

# Sustainability of Current Account Deficits in Turkey: Markov Switching Approach

Melike Elif Bildirici

Department of Economics, Yıldız Technical University

Barbaros Bulvarı 34349, İstanbul Turkey

Tel: 90-212-383-2527 E-mail: melikebildirici@gmail.com

Fazıl Kayıkçı

Department of Economics, Yıldız Technical University

Barbaros Bulvarı 34349, İstanbul Turkey

Tel: 90-212-383-2534 E-mail: fkayikci@yildiz.edu.tr

Received: October 3, 2011

Accepted: October 17, 2011

Published: February 1, 2012

doi:10.5539/ijef.v4n2p135

URL: <http://dx.doi.org/10.5539/ijef.v4n2p135>

## Abstract

Countries may face debt problems for periods when the long-run solvency condition about current account deficits holds. Using Markov Switching model, the econometric methodology proposed in this study allows us to distinguish periods that are associated with unsustainable outcomes from those in which the solvency condition holds. Analyzing Turkey's current account deficits between 1987:4 and 2010:4, it is found through defining three regimes that probability of persistency in the sustainable path is 0,696 whereas the probabilities of transition to the crisis path and to the unsustainable path from the sustainable path are 0,125 and 0,178 respectively. Also, Turkey seems to be in a crisis regime since the first quarter of 2010. This may be an informative alert for the Turkish economy about oncoming balance of payments crisis in a year.

**Keywords:** Current Account, Balance of Payments, Sustainability, Markov Switching

## 1. Introduction

Several developing countries have experienced substantial and persistent current account deficits in recent years; this has raised the issue of sustainability and increased the volume of studies about the measures of sustainable current account deficits in the economic literature. Researchers are especially concentrated on the issue that whether the deficits result with a balance of payments crisis or not. In this respect, some sustainability criteria were developed and these were used as indicators for the crises.

Different tests have been developed to provide an answer to the question of whether accumulating debt due to current account deficits over time is sustainable. These tests basically assume the rate of growth of the economy and the pattern for the trade balance as given, therefore implying that the economy will go on to progressing as it did in the past. These types of tests typically provide a definite answer: they reject sustainability or not. This method offers an alternative complementary procedure inspired by the reality that the stochastic properties of the variables in the analysis are generally subject to structural breaks which are expressions of policy changes taking place over the period. It imposes identifying restrictions which describes states for the current account as being related to the stationary and nonstationary periods in the sample period, and hence, it appears to be consistent with the long run budget constraint. This type of analysis can accommodate situations when the debt might be sustainable in the long-run even though the economy may depart from the sustainable path for some sub periods. (Raybaudi, Sola and Spagnolo, 2004, p. 217).

Since the solvency concept is evaluated in the long-run, countries may be faced with debt problems for sub periods even though the condition of long-run sustainability holds. The purpose of the usage of Markov switching model is to discover the circumstances where the countries might satisfy the solvency criterion, but faced with important short run imbalances which may become high enough to violate solvency in the future: when the long-run sustainability condition is satisfied but the presence of temporary deviations from this condition providing a danger that country may likely to face debt problems in the future. Therefore, it tries to identify sub periods in which the

current account deficits look as nonstationary: If the time period that economy stays in these subperiods become longer, the probability of the violation of solvency will increase. The econometric methodology proposed in the Markov switching models allows us to distinguish periods that are associated with unsustainable outcomes from those in which the solvency condition holds. (Raybaudi et al, 2004, p. 219).

In the next section, literature about the sustainability of current account deficits will be presented briefly. Third section consists of the data description and methodology. Fourth section includes the empirical results. In the last section, evaluation of the sustainability of current account position of Turkey will be presented according to the empirical results.

## 2. Brief Literature Review

The pattern of current account imbalances has received considerable attention in the economics literature for many years. However, growth of current account deficits and financial crisis in the last decades makes the policymakers and economists to pay more attention and to work more frequently on the issue. One part of the literature considers the intertemporal approach to the current account according to which forward looking dynamic saving and investment decisions determine the current account deficits such as Obstfeld and Rogoff (1994) Ghosh and Ostry (1995) and Campa and Gavilan (2006). Also, intertemporal approach has been used to evaluate the impact on the current account of fiscal policy in Leiderman and Razin (1991), terms of trade fluctuations in Mansoorian (1998) and global productivity shocks in Glick and Rogoff (1995).

Sustainability of current account deficit is one of the popular subjects among the researchers since most of the countries persistently had deficits for the last years. Thus, different methodologies and related empirical works have emerged to determine the sustainability of current account deficits. A common feature in existing literature is the searching for stationary current accounts using unit root tests such as Wu et al. (2001) for Organization of Economic Cooperation Countries (OECD). Another approach is to examine the cointegration between exports and imports such as Husted (1992), Leachman and Francis (2000). There are also some studies that apply both methodology such as Baharumshah, Lau and Fountans (2003). Furthermore, some researchers apply these methodologies by using intertemporal solvency approach such as Matsubayashi (2005), Campa and Gavilan (2006), or by using Markov switching process such as Raybaudi, Sola and Spagnolo (2004). Some researchers try to find indicators for the sustainability without implying an empirical work such as Milesi-Ferretti and Razin (1996), Oğuş and Sohrabji (2008).

## 3. Data and Methodology

### 3.1 Data

Current Account to GDP ratio is the only variable used in this method. Data of current account and GDP are obtained from the Central Bank of the Republic of Turkey. Current Account Balance data is obtained as US Dollar and transformed to Turkish Lira by using the monthly averages of the Exchange rate of the Central Bank of the Republic of Turkey. Since the observations for Gross Domestic Product is obtained only for each quarter in the period, current account values are transformed to the quarterly data. The frequency of the data is quarterly between 1987:4 and 2010:4.

### 3.2 Methodology

The Markov switching model, also known as regime switching model, developed by Hamilton (1989), is one of the most popular non-linear time series models. In this model, non-linearities arise if processes are confronted with discrete shifts in regime. By permitting switching between these N regimes, in which the dynamic behavior of series is markedly different, more complex dynamic patterns can be characterized. The switching mechanism is controlled by an unobservable state variable that follows a first order Markov chain. Altuğ and Bildirici (2010, p.5) defined the algorithm of Hamilton's model in their application of business cycles around the globe. Following their definition, when the current account balance is defined as a sum of its trend and cycle components like;

$$cab_t = tr_t + cy_t \quad (\text{Eq. 1})$$

where  $cab$  denotes the current account balance,  $tr$  denotes the trend component and  $cy$  denotes the cycle component. Trend component depends on an unobserved Markov state variable denoted as  $s_t$ ;

$$tr_t = \alpha_1 s_t + \alpha_0 + tr_{t-1} \quad (\text{Eq. 2})$$

Differencing results with;

$$\Delta cab_t = \alpha_1 s_t + \alpha_0 + \Delta cy_t \quad (\text{Eq. 3})$$

Hamilton (1989) considered a Markov switching model as mean of the process changes according to the unobserved state

$$y_t - \mu(s_t) = \beta_i \sum_{i=1}^n (y_{t-i} - \mu(s_{t-i})) + \varepsilon_t \quad (\text{Eq. 4})$$

The probability that the state variable equals some particular value  $j$  depends on the past only through the most recent value  $s_{t-1}$ :

$$P\{s_t = j | s_{t-1} = i, s_{t-2} = k, \dots\} = P\{s_t = j | s_{t-1} = i\} = p_{ij} \quad (\text{Eq. 5})$$

As such, a structure may prevail for a random period of time, and will be replaced by another structure when switching takes place. The transition probability  $p_{ij}$  gives the probability that state  $i$  will be followed by state  $j$ . Clearly, the transition probabilities satisfy

$$p_{i1} + p_{i2} + \dots + p_{iN} = 1 \quad (\text{Eq. 6})$$

Three-regime Markov-switching Auto Regressive model can be presented in a matrix format such as;

$$P = \begin{pmatrix} p_{11} & p_{12} & p_{13} \\ p_{21} & p_{22} & p_{23} \\ p_{31} & p_{32} & p_{33} \end{pmatrix} \quad (\text{Eq. 7})$$

#### 4. Empirical Results

Using Markov Switching Auto Regressive process with three regimes, current account behavior of the Turkish Economy for the last 23 years was analyzed in order to reveal the sustainable, unsustainable and crisis periods besides discovering the probabilities of emerging of such periods. These three regimes are defined as; crises, unsustainable current account deficits which lead into crises, sustainable current account balances. Matrix of transition probabilities for the two regimes is shown below;

$$P = \begin{pmatrix} 0.831 & 0.098 & 0.070 \\ 0.084 & 0.865 & 0.050 \\ 0.125 & 0.178 & 0.696 \end{pmatrix} \quad (\text{Eq. 8})$$

According to the above matrix, it can be argued that the probability of persistency in the crises paths is 0.831 whereas the probabilities of transition to the unsustainable path and to the sustainable path from the crisis are 0.098 and 0.070 respectively. The probability of persistency in the unsustainable paths is 0.865 whereas the probabilities of transition to the crisis path and to the sustainable path from the unsustainable path are 0.084 and 0.050 respectively. The probability of persistency in the sustainable path is 0.696 whereas the probabilities of transition to the crisis path and to the unsustainable path from the sustainable path are 0.125 and 0.178 respectively.

In other words, the probability of being in a crisis in time  $t$  conditional on the current account balance being in a crisis regime, unsustainable and sustainable regimes in time  $t-1$  are estimated as about 83.1%, 8.4% and 12.5% respectively.

In the figure 1; crisis, unsustainable and sustainable regimes for the current account balance with respect to observation years are presented. It shows the smoothed probabilities of being in regime 1 (crisis regime), regime 2 (unsustainable regime) or regime 3 (sustainable regime). According to the empirical results and figure, 29 observations are classified in regime 1 whereas 43 observations are in regime 2 and 15 observations are in regime 3. Durations of regimes are 5.9 quarter, 7.4 quarter and 3.2 quarter respectively.

#### 5. Conclusion

Figure 1 shows that several shifts between the regimes took place over time. These shifts coincide especially with the economic crises in Turkey for the last two decades. Regime 1, which is called as crisis regime, strongly emerges in the years 1994, 1996, 2001 and 2010. Economic crisis that were realized in 1994 and 2001 can be explained well with the unsustainable behavior of current account balance. Although 1996 appears as crisis period for the current account, it has not realized which gives rise to an idea that MS model overestimate the crises in the current account balance.

Periods that are defined as unsustainable by the MS model emerges generally before the crisis periods such as 1993,

1999-2000 and 2003-2008. Probability of switching from unsustainable regime to the crisis is so small that the economy can stay in the sustainable path for a long time. Explanation of this situation lies in the definition of the Markov Switching process; countries might satisfy the solvency criterion, but faced with important short run imbalances which may become high enough to violate solvency in the future: when the long-run sustainability condition is satisfied but the presence of temporary deviations from this condition providing a danger that country may likely to be faced with debt problems in the future. This can also be seen from the duration of the regimes; duration of the unsustainable regime is higher than the other regimes indicates that economy can stay in the unsustainable path long enough without violating the solvency condition. However, the longer the economy stays in these periods, the more likely that they end up with a balance of payments crisis.

It is so interesting that, according to the time profiles of the regimes in figure 1, Turkey seems to be in a crisis regime since the first quarter of 2010. This may be an informative alert for the Turkish economy about oncoming balance of payments crisis in a year.

## References

- Altuğ, S., & Bildirici, M. (2010). Business Cycles Around the Globe: A Regime Switching Approach. Working Papers, TÜSIAD, *Koç University Economic Research Forum*.
- Baharumshah, A. Z., Lau, E., & Fountas, S. (2003). On the Sustainability of Current Account Deficits: Evidence from Four ASEAN Countries. *Journal of Asian Economics*, 14(3), 465-487. [http://dx.doi.org/10.1016/S1049-0078\(03\)00038-1](http://dx.doi.org/10.1016/S1049-0078(03)00038-1)
- Campa, J. M., & Gavilán, A. (2006). Current Accounts in the Euro Area: An Intertemporal Approach. *IESE Research Papers*, D/651.
- Ghosh, A.R., & Ostry, J. D. (1995). The Current Account in Developing Countries: A Perspective from the Consumption-Smoothing Approach. *World Bank Economic Review*, 9, 305-333. <http://dx.doi.org/10.1093/wber/9.2.305>
- Glick, R., & Rogoff, K. (1995). Global Versus Country-Specific Productivity Shocks and the Current Account. *Journal of Monetary Economics*, 35, 159-192. [http://dx.doi.org/10.1016/0304-3932\(94\)01181-9](http://dx.doi.org/10.1016/0304-3932(94)01181-9)
- Hamilton, J. D. (1989). A New Approach to the Economic Analysis of a Nonstationary Time Series and the Business Cycle. *Econometrica*, 57, 357-384. <http://dx.doi.org/10.2307/1912559>
- Husted, S. (1992). The Emerging U.S. Current Account Deficit in the 1980s: A Cointegration Analysis. *The Review of Economics and Statistics*, 74(1), 159-166. <http://dx.doi.org/10.2307/2109554>
- Leachman, L. L., & Francis, B. B. (2000). Multicointegration Analysis of the Sustainability of Foreign Debt. *Journal of Macroeconomics*, 22(2), 207-227. [http://dx.doi.org/10.1016/S0164-0704\(00\)00129-4](http://dx.doi.org/10.1016/S0164-0704(00)00129-4)
- Leiderman, L., & Razin, A. (1991). Determinants of External Imbalances: The Role of Taxes, Government Spending, and Productivity. *Journal of the Japanese and International Economies*, 5(4), 421-450. [http://dx.doi.org/10.1016/0889-1583\(91\)90007-D](http://dx.doi.org/10.1016/0889-1583(91)90007-D)
- Mansoorian, A. (1998). Habits and Durability in Consumption and the Dynamics of the Current Account. *Journal of International Economics*, 44(1), 69-82. [http://dx.doi.org/10.1016/S0022-1996\(97\)00010-X](http://dx.doi.org/10.1016/S0022-1996(97)00010-X)
- Matsubayashi Y. (2005). Are US Current Account Deficits Unsustainable? Testing for the Private and Government Intertemporal Budget Constraints. *Japan and the World Economy*, 17, 223-237. <http://dx.doi.org/10.1016/j.japwor.2003.12.011>
- Milesi-Ferretti, G. M., & Razin, A. (1996). Sustainability of Persistent Current Account Deficits. *NBER Working Papers*, no:5467.
- Obstfeld M., & Rogoff, K. (1994). The Intertemporal Approach to the Current Account. *NBER Working Papers*, no: 4893.
- Oğuş A., & Sohrabji, N. (2008). On the Optimality and Sustainability of Turkey's Current Account. *Empirical Economics*, 35(3), 543-568. <http://dx.doi.org/10.1007/s00181-007-0178-6>
- Raybaudi, M., Sola, M., & Spagnolo, F. (2004). Red signals: current account deficits and sustainability. *Economics Letters*, 84, 217-223. <http://dx.doi.org/10.1016/j.econlet.2004.02.005>
- Wu, J. L., S. L. Chen, & H. Y. Lee. (2001). Are Current Account Deficits Sustainable? Evidence From Panel Cointegration. *Economics Letters*, 72, 219-224. [http://dx.doi.org/10.1016/S0165-1765\(01\)00420-7](http://dx.doi.org/10.1016/S0165-1765(01)00420-7)

Table 1. Diagnostic Checks for the Model

TEST	Statistic	Probability
Std. Residuals: portmanteau autocorrelation test	11.24	0.188
Std. Residuals: normality test	0.989	0.609
Std. Residuals: heteroskedasticity test	7.382	0.2496
Prediction Error: portmanteau autocorrelation test	36.21	0.000
Prediction Error: normality test	7.96	0.018
Prediction Error: heteroskedasticity test	6.65	0.573
AutoRegressive Error: portmanteau autocorrelation test	49.61	0.000
AutoRegressive Error: normality test	6.37	0.041
AutoRegressive Error: heteroskedasticity test	7.27	0.506

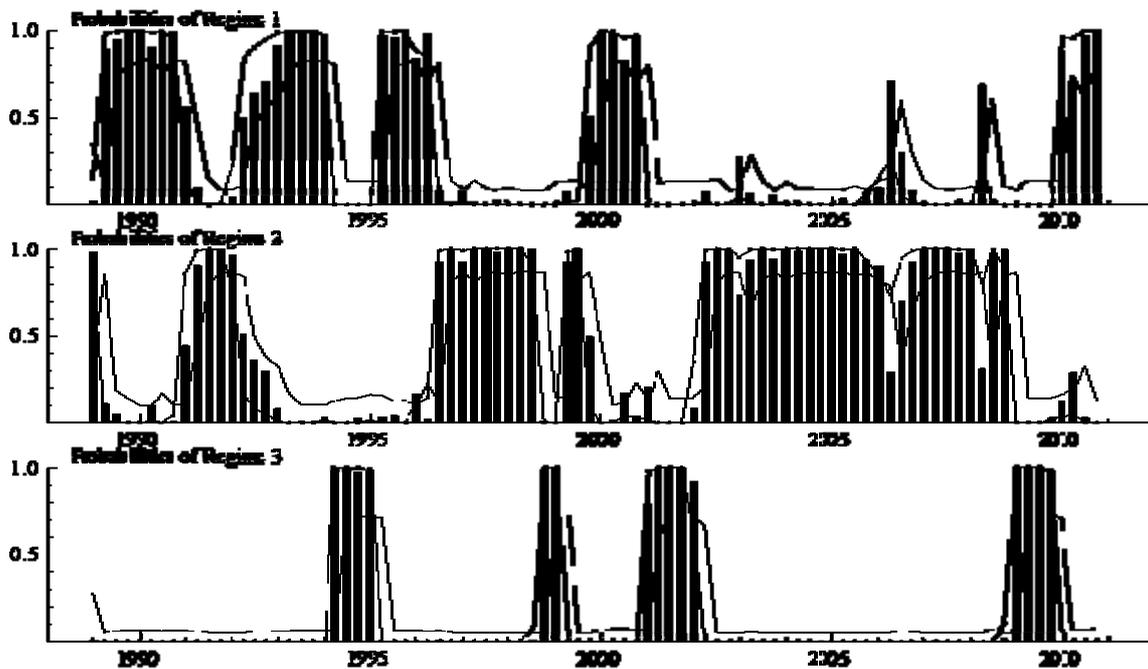


Figure 1. Probabilities of Regimes for the Current Account

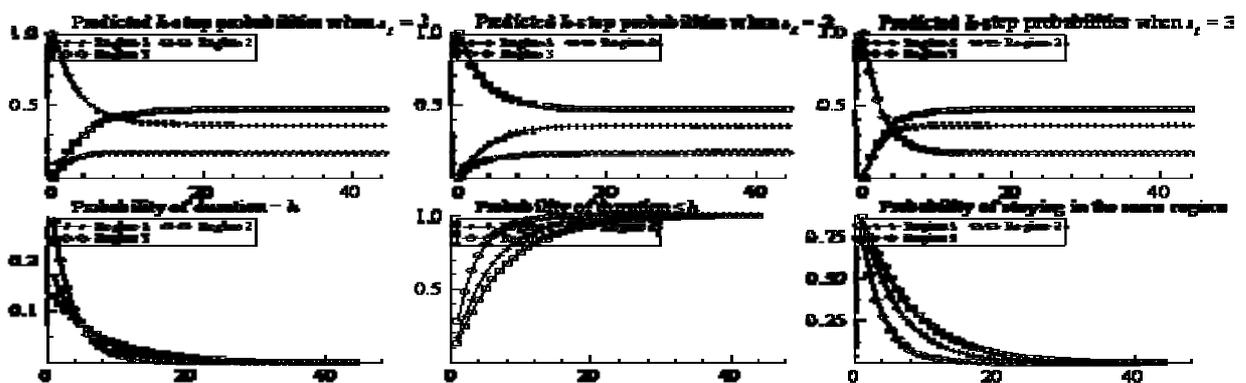


Figure 2. Predicted h step Probabilities and Probabilities of Stability