

FUNDAMENTALS, CREDIT RATINGS AND GLOBAL INDICATORS:  
WHAT DETERMINES TURKISH  
SOVEREIGN SPREADS?

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## ABSTRACT

### Fundamentals, Credit Ratings and Global Indicators: What Determines Turkish Sovereign Spreads?

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This thesis analyzes empirically the determinants of Turkish sovereign risk as proxied by J.P. Morgan's Turkish Composite Emerging Market Bond Index spread for period 1997-2005. Specifically, the thesis explores the relative importance of country specific fundamentals, called the "pull" factors, compared to global liquidity conditions, called the "push" factors, in explaining the movements in the Turkish sovereign spreads. We use Turkish credit ratings and alternatively a number of macro-variables to account for the pull factors. We also use the stance and predictability of the U.S. monetary policy as an important indicator of global financial climate. Specifically, making use of effective federal funds rate and the federal funds futures rate, we decompose the U.S. monetary policy into its anticipated and unanticipated components. We also extend the analysis to a panel of 15 emerging market country spreads. We uncover that sovereign ratings or fundamentals and the volatility of global liquidity conditions not the level of global liquidity conditions are significant in explaining the movements in the Turkish and other 14 emerging market countries sovereign spreads. To understand when the unanticipated

component became insignificant, we estimate rolling and recursive regressions and conclude that due to Federal Reserve Open Market Committee's policy change in releasing the statement in February 1994, unanticipated component becomes insignificant.

## KISA ÖZET

Temel Göstergeler, Kredi Notları, Küresel Göstergeler:

Türkiye'nin Ülke Riski Nasıl Belirlenir?

Burcu Ciğerli

Bu tez Türkiye'nin ülke riskinin etkenlerini ampirik olarak incelemektedir. Türkiye'nin ülke riski 1997-2005 dönemi J.P Morgan Gelişmekte Olan Ülkeler Bono Endeksi baz alınarak hesaplanmıştır. Tezde “çekiş” faktörleri olarak adlandırılan ülkeye özgü temel göstergeleri, “itiş” faktörleri olarak adlandırılan global etkenlerle karşılaştırılmış, görelilik olarak bunların önemleri üzerinde durulmuştur. Çekiş faktörleri olarak Türkiye'nin kredi notları ve alternatif olarak bazı temel makro göstergeler kullanılmıştır. Bunun yanısıra, A.B.D'nin para politikasının global finansal durumunu belirleyen önemli bir etken olduğunu düşünmekteyiz. Efektif federal faiz oranları ve gelecek sözleşmeli federal faiz oranlarını kullanarak, A.B.D. para politikalarını beklenen ve beklenmeyen olmak üzere iki kategoriye ayırdık. Bunun yanısıra, çalışmamızı 15 gelişmekte olan ülkenin zaman içindeki verilerini kullanarak geliştirdik. Bütün bu çalışmalar sonucu ortaya çıkan: ülke kredi notları veya temel göstergeler ve küresel likidite durumunun dalgalanması, Türkiye ve diğer 14 gelişmekte olan ülke risklerindeki hareketleri açıklamakta önemlidir, küresel likidite seviyesi ise bu hareketleri açıklamakta önemsizdir. A.B.D. para politikasının beklenmeyen kısmının ne zaman önemsiz hale geldiğini anlamak için hareketli bir pencere içindeki verileri kullanan regresyon metodları

uygulanmıřtır. Son olarak, řubat 1994 tarihinde Amerikan Merkez Bankası Aık Pazar Komitesi'nin toplantı sonrası duyuru yayımlamasında yaptıđı deđiřiklik sonucu A.B.D. para politikasının beklenmeyen kısmı bu tarihten itibaren lke riskini aıklamakta anlamsız hale gelmiřtir.

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# 1 Introduction

Following the financial account liberalizations at the end of the 1980s, the quantity and value of external debt raised by emerging market economies in the form of Eurobond issues increased significantly, albeit non-monotonically. The cost of raising capital by issuing Eurobonds depends on country risk and varies among countries since other than global liquidity, idiosyncratic factors referred to as “country-specific fundamentals ” also matter. The spread on each emerging market country’s sovereign bond -the premium that is offered to investors above the yield paid on the U.S. government bonds with the same maturity- is a proxy for that country’s sovereign risk. During the 2001-2005 period, the annual average spreads on emerging market bonds tightened by 520 basis points, from 837 basis points to 317 basis points approximately. Improving country-specific fundamentals clearly played an important role in reducing the spreads. However, the abundance of global liquidity and increased risk appetite of investors stemming from the looseness of monetary policy in the financial centers and the recent inflow of institutional investors such as the pension funds were also influential. Whether the significant decline in interest rate spreads since the beginning of 2001 is sustainable or not is a nontrivial issue. To put it differently, whether worsening fundamentals and/or worsening market sentiment would trigger a sudden reversal in capital flows from emerging market economies and the

timing of such a reversal is very critical both to lenders and the policymakers of the borrowers.

Similar to many other developing countries at the time, Turkey opened up its financial account in August 1989, in the hope of attracting foreign money to finance the borrowing requirement of the public sector, which would reduce the prevailing high real interest rate and decrease crowding-out in private investment. However, the 1990s were plagued by frequent capital reversals, high rates of inflation and real interest rate and volatile real GDP growth rate. In the last two decades, Turkey experienced two balance of payments crises and was adversely affected by the Asian crisis of 1997 and the Russian and Brazilian crises of 1998-1999.<sup>1</sup> Following the structural and stability program backed by the IMF since 2001 and the prospects of a future membership within the European Union, Turkey achieved structural transformation and the rapid improvement in its macroeconomic fundamentals. Since 2001, the primary surplus of the consolidated budget has averaged 5.6 % and never fell below 4.2 %. The primary government-sector surplus comfortably exceeded the target (and IMF performance criterion) of 6.5% of GDP in 2004.

Reduced mature market interest rates along with the improved country-specific fundamentals help Turkey to borrow by issuing Eurobonds. As can be seen from Table 1, throughout 2001-2005 roughly half of Turkey's external

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<sup>1</sup>See Alper and Saglam (2001) and Selcuk and Erdogan (2001) for major developments in the Turkish economy during the 1990s.

debt is in terms of Eurobonds.

Insert Table 1 here

The aim of this thesis is to analyze the determinants of emerging markets' sovereign spreads, with a special emphasis on Turkey. We attempt to evaluate the relative importance of fundamentals and global liquidity conditions in explaining the movements in sovereign spreads. Using data from 1997-2005, we present empirical evidence on how changes in global liquidity conditions and fundamentals or emerging markets credit ratings influence emerging markets country risk. This is an important issue especially for Turkey as a convergence economy achieved rapid recovery after the 2001 crises with the help of liquid international markets, impressive legislative steps toward EU membership prospect and coherent steps in implementing the IMF-backed stabilization program. Previous empirical literature emphasized short-term interest rates and some variable capturing the volatility in financial markets; such as the U.S. and E.U. Besides simply using the effective federal funds rate for proxying the level of the U.S. monetary policy stance and hence global liquidity conditions, we follow the new literature on news effects, Rudebusch(1998), Kuttner (2001) and Gurkaynak et al. (2005) and extract the anticipated and the unanticipated components of the U.S. monetary policy by using U.S. federal funds target and futures rates. They show that the response of U.S. bond yields and asset prices to unanticipated U.S. monetary

policy change is positive and significant.

Our empirical analysis for Turkey using 1997-2005 period reveal that the current account balance per GDP, budget balance per GDP, reserves per short-term debt, expected inflation, credits per monetary base, Istanbul Stock Exchange (ISE) prices and credit ratings are significant in explaining the movements in Turkish bond spreads along with the volatility of global liquidity conditions. Our estimation results on Turkish and emerging market spreads show that among the global liquidity measures the implied volatility of the S&P's 500 index matters. However the anticipated and the unanticipated components of the U.S. monetary policy actions do not seem to be an important determinant of sovereign spreads. This is a surprising result, since spread is the difference between risky asset and risk-free asset and risk-free asset is proxied by the 10 year U.S. treasury bill rate and from Rudebusch(1998), Kuttner (2001) and Gurkaynak et al. (2005) we know that unanticipated component increases the 10 year U.S. treasury bill rate, hence the response of the sovereign spreads to unanticipated U.S. monetary policy change is expected to be positive through the 10 year U.S. treasury bill rate. However, this does not hold from 1998 through 2005. To get a better understanding of this surprising result we check for the effect of the unanticipated component on 10 year U.S. treasury bill rate from 1998 through 2005 and find that it is insignificant. In appendix, we estimate rolling and recursive regressions and reveal that after February 1994 which is the start of Federal Reserve Open

Market Committee statement release, 10 year U.S. treasury bill rates do not respond to unanticipated component.

We proceed as follows. Section 2 provides the data and methodology used in this paper. Section 3 presents the estimation results on Turkish sovereign spreads. Section 4 presents the panel analysis of fifteen emerging market countries, appendix presents rolling and recursive regression of the 10 year U.S. treasury bill rate on the anticipated and unanticipated components of the U.S. monetary policy actions and Section 5 concludes.

## 2 Data and Methodology

This thesis analyzes the determinants of Turkey's sovereign risk which is proxied by J.P. Morgan EMBI+ Turkey and represented in natural logarithms of monthly averages of daily data.<sup>2</sup>

As can be seen from Figure 1 Turkey's sovereign spread is higher than the emerging market's composite index<sup>3</sup> in crises years. The major reason why Turkish sovereign spreads outperformed the composite index since the end of 2003 may be explained by the stand-by agreement with the IMF in 2001 and EU membership prospects.

Insert Figure 1 here

From a theoretical perspective, the yield on the interest rate spread can be defined as the return on risky asset minus the return on risk-free asset. Emerging market bonds can be thought as the risky asset since they have a higher probability of default than the yield on government bonds of countries with mature financial markets such as the U.S. One can easily demonstrate that the rate on risky asset has to rise more than any rise on risk-free asset in order to compensate investors for risk. Following Arora and Cerisola (2001), suppose that  $r$  and

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<sup>2</sup>J.P. Morgan EMBI+ covers Brady and other restructured sovereign bonds and takes U.S. treasuries as the risk-free assets.

<sup>3</sup>EMBI+ Composite Index comprises mainly Eurobonds and Brady bonds with minimum face value of U.S.\$ 500 million and maturity of at least 2.5 years and covers a wide cross-section of 16 countries, their ratings must be lower than BBB+ according to S&P's, and 68 instruments, from 1998 onwards.

$i$  denote the interest rate on a risk-free asset and a risky asset, respectively for some pre-specified time horizon. Let  $p$  denote the probability of repayment of the risky asset and  $S = i - r$ , denote the interest rate spread. In equilibrium, assuming that investors are risk-neutral and there is perfect capital mobility with no transaction costs, return on the risk-free asset is equal to the expected return on risky asset:  $(1 + r) = p \times (1 + i) + (1 - p) \times 0$  and the partial derivative of  $S$ , with respect to  $r$  is  $(1 - p)/p$ , which is positive since  $p < 1$ , and its derivative with respect to  $r(p)$  where  $r$  is a decreasing function of  $p$ , is again positive. One may also consider the situation in which the probability of repayment depends negatively on  $r$  since the increase in return on risk-free asset decreases the risk tolerance of investors and they tend to invest more on the risk-free asset, this reduces the probability of repayment since emerging market countries cannot roll over their existing debts. In such a situation the derivative of  $S$  with respect to  $r$  is greater than  $(1 - p)/p$  and is equal to  $\{(1 - p)/p\} - \{(1 + r) \times p'/p^2\}$

A number of relatively recent papers<sup>4</sup> have addressed the issue of how movements in emerging market sovereign bond spreads can be accounted for. The IMF Global Financial Stability Report (GFSR) 2004 broadly categorizes the factors that effect movements in spreads into two. The first category includes country specific fundamentals labelled as the “pull ” factors. The pull factors include indicator variables for maintaining financial and monetary stability of the

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<sup>4</sup>Among others see Arora and Cerisola (2001), Eichengreen and Mody (1998), IMF Global Financial Stability Report (2004) and (2006), Sy (2001).

country. These country-specific fundamentals are referred to as the pull factors since borrowers compete and attract financial flows based on the soundness of these variables. Alternatively one may use the credit ratings announced by the rating agencies for each country as a proxy for these pull factors. The second category of factors that effect movements in spreads includes market sentiment or global liquidity labelled the “push” factors. Global liquidity increases are referred to as the push factors since lower returns in financially mature countries push excess liquidity to emerging market economies. Push factors may be proxied by indicator variables for global liquidity availability such as the U.S. federal funds target rate<sup>5</sup> or the volatility of the difference between the U.S. federal funds rate and U.S. treasury bill yields. We next examine the determinants of Turkish sovereign spreads according to two criteria; pull factors and push factors.

## **2.1 Pull Factors**

Pull factors are proxied in two different categories: sovereign credit ratings and country-specific fundamentals.

We first use Turkish sovereign credit rating obtained from Standard and Poor’s. As can be seen from Table 2, Turkey’s first rating was assigned in May 1992 and is the best rating in Turkey’s credit rating history.

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<sup>5</sup>The federal funds rate is the interest rate at which depository institutions lend balances at the U.S. Federal Reserve to other depository institutions overnight.

Insert Table 2 here

Following Sy(2003), as can be seen from Table 3 we first translate the rating scale into an index spanning from 1 to 58 by treating changes in outlook as intermediate steps between two ratings.

Insert Table 3 here

Next, we use a logit-type transformation of this index to account for possible nonlinearities in the rating scale.

$$L_t = \ln\left(\frac{I_t}{59 - I_t}\right)$$

where  $I_t$  is the rating index assigned by Standard and Poor's. Figure 2 represents Turkish credit ratings after logistic transformation.

Insert Table 3 and Figure 2 here

Next we explore different country specific fundamentals in explaining the movements in Turkish sovereign spreads. <sup>6</sup>

Country-specific fundamentals are obtained from the Central Bank of the Republic of Turkey and the Turkish Treasury. First, we consider the money market

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<sup>6</sup>We do not include credit ratings and country-specific fundamentals in the same regression because of multicollinearity. Cantor and Packer (1996) report that per capita income, GDP growth, inflation, fiscal balance, external debt, indicator for economic development and indicator for default history can explain the 90 % variability in sovereign credit ratings. Besides these, there is also evidence that the sovereign ratings are the key determinants of the pricing of sovereign bonds and that sovereign spreads incorporate market participants' views of expected rating agencies. (Sy, 2001)

liquidity conditions of Turkey. We have two indicators for it: foreign exchange reserves per short-term debt and foreign exchange reserves per monetary base. As can be seen in Figure 3, before the crises in 2001, the foreign exchange reserves of Turkey were negative (in natural logarithms) which may be considered as a signal of crisis.

Insert Figure 3 here

Although it appears that Turkey achieved macroeconomic stability, as can be seen from Figure 4, there is a widening trend in the current account deficit. Akcay and Ucer (2006) argues that this increase in current account deficit seems to be driven by investment (rather than consumption).

Insert Figure 4 here

In order to account for the importance of current account dynamics, we use current account balance per GDP as a proxy for it. Besides current account per GDP, we also control for import volume, export volume and consumer price index based real exchange rate. They are seasonally adjusted and detrended by using Hodrick-Prescott filter.

In order to account for fiscal discipline we use budget balance per GDP. In 2001 Turkey's financial position was very vulnerable to disturbances in the economy, because of government policies and weak financial regulations. Continuous fiscal discipline with the decline in the interest rates in mature markets helped

Turkey to reduce the burden of expenses. As it can be seen from Figure 5, deficit in the budget began to decline.

Insert Figure 5 here

When one consider the level rate of inflation, Turkey has achieved considerable progress since 2001. This progress can be explained by the implementation of the IMF stabilization program and the increased confidence in the economy. Investors might have a forward looking behavior thus, we control the effects of expected inflation on Turkey's country risk.

Additionally, seasonally adjusted and detrended closing prices of Istanbul Stock Exchange (ISE) market and banks credits per monetary base are included. Higher ISE prices indicate increased confidence of investors in the Turkish economy and higher bank credits indicate a sound macroeconomic environment for investment.

In recent decade, Turkey experienced two balance of payment crises. The crises period are proxied by the use of a dummy variable constructed as follows: when Turkey's EMBI+ spread exceeds 1000 bps in a given month dummy variable takes the value one, otherwise takes zero. From September 1997 through June 2006, the dummy variable takes on the value one for three months: April, July and August 2001.

## 2.2 Push Factors

Global liquidity conditions influence the sovereign spreads in an environment of increased globalization. From the beginning of the 1990s emerging markets became more dependent to changes in the U.S. monetary policy, because of its weight in the mature financial markets, political and economic power in the world. There are two categories that explain so-called push factors. First category is the volatility of the U.S. monetary policy actions, and the second category is the level of the U.S. monetary policy actions.

Following Arora and Cerisola (2001) and GFSR (2004), one may proxy the level of the U.S. monetary policy actions by effective federal funds rate. However, this methodology may not be adequate. For instance, in May 2004 Federal Reserve Open Market Committee (FOMC) held a regular meeting.<sup>7</sup> There was no change in the target federal funds rate however in the minutes of that meeting a future increase in target federal funds rate was implied. As can be seen from Figure 6, after following the release of the meeting EMBI+ Composite Index rised sharply. However, this rise cannot be captured by current effective federal funds rate. Thus we look for another variable that captures the forward looking behavior of the investors.

Insert Figure 6 here

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<sup>7</sup>The FOMC holds eight regularly scheduled meetings per year. At these meetings, the Committee reviews economic and financial conditions, and determines the appropriate stance of monetary policy.

The “news effects” literature, including Rudebusch (1998) and Gurkaynak (2005), decomposes the changes in the target federal funds rate into two: anticipated and unanticipated component. Kuttner (2001) estimates the impact of monetary policy actions on bill, note and bond yields, using data from the futures market<sup>8</sup>, and reports that interest rates’ response to anticipated target rate change is small, while their response to unanticipated change is positive and highly significant. This implies that the interest rates’ response to the “surprise” component of Fed policy is significantly stronger than the response to the change in the target itself. Following methodology of Kuttner (2001) and Rudebusch (1998) we extract the anticipated and unanticipated components of the U.S. monetary policy as follows.

The federal funds futures contracts’ settlement price is determined by the monthly average funds rate, rather than the rate on a certain day. The difference between the average effective federal funds rate in month  $s$  and the one-month futures rate on the last day of month  $s-1$  can be treated as the “surprise”. The unanticipated change in the funds rate may be defined as the average effective federal funds rate in month  $s$ , minus the 1-month futures rate on the last day of previous month

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<sup>8</sup>Federal funds futures have traded on the Chicago Board of Trade since October 1988 and settle based on the average effective federal funds rate that is realized for the calendar month specified in the contract. Thus, daily changes in the current-month futures rate largely reflect the revisions to the market’s expectations for the federal funds rate over the remainder of the month.

$$\bar{\Delta} \tilde{r}_s^u \equiv \frac{1}{m} \sum_{i \in s} \tilde{r}_i - f_{s-1,m}^1$$

and the anticipated change in the funds rate is:

$$\bar{\Delta} \tilde{r}_s^a \equiv f_{s-1,m}^1 - \tilde{r}_{s-1,m}$$

In these two equations we use  $\bar{\Delta}$  is used to refer to the change from the last day of month  $s-1$  to the average of month  $s$ .

The sum of these two anticipated and unanticipated components is the average federal funds rate in month  $s$  minus the federal funds rate on the last day of month  $s-1$ .

The second category that explain the push factors is the volatility measure. There are different methods in modelling the volatility in mature financial markets. For instance, Arora and Cerisola (2001) prefer the ARCH model developed by Engle (1982) since, within month based and six-month moving averages between the yield on 3-month U.S. treasury bill and the U.S. federal funds rate have some constraints and limitations.<sup>9</sup> Thus, Arora and Cerisola (2001) prefer to use the fitted values for the conditional standard error from an ARCH model spread between the yield on the three-month U.S. treasury bill and the U.S. federal funds rate in order to avoid these constraints and limitations. The ARCH model is very useful because it captures persistence in volatility. In addition to

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<sup>9</sup>Within month based volatility measure may not capture heightened uncertainty about the expected stance of the U.S. monetary policy. Six-month moving average volatility measure leads to strong autocorrelation.

ARCH based volatility measure, following GFSR (2004) and (2006) we use VIX which is the volatility implied by the options contracts on the S&P's 500 index, obtained from the Chicago Board of Exchange. The results are similar, but we presents the results for use VIX since it is the volatility of the global economy not the volatility of the difference between two interest rates.

Figure 7 shows the level of the global liquidity conditions. As can be observed from Figure 7, in 2001 the unanticipated component is more volatile, this is due to three unscheduled FOMC meetings in that year.

Insert Figure 7 here

### 3 Estimation Results

We model the Turkish sovereign spreads, as a linear function of pull and push factors and crisis dummy as follows:

$$spread_t = \alpha + \beta x_t^1 + \delta x_t^2 + \theta dummy_t + \epsilon_t \quad (1)$$

In the first model  $x_t^1$  compose of a single variable which is Turkish credit ratings and in the second model  $x_t^1$  is a vector containing country-specific fundamentals. The monthly estimation results from September 1997 to December 2005 in these two models are given in Table 4.

Insert Table 4 here

In the first model, we regress natural logarithms of Turkish sovereign spreads on anticipated and unanticipated components of the U.S. monetary policy, VIX, credit ratings of Turkey and a crisis dummy.

In the second model, we regress Turkish sovereign spreads on anticipated and unanticipated components of the U.S. monetary policy, VIX, current account per GDP, reserves per short-term debt, Istanbul Stock Exchange market closing prices in terms of U.S. dollars, credits of banks per monetary base, budget balance per GDP, inflation rate and crisis dummy.

We first analyze the importance of pull factors in determining the movements in Turkish sovereign spreads by using credit ratings. The estimated coefficient

of credit ratings is negative and statistically significant. This result is consistent with Sy (2001); the higher Turkey's credit ratings the lower the probability of default. We then analyze the importance of pull factors in determining the movements in Turkish sovereign spreads by using number of macroeconomic variables. Foreign exchange reserves per short-term debt, which is a proxy for money market liquidity conditions of Turkey, has a negative and significant sign. One standard deviation improvement in Turkey's foreign exchange reserves per short-term debt lowers the spread by 8 percent of the prevailing level. Higher reserves mean increased liquidity and this lowers the probability of non-repayment. The coefficient of bank credits per monetary base is negative and significant. Higher bank credits imply increase in the investment incentives within the country, therefore they are negatively related with spreads. Higher budget balance may be interpreted as the case in which the government has the ability to tax the citizens to cover its expenses or debts. One standard deviation improvement in budget balance per GDP reduces the spread 26 percent. Thus, a prudent fiscal policy in Turkey lowers Turkish sovereign spreads.

In order to include current account dynamics into the model we first use current account per GDP. A large current account deficit indicates that the public and private sectors have excess demands for loanable funds which should be financed from abroad. One standard deviation improvement in current account reduces the spreads by 18 percent from their prevailing level. Alternatively, we

use import volume, export volume and real exchange rate in our estimations. Our estimation results neither improved nor deteriorated.

We assume investors have forward looking behavior and used not only current and lagged values but also future values of inflation rate in our estimations. By using *exposed* inflation rate we are assuming perfect foresight on behalf of investors. Higher future inflation is related with loose monetary policy or imprudent fiscal behavior and hence expected to increase the spreads. Indeed, we observe one percent increase in 6-month by future inflation increased the Turkish sovereign spreads by 6 percent. In order to include other political and economic factors we use ISE values. Increase in ISE closing prices by one percent decreases the Turkish sovereign spreads by 5 percent.

In Figure 9 we plot the estimated spreads by using only fundamentals (excluding global liquidity conditions) and actual spreads. In general, as can be observed from Figure 9 fundamentals move together with the actual spreads. It is interesting to note that in 2002 fundamentals decline prior to the actual spreads.

Insert Figure 9 here

We next analyze push factors by using anticipated, unanticipated components of U.S. target federal funds rate change and VIX. In both of these two models, VIX is positive and significant. Higher volatility of the global liquidity conditions

implies worsening global liquidity conditions and results in increase in spreads.

In order to account for the level of global liquidity conditions, we first use effective federal funds rate as the only indicator for the level of the U.S. monetary policy actions. Similar to previous studies we note that effective federal funds rate is not a significant factor in determining Turkish bond spreads. Instead of effective federal funds we also use the anticipated and unanticipated components of the target federal funds rate changes as discussed in previous section. However we see that both these components are also insignificant as determining Turkish sovereign spreads. We attempt to analyze this surprising result in Appendix.

In Figure 10, we plot the estimated spread by using global liquidity conditions and actual spreads. It is important to note that estimated spread is more volatile than the actual spread. Global liquidity conditions at the beginning of 2003 decline prior to actual spreads.

Insert Figure 10 here

As stated above, we proxy the level of global liquidity conditions by the anticipated and unanticipated components of the U.S. target federal funds rate changes. This methodology may be considered backward looking since the unanticipated component in this month is the difference between the realized and expected of the previous month.<sup>10</sup> To include a forward looking structure into

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<sup>10</sup>We also use anticipated and unanticipated components with  $t+1$  and  $t+2$  to account for forward looking methodology, but they are still insignificant.

the model, we also use spot-month, 1-month, 2-month, 3-month ahead futures rate as a proxy for the “anticipated” component of the U.S. target federal funds rate change and *exposed* effective federal funds rate as the actual component of the U.S. target federal funds rate change. The difference between actual and anticipated component is the “surprise”. Alternatively, we use monthly changes in federal funds futures rate for various horizons and effective federal funds rate. None of these variables seem to explain movements in sovereign spreads. The rationale behind this may be explained in three ways: first, this may be specific to Turkish spreads, second, risk-free rate may not respond to unanticipated component of the U.S. target federal funds rate change and third, spreads may not respond to risk-free rate.

To understand whether this result is specific to Turkish spreads or not, we extend Kuttner’s (2001) methodology to 15 emerging market countries. By replicating Kuttner’s (2001) methodology, we show the anticipated and unanticipated components of the U.S. target federal funds rate do not matter in explaining the movements in 10 year U.S. treasury bill rate from 1998 through 2005. This is the period of our analysis, since EMBI+ is not available prior to this date.

To conclude, although the increase in estimated spreads from Model 2 is greater than the increase in actual spreads in 2001, as can be seen from Figure 11 the model appears to follow the general movement of actual spreads.

Insert Figure 11 here

## 4 Panel Estimation

Recent papers on sovereign spreads use panel estimation methodology, like GFSR (2004) and GSFR (2006). They use a panel of 17 emerging market countries. GFSR (2004) proxy country-specific fundamentals by S&P's and Moody's credit ratings, whereas GFSR (2006) use political, economic and financial risk ratings. In considering the level of global liquidity conditions, GFSR (2004) proxies it by using 3-month LIBOR rate whereas GFSR (2006) uses by 3-month ahead federal funds futures rate and volatility between 3-month ahead federal funds futures rate and target federal funds rate. The former study reveals that the response of sovereign spreads to 3-month LIBOR rate is positive and significant. The latter study uncovers that 3-month ahead and volatility between 3-month ahead federal funds futures rate and target federal funds rate are positive and significant. Both of these two papers proxy the volatility of global liquidity conditions through the inclusion of VIX.

In this section, we also explore the importance of the U.S. monetary policy surprises in explaining movements in the emerging markets' sovereign spreads by using a monthly unbalanced panel data for 15 countries<sup>11</sup> for 1997-2005. Similar to the analysis in the previous section we use U.S. target federal funds rate changes into its anticipated and unanticipated components. We also use

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<sup>11</sup>These countries are Argentina, Brazil, Bulgaria, Columbia, Venezuela, Morocco, Mexico, Panama, Peru, Poland, Philippines, Ecuador, South Africa, Russia and Turkey.

the credit ratings of each of the fifteen countries to control for country specific fundamentals.

We estimate the following linear model to explain changes in emerging market sovereign spreads:

$$spread_{it} = \alpha_i + \gamma z_{it} + \beta x_t + \epsilon_{it} \quad (2)$$

for  $i=1,2,\dots,15$  countries and  $t$  is from September 1997 to December 2005 giving a total unbalanced panel of 1262 observations.  $x$  is a vector of variables used to proxy the global liquidity conditions. These variables include the anticipated and the unanticipated components of the U.S. monetary policy and VIX.  $z$  is the credit ratings of 15 emerging markets. All variables are expressed in natural logarithms.

Table 5 presents the regression results of unbalanced panel estimation of 15 emerging market countries under common and fixed effects models.

Insert Table 5 here

The first column in Table 5 reports the regression results from a model with a common intercept i.e.,  $\alpha_i=\alpha$ , across all countries. All variables are statistically significant, but anticipated and unanticipated components' have inverse signs what we expected. Next, we estimate model and conclude the presence fixed effects, i.e., intercepts differ according to each cross-sectional unit. By

employing cross section SUR weighted least squares, which is a feasible GLS estimator, we correct both cross-section heteroskedasticity and contemporaneous correlation. The results are given in Table 5 column 2. The second column uses the anticipated and the unanticipated components of the U.S. monetary policy, VIX and credit ratings under fixed effects. We observe that it is the volatility measure that matters for the spreads and not the anticipated and unanticipated components<sup>12</sup>.

Table 6 represents the risk premium of each emerging market in our sample in fixed effects model.

Insert Table 6 here

In the fixed effects model, the lower constant term indicates a lower risk premium. In our sample, Poland has the negative and the lowest constant term, and it is consistent with the high credit ratings of Poland.

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<sup>12</sup>Following IMF-GFSR (2006), we also estimate 15 emerging markets' sovereign spreads on VIX, 3-month ahead federal funds futures rate, volatility of 3-month ahead federal funds futures rate minus target federal funds rate and their credit ratings. Our estimation results reveal that only the credit ratings and VIX matter in explaining the movements in emerging markets sovereign spreads under the presence of fixed effects.

## 5 Conclusion

This thesis presents empirical evidence about the determinants of Turkey's and emerging markets' sovereign risk which are proxied by J.P. Morgan's EMBI+ country spreads. First, we analyze the determinants of Turkish spreads in two parts: country-specific fundamentals labelled the pull factors, and market sentiment or global liquidity, labelled the push factors. Country-specific fundamentals are considered under two categories; one is the credit ratings and the other is the proxies for liquidity conditions, current account dynamics and the fiscal discipline as well as other macroeconomic and political factors. Similarly, global liquidity conditions are considered in two parts: level and volatility of the global liquidity conditions. Earlier literature on sovereign spreads, such as IMF' Global Financial Stability Report (2004) and Arora and Cerisola (2001), proxy the level of global liquidity conditions by short-term U.S. interest rates, such as 3-month LIBOR rate and effective federal funds rate. Following new literature on news effects, such as Rudebusch (1998), and Kuttner (2001), we attempt to capture the level of liquidity conditions by decomposing the U.S. target federal funds rate change into its anticipated and unanticipated components, and the volatility of global liquidity conditions is captured by using VIX which is the volatility implied by the options contracts on the S&P's 500 index .

Our results conform the previous studies on credit ratings and point out the

indirect relationship between sovereign spreads and credit ratings. Among country specific fundamentals, higher current account deficit per GDP in Turkey is found to increase the sovereign spreads. Also, money market liquidity conditions matter in pricing the Turkish Eurobonds. Higher foreign exchange reserve per short term debt decreases the sovereign spreads. Budget balance which is a proxy for fiscal discipline is also important in determining the spreads. Higher fiscal discipline which can be related to fiscal stability reduces the Turkish spreads. Increased future inflation increases the spreads. In analyzing the determinants of Turkish sovereign spreads, our estimation results reveal that anticipated and unanticipated components of the U.S. target federal funds rate change do not seem to matter.

This thesis also explores the relative importance of global liquidity conditions and country-specific fundamentals, proxied by credit ratings, in explaining the sovereign risk in emerging markets, by using the unbalanced panel estimation methodology. Under the presence of fixed effects, our analysis reveals that it is the volatility of the global liquidity conditions and sovereign credit ratings that are important, as we have found in the Turkish case.

We also analyze the response of the U.S. bond yields and asset prices to the unanticipated component of the U.S. monetary policy actions. This is an important issue to understand why we cannot find a significant relation between sovereign spreads and the unanticipated component. We use rolling regressions,

recursive regressions with fixed final date and recursive regression with fixed initial date by using the change in 10 year U.S. treasury bill as the dependent variable in order find out the timing of the structural break. Our monthly and daily observations reveal that there is a structural break at the beginning of the 1990s.

Prior to 1994, FOMC did not announce any changes at the time they are made. Market participants inferred the changes from the type of open-market operation and the level of federal funds rate. After February 1994, FOMC began to announce the changes in their policy. Moreover, after February 2000, they began to comment on their future policy.

To conclude, this thesis reveals that in pricing the sovereign risk in Turkey and in other emerging markets, country-specific fundamentals and the volatility of global liquidity conditions are important.

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# A Appendix

## A.1 Rolling Regressions

As stated in section 2, interest rate spread is a measure of sovereign risk and is defined as the difference between the rate of return on risky asset and risk-free asset. In our study, risk-free rate is proxied by the 10 year U.S. treasury bill rate. The rationale for this can be explained as follows: if as a result of an increase in the target federal funds rate 10 year U.S. treasury bill rate goes up, this implies a rise in risk-free asset which then implies increase in sovereign spreads. However, effective federal funds rate is not robust in considering the significance of the unanticipated components. However this does not hold. In the thesis we attempt to incorporate the previous empirical literature on sovereign spreads by incorporating anticipated and unanticipated components of U.S. target federal funds rate changes rather than effective federal funds rate perse. The motivation for this approach is given in the recent new literature, Rudebusch (1998), Kuttner (2001), and Gurkaynak (2005). We decompose U.S. monetary policy actions into its anticipated and unanticipated components by using effective federal funds rate and federal funds futures rate. Kuttner (2001) reveals that the response of 10 year U.S. treasury bill rate to the unanticipated component is positive and significant between June 1989 and January 2000. However, as stated in Section 3 and 4, the response of Turkish sovereign spreads as well as 15 emerging

market sovereign spreads to the unanticipated and anticipated component of the U.S. target federal funds rate change is insignificant. Therefore, we check for the link between the unanticipated component and 10 year U.S. treasury bill rate. In our estimations from 1998 through 2005, the change in 10 year U.S. treasury bill rate does not respond to the unanticipated component of the U.S. monetary policy actions. To understand when the unanticipated component becomes insignificant in explaining the changes in 10 year U.S. treasury bill rate, we perform rolling regressions with fixed window length, fixed end point and fixed starting point. We estimate following regression in equation 3,

$$\bar{\Delta}R_s = \alpha + \gamma\bar{\Delta}r_s^a + \beta\bar{\Delta}r_s^u + \epsilon_t \quad (3)$$

where  $\bar{\Delta}R_s$  is the change in 10 year treasury bill rate, and  $\bar{\Delta}r_s^a$  is the anticipated component and  $\bar{\Delta}r_s^u$  is the unanticipated component.

We first run rolling and recursive regressions with monthly observations, second we use the same methodology with daily observations, specifically on *target rate change FOMC meeting days*.

### A.1.1 Rolling and Recursive Regressions, Monthly Observations

First, we replicate Kuttner (2001) by using the change in 10 year U.S. treasury bill rate<sup>13,14</sup> as the dependent variable from June 1989 through January 2000.

The estimated coefficients are as follows:

$$\widehat{\bar{\Delta}R_s} = 0.01 + 0.03\bar{\Delta}r_s^a + 0.44\bar{\Delta}r_s^u \quad (4)$$

In equation 3, only the unanticipated component is significant. However, estimation results in equation 4 that is from September 1998 through December 2005 reveals that both the anticipated and unanticipated components are insignificant.

$$\widehat{\bar{\Delta}R_s} = 0.004 - 0.002\bar{\Delta}r_s^a - 0.204\bar{\Delta}r_s^u \quad (5)$$

We start from June 1989 and January 2000, and then roll the regression over the entire sample with fixed window length of 128 observations. As can be observed from Figure 11, the anticipated component is insignificant, but the unanticipated component becomes insignificant after removing July 1991 and adding February 2002. Moreover, the estimated coefficient of the unanticipated component declines as the window moves. We estimate from June 1989 through January 2000, the coefficient of the unanticipated component is about 4 percent, but from May 1995 through December 2005, it declines to -1.2 percent.

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<sup>13</sup>Rather than using the level of 10-year U.S. treasury bill, Kuttner (2001) prefers to use its change, since monthly averaging of federal funds rate understates the “true” surprise.

<sup>14</sup>Change in 10-year treasury bill rate is defined as:  $\bar{\Delta}R_s \equiv \frac{1}{m} \sum_{i \in s} R_i - R_{s-1, m}$  ,

Insert Figure 11 here

Next, we reduce the window size to 7 years which includes 85 monthly observations, and replicate the monthly methodology. First, regression is from June 1989 through June 1996. By keeping the sample size fixed, we roll the regression over the entire sample. Figure 12 reveals after removing October 1992 and adding October 1999, the unanticipated component becomes insignificant.

Insert Figure 12 here

Next, we reduce the window size to 5 years which includes 61 observations and replicate the monthly methodology. Figure 13 states that after rolling the regression from September 1993 through September 1998, the unanticipated component becomes insignificant.

Insert Figure 13 here

These regression results do not provide enough information on whether adding the observation at the end of the 1990s or removing the observation from the beginning of the 1990s makes the unanticipated component insignificant. Therefore, we estimate recursive regressions with a fixed end date and fixed starting point.

We first estimate recursive window with fixed end date. Our first regression is between June 1989 and December 2005. Our sample moves forward and we

remove one observation from the starting point until September 1998 and its size is not fixed. As can be observed from Figure 14, the unanticipated component becomes insignificant after removing the observation in September 1990.

Insert Figure 14 here

Second, we use the recursive window with a fixed starting date. Our sample starts in June 1989 and ends in January 2000. The sample moves forward and its size is not fixed. As can be observed from Figure 15, the unanticipated component is always significant, whereas the anticipated component is insignificant.

Insert Figure 15 here

Monthly observation results show that removing the data before 1994 makes the unanticipated component insignificant. Before 1994, FOMC did not announce any policy changes. After February 1994, they began to announce any policy changes, then investors became more informed. This policy change reduces the significance of the unanticipated component.

### **A.1.2 Rolling and Recursive Regressions, Daily Observations**

Following Kuttner's (2001) daily methodology, we also analyze the one-day response of interest rates to changes in federal funds target rate. As we can see from Table 7, there are 42 target rate changes from June 1989 through February 2000. In daily methodology, one day surprise is the difference between the spot-month

futures rate on the FOMC meeting day whereas the anticipated component is the difference between the target rate change and unanticipated change.<sup>15</sup>

There are 70 target rate changes from June 1989 through December 2005. We start our daily regressions from June 1989 through February 2000. Then we roll the regression by keeping the sample size fixed. As can be seen from Figure 16, the unanticipated component becomes insignificant after January 3, 2001.

Insert Figure 16 here

Then we use a recursive window with a fixed final date. Our sample starts on September 29, 1998 and ends on December 13, 2005. The sample moves backward and its size is not fixed. As can be observed from Figure 17, both the unanticipated and anticipated components are insignificant.

Insert Figure 17 here

We also use a recursive window with a fixed initial date. Our sample starts on June 6, 1989 and ends on February 2, 2000. The sample moves forward and its size is not fixed. As can be observed from Figure 18, the unanticipated component becomes significant after adding the third observation which corresponds to January 3, 2001.

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<sup>15</sup>When the change comes on the first day of the month, then the difference between spot-month futures rate and one-month ahead futures rate is used. When the change comes on the last day of the month, it would have no effect on that month's spot rate, thus the difference in one-month futures rate must be used.

Insert Figure 18 here

Daily observation results show that adding observations after the beginning of the 2000s makes the unanticipated component insignificant. This result is not robust with monthly estimation results.

We first check to see whether there is a structural break in February 1994, since this the change in the FOMC policy in releasing the statement. Prior to 1994, FOMC did not announce any policy change, but after February 1994 they began to release a statement about the meeting. In 2000, they changed their policy again and they began to announce the future policy of FOMC meetings. Hence, we perform Chow tests to confirm that there is a structural break in the data after February, 1994 and 2000. First, we consider intercepts and estimated coefficients of anticipated components do not differ in subperiods and estimated coefficients of unanticipated component differ. Then, we consider intercepts do not differ but estimated coefficients of anticipated and unanticipated components differ. We find out that the test results do not differ, hence we prefer to use the restricted model: intercepts and estimated coefficients of anticipated components do not differ in subperiods and estimated coefficients of unanticipated component differ. As can be seen from Table 8, Chow test results confirm that there is no structural break in the data after February 2000 however there is a structural break in February 1994. We also impose Chow test to the regression from March 1994 through December 2005, and we see that there is no structural break in

February 2000.

Insert Table 8 here

To conclude, removing the data before 1994 makes the unanticipated component insignificant.

## Figures

Figure 1: EMBI+ and Turkish Bond Spreads: 1998:01-2006:05

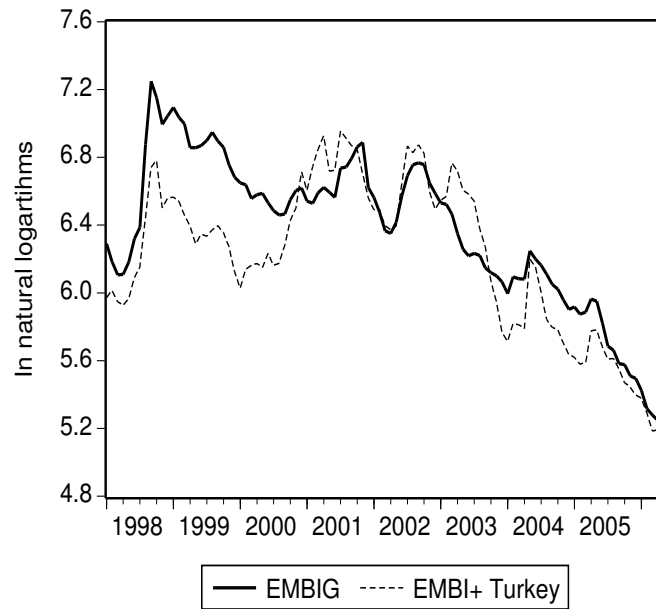


Figure 2: Standard and Poors' Credit Ratings for Turkey: 1997:09-2006:06

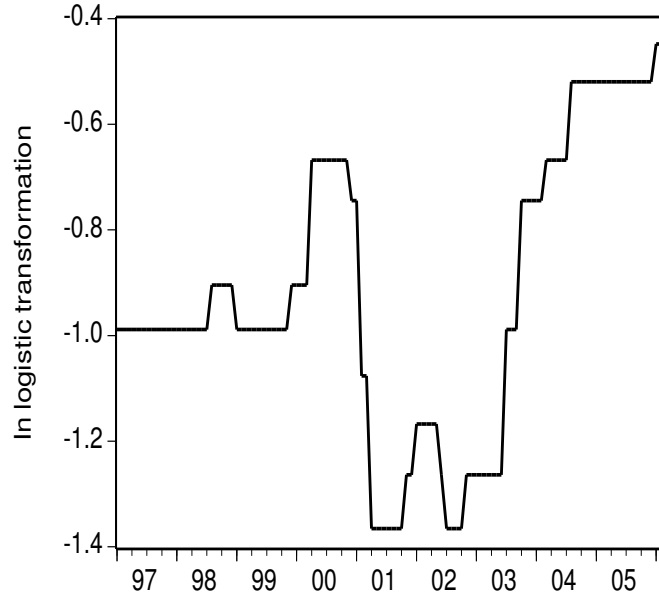


Figure 3: Turkey's Foreign Exchange Reserves per Short Term Debt: 1997:09-2006:03

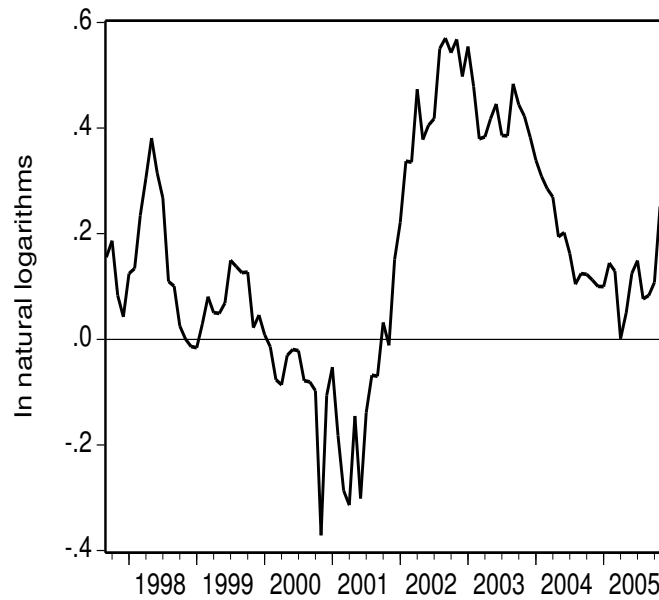


Figure 4: Turkey's Current Account Balance per GDP: 1997:09-2006:03

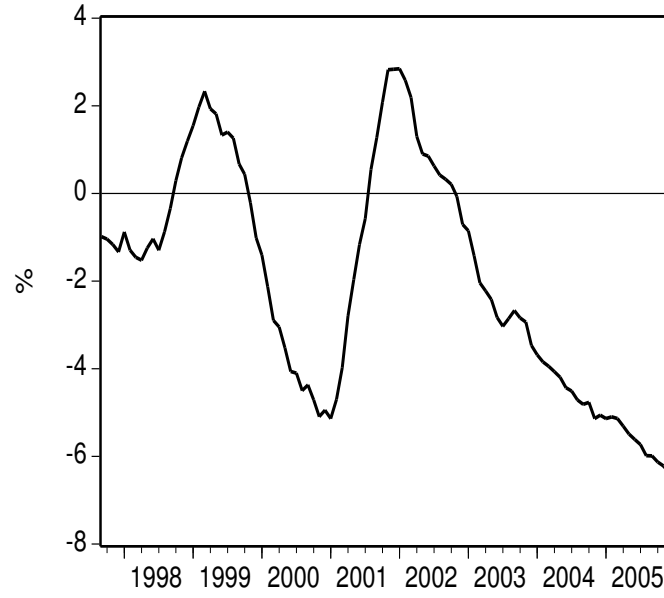


Figure 5: Turkey's Budget Balance per GDP: 1997:09-2006:03

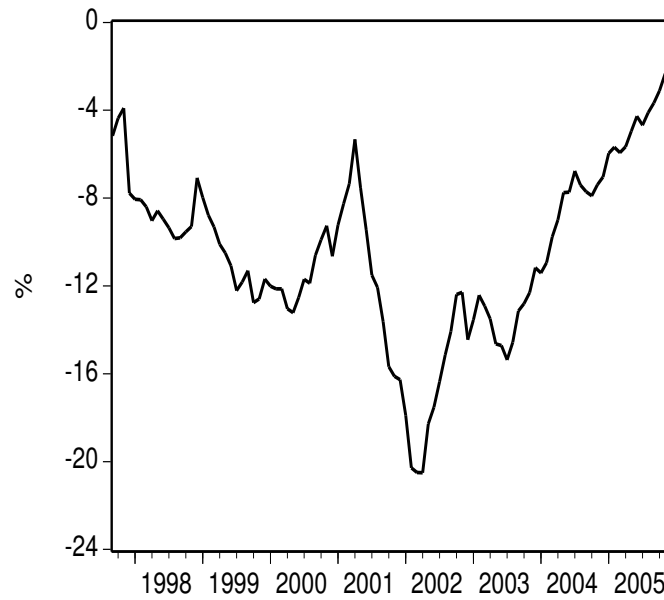


Figure 6: Federal Funds Rate and EMBI+ Composite Index in 2004

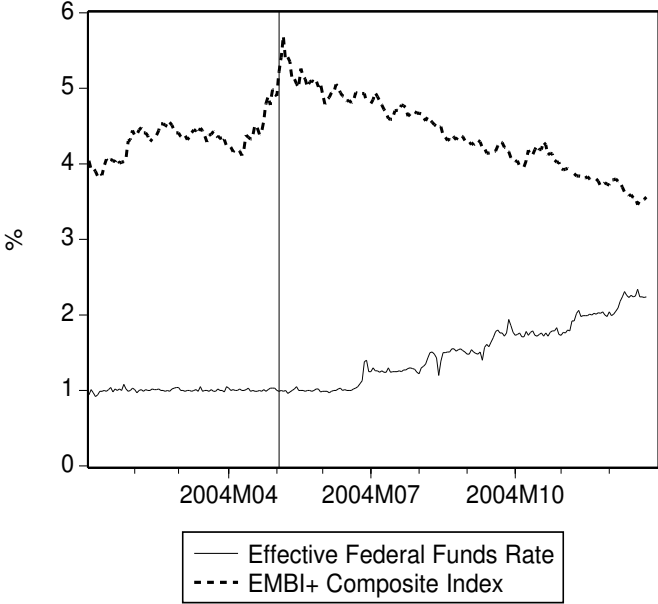


Figure 7: Global Liquidity Measures Level Variables: 1997:09-2005:12

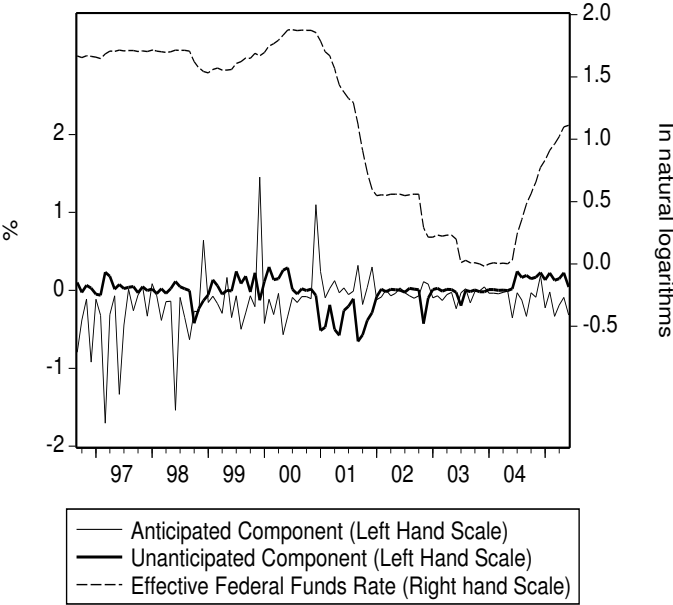


Figure 8: Actual and Estimated EMBI+ Turkey (Fundamentals): 1997:09-2005:12

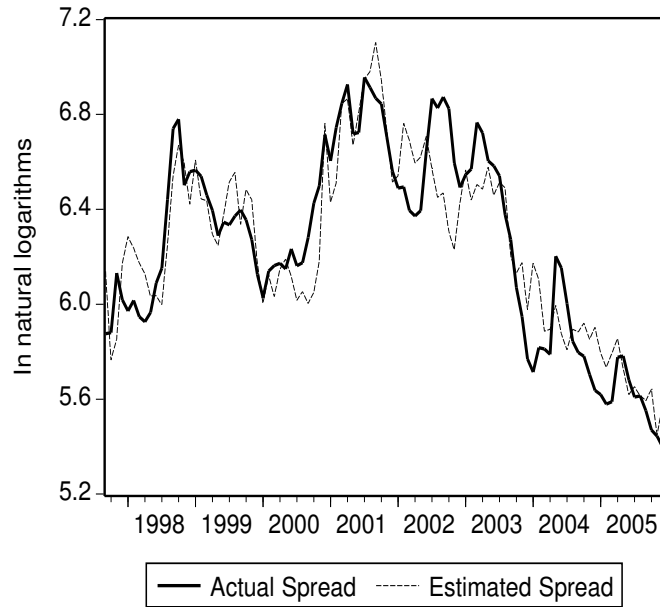


Figure 9: Actual and Estimated EMBI+ Turkey (Global Liquidity): 1997:09-2005:12

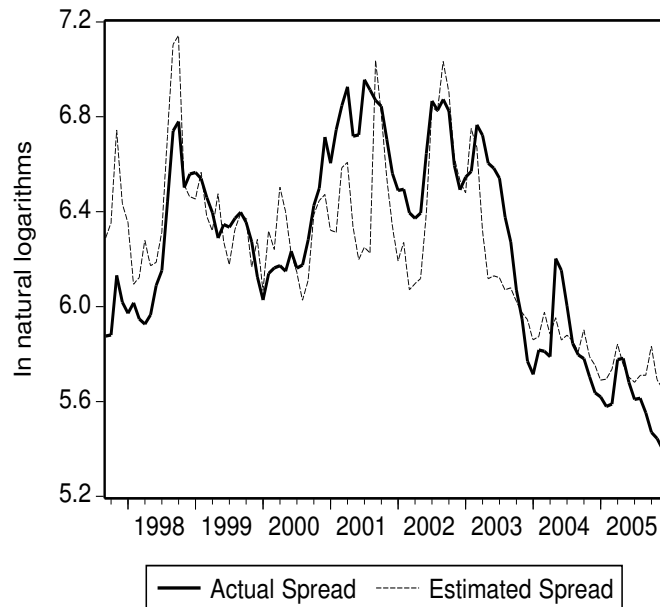


Figure 10: Actual and Estimated EMBI+ Turkey: 1997:09-2005:12

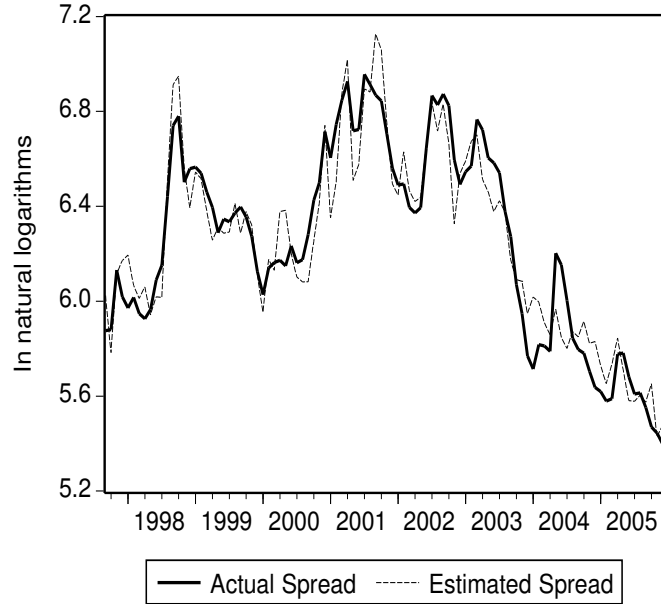


Figure 11: Rolling Regressions with Window Size of 11 years, Monthly Observations

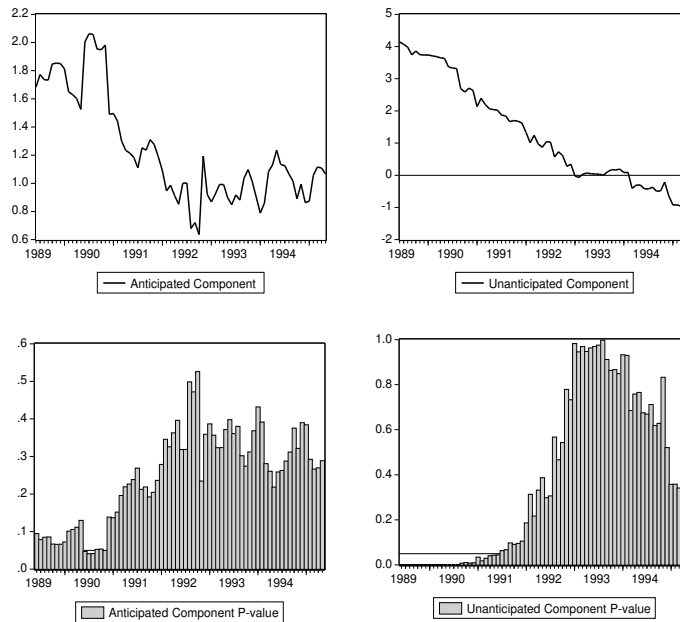


Figure 12: Rolling Regressions with Window Size of 7 years, Monthly Observations

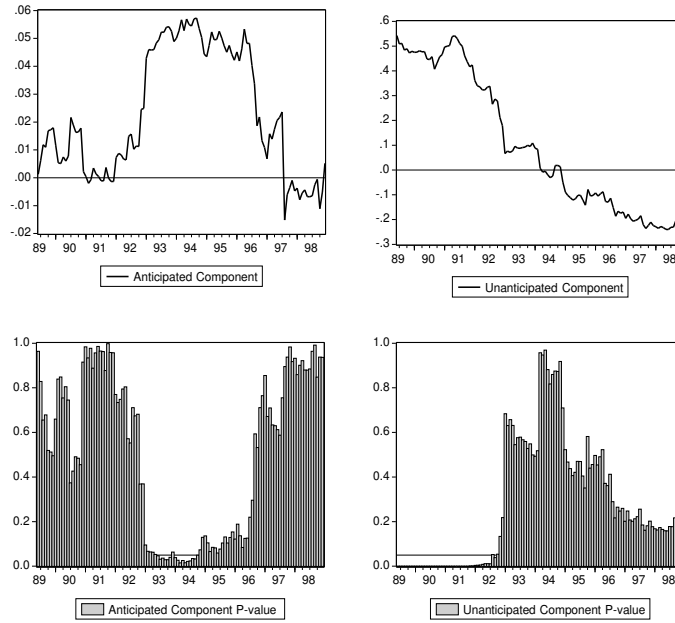


Figure 13: Rolling Regressions with Window Size of 5 years, Monthly Observations

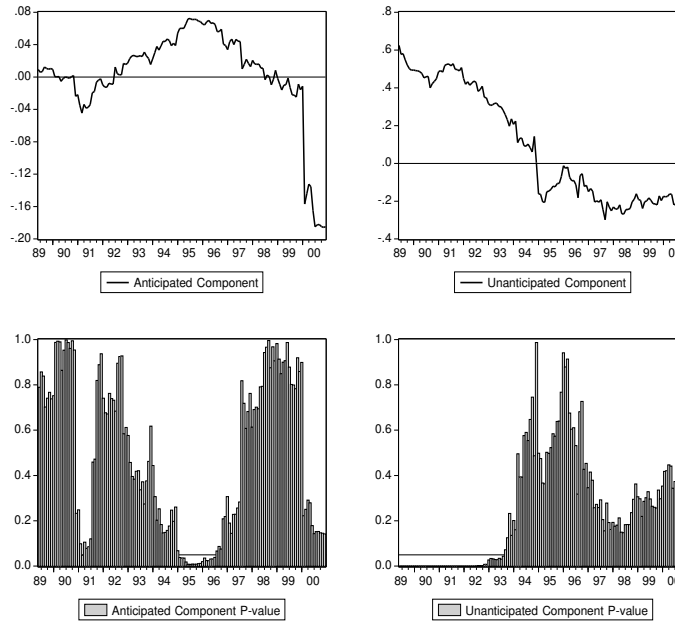


Figure 14: Recursive Regressions with Fixed End Date, Monthly Observations

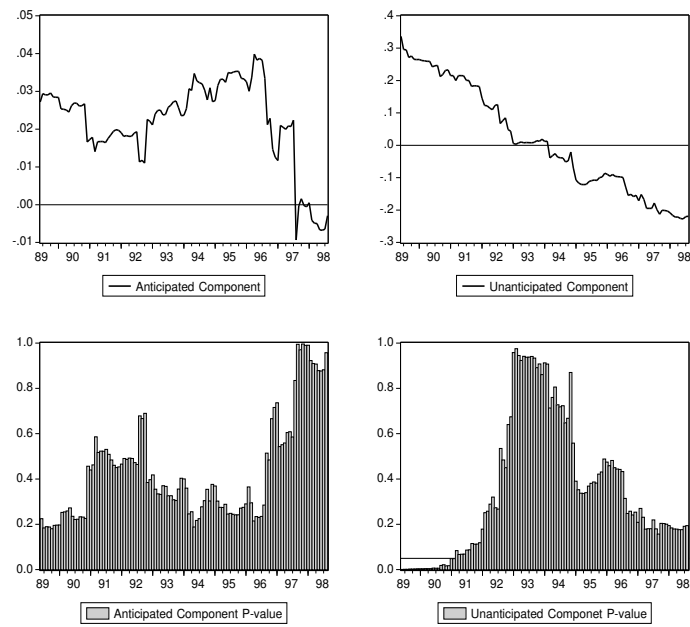


Figure 15: Recursive Regressions with Fixed Starting Date, Monthly Observations

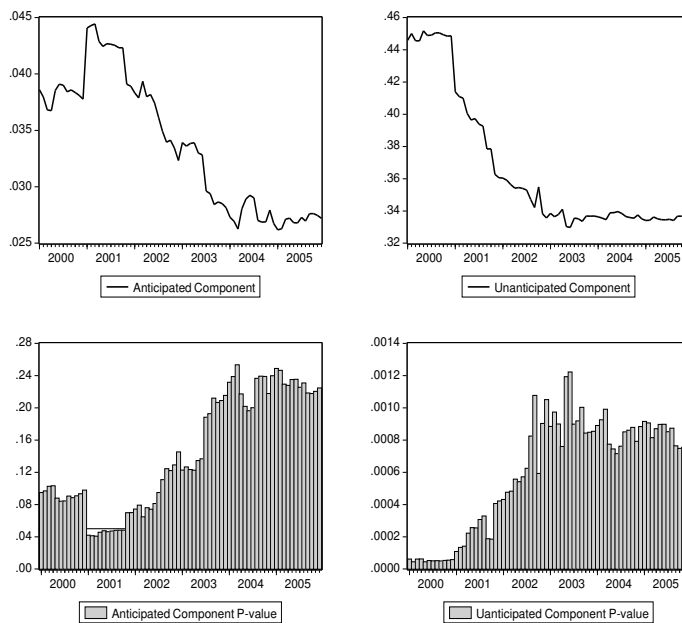


Figure 16: Rolling Regressions with Window Size of 42 Daily Observations

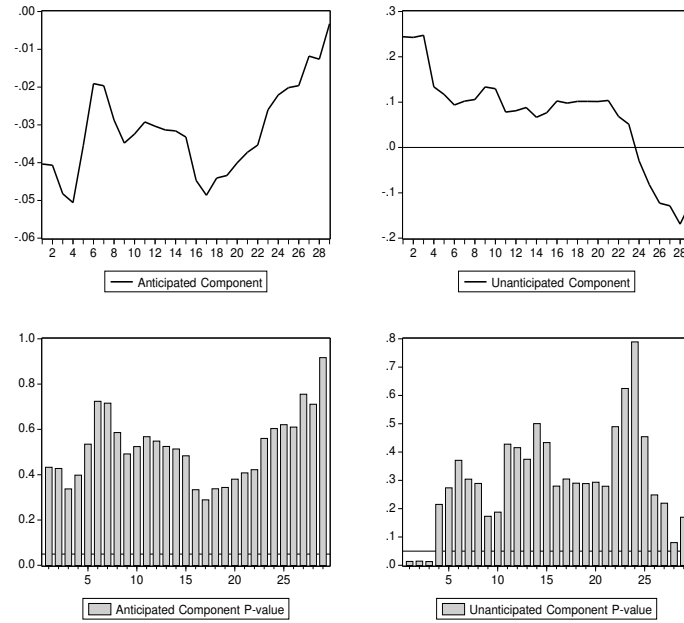


Figure 17: Recursive Regressions with Fixed End Date, Daily Observations

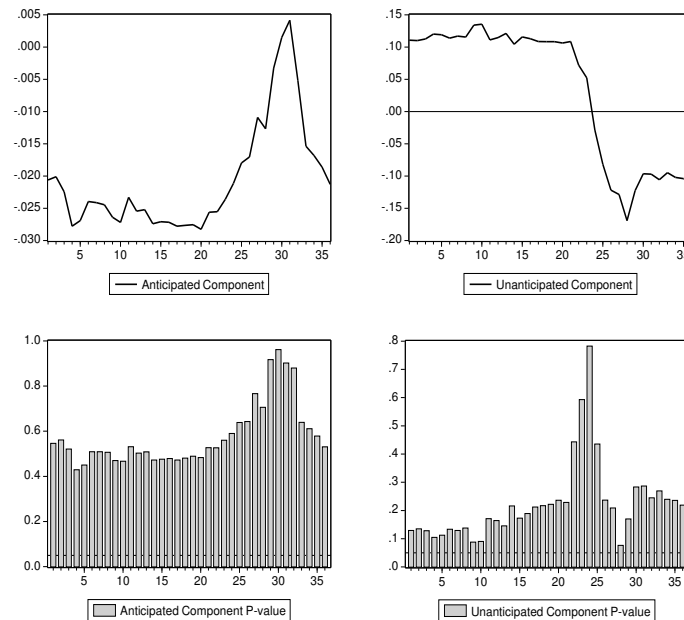
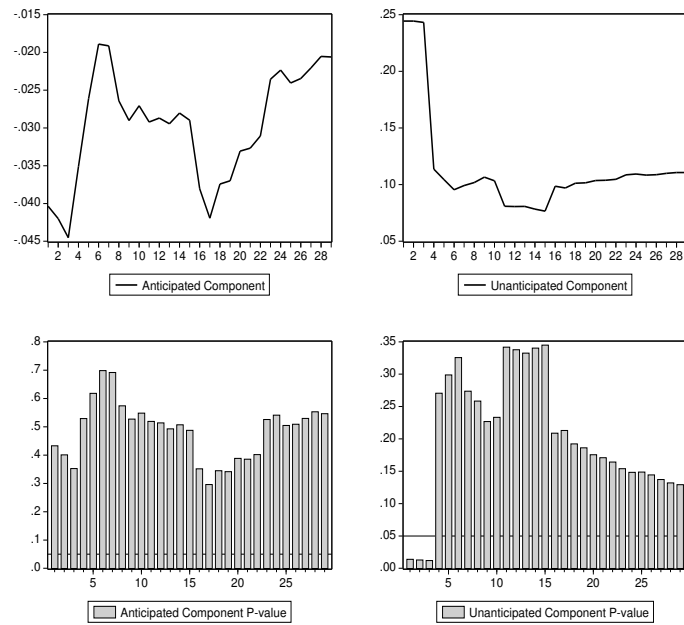


Figure 18: Recursive Regressions with Fixed Starting Date, Daily Observations



## Tables

Table 1: The structure of Turkish Public Sector Debt

|                              | 2001 | 2002 | 2003 | 2004 | 2005 |
|------------------------------|------|------|------|------|------|
| Total Public Sector Debt/GNP | 96.0 | 85.6 | 81.2 | 75.6 | 68.2 |
| Domestic Debt/GNP            | 69.2 | 54.5 | 54.5 | 52.3 | 50.3 |
| Cash Debt/GNP                | 33.1 | 32.5 | 36.6 | 38.6 | 39.9 |
| Non-cash Debt/GNP            | 36.2 | 22.0 | 17.9 | 13.7 | 10.4 |
| Floating Rate Notes/GNP      | 34.5 | 23.3 | 23.3 | 21.0 | 21.7 |
| FX and FX-indexed Debt/GNP   | 16.5 | 12.5 | 9.2  | 8.0  | 7.8  |
| Fixed Rate Notes/GNP         | 10.1 | 13.7 | 19.2 | 22.1 | 20.9 |
| External Debt/GNP            | 26.8 | 31.1 | 26.7 | 22.8 | 17.8 |
| IMF Debt/GNP                 | 0.3  | 7.6  | 7.0  | 6.1  | 4.0  |
| Other multilateral loans/GNP | 4.1  | 3.7  | 2.9  | 2.6  | 2.1  |
| Eurobonds/GNP                | 13.9 | 12.7 | 11.3 | 9.9  | 8.7  |
| Commercial loans/GNP         | 4.0  | 3.4  | 2.6  | 2.0  | 1.6  |
| Bilateral loans/GNP          | 4.4  | 3.7  | 2.9  | 2.2  | 1.4  |

Source: Turkish Treasury and author's own calculations.

Table 2: Turkey's Credit Rating History (Standard and Poor's)

| <b>Date</b> | <b>Rating Action</b> | <b>Foreign Currency Bonds and Notes</b> | <b>Outlook</b> |
|-------------|----------------------|---|----------------|
| 5-May-92    | Rating Assigned      | BBB                                     | Stable         |
| 3-May-93    | Rating Lowered       | BBB                                     | Negative       |
| 22-Mar-94   | Rating Confirmed     | BBB                                     | Negative       |
| 16-Aug-94   | Rating Raised        | BBB                                     | Stable         |
| 24-Jul-95   | Rating Raised        | BBB                                     | Positive       |
| 18-Oct-95   | Rating Lowered       | B+                                      | Stable         |
| 18-Jul-96   | Rating Lowered       | B+                                      | Negative       |
| 13-Dec-96   | Rating Lowered       | B                                       | Negative       |
| 13-Dec-96   | Rating Raised        | B                                       | Stable         |
| 21-Jan-99   | Rating Confirmed     | B                                       | Stable         |
| 10-Dec-99   | Rating Raised        | B                                       | Positive       |
| 25-Apr-00   | Rating Raised        | B+                                      | Positive       |
| 5-Dec-00    | Rating Lowered       | B+                                      | Stable         |
| 21-Feb-01   | Rating Lowered       | B+                                      | Negative       |
| 23-Feb-01   | Rating Lowered       | B                                       | Negative       |
| 17-Apr-01   | Rating Lowered       | B-                                      | Negative       |
| 27-Apr-01   | Rating Raised        | B-                                      | Stable         |
| 11-Jul-01   | Rating Lowered       | B-                                      | Negative       |
| 29-Jan-02   | Rating Raised        | B-                                      | Positive       |
| 26-Jun-02   | Rating Lowered       | B-                                      | Stable         |
| 9-Jul-02    | Rating Lowered       | B-                                      | Negative       |
| 7-Nov-02    | Rating Raised        | B-                                      | Stable         |
| 28-Jul-03   | Rating Raised        | B                                       | Stable         |
| 16-Oct-03   | Rating Raised        | B+                                      | Stable         |
| 8-Mar-04    | Rating Raised        | B+                                      | Positive       |
| 17-Aug-04   | Rating Raised        | BB-                                     | Stable         |
| 23-Jan-06   | Rating Raised        | BB-                                     | Positive       |
| 27-Jun-06   | Rating Lowered       | BB-                                     | Stable         |

Table 3: Credit Rating Index (Based on S&P's Rating Scale)

| <b>S&amp;P's Rating</b> | <b>Assigned Score</b> |                        | <b>S&amp;P's Rating</b> | <b>Assigned Score</b> |                            |
|-------------------------|-----------------------|------------------------|-------------------------|-----------------------|----------------------------|
| <b>AAA</b>              | 58                    |                        | <b>BB+</b>              | 28                    |                            |
| <b>AA+</b>              | 55                    |                        | <b>BB</b>               | 25                    |                            |
| <b>AA</b>               | 52                    |                        | <b>BB-</b>              | 22                    |                            |
| <b>AA-</b>              | 49                    |                        | <b>B+</b>               | 19                    |                            |
| <b>A+</b>               | 46                    |                        | <b>B</b>                | 16                    |                            |
| <b>A</b>                | 43                    |                        | <b>B-</b>               | 13                    |                            |
| <b>A-</b>               | 40                    | Upper investment grade | <b>CCC+</b>             | 10                    |                            |
| <b>BBB+</b>             | 37                    |                        | <b>CCC</b>              | 7                     |                            |
| <b>BBB</b>              | 34                    |                        | <b>CCC</b>              | 4                     |                            |
| <b>BBB-</b>             | 31                    | Lower investment grade | <b>CC</b>               | 1                     | Lower non-investment grade |
|                         |                       |                        | <b>SD</b>               | 0                     | Selective Default          |

Note that there are 3 increments for positive, stable and negative outlooks.

Table 4: Estimation Results-Turkey

| 09/97-06/05              | Dependent Variable: Turkey's EMBI+ |                                 |
|--------------------------|------------------------------------|---------------------------------|
|                          | Model 1                            | Model 2                         |
| Anticipated              | -0.073<br>(0.051)                  | -0.051<br>(0.042)               |
| Unanticipated            | -0.211<br>(0.205)                  | 0.147<br>(0.244)                |
| VIX                      | 0.027 <sup>a</sup><br>(0.005)      | 0.031 <sup>a</sup><br>(0.004)   |
| Credit Ratings           | -0.625 <sup>a</sup><br>(0.147)     | ...                             |
| Reserves/Short-term Debt | ...                                | -0.412 <sup>a</sup><br>(0.097)  |
| Credits/Monetary Base    | ...                                | -0.394 <sup>a</sup><br>( 0.179) |
| Current Account/GDP(t-2) | ...                                | -0.068 <sup>a</sup><br>(0.019)  |
| Budget Balance/GDP       | ...                                | -0.064 <sup>a</sup><br>(0.009)  |
| Inflation (t+6)          | ...                                | 0.592 <sup>a</sup><br>( 0.210)  |
| Crisis Dummy             | 0.336 <sup>a</sup><br>(0.093)      | 0.182 <sup>b</sup><br>( 0.095)  |
| ISE (in USD)             | ...                                | -0.542 <sup>a</sup><br>(0.084)  |
| Constant                 | 5.054 <sup>a</sup><br>(0.086)      | 5.129 <sup>a</sup><br>(0.294 )  |
| Adjusted $R^2$           | 0.74                               | 0.88                            |
| Log likelihood           | 24.99                              | 63.13                           |

Newey-West corrected standard errors are given in parenthesis.

<sup>a</sup> Coefficient significant at 5% level of significance.

<sup>b</sup> Coefficient significant at 10% level of significance.

Table 5: Unbalanced Panel Estimation Results

| 09/97-12/05    | Dependent Variable: Emerging Markets' EMBI+ |                                |
|----------------|---|--------------------------------|
|                | Common Effects                              | Fixed Effects*                 |
| Volatility     | 0.045 <sup>a</sup><br>(0.002)               | 0.040 <sup>a</sup><br>(0.002)  |
| Anticipated    | -0.159 <sup>a</sup><br>(0.057)              | -0.086<br>(0.055)              |
| Unanticipated  | -0.625 <sup>a</sup><br>(0.200)              | -0.239<br>(0.186)              |
| Credit Ratings | -0.161 <sup>a</sup><br>(0.004)              | -0.124 <sup>a</sup><br>(0.005) |
| Constant       | 4.970 <sup>a</sup><br>(0.059)               | 5.142 <sup>a</sup><br>(0.054)  |
| Adjusted $R^2$ | 0.54  | 0.86                           |

<sup>a</sup> Coefficient significant at 5% level of significance.

\* Cross section weights are given in order to allow for the presence of cross-section heteroskedasticity. By applying cross-section SUR weighted least squares, which is simply a feasible GLS estimator, we correct both cross-section heteroskedasticity and contemporaneous correlation. Heteroskedasticity and contemporaneous correlation corrected standard errors are give in parenthesis.

Table 6: Fixed Effects Coefficients from Panel Estimation

| Country      | Coefficient |
|--------------|-------------|
| Argentina    | 0.497       |
| Brazil       | 0.502       |
| Bulgaria     | -0.258      |
| Columbia     | 0.211       |
| Venezuela    | 0.467       |
| Morocco      | -0.226      |
| Mexico       | -0.578      |
| Panama       | -0.112      |
| Peru         | 0.040       |
| Poland       | -1.020      |
| Philippines  | 0.048       |
| Ecuador      | 0.817       |
| South Africa | -0.929      |
| Russia       | -0.025      |
| Turkey       | 0.071       |

Table 7: Actual, Anticipated and Unanticipated Components

|      | Date  | Actual | Anticipated | Unanticipated |
|------|-------|--------|-------------|---------------|
| 1989 | 6/6   | -25    | -24         | -1            |
|      | 7/7   | -25    | -23         | -2            |
|      | 7/27  | -25    | -25         | 0             |
|      | 10/18 | -25    | -25         | 0             |
|      | 11/6  | -25    | -29         | 4             |
|      | 12/20 | -25    | -5          | -20           |
| 1990 | 7/13  | -25    | -11         | -14           |
|      | 10/29 | -25    | -2          | -23           |
|      | 11/14 | -25    | -29         | 4             |
|      | 12/7  | -25    | 3           | -28           |
|      | 12/18 | -25    | -27         | 2             |
| 1991 | 1/8   | -25    | -8          | -17           |
|      | 2/1   | -50    | -24         | -26           |
|      | 3/8   | -25    | -8          | -17           |
|      | 4/30  | -25    | -8          | -17           |
|      | 8/6   | -25    | -10         | -15           |
|      | 9/13  | -25    | -20         | -5            |
|      | 10/31 | -25    | -20         | -5            |
|      | 11/6  | -25    | -12         | -13           |
|      | 12/6  | -25    | -16         | -9            |
|      | 12/20 | -50    | -15         | -35           |
|      |       |        |             |               |
| 1992 | 4/9   | -25    | 2           | -27           |
|      | 7/2   | -50    | -13         | -37           |
|      | 9/4   | -25    | -2          | -23           |
| 1994 | 2/4   | 25     | 12          | 13            |
|      | 3/22  | 25     | 28          | -3            |
|      | 4/18  | 25     | 16          | 10            |
|      | 5/17  | 50     | 36          | 14            |
|      | 8/16  | 50     | 35          | 15            |
|      | 11/15 | 75     | 75          | 0             |
| 1995 | 2/1   | 50     | 45          | 5             |
|      | 7/6   | -25    | -24         | -1            |
|      | 12/19 | -25    | -14         | -11           |
| 1996 | 1/31  | -25    | -18         | -7            |
| 1997 | 3/25  | 25     | 22          | 3             |

|       | Date  | Actual | Anticipated | Unanticipated |
|-------|-------|--------|-------------|---------------|
| 1998  | 9/29  | -25    | -25         | 0             |
|       | 10/15 | -25    | -29         | 4             |
|       | 11/17 | -25    | -19         | -6            |
| 1999  | 6/30  | 25     | 29          | -4            |
|       | 8/24  | 25     | 23          | 2             |
|       | 11/16 | 25     | 17          | 8             |
| 2000  | 2/2   | 25     | 31          | -6            |
|       | 3/21  | 25     | 28          | -3            |
|       | 5/16  | 50     | 45          | 5             |
| 2001  | 1/3   | -50    | -12         | -38           |
|       | 1/31  | -50    | -51         | 0             |
|       | 3/20  | -50    | -56         | 6             |
|       | 4/18  | -50    | -10         | -40           |
|       | 5/15  | -50    | -42         | -8            |
|       | 6/27  | -25    | -30         | 5             |
|       | 8/21  | -25    | -26         | 1             |
|       | 9/17  | -50    | -20         | -30           |
|       | 10/2  | -50    | -43         | -7            |
|       | 11/6  | -50    | -40         | -10           |
| 12/11 | -25   | -25    | 0           |               |
| 2002  | 11/6  | -50    | -31         | -19           |
| 2003  | 6/25  | -25    | -43         | 18            |
| 2004  | 6/30  | 25     | 26          | -1            |
|       | 8/10  | 25     | 23          | 2             |
|       | 9/21  | 25     | 24          | 2             |
|       | 11/10 | 25     | 25          | 0             |
|       | 12/14 | 25     | 25          | 0             |
| 2005  | 2/2   | 25     | 25          | 0             |
|       | 3/22  | 25     | 25          | 0             |
|       | 5/3   | 25     | 25          | 0             |
|       | 6/30  | 25     | 25          | 0             |
|       | 8/9   | 25     | 25          | 0             |
|       | 9/20  | 25     | 24          | 1             |
|       | 11/1  | 25     | 25          | 0             |
|       | 12/13 | 25     | 25          | 0             |

Table 8: Chow Breakpoint Test Results

|   |             |                               |      |
|---|-------------|-------------------------------|------|
| Estimation Period: 1989/06-2005/12      |             |                               |      |
| Chow Breakpoint Test : 1994/02          |             |                               |      |
| F-statistic                             | <b>9.49</b> | F-critical <sub>(1,195)</sub> | 3.89 |
| Estimation Period: 1989/06-2005/12      |             |                               |      |
| Chow Breakpoint Test : 2000/02          |             |                               |      |
| F-statistic                             | <b>4.05</b> | F-critical <sub>(1,195)</sub> | 3.89 |
| Estimation Period: 1994/03-2005/12      |             |                               |      |
| Chow Breakpoint Test : 2000/02          |             |                               |      |
| F-statistic                             | 0.00        | F-critical <sub>(1,138)</sub> | 3.92 |
| Estimation Period: 1989/06-2005/12      |             |                               |      |
| Chow Breakpoint Test :1994/02 & 2000/02 |             |                               |      |
| F-statistic                             | <b>4.78</b> | F-critical <sub>(2,194)</sub> | 3.04 |

Note: Bold F-statistics indicates rejected null hypothesis at 5 percent.