the largest share in aggregate expenditure in Turkey, and high growth rates would be expected inevitably to stimulate more use of imported raw materials in production. In such cases, a significant amount of a reduction in import demand together with a high economic growth will necessitate the policy measures that yield import substitution. More importantly, since the demand for imported raw materials are unavoidable in domestic production, macroeconomic policies emphasising heavily on the adjustment of foreign exchange rate is most likely to result in inflation rather than a reduction in import bills. However in a opposite case where consumer goods imports have the largest share, the foreign exchange rate adjustment policy would be sufficient in correcting current account imbalances.

(*Table 1 about here*)

There have been various attempts to examine the linkage between imports and the macro components of aggregate expenditure, namely consumption, public spending, investment and exports (Giovannetti, 1989; Abbott and Seddighi, 1996; Alias and Cheong, 2000; Narayan and Narayan, 2005 and Frimpong and Oteng-Abayie, 2006). In addition to some policy concerns, previous research is also built upon an important econometric drawback of traditional modelling approach. In this regard, the standard import demand model relates the import demand to relative prices and an activity variable namely gross domestic product in most of the cases, and assumes that import content of each macro component of aggregate expenditure is the same (*see* Boylan *et al.* 1980; Goldstein and Khan, 1985; Asseery and Peel 1991; Arize and Ndubizu, 1992; Bahmani-Oskooee, 1998). It follows that if the different macro components of aggregate expenditure have different import content, then the use of a single demand variable in the aggregate import demand function will lead to *aggregation bias* (Giovannetti, 1989 and Abbott and Seddighi, 1996). In order to avoid from this problem, the import demand function is estimated as a function of relative prices and disaggregated expenditure components. However this direction of research on import demand lacks a theoretical framework to incorporate the macro components of aggregate expenditure into the import demand function. Their approach has been rather *eclectic* and, unfortunately, has not been based upon a microeconomic underpinning. In what follows, we introduce a microeconomic framework basing on a utility maximization of a country subject to a budget constraint, namely balance of payment.

In suggesting an alternative microeconomic framework to standard import demand function, our modelling approach differs from those in the literature in an important way. In the standard model, import demand is treated as a cost-minimizing input, which is required to produce gross domestic product described by a Cobb-Douglas production function, and in accordance with this treatment, imports are explained as an excess of domestic demand of the goods in question over their domestic supply. This treatment of import demand is based on the assumption that the aggregate of imported and domestically produced goods are a perfect substitute. However this assumption seems to be hardly tenable in practice, and evidence shows that imported and domestically produced goods with different countries of origin should be treated as incomplete substitutes. With this assumption we derive a reduced form of import demand function, which allows for the inclusion of different macroeconomic components of aggregate expenditure separately in the model.

The organisation of the paper is as follows. In Section 2 we introduce the theoretical model, which leads us to a reduced form of import demand function. The econometric issues, estimation methods and results are discussed in Section 3. In Section 4 we highlight our main findings and our conclusions draw.

II. THE THEORETICAL MODEL

The purpose of this section is to introduce a microeconomic framework for the import demand function which explicitly enables us to incorporate disaggregate expenditure components. The model derived here is based on Welsch (1987). In this regard our approach differs from those in the literature in various ways. The traditional import demand function is derived as a *Hicksian* demand function by minimising the cost of production as an objective function subject to a given level of output, which is described by a Cobb-Douglas production function. In this theoretical underpinning, imports serve as an input, and are determined as an excess of domestic demand of the goods in question over their domestic supply. It is implicitly assumed that goods of same kind are complete substitutes. However this is hardly true in reality and Armington (1969) suggests treating goods with different countries of origin as incomplete substitute. This assumption constitutes the major difference of our modelling approach here.

The model of import demand should also incorporate the budget constraint of the economy in question by assuming that total income should be allocated among expenditure on incompletely substitutable goods. In other words, in deciding on the quantity of imports, the economy in question encounters the constraint that its expenditure on imports and domestically produced goods equal its income. This assumption ensures that the allocation of total expenditure can be altered under the effects of different market forces.

We also extend our theoretical framework by allowing for a standard quantity of imported and domestically produced goods. These standard quantities are assumed to be predetermined by past orders (see Marston, 1971), and/or habit formation (see Pollak, 1970) within the economy, and are irrespective of current prices.[5] Accordingly these standard quantities correspond to standard expenditures which reduce total income currently available for the purchase above these standard amounts in the current period. The important implication of this assumption for our

[5] In the traditional approach, past orders and habit formation are considered as reasons that prevent the prompt adjustment of current import demand to its optimal level, and provides a theoretical support in incorporating an *eclectic* dynamic adjustment procedure into the import demand function (Khan and Ross 1977 and Goldstein and Khan, 1985).

modelling import demand function is that only expenditure above these standard amounts are affected by current prices.

Given this general framework, the *Linear Expenditure System* (LES) is considered to be the simplest way of incorporating these features of demand behaviour into the import demand model (see Stone 1954; Pollak and Wales, 1969; Deaton and Muellbauer, 1980).[6] We use the dynamic version of LES in this paper, and assume that standard demand in each period is proportional to demand in previous period. A general dynamic linear expenditure system can derived from the maximisation of the aggregate utility function in the following form:

$$U(X_t) = \sum_{i=1}^{k} \beta_i \log(x_{it} - x_{it}^*), \;\; \beta_i > 0, \quad \sum_{i=1}^{k} \beta_i = 1, \quad (x_{it} - x_{it}^*) > 0, \tag{1}$$

Subject to budget constraint,

$$Y_t = \sum_{i=1}^{k} p_{it} x_{it} \tag{2}$$

Where and x_i denotes the rate of consumption of the i^{th} good; p_i is the price of the i^{th} good; x_i^* is the standard quantity of good *i* required by the country; β_i is the marginal expenditure share; *Y* is total nominal income; *k* is the number of goods. The question that the representative agent (a country in this case) must decide how much the country demands x_{it} above its standard quantities in order to maximize its utility. Maximizing (1) subject to the budget constraint (2) yields the following expenditure function:[7]

$$p_{it} x_{it} = p_{it} x_{it}^* + \beta_i \left(Y_t - \sum_{i=1}^{k} p_{it} x_{it}^* \right), \tag{3}$$

or

[6] A search for a different theoretical framework for import demand is not new in the literature. There have been several previous attempts, which were based on microeconomic theory. In empirical studies however, possessing a sound microeconomic underpinning, along with having good statistical diagnostics and reasonable forms of dynamics, is considered as one of the selection criteria of an appropriate import demand function. Despite its common usage in the application of consumer theory, Linear Expenditure System has also been employed in studies examining the structure of international trade by commodity (*see* Welsch, 1989).

[7] The formal derivation can be found in the appendix.

$$x_{it} = x_{it}^{*} + \frac{\beta_i}{p_{it}}\left(Y_t - \sum_{i=1}^{k} p_{it} x_{it}^{*}\right), \qquad (4)$$

To account for pre-existing contracts (commitments), the fraction α_i of standard demand, for which current prices are valid, and the fraction $(1-\alpha_i)$ for the rest-lagged prices, are added. Then,

$$x_{it} = x_{it}^{*} + \frac{\beta_i}{p_{it}}\left(Y_t - \sum_{i=1}^{k} p_{it} a_{it} x_{it}^{*} + p_{it-1}(1-\alpha_{it}) x_{it}^{*}\right), \qquad (5)$$

According to the assumption that the necessary quantity of each good is proportional to the consumption of that good in the previous period, we can also write equation (6),

$$x_{it}^{*} = \lambda_i x_{it-1}, \qquad 0 \le \lambda_i \le 1, \qquad i=1,\ldots,k \qquad (6)$$

where λ_i refers to the habit formation coefficient (see Pollak, 1970). Hence upon substituting (6) into (5), the following functional forms can be derived:

$$x_{it} = \lambda_i x_{it-1} + \frac{\beta_i}{p_{it}}\left(Y_t - \sum_{i=1}^{k} \lambda_i x_{it-1}\left[p_{it}\alpha_{it} + p_{it-1}(1-\alpha_{it})\right]\right),$$

$$= \lambda_i x_{it-1} + \frac{\beta_i}{p_{it}}\left(Y_t - \sum_{i=1}^{k} \lambda_i \left[p_{it}\alpha_{it} x_{it-1} + (1-\alpha_{it}) x_{it-1}^{n}\right]\right), \qquad (7)$$

where "*n*" stands for variables in nominal terms. In equation (7) x_{t-1}^{n} indicates nominal expenditure on standard quantities of x_{it} which are valued with past prices. Rearranging equation (7) gives

$$x_{it} = \lambda_i (1-\alpha_{it}\beta_i) x_{it-1} + \beta_i \frac{Y_t}{p_{it}} - \beta_i \left[\sum_{j=2}^{k} \alpha_{jt} \lambda_j \frac{p_{jt}}{p_{it}} x_{jt-1}\right]$$

$$-\left\{\beta_i \sum_{j=2}^{k} \lambda_j \left[(1-\alpha_{it}) \frac{x_{it-1}^n}{p_{it}}\right] - \beta_i \sum_{j=2}^{k} \lambda_j \left[(1-\alpha_{jt}) \frac{x_{jt-1}^n}{p_{it}}\right]\right\}, \qquad (8)$$

where

$$a_i = \lambda_i(1-\alpha_i\beta_i);\; b_i = \beta_i;\; c_{ij} = \beta_i\alpha_j\lambda_j;\; d_{ij} = \beta_i\lambda_j(1-\alpha_i);\; e_{ij} = \beta_i\lambda_j(1-\alpha_j),$$

$$i=1,\dots,n;\; j=2,\dots k.$$

Finally, the resulting demand equation for x_{it} can be written as

$$x_{it} = a_i x_{it-1} + b_i \frac{Y_{it}}{p_{it}} - c_i \frac{x_{it-1}^n}{p_{it}} - d_i \frac{x_{jt-1}^n}{p_{it}} - e_i \frac{p_{jt}}{p_i t} x_{jt-1}, \qquad i=1,\dots,k \qquad (9)$$

Since we are concerned with aggregate import demand, we consider it as if there exist only two aggregate goods, namely aggregate imported goods and domestically produced goods (i.e. k=2). Therefore we assume that i and j stands for imported and domestically produced goods in (9) respectively.

In an open economy framework, the balance of payment constraint involves the equality between aggregate income and expenditure at the macroeconomic level. Total nominal income available consists of income from gross domestic sales (*YN*), exports (*X*), net transfer (NT) and capital income (*CI*) and finally the net increase in debts (*B*). Aggregate expenditure is, on the other hand, allocated between the purchase of imported goods (*m*) and domestically produced goods (*y*).[8] Denoting the import prices by *pm*, the *GDP* deflator by *pd*, the budget constraint as follows:

$$m_t.pm_t + y_t.pd_t = YN_t + X_t + NT_t + CI_t + B_t \qquad (10)$$

In identity (10), the right hand side corresponds to the aggregate income variable denoted by *Y* in (9); m_t and y_t stand for x_{it} and x_{jt} variables in (9) respectively. Using the national accounts identity, the right hand side of (10) can also be written as follows:

$$m_t.pm_t + y_t.pd_t = C_t + I_t + X_t \qquad (11)$$

[8] All capital letters stand for the nominal values of each relavent variable whereas the samal cases show their real values.

where C_t and I_t are nominal consumption and investment, respectively. We can use the right hand side of (11), instead of the right hand side of (10), as income variable, and write equation (9) for import demand as follows:

$$m_t = a_1 m_{t-1} + b_1 \frac{Y_t}{pm_t} - c_1 \frac{M_{t-1}}{pm_t} - d_1 \frac{Y_{t-1}}{pm_t} - e_1 \frac{pd_t}{pm_t} y_{t-1} \tag{12}$$

where M_{t-1} and Y_{t-1} indicate nominal expenditures on standard quantities of imported and domestically produced goods valued with past prices respectively. The impacts of these two variables is expected to be negative mainly because a certain fraction of standard quantities of both goods valued at past prices decrease the nominal income available to spend on imported and domestically produced goods in the current period. It is also interesting to compare the performance of equation (12), with and without the assumption of a unique propensity to import. Therefore, by removing the unique propensity to import assumption, we can write the extended form of (12) as follows:

$$m_t = a_1 m_{t-1} + b_{11} \frac{C_t}{pm_t} + b_{12} \frac{I_t}{pm_t} + b_{13} \frac{G_t}{pm_t} + b_{14} \frac{X_t}{pm_t} - c_1 \frac{M_{t-1}}{pm_t} - d_1 \frac{Y_{t-1}}{pm_t} - e_1 \frac{pd_t}{pm_t} y_{t-1} \tag{13}$$

The import demand function presented in this section is based on sound microeconomic framework. The economic theory therefore gives a particular form of import demand function such as (12) and (13), and possible variables that is theoretically expected to influence the import demand of the country. Unlike traditional import demand functions, the advantage of this specification is that it allows for the examination of the marginal propensities to imports of disaggregated expenditure components, namely consumption, public expenditure, investment and exports. Import demand functions (12) and (13) appear to be quite similar to those employed in Giovannetti (1989), Abbott and Seddighi (1996) and Narayan and Narayan (2005). However the demand function theoretically derived in this section includes some additional variables, such as nominal expenditures on standard quantities of imported and domestically produced goods. In the following section equations (12) and (13) are estimated using data from the Turkish economy.

III. DATA AND ECONOMETRIC ESTIMATION

We estimated several versions of equations (12) and (13) on quarterly data for Turkey for the period 1990Q2-2007Q1. The data is available at the website of the

Central Bank of Turkey (www.tcmb.gov.tr), and are not seasonally adjusted. All variables are expressed in logarithm.[9] Both equations (12) and (13) are reduced forms models, which were derived from an explicitly defined microeconomic underpinning. However, the stochastic properties of the data are our main concern and inevitably dictate the most appropriate specification of equations (12) and (13).

(*Table 2 about here*)

It is well known that macroeconomic time series are non stationary and that any regression running between non-stationary variables is most likely to render spurious correlations (Granger and Newbold, 1974). Before inferring from the estimation results of the autoregressive model, it is necessary to analyse the stochastic propensities of the data. That is, it must be determined whether or not the time series in concern are stationary. Then in the presence of stationary time series, it must also be detected whether or not these series are co-integrated. Traditionally, the Augmented Dickey-Fuller (ADF) unit root test is used to check for non-stationarity (Dickey and Fuller, 1979 and 1981). The test results are reported in the Table 2. As seen in the table, a number of lagged dependent variables are required to ensure a white noise error term. According to these results, all variables appear to have a unit root, and must be differenced once to achieve their stationarity.

Having determined the order of integration of time series used in estimating (13), it can now be proceeded to test for the presence of the co-integration relationship between the variables already defined in equation (13). The two stage Engle and Granger method is used for this purpose. The presence of the co-integration relationship between I(1) variables in equation (12) and (13) is tested by estimating along running equations between these variables. This estimated co-integration function is seen in the bracket in Table 4. The *ADF* test was applied to the residuals obtained from this estimated regression in order to examine whether these residuals are stationary. The test results yields the ADF statistics of 7.02, confirming the existence of the co-integration relationship between I(1) variables derived in the theoretical model. The important drawback of the two-stage Engel and Granger method is that it implicitly assumes the existence of one co-integrating vector between the variables defined in the co-integration relation. In order to test whether or not this finding is robust, we also used the Johanson multivariate co-

[9] Economic theory does not provide any specific suggestion on the best functional form and the most appropriate measure of the variables in concern. Khan and Ross (1977) and Boyland *et al.* (1980) suggested that the long-linear forms purely on the basis of statistical testing. Additionally conventional import demand equations have mostly been specified in the log form due to its convenience and ease of interpretation.

integration test, and the results are reported in Table 3, where the trace and maximum eigenvalue tests derived from Johansen maximum likelihood procedure. To carry out this test we proceeded sequentially by first testing for H_0: r<=0, where *r* is the number of co-integrating vectors. If H_0 is rejected, we then tested for r<=1 and so on, until the null hypothesis could not be rejected (Harris, 1995). At both 5 % significance level, the null hypothesis of zero co-integrating vector appears to be strongly rejected, while the hypothesis of one or more co-integrating vectors is not. According to both tests results there exits, at most one co-integrating vector in respect of variables specified in the model.

In addition to the Engle and Granger test procedure and the Johanson multivariate co-integration test, we also use the bound test for co-integration (Pesaran and Pesaran, 1997; Pesaran and Shin 1999; Pesaran *et al.*, 2001). This testing procedure has become quite popular for the similar studies using small samples. The test procedure is based upon estimating Unrestricted Error Correction Model (UECM) with and without co-integrating relationship. The bound test is conducted using the F-test. With this test, it is possible to jointly test the significance of the coefficients on the one period lagged levels of the variables in the UECM.[10] We conducted the bound test only for the UECM with import demand as the dependent variable, and the calculated *F*-statistics confirms the presence of one co-integration relationship with the calculated *F* value 2.399 (*p*-value 0.033).

(*Table 3 about here*)

We therefore followed the Engle-Granger representation theorem (Engle and Granger, 1987), and a dynamic error correction model was estimated by regressing import demand in first difference on all independent variables in first differences and the lagged value of the residual derived from the first stage as the error correction term. The estimation results are reported in Table 4.

The estimated coefficient of the error correction term is expectedly negative and statistically significant, providing that the adjustment is non-explosive and that the long-run equilibrium is attainable. This coefficient measures the speed at which import demand adjusts to changes in explanatory variables before converging to its equilibrium level. The coefficient value of -0,395 suggests that convergence to equilibrium after a shock is very sluggish in Turkey and indicates that imbalances in current accounts cannot be tackled quickly in the short-run. This is because there may be some frictions and/or some structural constraints in the economy causing

[10] The Engle and Granger and Johansen multivariate co-integration tests indicate the presence of one co-integrating relationship between variables defined in equation (13). The bound test in this respect is conducted only to make sure that our conclusion on the presence of one co-integration relationship is robust. The test is conducted only for the case of import demand considered as the dependent variable.

this slow down. In comparison with similar studies in the literature, this speed of adjustment appears to be very slow. With the coefficient value 0.755, Abbott and Seddighi (1996) estimated very quick adjustment for the UK economy. Narayan and Narayan (2005) showed that the size of this error correction term was 0.76 for Fiji, whereas Alias and Cheong (2000) noted very quick adjustment with the coefficient 0.639 for the Malaysian economy. Unlike these countries, only 39.5 % of disequilibrium caused by any shock is able to be corrected within a single year in Turkey. This empirical finding hence suggests that import demand is expected to respond to any political measure designed to correct current account imbalances very slowly.

The equilibrium relationship estimated at the first stage of the Engle and Granger two stage co-integration test indicates clearly that the major determinants of the Turkish aggregate imports, in the long run, are consumption, relative prices and exports. In particular, consumption expenditure appears to dominate the influence of other macro components of final expenditure in the long run. Traditionally public expenditure has accounted for the weak fiscal stance of the Turkish economy, and has been expected to be a cause of a large balance of payments disequilibrium. However aggregate public expenditure in our result turned out to be insignificant in the con-integration relationship, indicating that this government spending might have been mostly on non-tradable goods, such as construction and public services, rather than tradables. There also appears to be significant differences between the partial elasticities of demand to imports with respect to consumption expenditure, exports and investment, with estimated elasticities of 0.749, 0.354 and 0.111, respectively. Therefore, the co-integration analysis suggests that **(1)** the major long-run determinants of aggregate imports in Turkey is aggregate private consumption expenditure; **(2)** there exists significant differences between the elasticities of imports with respect to different macro components of final expenditure; **(3)** changes in the price of imports relative to the price of domestically produced goods appears to have important effect on the Turkish importation in the long run, with the estimated long-run elasticity of -0,568; **(4)** public expenditure cannot account for changes in demand for imports, at least directly in the long run.

Table 4 – Long Run and Short Run Estimation Results of Aggregate Import Demand Function

$$\Delta \ln m_t = \underset{(6,87)}{0,196} + \underset{(6,91)}{0,9948}\Delta \ln(C/pm)_t + \underset{(3,42)}{0,302}\Delta \ln(I/pm)_t + \underset{(0,23)}{0,047}\Delta \ln(G/pm)_t + \underset{(1,64)}{0,228}\Delta \ln(X/pm)_t$$

$$- \underset{(-5,14)}{0,840}\Delta \ln(pd/pm)_t + \underset{(0,94)}{0,098}\Delta \ln(M_{t-1}/pm_t) - \underset{(-1,76)}{0,080}D1 - \underset{(-4,21)}{0,233}D2 - \underset{(-9,23)}{0,460}D3$$

$$- \underset{(-2,45)}{0,395}\Big\{\ln m_{t-1} - \underset{(4,19)}{0,749}\ln(C/pm)_{t-1} - \underset{(2,02)}{0,111}\ln(I/pm)_{t-1} + \underset{(-0,10)}{0,012}\ln(G/pm)_{t-1} - \underset{(4,91)}{0,354}\ln(X/pm)_{t-1}$$

$$+ \underset{(-3,78)}{0,568}\ln(pd/pm)_{t-1} - \underset{(3,38)}{0,284}\ln(M_{t-2}/pm_{t-1}) - \underset{(0,66)}{0,026}D1 - \underset{(2,03)}{0,068}D2 + \underset{(-4,00)}{0,165}D3\Big\}$$

Adj-R^2=0,859; F-*Stat.*=41,25; D.W.=1,90; Serial correlation: $\chi^2(4)$= 0,974; Functional form: $\chi^2(1)$=0,022 ; Normality: $\chi^2(4)$=2,736 ; Heteroscedasticity: $\chi^2(1)$= 0,557; ARCH: $\chi^2(4)$=0,597.

Note: *t*-values are indicated by the figures in the parenthesis under estimated coefficients, and * denote statistically significance at the 1 percent level.

The short-run dynamics of import demand appear to be determined to a large extent by the growth rates of consumption expenditure and investment. A 1 % increase in the growth of consumption lead to 0.995 % increase the growth rate of import demand. The magnitude of this effect is 0.303 % in response to a 1 % increase in the growth of investment expenditure. Changes in the growth of public spending and expenditure on exports seem to have no statistically significant effect on import demand in the short run. The relative price variable is negatively related with imports and its effect, with the estimated coefficient of 0.84, is largest in magnitude after the consumption expenditure. This result allows for the interpretation of the recent experience of current account deficits in the Turkish economy, which causes concern among policy makers and economists. It is clear that a favourable international environment and over liquidity in the global financial markets allow the removal of liquidity constraints on the expenditures of Turkish consumers and firms, and the creation of over capacity of expenditure which increases import demand. The results of this empirical research indicate that consumption and investment are two crucial expenditure components that stimulate import demand in the short run. On the basis on the empirical result in Table 4, we can also conclude that Turkish private sector expenditure, but not public expenditure, can account for the large surge in recent current account deficits.

(*Figure 1, Figure 2 and Figure 3 about here*)

According to the results of the diagnostic tests, the short-run model appears to be well behaved with a white noise error term and diagnostic test results[11] reported in Table 4. The model fits the Turkish data well with an adjusted-R^2 value of 0.86. The t-ratio of the lagged level of the dependent variable is very high, providing evidence in favour of the presence of error correction term. The coefficients are generally significant and of the expected signs. The plot of actual and fitted values suggests that the short-run model tracks the data very well (see Figure 1). Moreover the CUSUM test and CUSUM Square test of stability (see Figure 2) indicates that the estimated parameters of the model have remained stable over the sample period. The recursive coefficient test (see Figure 3) also shows that there is no structural change in coefficients of disaggregated expenditure components.

IV. CONCLUSION

Recently there has been increasing interest to estimate the marginal propensities of aggregate expenditure components in the empirical import demand literature. Whilst a rather eclectic approach has been common in the literature, a microeconomic underpinning has been the missing component of this approach. This paper was motivated by the need, first, to examine the marginal propensity of expenditure components to imports in Turkey, and then to provide a microeconomic framework for this empirical investigation. Using the linear expenditure function of the consumer theory, we were theoretically able to deconstruct the marginal propensity of domestic aggregate expenditure to import into its components.

The reduced form of the model was estimated with quarterly data from the Turkish economy. The estimated demand function fits the data well, and suggests the need for examining the effects of each aggregate expenditure components separately in both the long-and short run. Our empirical investigation postulates that there exists a long run relationship between aggregate imports and the main components of final expenditure and a relative price variable. Moreover, there are significant differences between the long-run partial elasticities of imports with respect to different components of aggregate expenditure. Consumption expenditure in particular appears to be the major determinant of the Turkish imports in the long run. It is followed by exports and investment expenditure. The

[11] The diagnostic tests used includes the Durbin-Watson test; Lagrange-multiplier test for serial correlation; Lagrange multiplier test for autoregressive conditional heteroscedasticity; the Ramsey reset test functional form test; the Jargue-Bera test for normality; the Koenker test for Heteroscedasticity and the Hausman test for exogenity.

long-run price elasticity of demand for imports seems to possess the second largest effect on the demand for imports.

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Appendix - A

We begin with an aggregate utility function of the form

$$Max. \quad U(X) = \sum_{i=1}^{n} \beta_i \log(x_i - x_i^*), \tag{1}$$

$$\text{Subject to} \qquad Y = \sum_{i=1}^{n} p_i x_i \tag{2}$$

where

$$\beta_k > 0, \quad \sum_{i=1}^{n} \beta_i = 1, \quad (x_k - x_k^*) > 0, \tag{3}$$

and x_i denotes the rate of consumption of the i^{th} good; p_i is the price of the i^{th} good; x_i^* is the subsistence quantity of good i required by the consumer; β_i is the marginal expenditure share.

Maximizing (1) subject to the budget constraint (2) yields the following Lagrange function:

$$Z = \sum_{i=1}^{n} \beta_i \log(x_i - x_i^*) + \lambda(Y - \sum_{i=1}^{n} p_i x_i) \tag{4}$$

The first order conditions of (4) can be written as follows:

$$\frac{\partial Z}{\partial x_i} = \frac{\beta_i}{(x_i - x_i^*)} - \lambda p_i = 0, \qquad i = 1,\ldots,n \tag{5}$$

$$\frac{\partial Z}{\partial \lambda} = Y - \sum_{i=1}^{n} p_i x_i = 0 \tag{6}$$

From (5)

$$\beta_i = \lambda p_i (x_i - x_i^*), \qquad i = 1,\ldots,n \tag{7}$$

The adding up condition of the budget condition also requires the following

$$\sum_{i=1}^{n} \beta_i = 1 \tag{8}$$

Substituting (7) into (8) gives

$$\lambda\left(\sum_{i=1}^{n} p_i (x_i - x_i^*)\right) = 1 \tag{9a}$$

(9a) can be re-written as

$$\lambda\left(\sum_{i=1}^{n} p_i x_i - \sum_{i=1}^{n} p_i x_i^*\right) = 1 \tag{9b}$$

Since $\sum_{i=1}^{n} p_i x_i = Y$ from (6), the following can also be written

$$Y - \sum_{i=1}^{n} p_i x_i^* = \frac{1}{\lambda}, \qquad \text{or} \qquad \lambda = \frac{1}{Y - \sum_{i=1}^{n} p_i x_i^*} \tag{10}$$

From (5)

$$\frac{\beta_i}{(x_i - x_i^*)} = \frac{1}{Y - \sum_{i=1}^{n} p_i x_i^*} p_{i,} \qquad i = 1,\ldots,n \tag{11}$$

(11) can also be written as

$$\beta_i\left(Y-\sum_{i=1}^{n}p_ix_i^*\right)=p_ix_i-p_ix_i^*, \qquad i=1,\ldots,n \tag{12}$$

Then

$$p_ix_i=p_ix_i^*+\beta_i\left(Y-\sum_{i=1}^{n}p_ix_i^*\right), \qquad i=1,\ldots,n \tag{13}$$

And finally

$$x_i=x_i^*+\frac{\beta_i}{p_i}\left(Y-\sum_{i=1}^{n}p_ix_i^*\right), \qquad i=1,\ldots,n \tag{14}$$

To account for pre-existing contracts (commitments), the fraction α_i of standard demand, for which current prices are valid, and the fraction $(1-\alpha_i)$ for the rest-lagged prices are added. Then,

$$x_i=x_i^*+\frac{\beta_i}{p_i}\left(Y-\sum_{i=1}^{n}p_ia_ix_i^*+p_{i-1}(1-\alpha_i)x_i^*\right), \qquad i=1,\ldots,n \tag{15}$$

According to the assumption that the necessary quantity of each good is proportional to consumption of that good in the previous period; we can write,

$$x_i^*=\lambda_ix_{i-1}, \qquad 0\le\lambda_i\prec 1, \qquad i=1,\ldots,n \tag{16}$$

where λ_i refers to as habit formation coefficient.

$$x_i=\lambda_ix_{i-1}+\frac{\beta_i}{p_i}\left(Y-\sum_{i=1}^{n}\lambda_ix_{i-1}\left[p_i\alpha_i+p_{i-1}(1-\alpha_i)\right]\right),$$

$$=\lambda_ix_{i-1}+\frac{\beta_i}{p_i}\left(Y-\sum_{i=1}^{n}\lambda_i\left[p_i\alpha_ix_{i-1}+(1-\alpha_i)x_{i-1}^n\right]\right), \qquad i=1,\ldots,n \tag{17}$$

Where "*n*" stands for variables in nominal terms

$$x_i=\lambda_i(1-\alpha_i\beta_i)x_{i,t-1}+\beta_i\frac{Y}{p_i}-\beta_i\left[\sum_{j=2}^{n}\alpha_j\lambda_j\frac{p_j}{p_i}x_{j,t-1}\right]$$

$$-\left\{\beta_i\sum_{j=2}^{n}\lambda_j\left[(1-\alpha_i)\frac{x_{i,t-1}^n}{p_i}\right]-\beta_i\sum_{j=2}^{n}\lambda_j\left[(1-\alpha_j)\frac{x_{j,t-1}^n}{p_i}\right]\right\}, \quad i=1,\ldots,n \tag{18}$$

Where $a_i=\lambda_i(1-\alpha_i\beta_i)$; $b_i=\beta_i$; $c_{ij}=\beta_i\alpha_j\lambda_j$; $d_{ij}=\beta_i\lambda_j(1-\alpha_i)$; $e_{ij}=\beta_i\lambda_j(1-\alpha_j)$, $i=1,\ldots,n; j=2,\ldots,n$. Finally, the resulting demand equation can be written as

$$x_i=a_ix_{i-1}+b_i\frac{Y_i}{p_i}-c_i\frac{x_{i-1}^n}{p_i}-d_i\frac{x_{j-1}^n}{p_i}-e_i\frac{p_j}{p_i}x_{j-1}, \qquad i=1,\ldots,n \tag{19}$$

For *n = 2* assuming that *i* and *j* stands for imported and domestically produced goods. x_i and y_i can hence represent expenditure, import and domestically produced goods.

Table 1.
The Shares of Imports in Aggregate Expenditure Components

YEAR	C	G	I	X	M
1987	68,56	7,86	25,77	15,60	17,80
1988	67,82	7,59	23,12	18,10	16,60
1989	66,92	7,64	25,17	18,00	17,70
1990	69,28	7,55	27,78	17,00	21,60
1991	70,10	7,83	24,98	17,40	20,30
1992	68,95	7,74	26,38	18,40	21,50
1993	69,45	7,58	31,63	18,40	27,10
1994	68,98	7,67	23,29	22,20	22,20
1995	67,55	7,58	29,26	22,30	26,60
1996	68,24	7,67	28,72	25,30	29,90
1997	68,76	7,42	29,87	28,00	34,00
1998	67,03	7,75	28,59	30,40	33,70
1999	68,49	8,66	27,34	29,60	34,10
2000	67,79	8,65	30,52	32,90	39,90
2001	66,53	8,55	19,12	38,20	32,40
2002	62,98	8,36	24,09	39,30	34,80
2003	63,49	7,71	27,43	43,10	41,80
2004	64,11	7,11	32,05	44,50	47,80
2005	64,94	6,78	32,92	45,00	49,60
2006	64,37	7,00	32,72	46,00	50,10
2007	63,64	6,57	38,21	48,90	57,30

Source: www.tcmb.gov.tr.
Note. The shaded area shows the single party government period.

Table 2.
Units Root tests of the Variables[a]

Variables	ADF	Lag-Length
m_{t-1}	-3.18	0
$(C/pm)_t$	-3.06	8
$(I/pm)_t$	-3.31	8
$(G/pm)_t$	-3.48	8
$(X/pm)_t$	-2.54	4
(Y_{t-1}/pm_t)	-3.15	8
$(pm/pd)_t Y_t$	-3.08	0
(M_{t-1}/pm_t)		
$\Delta\ m_{t-1}$	-8.47	0
$\Delta\ (C/pm)_t$	-4.94	4
$\Delta\ (I/pm)_t$	-2.57	8
$\Delta\ (G/pm)_t$	-3.56	3
$\Delta\ (X/pm)_t$	-2.23	3
$\Delta\ (Y_{t-1}/pm_t)$	-12.63	1
$\Delta\ (pm/pd)_t Y_t$	-6.80	2
$\Delta\ (M_{t-1}/pm_t)$	-10.31	0

Note: [a])All variables are in logarithm.

Table 3.

(a) Unrestricted Cointegration Rank Test (Trace)

Null hypothesis	Eigenvalue	Trace Statistics	95% critical value	Prob.
r = 0	0,787	194,25	125,62	0,000
r <= 1	0,453	82,14	95,75	0,086
r <= 2	0,311	52,30	69,82	0,536
r <= 3	0,224	27,67	47,86	0,828
r <=4	0,12	10,97	29,80	0,962
r <=5	0,037	2,51	15,50	0,985
r <=6	0,000	0,01	3,84	0,932

Note: The critical values are taken from MacKinnon-Haug-Michelis (1999)
r: the number of cointegrating vector.

(b) Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Null hypothesis	Eigenvalue	Max-Eigen. Satistics	95% critical value	Prob.
r = 0	0,787	102,11	46,23	0,000
r <= 1	0,453	32,84	40,08	0,153
r <= 2	0,311	24,62	33,88	0,411
r <= 3	0,224	16,70	27,58	0,606
r <=4	0,12	8,46	21,13	0,874
r <=5	0,037	2,50	14,27	0,974
r <=6	0,000	0,01	3,84	0,932

Note: The critical values are taken from MacKinnon-Haug-Michelis (1999)
r: the number of cointegrating vector.

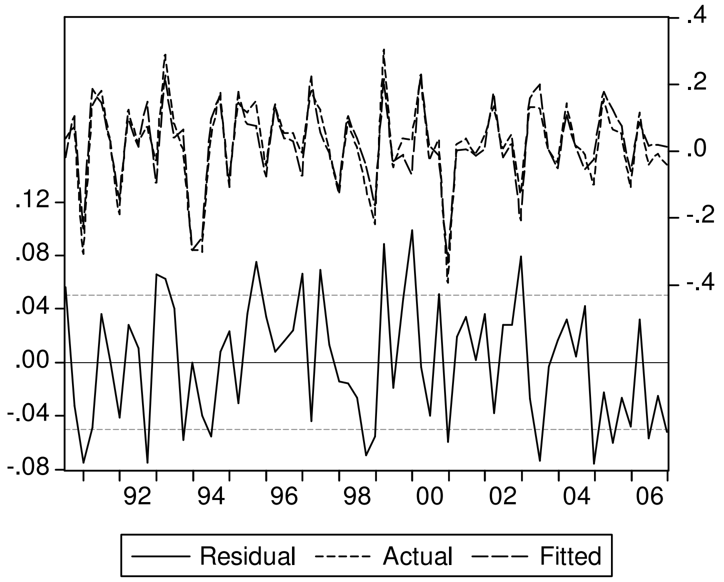
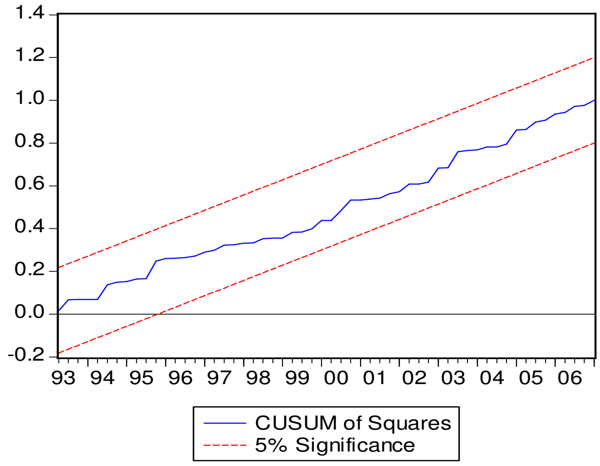


Figure 1 - Plot of actual and fitted values



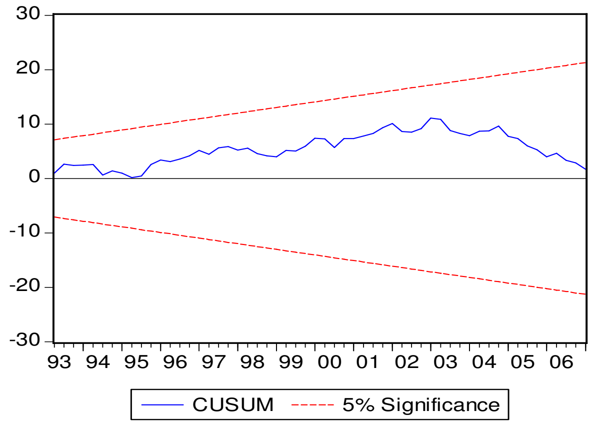


Figure 2 – CUSUM Stability Tests

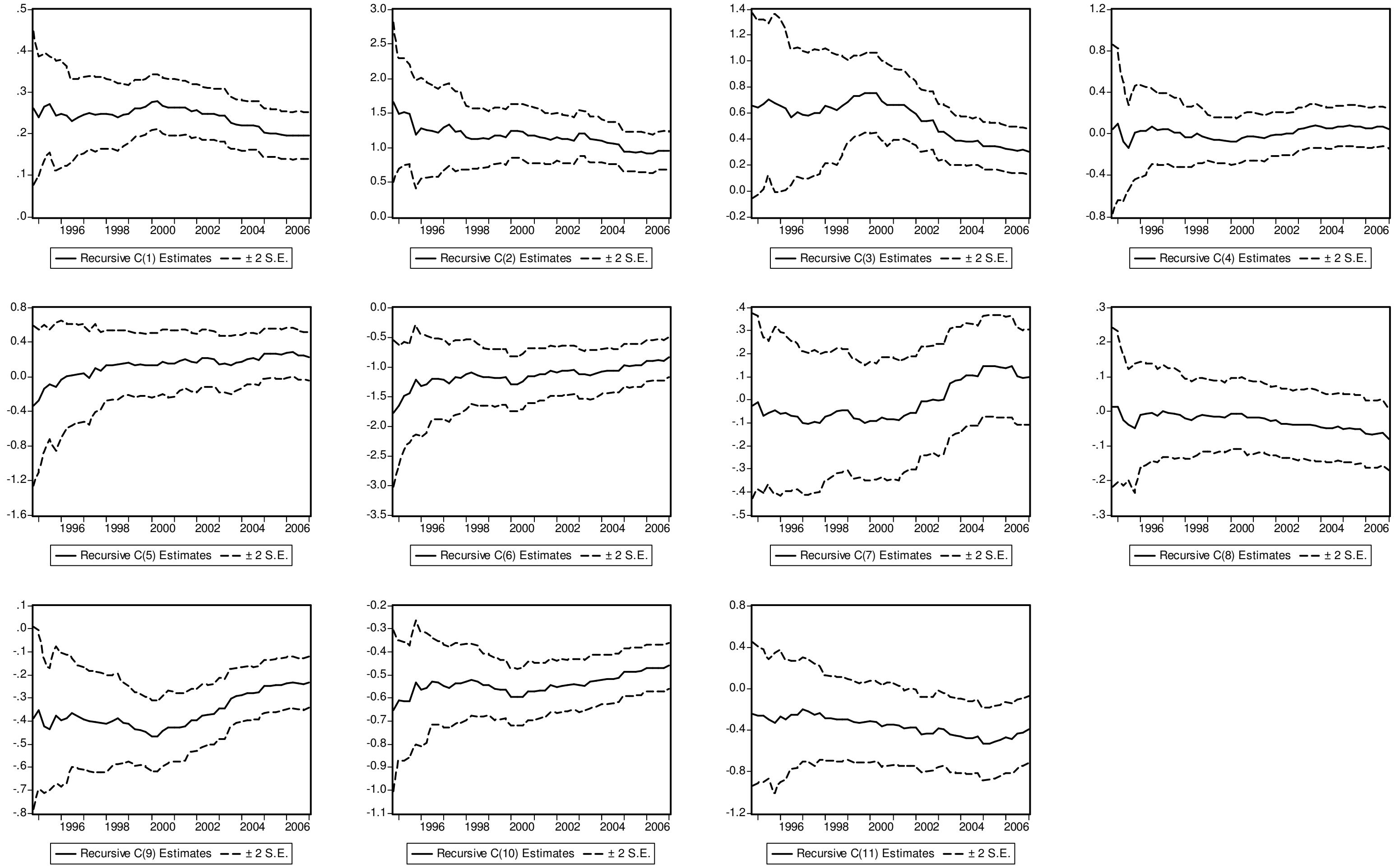


Figure 3 - The recursive coefficient test