THE TURKISH CURRENT ACCOUNT, REAL EXCHANGE RATE AND SUSTAINABILITY: A METHODOLOGICAL FRAMEWORK

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I. INTRODUCTION

Embarked on an accession path to the European Union (EU), Turkey needs higher investment ratios to sustain high growth rates for a prolonged period so as to sustain convergence with the EU. In a fast medium−term growth scenario, pressures on the current account are likely to emerge as investment will need to increase while fast income growth will also boost consumption and imports. However, in the case of Turkey, large current account (CA) deficits are also likely to be combined with an appreciating real exchange rate, as in the past few years, in response to robust capital inflows as Turkey gets closer to EU accession. A "convergence play", similar to those seen in other EU accession countries and Eurozone members, where expected declines in domestic interest rates to levels closer to the EU average generate expectations of significant capital gains, is likely to make portfolio investments to Turkey particularly attractive. This could intensify pressures on the current account and leave the country vulnerable to possible swings in market sentiment and capital flow reversals.

In this context, it is important to keep the current account deficit at sustainable levels. During the last three and half decades Turkey has experienced four balance of payments crises. These crises highlighted the danger of having excessively large current account deficits which are associated with a high probability of a balance of payments crisis.

Of course, large current account deficits were not the only cause of these currency crises. During the periods prior to the crises, current account deficits were financed mainly by short-term foreign borrowing. There were also deeper weaknesses in the Turkish economy. The 1994 and 2001 crises occurred when the country was facing large fiscal deficits, huge public debts, problems in the banking sector, and high inflation rates. Budget deficit, measured by the public sector borrowing requirements in proportion to the GNP, amounted to 10.9 percent during 1991–93, and to 10.4 during 1994–2003. Inflation rates during 1990–2000 fluctuated between 54.9 and 106.3 percent, and the average inflation rate amounted to 75.2 percent. There were distortions created by the state banks, which had a substantial share of the banking sector total assets. These banks faced unrecovered costs from duties carried on behalf of the government, and they covered their financing needs from markets by borrowing at high interest rates and short maturities. Currency and maturity mismatches on the balance sheets of the banks had left the public authorities little leeway for using either interest-rate or exchange rate adjustments to restore balance without undermining the stability of the banking sector. In addition, Turkey lacked, in the banking sector, competent supervisory authorities and a regulatory framework. Thus Turkey before the 2001 crisis had neither resolved its fiscal problems, nor attained price stability or a sound banking sector.

The lessons learned from past crisis episodes are that preserving CA sustainability requires prudent macroeconomic policies to be in place; a sound banking system and strong prudential supervision; and a strong investment climate to attract FDI and other long-term capital flows. Strong productivity growth to offset the impact of real exchange rate appreciation is important to maintain external competitiveness and sustaining the current account deficits. In the recent years of very strong growth in Turkey since the 2001 crisis, vulnerabilities have emerged again because, despite fiscal consolidation, domestic savings have increasingly fallen short of domestic investment, resulting in a widening

deficit of the external current account. Of course, history does not necessarily need to repeat itself: Thanks to sustained reforms since the 2001 crisis, Turkey is now in a much better position to cope with external vulnerabilities. However, it is important that the sustainability of the current account be analyzed under different growth scenarios and assumptions about the external environment, so as to design policies conducive to sustained growth.

The purpose of this paper is to provide a methodological framework for the analysis of the sustainability of the current account in Turkey. The paper is structured as follows. While Section 1 considers briefly the macroeconomic developments during the last few decades emphasizing issues related with the foreign exchange regime followed by the country during the last few decades, Section 2 considers empirical determination of export and import demand functions. Section 3 elaborates a framework for assessing current account sustainability based on these empirical estimates and by distinguishing the fundamental determinants of foreign debt dynamics. Based on this framework, Section 4 discusses scenarios for sustainability in the coming years. Finally Section 5 concludes the paper.

II. DEVELOPMENTS IN CURRENT ACCOUNT, REAL EXCHANGE RATE AND FOREIGN EXCHANGE REGIME

Figure 1 shows developments in the current-account-to-GDP ratio over the period 1970-2005. Turkey has faced currency crises in early 1970, late 1970's, 1994 and 2001. The figure indicates that the probability of a balance of payments crisis increases in Turkey as the current-account-deficit-to-GDP ratio increases above 5 percent.

Standard economic theory says that the current account balance improves as the real exchange rate depreciates, which increases net exports once the J-curve (the phenomenon whereby the trade balance at first worsens following a depreciation has worked itself out), worsens as domestic absorption increases (since higher domestic absorption implies

higher imports), and improves with increases in foreign absorption (since higher foreign absorption implies higher imports abroad, and thus higher exports of the domestic country).

Figure 1: Current Account-to-GDP Ratio (1970–2005)
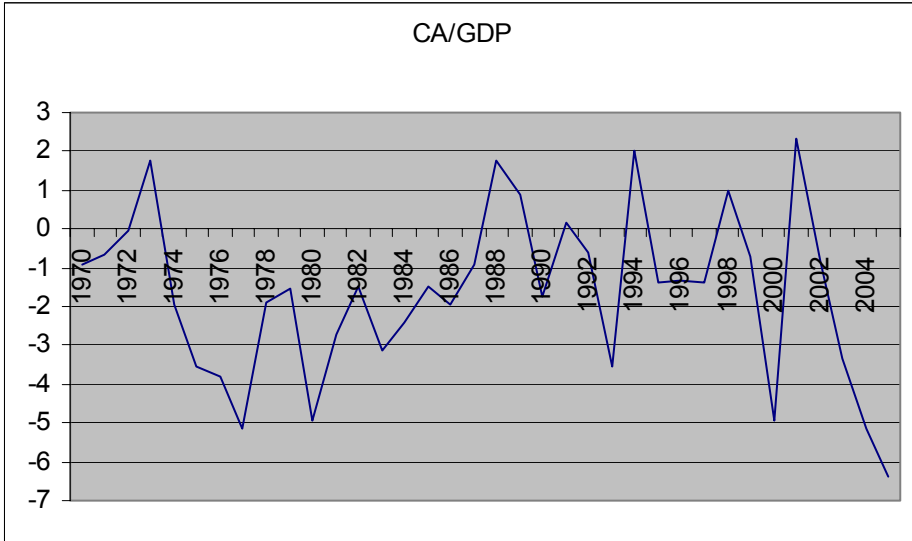
Source : Central Bank of Turkey

In order to study the developments in the real exchange rate (RER) over the period 1970–2005, one has to decide first on the appropriate methodology for construction of the RER indices. Here one is faced with four decisions: choice of the price index, choice of the currency basket, choice of weights and choice of mathematical formula.[1] In the formulation of the RER we use consumer price index (CPI) since these data are available on a monthly basis for a large number of countries. Regarding the currency basket we consider four cases: in the first case the basket consists of US Dollars only, in the second case the basket consists of 50 percent US Dollars and 50 percent of German Marks, in the third case we consider the basket consisting of German Marks only and finally, in the fourth case we consider the currency basket consisting of the currencies of a large number of countries. In this case, we

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[1] On the methodology for constructing RER indices see Chinn (2005).

consider countries which are major competitors of Turkey in world markets as well as major suppliers of imported commodities to Turkey. The countries considered in the fourth case consist of:

- Western Europe: Belgium, France, Germany, Greece, Italy, Netherlands, Portugal, Spain, Switzerland and the UK
- Americas: Brazil, Canada, Mexico and the US
- Middle East and North Africa: Egypt, Iran, Syria, Tunisia
- Central and Eastern European and Commonwealth of Independent States Countries: Czech Republic, Hungary, Poland, Russia
- Asia: China, Indonesia, Japan, Korea, Malaysia, Taiwan, and Thailand.

In order to determine the weights of different countries, we used the approach developed by Zanello and Desruelle (1997). According to their approach, overall trade weights are derived by combining the bilateral import weights with the double export weights, using the relative size of Turkish imports and exports in the overall Turkish trade to average both sets of weights. One can put these in formal terms as

Import weight: $w_i^m = (M_i / M)$

Export weight: $w_i^x = (\dfrac{X_i}{X}) \left(\dfrac{y_i}{y_i + \sum_h X_h^i} \right) + \sum_{k \neq i} (\dfrac{X_i^k}{X}) \left(\dfrac{X_i^k}{y_k + \sum_h X_h^k} \right)$

Overall weight: $w_i = \left(\dfrac{M}{X + M} \right) w_i^m + \left(\dfrac{X}{X + M} \right) w_i^x$

where M_i denotes the value of imports of Turkey from country i, M is the total value of Turkish imports, X_i is the value of Turkish exports to country i, X is the total value of Turkish exports, y_i is the value of domestic manufacturing production for home market of country i, and X_i^k is the value of exports of country k to country i.

The formula used for estimation of the RER is given by:

$RER = \Pi \left[\dfrac{CPI_i / E_i}{CPI / E} \right]^{w_i}$,

where P stands for the product sign, i is the index that runs over the country's trade partners, CPI_i is the CPI of country i, E_i is the exchange rate defined as domestic currency per unit of US Dollar of country i, CPI is the Turkish CPI, E is the TL/\$ exchange rate and w_i is the competitiveness weight attached to country i calculated using the method of Zanello and Desruelle (1997). Table 1 shows the trade weights used in our calculations.

Table 1: Trade Weights

|	CPI Based			WPI Based		
	2000–2005	1980–1999	1970–1979	2000–2005	1980–1999	1970–1979
Belgium–Lux.	3.651	4.193	4.638	4.062	4.751	0.000
Brazil	0.493	0.000	0.000	0.549	0.000	0.000
Canada	0.662	0.761	0.842	0.736	0.863	1.296
China	1.326	0.000	0.000	0.000	0.000	0.000
Czech Republic	0.386	0.000	0.000	0.429	0.000	0.000
Egypt	0.849	0.983	0.000	0.945	1.113	0.000
France	9.043	10.319	11.415	10.061	0.000	0.000
Germany	21.783	24.902	27.545	24.235	28.216	42.392
Greece	0.665	0.765	0.000	0.000	0.867	0.000
Hungary	0.334	0.000	0.000	0.372	0.000	0.000
Indonesia	0.396	0.450	0.000	0.441	0.510	0.000
Iran	0.778	0.000	0.000	0.866	0.000	0.000
Italy	14.680	16.798	18.581	16.333	19.034	0.000
Japan	4.041	4.563	5.048	4.495	5.171	7.768
Korea	2.457	2.764	0.000	2.733	3.132	0.000
Malaysia	0.464	0.542	0.000	0.516	0.000	0.000
Mexico	0.159	0.182	0.000	0.177	0.000	0.000
Morocco	0.308	0.353	0.000	0.000	0.000	0.000
Netherlands	3.857	4.461	4.935	4.291	5.055	7.595
Poland	0.810	0.000	0.000	0.902	0.000	0.000
Portugal	0.307	0.352	0.389	0.341	0.000	0.000
Russia	5.998	0.000	0.000	0.000	0.000	0.000
Spain	3.106	3.559	0.000	3.456	4.032	0.000
Switzerland	3.370	3.866	4.276	3.749	4.380	6.581
Syria	0.473	0.000	0.000	0.000	0.000	0.000
Taiwan	1.347	0.000	0.000	0.000	0.000	0.000
Thailand	0.413	0.000	0.000	0.460	0.000	0.000
Tunisia	0.308	0.000	0.000	0.343	0.000	0.000
UK	8.979	10.334	11.431	9.989	11.710	17.592
US	8.555	9.855	10.901	9.519	11.166	16.776
Total	100	100	100	100	100	100

Source: The authors

Next, following the approach of Sekkat and Varoudakis (2000), we define another RER measure as the price of tradable goods to non-tradables. The formula used for the estimation of this RER is given by

$$RER = \prod \left[\frac{WPI_i / E_i}{CPI / E} \right]^{w_i},$$

where WPI refers to wholesale price index. Table 1 shows again the trade weights used in the calculations. Note that in both versions of the RER an increase in RER denotes RER depreciation.
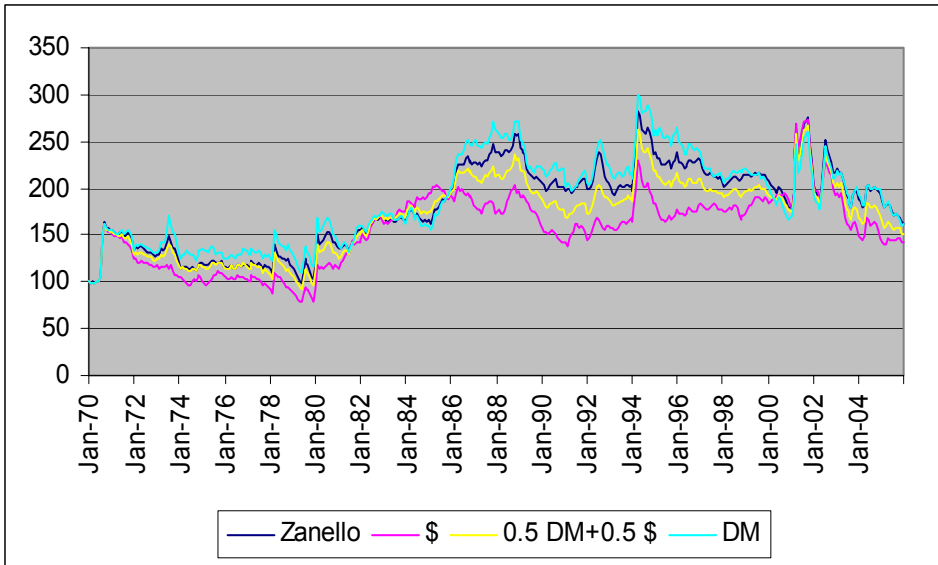
Figure 2 shows the time path of four different estimates of the RER based on CPI over the period 1970–2005. On the other hand, Figure 3 shows the time path of the four estimates of RER based on the approach of Sekkat and Varoudakis (2000). In Figure 3, the first estimate assumes that the currency basket consists of the currencies of a large number of countries with weights shown in Table 1. The second estimate considers the currency basket to consist of US Dollars only, the third estimate assumes that the share of US Dollar is 50 percent and that of the German Mark is also 50 percent. In the last case we consider the currency basket to consist of German Marks only.

Figure 2: Real Exchange Rate Based on CPI Indexes (1970–2005)
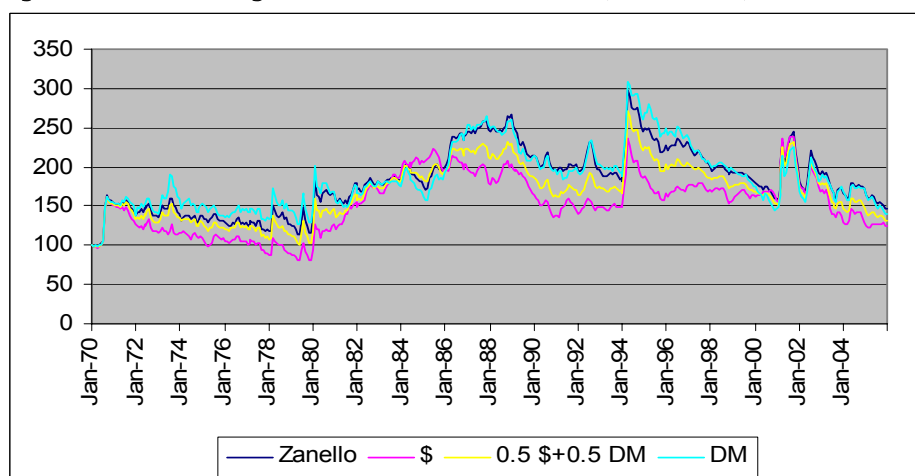
Source : The authors

**Figure 3: Real Exchange Rate Based on WPI Indexes (1970–2005)**

Figures 2 and 3 reveal that there are five episodes of RER developments during the period 1970–2005. In mid–1970, when Turkey faced a foreign exchange crisis, the RER was devalued by 65.78 percent. Thereafter the RER started to appreciate. After the foreign exchange crisis of late 1970's, the RER depreciated sharply with the stabilization measures of 1980. It kept depreciating until 1988 and then started to appreciate again. Appreciation of the RER carried on until 1994 when the country was faced with another currency crisis. In 1994 the RER depreciated sharply but after a while RER started to appreciate again from April 1994 to February 2001 when the country was faced with the currency crisis of 2001. After the sharp depreciation of the RER during February 2001 to April 2001, the RER started to appreciate, with the appreciation accelerating after November 2001.

To emphasize the extent of annual inflation and rate of depreciation of the nominal exchange rate, we show in Figure 4 the time path of inflation and rate of depreciation of the TL/$ exchange rate, as the growth of CPI compared to its 12 month period lag value and as the

growth rate of the TL/$ exchange rate compared to its 12 month period lag value, respectively, on a monthly basis. The figure reveals that the annual rate of depreciation of the TL/$ exchange rate has exceeded the annual rate of domestic inflation during the crisis periods of 1970, 1980, 1994, 2001 and also during the period February 1980 – December 1984 when the government was deliberately pursuing a policy of RER depreciation. On the other hand, the rate of inflation has exceeded the rate of depreciation of the TL/$ exchange rate during the remaining periods, leading to an appreciation of the RER.

Figure 4: Annual CPI Inflation and Annual Rate of Devaluation of the Exchange Rate (1970–2005)
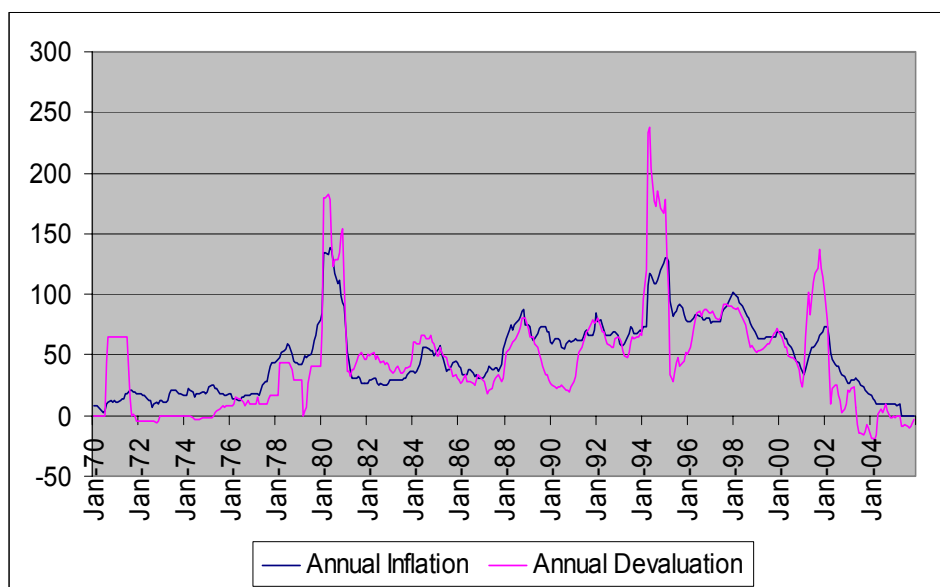
Source : The authors

We next turn to consideration of the foreign exchange regime followed by Turkey during the period 1970–2005. The IMF in its "Annual Report on Exchange Arrangements and Exchange Restrictions" classified the exchange rate policies based on information provided by the member countries. During 1970s the IMF indicated whether the country applied par (fixed) values or not. During 1974–82 it further reported whether the exchange rate was maintained within relatively narrow margins in terms

of the U.S. dollar, British sterling, French franc, South African rand or Spanish peseta, a group of currencies, or a composite of currencies. Finally, during 1970–82 the IMF also emphasized whether the country applied special rates for some or all of capital transactions, import rate different from export rate, more than one rate for imports, and finally whether more than one rate was applied for exports. After 1983 the number of classification categories was expanded to three. The three-bucket classification that prevailed through most of the 1980's and 1990's consisted of (i) pegged regimes, (ii) regimes with limited flexibility, and (iii) more flexible arrangements. The first broad regime group consists of two sub-groups, i.e. single currency pegs and composite currency pegs. The second group has been used to classify the European countries (prior to the monetary union) with exchange rate arrangements vis-à-vis one another (i.e. the Snake, the Exchange Rate Mechanism, etc.) and the Gulf countries. The third bucket includes two sub-groups, i.e. managed floats, either according to a set of indicators or in a country-specific way, and independent floats. In this classification the exchange rate arrangement (i) refers to fixed, (ii) to intermediate and (iii) to flexible regimes. However, the classification had two major shortcomings. First, it failed to capture differences between what the countries claimed to be doing and what they were actually doing. Second, by lumping rigid forms of pegs together with softer pegs it failed to acknowledge the different degree of monetary autonomy afforded by each regime. To address these shortcomings, in 1999 the IMF adopted a new classification scheme based on still de facto policies. The new scheme allows for eight different categories ranging from the adoption of a foreign currency as legal tender to free floats.[2]

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[2] The eight regimes are: (I) dollarization and euroization, (II) currency board, (III) conventional fixed pegs, (IV) horizontal bands, (V) crawling pegs, (VI) crawling bands, (VII) managed float with no preannounced path for the exchange rate, and (VIII) independent float. Under "conventional fixed pegs" the currency is pegged to another currency or currency basket within a band of at most +/– 1 percent. While "horizontal bands" refer to pegs with bands larger than +/– 1 percent, "crawling pegs" refer to pegs with central parity periodically adjusted in fixed amounts at a pre-announced rate or in response to changes in selected quantitative indicators. "Crawling bands" refer to crawling pegs combined with bands larger than +/– 1 percent. While "managed float with no preannounced path for the exchange rate" refers to a regime with active

Table 2, in columns 1-4, shows the evolution of the Turkish exchange rate regime according to the IMF's "Exchange Arrangements and Exchange Restrictions". The table reveals that Turkey applied a par exchange rate regime during 1970-73, that the exchange rate was maintained within a relatively narrow margin during 1974-75, and that the exchange rate was not maintained within a narrow margin during 1976-82. According to the IMF, Turkey applied special rates for some or all capital transactions during 1970 and 1974. During 1971-73 Turkey applied import rates different from export rates, and more than one rate for exports, and during 1976-77 it applied, in addition, more than one rate for imports. During the 1980-82 period Turkey applied special rates for some or all capital transactions, import rates different from export rates, and more than one rate for imports and exports. After 1983 Turkey was classified as having "more flexible arrangements". Later during 1996-97 it was classified as having a 'managed floating', during 1998-99 a 'crawling peg' and during 2000-05 an 'independently floating'.

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interventions without precommitment to a preannounced target or path for the exchange rate, the "independent float" regime refers to market-determined exchange rate with monetary policy independent of exchange rate policy. This classification treats exchange arrangements II, III, and I as fixed regimes, IV, V, and VI as intermediate regimes, and VII and VIII as flexible regimes.

Table 2: Exchange Rate Regimes

	IMF Classification (1)	IMF Classification (2)	IMF Classification (3)	IMF Classification (4)	Classification of Babula and Otker (5)	Classification of Reinhart and Rogoff	Volatility of Exchange Rates Annual	Volatility of Exchange Rate Changes	Volatility of Reserves
1970	(i) + (1)					peg to US dollar	5.32	13.42	1.95
1971	(i) + (2) + (4)					peg to US dollar	0.52	1.49	2.31
1972	(i) + (2) + (4)					de facto crawling band around US Dollar/parallel market	0.00	0.00	3.35
1973	(i) + (2) + (4)					de facto crawling band around US Dollar/parallel market	0.00	0.00	2.77
1974		(i) + (1)				de facto crawling band around US Dollar/parallel market	0.52	0.81	2.09
1975		(i)				de facto crawling band around US Dollar/parallel market	0.67	0.83	2.28
1976		(ii) + (2) + (3) + (4)				de facto crawling band around US Dollar/parallel market	0.81	1.58	1.61
1977		(ii) + (2) + (3) + (4)				freely falling/de facto crawling band around US$/parallel market	1.32	2.46	1.12
1978		(i) + (1)				freely falling/de facto crawling band around US$/parallel market	2.49	8.62	1.48
1979		n.a.				freely falling/de facto crawling band around US$/parallel market	3.00	6.06	1.45
1980		(ii) + (1) + (2) + (3) + (4)				freely falling/de facto crawling band around US$/parallel market	9.17	18.02	1.97
1981		(ii) + (1) + (2) + (3) + (4)				managed floating/parallel market	3.254	2.237	3.131
1982		(ii) + (1) + (2) + (3) + (4)				managed floating/parallel market	2.995	1.865	2.446
1983			(iii)			managed floating	3.245	1.379	1.801
1984			(iii)			freely falling/managed floating	3.950	2.547	2.543
1985			(iii)			freely falling/managed floating	2.360	1.769	1.550
1986			(iii)			freely falling/managed floating	2.472	2.261	2.583
1987			(iii)			freely falling/managed floating	2.391	1.154	1.825
1988			(iii)			freely falling/managed floating	5.080	2.108	2.832
1989			(iii)			freely falling/managed floating	2.149	1.186	4.079
1990			(iii)		9	freely falling/managed floating	1.834	0.978	2.816
1991			(iii)		9	freely falling/managed floating	4.854	2.929	4.688

	IMF Classification (1)	IMF Classification (2)	IMF Classifi- cation (3)	IMF Classifi- cation (4)	Classification of Babula and Otker (5)	Classification of Reinhart and Rogoff	Volatility of Exchange Rates Annual	Volatility of Exchange Rate Changes	Volatility of Reserves
1992			(iii)		9	freely falling/managed floating	4.296	2.142	4.776
1993			(iii)		9	freely falling/managed floating	4.433	1.579	3.553
1994			(iii)		7	freely falling/managed floating	10.770	15.141	8.115
1995			(iii)		9	freely falling/managed floating	3.579	2.515	14.266
1996			(iii)		9	freely falling/managed floating	5.222	1.245	8.618
1997			(iii)		9	freely falling/managed floating	5.538	0.944	8.913
1998			(iii)		7	crawling band around DM/freely falling	3.659	1.812	12.500
1999				IV	7	crawling band around Euro/freely falling	4.618	1.373	5.658
2000				IV	7	crawling band around Euro/freely falling	2.323	1.102	8.480
2001				VIII	13	freely falling/freely floating	9.773	8.080	13.553
2002				VIII			3.247	3.310	7.190
2003				VIII			3.10	2.03	10.08
2004				VIII			3.00	2.90	3.77
2005				VIII			1.37	1.32	7.57
							3.426	3.311	4.714

Notes:

1. The two regimes are (i) par (fixed), and (ii) not par. (1) indicates that special rates are applied for some or all capital transactions, (2) import rates are different from export rates, (3) more than one rate for imports, and (4) more than one rate for exports.
2. The two regimes are (i) exchange rate maintained within relatively narrow margin, and (ii) exchange rate not maintained within relatively narrow margins. (1) indicates that special rates are applied for some or all capital transactions, (2) import rates are different from export rates, (3) more than one rate for imports and (4) more than one rate for exports.
3. The three regimes are: (i) pegged regimes, (ii) regimes with limited flexibility, and (iii) more flexible arrangements
4. The eight regimes are: (I) dollarization and euroization, (II) currency board, (III) conventional fixed pegs, (IV) horizontal bands, (V) crawling pegs, (VI) crawling bands, (VII) managed floats with no preannounced path for the exchange rate, and (VIII) independent float path for the exchange rate, and (VIII) independent float
5. The thirteen regimes of Babula and Otker-Robe are: (1) formal dollarization and euroization, (2) currency union, (3) currency board arrangements, (4) conventional fixed pegs vis-à-vis single currency, (5) conventional fixed pegs vis-à-vis a basket of currencies, (6) horizontal bands, (7) forward looking crawling pegs, (8) backward looking crawling pegs, (9) forward looking crawling bands, (10) backward looking crawling bands, (11) tightly managed floats, (12) other managed floats with no predetermined exchange rate path, and (13) independently floating.

Source: Babula and Otker-Robe (2002), Reinhart and Rogoff (2002), and the author.

On the other hand, while Babula and Otker-Robe (2002) distinguish between 13 regimes[3], Reinhart and Rogoff (2002) distinguish between 15 regimes.[4] Table 2 in column 5 reports the exchange regimes followed by Turkey according to the classification of Babula and Otker-Robe. The table shows that Turkey during the 1990s under high capital mobility has abandoned the intermediate regimes of "forward-looking crawling bands" and "forward-looking crawling pegs" and moved towards a regime of free floats. The Turkish exchange regime, according to the classification of Reinhart and Rogoff (2002), is reported in column 6 of Table 2. This classification reveals that Turkey during 1980–82 had multiple exchange rates and also had active parallel (black) rates. Furthermore, annual inflation rate in Turkey was running above 40 percent during 1980 and during 1984–2001, which have been classified by Reinhart and Rogoff as 'freely falling'.

We supplement the information provided in Table 2 columns 1–4 with the following additional measures: (i) "volatility of exchange rates" defined as the average of absolute monthly percentage changes in the

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[3] These regimes are: (1) formal dollarization and euroization, (2) currency union, (3) currency board arrangements, (4) conventional fixed pegs vis-à-vis single currency, (5) conventional fixed pegs vis-à-vis a basket of currencies, (6) horizontal bands, (7) forward-looking crawling pegs, (8) backward-looking crawling pegs, (9) forward-looking crawling bands, (10) backward-looking crawling bands, (11) tightly managed floats, (12) other managed floats with no predetermined exchange rate path, and (13) independently floating. The crawl is viewed as "backward-looking" when the crawl aims to passively accommodate e.g. past inflation differentials under a real exchange rate rule, and as "forward-looking" when the exchange rate is adjusted at a preannounced fixed rate and/or set below projected inflation differentials, typically when the exchange rate is envisaged to have an anchor role. Under "tightly managed floats" interventions take the form of very tight monitoring that generally results in stable exchange rates without having a clear exchange rate path, so as to permit the authorities an extra degree of flexibility in deciding the tactics to achieve a desired path. Under "other managed floats with no predetermined exchange rate path" exchange rate is influenced in a more ad hoc fashion. The classification of Babula and Otker-Robe treats exchange arrangements 1, 2, and 3 as hard peg regimes, 4–11 as intermediate regimes, and 12 and 13 as floating regimes.

[4] The regimes are: (1) no separate legal tender, (2) pre announced peg or currency board arrangement, (3) pre announced horizontal band that is narrower than or equal to +/- 2 percent, (4) de facto peg, (e) preannounced crawling peg, (5) preannounced crawling band that is narrower than or equal to +/- 2 percent, (6) de facto crawling peg, (7) de facto crawling band that is narrower than or equal to +/- 2 percent, (8) preannounced crawling band that is wider than or equal to +/- 2 percent, (9) de facto crawling band that is narrower than or equal to +/- 5 percent, (10) moving band that is narrower than or equal to +/- 2 percent, (11) managed floating, (12) freely floating, (13) freely falling, and (14) hyperfloats.

nominal exchange rate during a year, (ii) "volatility of exchange rate changes" defined as the standard deviation of the monthly percentage changes in the nominal exchange rate during a year, and (iii) "volatility of reserves" defined as the average of absolute monthly changes in the non-gold reserves, normalized by the reserve money in the previous month. We note that fixed regimes have low values for "volatility of exchange rates", low values for "volatility of exchange rate changes" and high values for "volatility of reserves". On the other hand, flexible regimes combine high values for "volatility of exchange rates" and "volatility of exchange rate changes" with low values for "volatility of reserves".

The estimated values of volatility of exchange rates, volatility of exchange rate changes and volatility of reserves for Turkey reported in columns 7–9 in Table 2 for 1970-2005 reveal that the volatility of exchange rates, volatility of exchange rate changes, and volatility of reserves have been low during the 1970s. Furthermore, volatility of exchange rates and volatility of exchange rate changes during 1981–1990 and during 2000 have been relatively low, and during the period 1980-1988 when Turkey tried to achieve annual RER devaluation of about 6 percent, the volatility of reserves has been rather low. On the other hand, during 2000 when Turkey followed a semi currency board arrangement the volatility of reserves has been relatively high.

The volatility of reserves started to increase after the liberalization of international capital movements in 1989. As the exchange rate became more and more determined by the market, the volatility of exchange rates and volatility of reserves increased considerably during the periods 1991–1993 and also during 1995-2001. During the crises periods of 1994 and 2001, the values for all three measures increased enormously. During the period 2002-2005 the country has experienced relatively high values of volatility of reserves, but relatively low values of volatility of exchange rates.

III. PRICE EFFECTS IN TURKISH FOREIGN TRADE

From economic theory we know that the current account balance improves with depreciation of the RER, worsens with increases in domestic absorption, and improves with increases in foreign absorption. To determine these relations empirically, we consider the imperfect substitutes model of international trade, the key underlying assumption of which is that neither imports nor exports are perfect substitutes for domestic goods. Import (export) demand and supply are modeled as functions of the relative price of imports (exports) and of aggregate demand for goods and services.

The Model

The quantity of imported goods demanded is assumed to depend on real domestic aggregate demand and the real exchange rate:

$M^d = M^d(\pi, AD)$

where M^d is the quantity of foreign goods imported, AD is the level of real domestic aggregate demand measured at constant prices, and $\pi = $ RER $(1 + t)$. Here t is the ad valorem average tariff rate on imports.

The demand for exports (foreign imports) depends on real foreign aggregate demand AD* and foreign relative price of imports π^* by the rest of the world:

$M^{d*} = M^{d*}(\pi^*, AD^*)$

where M^{d*} is the quantity of exports, $\pi^* = (p_x / E\, p_f)$ is the relative price of imports abroad. Here p_x is the price of exportables by the home country measured in terms of domestic currency, and p_f is the foreign price of commodities produced by the rest of the world measured in terms of foreign currency.

We assume that the supply schedules of importables are perfectly elastic. On the other hand, the supply of exportables in the home country is

assumed to depend on the price of exportables p_x, relative to the home price p of goods produced by the home country, measured in terms of domestic currency and and real income y in the country:

$X^s = X^s(p_x/p , y)$

where X^s is the supply of home country exportables and y denotes the real GDP. Here, exports are assumed to rise as real income serving the purpose of an index of productive capacity of the country rises. Imposing the equilibrium condition in the market for exportables

$M^{d*} = X^s$,

and expressing all relations in natural logarithms we get

(1) $\ln M = \alpha_0 - \alpha_1 \ln [RER (1 + t)] + \alpha_2 \ln AD$

(2) $\ln M^{d*} = \beta_0 - \beta_1 \ln (p_x/E\, p_f) + \beta_2 \ln AD^*$

(3) $\ln X^s = \gamma_0 + \gamma_1 \ln (p_x/p) + \gamma_2 \ln y$

(4) $\ln M^{d*} = \ln X^s$

Solving equations (2) – (4) for exports we obtain

(5) $\ln X = a_0 + a_1 \ln RER + a_2 \ln AD^* + a_3 \ln y$

where RER = $(E\, p_f/p)$, $a_1 > 0$, $a_2 > 0$ and the sign of a_3 is indeterminate.[5]

Data Sources

We now consider the annual data for the period 1970–2005. Data on Turkish GDP at constant prices, on exports and imports of goods at current prices measured in US dollars, and on aggregate domestic demand defined as the sum of consumption, plus investment plus government expenditures at constant prices, have been obtained from

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[5]   The literature on trade equations is vast. Goldstein and Khan (1985) provide excellent discussion.

the State Planning Organization. Tariff revenue figures excluding the VAT payments on imported commodities at current prices were obtained from the website of the Ministry of Finance. Annual data on foreign aggregate demand, defined as the weighted sum of consumption plus investment plus government expenditures at constant prices of various OECD countries, have again been obtained from the OECD.[6] Export and import price indexes of goods on a monthly basis were obtained from Central Bank publications and State Institute of Statistics. Finally, the RER data were obtained on a monthly basis following the method described above.

The import and export values have been converted to real imports and exports using the export and import price indexes. In the estimation of import and export functions, we use real exports and real imports measured in terms of millions of 1987 US dollars. When estimating the import function we use RER data adjusted for the tariff rates as shown in equation (1).

Empirical Evidence

In order to observe the equilibrium relationship, we estimate the long-term stable relationship for exports and imports using their basic determinants. We adopted Johansen's cointegration estimation method to identify the long-term relationship for these variables. Before going into the details of estimation, we performed heteroscedastic robust and Phillips and Perron (PP) unit root tests for the variables of interest. The test results are tabulated in Table 3. Test statistics cannot reject the presence of unit roots in levels for all the series considered when we included both constant, and constant and time trends. However, we can reject the null of the unit root with the intercept for the first differences of all the series. Therefore, we can safely assume that all the series considered are different stationary or I (1).

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[6] The weight of Belgium is 4.47 percent, Canada 0.81 percent, France 11.07 percent, Germany 26.66 percent, Italy 17.96 percent, Japan 4.94 percent, Netherlands 4.72 percent, Spain 3.8 percent, Switzerland 4.1 percent, United Kingdom 11 percent, and USA 10.47 percent.

Table 3: Unit Root Test Results

	Constant	Constant and Trend	First Difference
	PP	PP	PP
Real imports of consumption goods	0.14275	−1.88107	−6.6606**
Real imports of investment goods	−0.07905	−2.23147	−5.95951**
Real imports of non-energy intermediate goods	0.1828	−1.88632	−5.88581**
RER inclusive of tariffs	−1.8196	−1.25795	−6.93367**
Real domestic demand	−0.8179	−3.1271	−6.59466**
Real exports	−1.30172	−2.4237	−6.10947**
RER	−1.94938	−1.27677	−7.10945**
Real foreign demand	−1.14475	−2.69017	−3.99087**

*Note: ** indicates the level of significance at the 1 percent level and * indicates the level of significance at the 5 percent level.*

The estimated import demand schedules are presented in Table 4. During the estimation we first separate total imports into energy and non-energy imports. Next, we split non-energy imports into imports of consumption goods, imports of investment goods, and imports of non-energy intermediate goods. We note that for practical purposes, energy imports depend on the price of oil rather than the RER. Splitting non-energy imports into consumption, investment and non-energy intermediate goods is relevant since the RER elasticity of consumption goods, investment goods, and non-energy intermediate goods are quite different, and since there may be an increase in imports of intermediate goods over time reflecting a structural shift in the export pattern towards assembly-driven operations as a result of closer integration into international production networks. The results show that the RER elasticity of imports of consumption goods, investment goods and non-energy intermediate goods, in case a CPI-based measure of the RER obtained using the method of Zanello and Desruelle (1997) is used, are

2.1843, 0.874121 and 1.0376 respectively.[7] Similarly domestic demand elasticity of imports of consumption goods, investment goods, and non-energy intermediate goods are 3.2217, 2.11076 and 2.3039 respectively. The figures reveal high susceptibility of import flows to aggregate domestic demand.

Table 4: Import Functions

Dependent variable	Constant	Logarithm of CPI based RER inclusive of tariffs	Logarithm of real domestic demand
Real imports of consumption goods	−19.72558 (−5.5519)	−2.18433 (−3.0060)	3.22173 (9.94611)
Real imports of investment goods	−12.55229 (−7.104493)	−0.874121 (−2.318562)	2.11076 (12.61209)
Real imports of non−energy imports of intermediate goods	−12.47592 (−4.9575)	−1.03757 (−1.9919)	2.30387 (11.0879)

Note: t−statistics are displayed in parenthesis.

The estimated export supply schedule is given in Table 5. The elasticity of exports with respect to foreign aggregate demand is estimated as 3.4085. On the other hand, price elasticity of exports, when the CPI−based measure of the RER obtained using the method of Zanello and Desruelle (1997), is measured as 0.3403.

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[7] When deflating the export and import values measured in terms of current US Dollars by the export and import price indexes we have used for the period 1970−1995, the price indexes published on a monthly basis by the Central Bank of Turkey, and for the period 1996−2005, the price indexes published by the State Institute of Statistics. The import values of investment goods have been deflated by the import price index of investment goods published by the Central Bank of Turkey over the period 1970−1995. All other import and export values have been deflated by the general price indexes respectively as obtained above.

Table 5: Export Function

Dependent variable	Constant	Logarithm of CPI based RER inclusive of tariffs	Logarithm of real foreign demand
Logarithm of real exports	–43.6101 (–6.1369)	0.3403 (0.437)	3.4085 (5.4118)

Note : t–statistics are displayed in parenthesis.

We note that the Marshall–Lerner condition holds as the absolute values of estimated price elasticities for imports determined by the relationship

$$\eta_{im} = \eta_{con} \left(\frac{m_{con}}{m}\right) + \eta_{inv} \left(\frac{m_{inv}}{m}\right) + \eta_{ne} \left(\frac{m_{ne}}{m}\right)$$

and exports sum up to more than unity, where η_{con} denotes the price elasticity of imports of consumption goods, η_{inv} price elasticity of imports of investment goods, η_{ne} price elasticity of imports of non–energy intermediate goods, m_{con} imports of consumption goods, m_{inv} imports of investment goods, m_{ne} imports of non–energy intermediate goods, and m total imports. We note that import price elasticity is $\eta_{im} = 0.9676$ and that export price elasticity is $\eta_{ex} = 0.3403$. The Marshall–Lerner condition indicates that the trade balance improves following a real depreciation of the domestic currency.

IV. A FRAMEWORK FOR ASSESSING THE SUSTAINABILITY OF THE CURRENT ACCOUNT

Swan (1963), in a path–breaking paper taking productivity, the terms of trade, capital movements and other financial variables as given and assuming no special import restrictions imposed on balance of payments grounds, shows how employment and the balance of payments both depend on the level of spending and on the relative cost situation. In Figure 5 'real expenditure' is the total domestic investment and consumption

(private and public) at constant prices, called AD for short; and the 'cost ratio' is an index measuring competitive position of industries.

Figure 5: Swan Diagram
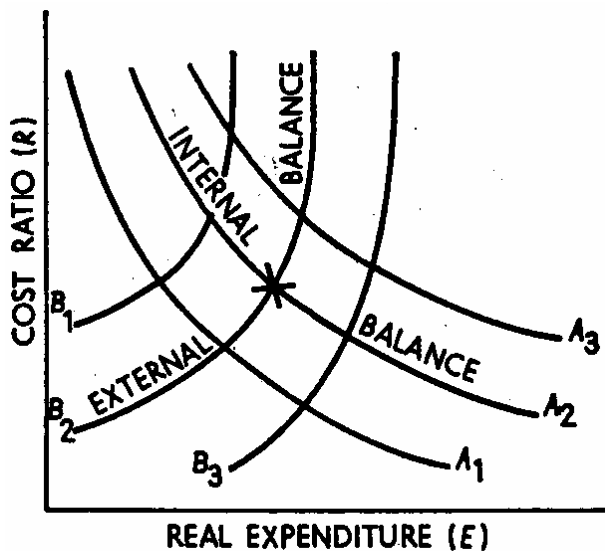
Source : Swan (1963)

Considering that for the cost ratio RER, we note that a given level of employment can be sustained with AD very low if RER is high enough, and vice versa. This is shown by Schedule A, where A_2 refers to full employment, A_1 underemployment and A_3 over-employment. Similarly a given balance of payments requires a combination of low RER and low AD, or high RER and high AD. This is shown by Schedule B, where B_2 stands for sustainable level of balance of payments deficit, B_1 for a relatively smaller deficit and B_3 for a relatively larger deficit. Swan (1963) points out that there are many A and B curves for different levels of employment and balance of payments.

Any combination of RER and AD along A_2 gives the internal balance, and any combination of B_2 gives external balance. The intersection of these two curves gives us the equilibrium values of RER and AD that will attain internal as well as external balance. The equilibrium value of the RER,

called the fundamental equilibrium exchange rate (FEER), is thus a normative one, and it is characterized by Williamson (1994) as the equilibrium exchange rate that would be consistent with 'ideal economic conditions'.

Although the determination of the internal balance relation A_2 is rather straightforward, the determination of external balance B_2 depends on the way that the sustainable level of current account is defined. To attack the problem of determination of sustainable level of current account, we consider the simple accounting methodology developed by Milesi–Ferretti and Razin (1996), which makes use of the balance of payments relation written as $TB_t^\$ - i*D_{t-1} + FDI_t + D_t - D_{t-1} = 0$ where $TB^\$$ denotes the non–interest current account, i^* the foreign rate of interest, D the stock of foreign debt, and FDI the foreign direct investment inflow. Note that $(TB_t^\$ - i*D_{t-1}) = Current\ Account_t$ and $(FDI_t + D_t - D_{t-1}) = Capital\ Account_t$, where all variables are measured in terms of foreign currency. Writing the non–interest current account explicitly by splitting total imports into energy and non–energy imports and considering the EU grants we have:

TB$ = Exports – Energy Imports – Non-Energy Imports + EU Grants + Other

where all variables are measured in terms of foreign currency, and '*Other*' stands for *Current Account – Exports + Energy Imports + Non-Energy Imports + i* D$_{t-1}$ – EU Grants.*[8]

Next we define the non–energy and non–interest current account surplus, *NETB = (Exports – Non-Energy Imports + Other).* If $d_t = \dfrac{E_t\,D_t}{p_t\,y_t}$

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is the foreign debt to GDP ratio; $netb_t = \dfrac{E_t \, NETB_t^{\$}}{p_t \, y_t}$ the non-interest non

energy current account surplus in proportion to GDP; *energy = (E x Energy Imports / py)* the energy import bill to GDP ratio; *eugrants = (E x EU Grants / py)* the EU grants to GDP ratio; and $fdi_t = \dfrac{FDI_t \, E_t}{p_t \, y_t}$ the FDI to

GDP ratio, the equation determining the time path of d_t which also stands for the economy's intertemporal financing constraint can be written as:

$$(6) \quad d_t = -netb_t + \frac{(1+r_t^{*})(1+\eta_t)}{(1+g_t)} d_{t-1} + energy_t - eugrants_t - fdi_t \ ,$$

where r_t^{*} denotes the foreign real rate of interest and η_t the rate of depreciation of the RER. The equation reveals that the external debt to GDP ratio decreases with increases in the non-interest, non-energy current account surplus in proportion to GDP *netb,* EU grants to GDP ratio *eugrants*, the FDI to GDP ratio *fdi*, and the growth rate of GDP *g.* By contrast, the debt to GDP ratio increases with increases in the foreign real interest rate *r**, rate of depreciation of the RER η*,* and energy import bill to GDP ratio *energy.*

Following the approach of von Hagen and Harden (1994), we solve the economy's intertemporal financing constraint forward for *n* periods and obtain:

$$(7) \quad d_t = \Gamma_t \delta_{t,n} d_{t+n} + \Gamma_t \sum_{i=1}^{n} \delta_{t,i} A_{t+i} \quad \text{where} \quad \delta_{t,k} = \prod_{i=1}^{k} \frac{1+g_i}{(1+r_i^{*})(1+\eta_i)} \quad \text{and}$$

$A_t = netb_t + fdi_t + eugrants_t - energy_t$. Here, $\delta_{t,k}$ can be interpreted as the 'k-periods ahead' discount factor used to calculate the present value of assets and liabilities in period $t + k$ for period *t*, and $\Gamma_t \, x_{t+k}$ denotes the period *t* expectation of the variable *x* in period $t + k$. The economy's intertemporal financing constraint indicates that, when intertemporal solvency holds (so that d_{t+n} is finite), current debt-to-GDP ratio equals the

expected discounted present value of foreign debt outstanding in period $t+n$ relative to GDP, plus the sum of all discounted A_t s between period t and period $t + n$.

To translate the intertemporal budget constraint into a practically more relevant requirement for debt sustainability, we consider the budget constraint for a limited period of time n* and add the sustainability condition that the discounted debt/GDP ratio at the end of period t+n*, discounted d_{t+n^*} should not exceed the debt/GDP ratio at time t, d_t. Thus, current account is not sustainable if:

(8) $$S(n^*) = d_t - \Gamma_t \delta_{t,n} \, d_{t+n} \; < 0 \, .^9$$

but this sustainability condition, while useful, is not easy to assess in practice. Even under initial negative A_t values over the next few years, the current account can be said to be sustainable if during the latter periods large positive non-interest non-energy current account to GDP, EU grants to GDP, FDI to GDP and relatively low values of energy import bill-to-GDP ratios are assumed. The analysis thus depends on the assumptions one makes about the evolution of A_{t+n} over time.

V. SCENARIOS FOR THE SUSTAINABILITY OF THE CURRENT ACCOUNT

In the exercise conducted below we introduce the following assumptions:

- We assume that n* = 10, and assume in the base case the continuation of the present policies into the future. In particular we assume that the value of *netb$_{2005+i}$* for i = 1, . . . , 10 will remain unchanged at its initial value of *netb$_{2005}$* = 0.2845 percent.

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[9] The formulation of the sustainability problem through the difference equation (6) assumes that FDI is a surer and safer form of external financing. Thus the analysis is the paper assumes that current account deficits financed mainly by FDI inflows does not lead to problems of sustainability of current account, but if FDI takes the form of purchases of stocks and if these shares can be liquidated easily in domestic markets, then it is possible to take the money out of the country as in other forms of investment. In those cases FDI makes no difference and there is no reason to separate FDI flows in the difference equation (6). Under these conditions, sustainability of the current account will require higher rates of depreciation of the RER than those obtained in our analysis given in section 4.

- In the case of energy products, we note that the average price of oil ($/barrel) has increased from $54.45 in 2005 to $64.34 in 2006, and that the price of Russian natural gas (US$/1000 m³) from $212.94 in 2005 to $290.40 in 2006. Concentrating in the following on oil imports only we assume under the base case that the price of oil (US$/barrel) will decrease to $58.4 in 2007 and to $50 thereafter. Thus, given *energy$_{2005}$* = 5.39 percent we have *energy$_{2006}$* = 6.37 percent, *energy$_{2007}$* = 5.79 and *energy$_{2005+i}$* = 4.95 for i = 3,..,10.

- Regarding EU grants, we assume in the base case that EU grants amount to 300 million Euros in 2005, 500 million Euros in 2006, 550 million Euros during 2007–2009, 700 million during 2010–2013 and 2 billion Euros during 2014–2015.[10]

- Regarding the growth rate of real income, we note that the average value of the growth rate of real GDP amounted to 4.08 per cent during 1980–1989 and to 4.3 percent during 1990–2005. The 2005 'Pre-Accession Economic Programme' published by the State Planning Organization at the end of 2005 foresees a growth rate of 5 percent over the next few years. The growth rate of real GDP in 2006 is expected to be around 6 percent. For the growth rate of GDP over the time period 2007 to 2015 we take the figure of 5 per cent in the base case, i.e. g_{2005+i} = 0.05 for i = 2,.., 10.

- To determine the foreign interest rate, we use the yields on Eurobonds issued by the Turkish Treasury. The average rate of return on Turkish US dollar–denominated Eurobonds during the last few years amounted to 12.515 percent in 2002, 10.852 percent in 2003, 8.605 percent in 2004, 7.93 percent in 2005, and 7.13 percent during the first few months of 2006.[11] Considering the value of 7.93 and deflating it by expected US CPI inflation rate over the next few years, we obtain a figure of 5.91 percent for foreign real interest rate. In the following we

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[10] When converting the Euro values into US Dollar values we use the exchange rate where 1 Euro equals US$ 1.25.

[11] We would like to thank Tekin Cotuk of the Undersecretariat of the Treasury for providing the data on Turkish Eurobonds.

take the figure of 6 percent for real foreign interest rate in the base case, i.e. $r^*_{2005+i} = 0.06$ for i = 1,.., 10.

- Next we consider the rate of depreciation of the RER. Although the CPI–based RER has appreciated over the period 2002–2005 at the annual rate of 7.53 percent, and the WPI–based RER at 7.66 percent, we abstract from further appreciation or depreciation of the RER under the base case due to the Balassa–Samuelson effect under the base case and assume that $\eta_{2005+i} = 0$ for i = 1, . . . , 10.[12]

- Concerning the FDI/GDP ratio, we note that while, during the period 2002–2004 the average FDI/GDP ratio amounted to 0.76 percent, the ratio increased to 2.7 percent in 2005 as a result of privatizations and private sector mergers and acquisitions. On the other hand, the 2005 'Pre–Accession Economic Programme' foresees FDI/GDP ratio of 1.367 percent over the next few years. Preliminary "best guess" estimates of FDI inflows for 2006 amount to $19 billion, and the forecasts are $14.2 billion for 2007, $8.5 billion in 2008, $8.2 billion in 2009 and $8 billion thereafter.

Next we consider a high–case scenario. Here we assume the price of energy products to revert to a lower level (temporary shock) starting from the fourth quarter of 2006.[13] Concentrating on the price of oil, we assume that the average price of oil (US$/barrel) will decrease from $62.33 in 2006 to $44.00 in 2007 and further to $41.50 thereafter. Furthermore we assume that the growth rate of real GDP will amount to 7 percent, and the foreign real interest rate will be 4 percent during the period 2007–2015. The assumptions introduced in the base and optimistic cases are summarized in Table 6.

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[12] For a discussion of Balassa–Samuelson effect see Togan and Berument (2006). Note that the current account is assumed to be independent of RER appreciation, driven by productivity growth.

[13] In the fourth quarter of 2006 the average price of oil (US$/barrel) is assumed to be $56.42 under the base case and $48.50 under the optimistic scenario.

Table 6: Assumptions of the Base and Optimistic Cases

Time	Annual EU grants Euros	FDI Inflow US$ billion	Balassa–Samuelson Effect (percent)	Oil Price		Growth Rate of GDP		Foreign Real Interest Rate		Non–Interest Non–Energy Current Account –to–GDP Ratio (percent)	A	
				Base $/barrel	Optimistic $/barrel	Base (percent)	Optimistic (percent)	Base (percent)	Optimistic (percent)		Base (percent)	Optimistic (percent)
2006	500 million	19	0	64.34	62.33	6	6	6	6	2005 level	−1.050	−0.852
2007	550 million	14.2	0	58.50	58.50	5	7	6	4	2005 level	−1.870	−0.502
2008	550 million	8.5	0	50.00	41.50	5	7	6	4	2005 level	−2.528	−1.766
2009	550 million	8.2	0	50.00	41.50	5	7	6	4	2005 level	−2.696	−1.963
2010	700 million	8	0	50.00	41.50	5	7	6	4	2005 level	−2.793	−2.087
2011	700 million	8	0	50.00	41.50	5	7	6	4	2005 level	−2.882	−2.201
2012	700 million	8	0	50.00	41.50	5	7	6	4	2005 level	−2.967	−2.307
2013	700 million	8	0	50.00	41.50	5	7	6	4	2005 level	−3.048	−2.407
2014	2 billion	8	0	50.00	41.50	5	7	6	4	2005 level	−2.843	−2.257
2015	2 billion	8	0	50.00	41.50	5	7	6	4	2005 level	−2.930	−2.359

Regarding foreign debt, we note that we have two sets of data. The first set is produced by the Turkish Treasury. With this data, the debt-to-GDP ratio in 2005 equals 46.9 percent. A second set of data which we use in our analysis is provided by Lane and Milesi-Ferreti (2006) for the period 1970–2004.[14] The authors define the net foreign assets as foreign assets minus foreign liabilities, and estimate the figures for 145 countries. Foreign assets are defined as the sum of portfolio equity assets, FDI assets, debt assets, and total reserves minus gold. Similarly foreign liabilities are defined as the sum of portfolio equity liabilities, FDI liabilities, and debt liabilities. In the following, we adjust Lane and Milesi-Ferreti's (2006) data, so that the estimates become consistent with the relation $D_t = D_{t-1} - Current\ Account_t - FDI_t$ used in our analysis, where D_t denotes the net foreign liabilities defined as foreign liabilities minus foreign assets. We consider Lane and Milesi-Ferreti's foreign asset figure, but define foreign liabilities as the sum of portfolio equity liabilities and debt liabilities. The debt-to-GDP ratio in 2005 using the adjusted Lane and Milesi-Ferreti's figures turns out to be 35.57 percent.[15]

We then calculate the value of the debt-to-GDP ratio in 2015 using the difference equation (6) and then the value of the sustainability measure (8). When under the base case $A_t = netb_t + fdi_t + eugrants_t - energy_t$ for t = 2006, .., 2015 equals the values shown in Table 6, the current account in 2005 turns out to be unsustainable in the sense that the actual debt-to-GDP ratio in 2005 falls short of the expected discounted present value of foreign debt outstanding in period 2015 by 24.42 per cent. The sustainability of the current account requires that the value of the sustainability measure be increased so that it becomes zero or positive. This goal can be achieved through increases in non-energy

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[14] The data set of Lane and Milesi-Ferreti (2006) is available via the Internet at http://www.imf.org/ external/pubs/ft/wp/2006/data/wp0669.zip.

[15] We do not use the foreign debt figures of the Treasury as they are generally not consistent with the relation $D_t = D_{t-1} - Current\ Account_t - FDI_t$ used in our analysis, where D_t denotes the net foreign liabilities defined as foreign liabilities minus foreign assets.

non-interest current account to GDP ratio $netb_{2005+i}$, EU grants to GDP ratio $eugrants_{2005+i}$, FDI to GDP ratio fdi_{2005+i}, or through a decrease in energy to GDP ratio $energy_{2005+i}$ during the period 2007–2015, or through a combination of increases in both the non–energy non–interest current account to GDP, EU grants to GDP and FDI to GDP ratios, and a decrease in energy to GDP ratio over time. To achieve the minimal condition for external sustainability, Turkey has to increase the value of A_t during each period from 2006 to 2015.

Suppose first that fdi_{2005+i}, $energy_{2005+i}$ and EU grants for i = 1, .., 10 amount to values shown in Table 6 under the base case. Economic theory tells us that non–energy, non–interest current account to GDP ratio net can be increased by decreasing the aggregate demand for domestic goods and services and/or by depreciating the RER. Decreasing the aggregate demand for goods and services would require that the country use contractionary policies. Overall, although adjustments are possible, little margin for further tightening of macroeconomic demand management policies may exist in the coming years in view of the high real interest rates and the large general government primary fiscal surplus—equivalent to 6.5 percent of GDP.

In the absence of adjustment in the underlying fundamentals for current account sustainability (FDI, energy bill, grants, domestic demand), changes in the exchange rate are the other possible adjustment mechanism for maintaining long–term sustainability of the current account. Depreciation of the RER increases exports and decreases imports via the direct RER effect considered in Tables 4 and 5, but depreciation of the RER also contains the growth in domestic aggregate demand, and thus limits import growth and helps restore the sustainability of the current account through this more indirect channel. The estimated aggregate demand function shown in Table 7 reveals that depreciation of the RER reduces the aggregate demand, which in turn reduces imports through the aggregate demand effect shown in Table 4.

Table 7: Aggregate Demand Function

Dependent variable	Constant	Logarithm of CPI based RER inclusive of tariffs	Logarithm of real GDP
Logarithm of Domestic Aggregate Demand	0.6030 (1.5993)	−0.1190 (−2.1228)	0.9964 (40.9769)

Note: t-statistics are displayed in parenthesis.

To determine the extent of depreciation in the RER required, *all else being equal,* for achieving current account sustainability in the baseline scenario, we consider the effect of percentage change in RER on non-interest, non-energy current account to GDP ratio, given by

$$\theta = \left(\frac{d \, NETB/GDP}{d \, RER/RER} \right)$$, which can be expressed as:

$$\theta = \frac{RER \, m}{y} \left(\eta_{exp} \left(\frac{x}{RER \, m} \right) + \eta_{imp} - 1 - \left[\gamma_{con} \frac{m_{con}}{m} + \gamma_{inv} \frac{m_{inv}}{m} + \gamma_{ne} \frac{m_{ne}}{m} \right] \varepsilon \right),$$

where η_{imp} and η_{exp} denote the import and export elasticities with respect to the RER, γ_{con} is the elasticity of imports of consumption goods with respect to aggregate demand, γ_{inv} is the elasticity of imports of investment goods with respect to aggregate demand, γ_{ne} is the elasticity of imports of non-energy intermediate goods with respect to aggregate demand, ε is the elasticity of aggregate demand with respect to RER, x is the real exports, m is the real imports and y is the real GDP. From previous considerations, we know that export price elasticity is 0.34 and import price elasticity is 0.97. On the other hand, the elasticity of imports of consumption goods with respect to aggregate demand is 3.22, the elasticity of imports of investment goods with respect to aggregate demand is 2.11, and the elasticity of imports of non-energy intermediate goods with respect to aggregate demand is 2.30. Table 7 reports that the elasticity of aggregate demand with respect to

RER is ε = −0.119. Since during 2005 the export-to-import ratio was 62.98 percent and import-to-GDP ratio was 26. 6 percent, we have θ = 8.98. Thus, a reduction in the ratio of the non-energy, non-interest current account by 1 percentage point of GDP requires a depreciation of the RER by 8.98 per cent. Thus sustainability of the current account in the base case requires that the RER be depreciated by 22.87 per cent.

The above results were derived from equation (6) for the value *netb₂₀₀₅₊ᵢ* for i = 2,..,10 that would satisfy the sustainability condition S(10) = 0. The results show that *netb₂₀₀₅₊ᵢ* for i = 2,..,10 has to be increased by 2.55 percent. Solving the difference equation (6) for the value of debt-to-GDP ratio in 2015, with the values of *energy₂₀₀₅₊ᵢ* , *eugrants₂₀₀₅₊ᵢ* , and *fdi₂₀₀₅₊ᵢ* of the base case for i = 1,..,10 shown in Table 6, and all other parameters remaining at their base scenario values, we note that the debt to GDP ratio increases from its value of 35.57 per cent in 2005 to 38.74 per cent in 2015. This increase in debt-to-GDP ratio is thus perfectly compatible with the sustainability condition specified above, but note that the estimated value of the increase in debt-to-GDP ratio from 35.57 percent to 38.74 percent does not consider the effect of changes in RER on debt-to-GDP ratio. Since by definition

$$ d_t = \frac{E_t D_t}{p_t y_t} = (\frac{RER_t}{p_t^*}) (\frac{D_t}{y_t}) , $$

we note that RER changes will affect the value of debt-to-GDP ratio, and that depreciation of the RER will lead to further increases in debt-to-GDP ratio. Hence, the results obtained above are downward-biased. They need to be corrected accordingly. In particular under the base case when RER depreciates by 22.87 percent, the debt-to-GDP ratio will not increase to 38.74 percent but rather to 47.6 percent.

The above considerations reveal that sustainability of the current account can be achieved with depreciation of the RER by 22.87 percent, but under relatively large increases in debt-to-GDP ratio from 35.57 percent

to 47.6 percent. An alternative specification of the sustainability condition requires that the ratio of the stock of net foreign liabilities-to-GDP, after say 10 years, taking account of the effect of RER changes on the debt-to-GDP ratio does not increase above its initial value attained during the time period 2005. Since this is a stronger condition than that of von Hagen and Harden, we note that attainment of sustainability requires now that the RER be depreciated by 33.22 percent in the base case.

Next, consider the high-case scenario where we assume the price of energy products to revert to a lower level (temporary shock), starting from the fourth quarter of 2006. In particular we assume that the average price of oil (US$/barrel) will decrease from $62.33 in 2006 to $44.00 in 2007 and to $41.50 thereafter. Furthermore we assume that the growth rate of real GDP will amount to 7 percent, and foreign real interest rate will be 4 percent during the period 2007–2015. In this case, the current account is still not sustainable in the sense that the actual debt-to-GDP ratio in 2005 falls short of the expected discounted present value of foreign debt outstanding in period 2015 by 21.8 per cent. Sustainability requires that the RER be depreciated by 17.17 percent. In this case debt-to-GDP ratio decreases from 35.57 percent in 2005 to 27.5 percent in 2015 when the effect of the change in RER on debt-to-GDP ratio is ignored, and to 32.27 percent when we take into account the effect of changes in RER on debt-to-GDP ratio. When we impose the sustainability condition that the ratio of the stock of net foreign liabilities-to-GDP, after say 10 years, taking account of the effect of RER changes on the debt-to-GDP ratio, does not change from its initial value attained during the time period 2005, then the required rate of depreciation of the RER decreases to 13.17 percent.

A downside scenario concerning projected growth and the energy bill would require even stronger exchange rate adjustment for current account sustainability. These, most likely, could not take place in an

orderly manner and would be conducive to a sharp economic slowdown similar to those seen in past crisis episodes.

The above considerations reveal that, in the absence of significant changes in the current account's fundamentals, sustainability would be achieved only with substantial depreciation of the RER. We now turn to long-term considerations by considering n* to be much larger than 10 years. In fact, we assume that n* = 25, and concentrate on the period 2006–2030. In this case it would be relevant to integrate the structural and common agricultural policy (CAP) funds that Turkey would be expected to start receiving from the EU upon accession, but the amount Turkey would receive in the long run from the EU is highly uncertain as it depends on both the future shape of the CAP and the outcome of the EU accession negotiation in this specific sector–a highly political and speculative issue. We assume that upon accession, which we expect to take place around 2016, Turkey will receive EU funds in the amount of 8 billion Euros annually. Next, we impose the sustainability condition that the ratio of the stock of net foreign liabilities-to-GDP after 30 years taking account of the effect of RER changes on the debt-to-GDP ratio does not change from its initial value attained during the time period 2005. When the other parameter values remain at their base case values of the year 2015, sustainability of the current account requires now that the RER be depreciated by 28.5 percent.

Table 8 shows the required rates of depreciation of the RER in order to achieve current account sustainability so that the ratio of the stock of foreign liabilities-to-GDP stays constant under different scenarios of the values of the critical parameters g, r*, and η when EU funds and price of energy products will develop as indicated in Table 6. The table shows that the rate of depreciation of the RER required to achieve current account sustainability for given values of r^* and η decreases once Turkey achieves higher real annual rates of growth of GDP.[16] When foreign rate

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[16] Here we abstract from consideration of the effect of an increase in GDP on non-interest, non-energy current account-to-GDP ratio *netb*. As the growth rate of GDP increases,

of interest r* increases the achievement of current account sustainability for given values of g, and η requires higher rates of depreciation of the RER. On the other hand, when the rate of appreciation of the RER due to the Balassa–Samuelson effect increases, the achievement of current account sustainability for given values of g, and $r*$ requires lower rates of depreciation of the RER.

Table 8: Size of the Rate of Depreciation of the Real Exchange Rate Needed to Achieve Current Account Sustainability Under Alternative Parameter Values

Rate of appreciation of the RER 0 percent				Rate of appreciation of the RER 2 percent			
	Foreign Real Rate of Interest				Foreign Real Rate of Interest		
Growth Rate	4	6	8	Growth Rate	4	6	8
3	23.72	29.43	34.93	3	17.46	23.36	28.99
5	23.14	28.51	33.65	5	17.23	22.80	28.09
7	21.87	27.05	31.99	7	16.09	21.54	26.65

Note: Rate of appreciation of the RER of 0 and 2 percent refer to appreciation of the RER due to the Balassa–Samuelson effect

VI. CONCLUSION

Since the 2001 crisis, Turkey has been trying hard to resolve its fiscal problems, attain price stability and create a sound banking sector. Resolute efforts to restore a sound macroeconomic framework and progress in structural reform have boosted growth but the rising deficit of the current account represents a key vulnerability in the presence of volatile capital flows.

The methodological framework presented in the paper indicates that, because the Turkish economy evolves in a very dynamic context, a broad

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non–energy imports will increase leading to a decrease in *netb.* Thus, the results reported in Table 8 are downward biased. We would like to thank Şeref Saygılı for emphasizing this aspect.

range of outcomes is possible with regard to the sustainability of current account. Under some base case assumptions regarding the fundamental determinants of the Turkish current account, as of 2006 sustainability is not secured. Within this scenario, and in the absence of changes in these fundamentals, achievement of sustainability would require a significant depreciation of the RER. However, under a high-case scenario—assuming larger foreign direct investment and transfers from the EU funds, higher productivity growth, and lower energy prices compared to their high levels in 2005/06—current account sustainability would be ensured only with a moderate depreciation of the RER.

Some important caveats concerning the analysis in this paper should be underscored:

First, the finding that, *all else being equal,* current account sustainability would require a depreciation of the RER does not necessarily mean that depreciation should indeed take place because, precisely, the fundamentals of the current account may change in a more favorable way in the future—and rational agents may expect them to do so. To the extent these fundamentals are expected to further improve (as in the case of Turkey upon EU accession) and the economy keeps growing at a fast pace as required for convergence with high-income countries, repayments of a higher foreign debt could be financed out of much higher incomes.

Second, although there is downside uncertainty regarding the assumptions in a baseline scenario like the one considered in this paper, there is much upside potential even beyond the high-case scenario we considered:

- Supported by a strong investment climate, and as in other new EU members, Turkey might be able to attract higher amounts of FDI than assumed in the base-case scenario. Indeed, in most new EU members, FDI has averaged 4–5 percent of GDP, compared to the FDI figures assumed in Table 6.

- With a customs union with the EU also covering agriculture, and thanks to its important potential in this sector, Turkey would be able to significantly increase its net exports of agricultural exports—thus benefit from a structural improvement in the fundamentals of current account sustainability.[17]
- Finally, to the extent the trade deficit reflects imports of equipment goods that will contribute to better productivity growth and expand capacity, export capacity may increase, thus directly improving the fundamentals for current account sustainability.

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[17] Evidence of such an expansionary incidence of alignment with the CAP has been presented in World Bank (2006), based on a CGE model for Turkey.

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