

# Stylized Facts for Business Cycles in Turkey

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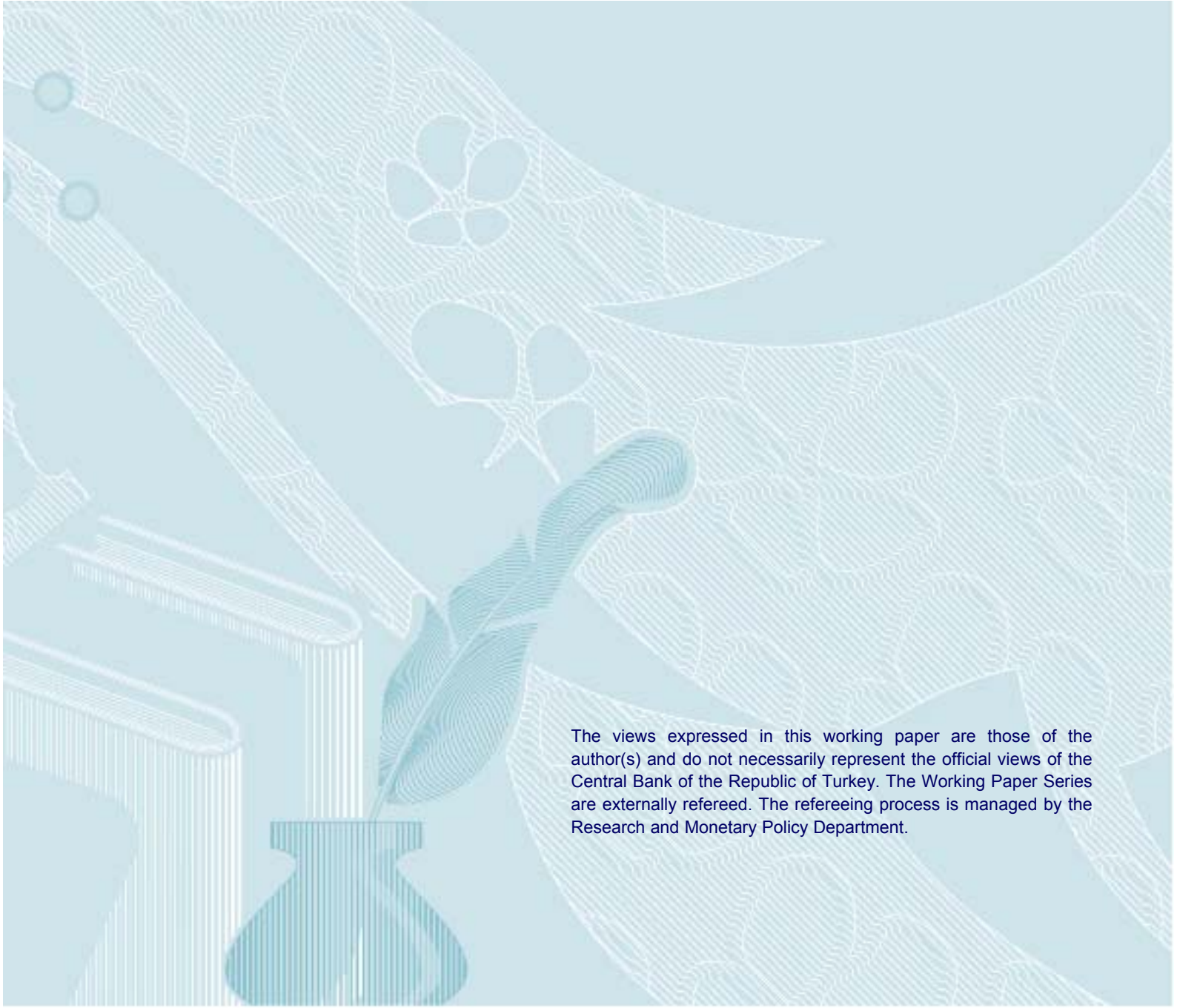
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# Stylized Facts for Business Cycles in Turkey

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## Abstract

This study documents the stylized facts about the business cycles in Turkey using quarterly data between 1987 and 2009. In particular, we document the business cycle turning points and average duration of cycles for Turkey, as well as the optimal smoothing parameter for Hodrick-Prescott (HP) filter estimated in line with our estimate of average business cycle duration for 1987-2009 period, 20 quarters, which is shorter compared to developed countries, and comparable to other developing countries. For filtering procedure, we use this estimated parameter, in addition to 1600, in HP filter and compare our findings. We find that business cycle relationships between macroeconomic variables in Turkey are mostly in accordance with the patterns observed for developing countries, which significantly differ from developed countries' business cycle facts. In particular, the real side of the economy is characterized by high volatility of consumption and a countercyclical pattern for net exports. Other important findings are that financial variables such as credit or sovereign spreads are very volatile and strongly correlated with output. In addition, the results show that the properties of the relationship between economic activity, prices and the interest rates differs between pre-2001 and post-2001 period, whereas the relationship among the real variables shows a smaller change between these periods.

**Key Words:** Nominal Business Cycle Facts, Real Business Cycle Facts, Turkish Economy.

**JEL Classification:** E1, E3, E5

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## 1. Introduction

Business cycles are defined as regular patterns in fluctuations in economic activity and recurrent patterns displayed by the data. Using the adjective *business* to restrict the concept to fluctuations in economic activity and adding the noun *cycle* to bar out fluctuations, which do not recur with a measure of regularity, Burns and Mitchell (1946) define business cycles as follows:

*“A cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general recessions, contractions, and revivals which merge into the expansion phase of the next cycle; where this sequence of changes is recurrent but not periodic.”*

Understanding the sources and properties of business cycles is necessary for policy makers and for developing more structural models. For example, documentation of the stylized facts for business cycles is important tool for the construction of theoretical models as statistical benchmarks and for the assessment of the validity of different theoretical models.

This paper documents the stylized facts about business cycles in Turkey characterized by cross-correlations between main economic variables as well as their observed persistency and volatilities, as a main objective. Besides understanding the stylized relationships between Gross Domestic Product (GDP) and its components, employment, capital stock and utilization of factors of production, we are also interested in the dynamics of prices, financial sector variables and short-term interest rates in relation to economic activity. We also investigate distinguishing properties of Turkish economy business cycles and see whether these dynamics resemble to that of other developing countries.

The year 2001 marks an important point for Turkish economy. Turkey experienced high volatility in financial sector and in the real side of the economy between 1987 and 2001. Most of the 1990s were characterized by very high and volatile inflation, high levels of government deficits and considerable degree of foreign exchange rate exposures in banking and real sectors. In 2000, Turkey launched a comprehensive stabilization program, aiming at improving the fiscal stance and decreasing the inflation to 20 percent by the end of 2000 via an exchange rate peg to a currency basket composed of U.S. dollar and euro. This program collapsed in early 2001 mostly due to weaknesses in the financial system prevailing since early 1990s, as well as insufficient inflation and fiscal performance. The result was the deep banking and currency crisis associated with a sharp contraction in real output. After 2001 crisis, there were significant reforms aiming at solving problems in the banking sector, restoring government finances and decreasing the inflation rate. The new Central Bank Law in 2001 granted operational independence to Central Bank of Republic of Turkey (CBRT) one of the necessary

conditions for the inflation targeting regime that started in 2002<sup>1</sup>. Also, Turkish lira started floating freely against foreign currencies in early 2001. Thanks to the comprehensive set of reforms, public debt to GDP ratio and government deficits decreased substantially after 2001, leading to an improvement in country risk premium. Finally, Banking Regulation and Supervision Agency, which was established in 2000, has played an important role in controlling capital adequacy ratios and foreign currency exposures in the banking sector in post-2001 period. Considering all of these reforms and structural differences across pre-2001 and post-2001 periods, we also compare business cycle facts between these two periods<sup>2</sup>.

The methodology in this paper basically follows the analysis of Stock and Watson (1999) and King and Rebelo (1999), who document business cycle properties of the U.S. economy. There are various studies examining characteristics of Turkish business cycles with similar methodology, such as Alper (1998, 2002), Aruoba (2001) and Berument et al. (2005). Alper (1998) investigates nominal stylized facts on a monthly frequency, using the twelve-month percentage change in addition to HP filter. Alper (2002) provides a comparison of Turkish business cycle facts with that of Mexico and US. Aruoba (2001) examines 1987:1-2000:4 period and works with a large set of macroeconomic variables including international variables. Berument et al. (2005) on the other hand focuses on cross correlation of Turkish GDP series with that of different European Union countries. Our paper focuses on a larger sample period and it differs in mainly three dimensions from these studies. First, we explicitly consider the fact that business cycles in developing countries are shorter and the long-term trend is more volatile than those observed in developed economies, which requires us to modify the filtering techniques used in standard practices for developed countries<sup>3</sup>. Following one of the most common practices in the literature, we extract the trend and business cycle components of our variables by using Hodrick-Prescott filter. However, in doing so, we use the optimal smoothing parameter estimated by considering the average duration of the cycles in Turkey in our sample period. Second, we analyze whether structural differences across pre-2001 and post-2001 periods are associated with changes in the structure of economic relationships, especially among the prices, economic activity and short-term interest rates. Third, we provide an account of whether comprehensive changes in the definition and coverage of the data yield differences in the conclusions regarding the main business cycle relationships. National account series in Turkey have been published only with new methodology since 1998, hence it is important to verify the comparability of the relationships obtained with the old data, which gives us more data points to extract information on Turkish economy, and the

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<sup>1</sup> See Kara (2008) for challenges faced and policy steps taken during the start of the implicit inflation targeting regime in 2002 and the transition to explicit inflation targeting regime in 2002-2005 period.

<sup>2</sup> Policy changes and political cycles are important determinants of Turkish long term economic growth. See Altug, et al (2008).

<sup>3</sup> For example, Altug (2009) documents shorter business cycles as one of the distinguishing properties of developing country business cycles.

new data, which will be the only dataset used in the analysis for the forthcoming periods. For the real GDP and its components in 1998:1-2009:4 period, we also analyze relationships using the new series.

Our findings are summarized as follows. First, we find that general business cycle characteristics of Turkish economy are similar to those observed in developing countries while they differ from developed countries. In particular, as in many developing countries, the business cycles in Turkey are characterized by more volatile trend term, shorter business cycle duration and higher output volatility than those observed for developed countries<sup>4</sup>. Also, countercyclical net exports and high volatility of consumption compared to output are important characteristics of Turkish economy business cycles, as observed in other developing countries. Second, based on the observation that average duration of business cycles in Turkey is 20 quarters for 1987-2009 period, we estimate the optimal smoothing parameter for HP filter as 14 and 177 for Turkey with two different methodologies. In addition to using standard 1600 value for the smoothing parameter, we also use this estimated value of 14 for our analysis. Third, we find that variables such as real credits, deposits, real exchange rates and risk premiums are strongly correlated with GDP, which indicates the importance of financial markets in Turkey<sup>5</sup>. Finally, our results suggest that post-2001 period is associated with a significant decline in the volatility of GDP, consumption and investment, possibly reflecting the improvements in financial system following wide range of structural reforms as well as the monetary policy and fiscal stance in post-2001 period.

Before presenting the findings of our analysis, it should be underlined that the results presented in this study should not be taken as evidence for causal relationships. The results documented here mainly represent the comovements between variables, which may be induced by different sets of common shocks. Moreover, relationships among various variables may entail simultaneous feedbacks to each other, as a result of which the causal implications are hard to obtain with simple correlations. Therefore, these results should be viewed as documentation of key statistical properties of the relationships between variables, and an outline of rough explanations about the mechanisms generating these relationships. Therefore, these relationships may serve as a starting point for further studies aiming at identifying the causal relationships and exact mechanisms generating the observed outcomes.

The rest of the paper is structured as follows. Section 2 presents the methodology and the dataset utilized in the analysis. Section 3 presents the stylized facts of Turkish economy regarding the comovements, volatility and persistency of some economic variables based on the estimated smoothing parameter. We analyze these properties by grouping the economic variables into six subcategories,

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<sup>4</sup> See Agenor, *et al.*, (2000); Rand and Tarp, (2002); Aguiar and Gopinath, (2007) and Male (2009) for developing country business cycles.

<sup>5</sup> See Tiryaki (2010) for the effects of financial frictions and interest rate shocks in Turkey.

namely real GDP and its components, monetary aggregates and interest rates, prices, main inputs in manufacturing industry, financial variables and some selected international variables.

## 2. Data and Methodology

### 2.1 Data

In this study, we use quarterly data for 1987-2009 period taken from various data sources, where all the real variables for this time interval are deflated to 1987 prices.<sup>6</sup> For determining statistical properties of the variables, we use Hodrick-Prescott filter, which is the most common trend-cycle decomposition technique in the business cycle literature. Before decomposing the data into cycle and trend terms, we take the natural logarithm of the raw data under the assumption that macroeconomic series are multiplicatively separable<sup>7</sup> and use Tramo-Seats methodology to obtain seasonally adjusted series used in the analysis<sup>8</sup>. For the real GDP and its components, we also analyze relationships using the “new series” obtained with new estimation methodology, which is in constant prices of 1998, covering 1998:1-2009:4 period.

### 2.2. Measuring Cycles

First step in analyzing business cycles is to define what constitutes a cycle. In the literature, there exist two different methodologies for the description of cycles. First one is termed as “*classical cycles*” which can be defined as sequential pattern of expansions and contractions in aggregate economic activity. Extending from seminal work of Burns and Mitchell (1946), this type of definition refers to cycles in the *levels* of a series and considers *absolute* movements in economic activity.

Identification of turning points is important for the classical cycle approach. Turning points are defined as points in time, when indicators for economic activity (real GDP, here) change direction from positive to negative, or vice versa. In literature, the most commonly used algorithm to detect turning points is the Bry and Boschan (1971) procedure<sup>9</sup>. Bry-Boschan algorithm (BB, thereafter)

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<sup>6</sup> There was a methodological change in calculation of the published GDP series and the GDP series calculated with new methodology covers 1998:1-2010:3 period. Therefore there exist two separate series: the old series covering the 1987:1-2007:3 period and the periodically updated new series beginning from 1998:1. For analyzing 1987-2009 period, we extend the old series with annual growth of new GDP series. Table 1 summarizes the list of variables, periods of their availability and the sources of the data.

<sup>7</sup> For the series including non-positive numbers, like trade balance, they are expressed as ratios to GDP, instead of taking logarithms. We also don't take logarithms of the series, which are measured in percentage points, like interest rate and EMBI spread, before filtering.

<sup>8</sup> We also used U.S. Bureau of Census' X-11 for seasonal adjustment as an alternative method and found similar results.

<sup>9</sup> The Bry-Boschan procedure has been applied among other studies by Watson (1994), King and Plosser (1994) Inklaar (2004) and Everts (2005).

calculates moving averages of different lengths to narrow down the region where the turning points are likely to be located and then pinpoints the exact month where the local maxima (peak) or minima (trough) occurred for a monthly deseasonalized reference series. This procedure imposes no structural assumptions on the data. The only required restrictions are: (i) a full business cycle (peak to peak or trough to trough) should last at least fifteen months (5 quarters), (ii) each business cycle phase (peak to trough, trough to peak) should last at least five months (2 quarters), (iii) peaks and troughs should alternate and (iv) turning points should not be located within the first or last 2 quarters of a time series<sup>10</sup>.

In Figure 1, we present the turning points in Turkish real GDP series detected by BB algorithm and Table 2 gives the main statistics about duration of business cycles in Turkey. Our findings indicate that the first trough point is observed in the first half of 1989 and is followed by the next one in 1994:2, which reflects repercussions of 1994 economic crisis. The third trough appears in 1999:3 reflecting the effects of Russian crisis. The last trough point, determined by Turkish currency and banking crises, is observed in 2001:3. We also find that mean cycle length in Turkey is 20 quarters and is rather shorter than developed countries, but is similar to the length for developing countries in general (Rand and Tarp, 2002). Moreover we observe that cycles show asymmetric behavior in the sense that duration of expansion phases (16 quarters) are longer than that of contraction phases (4 quarters).

The second concept for the definition of cycles is the “*deviation cycles*” or “*growth cycles*”, which focuses on recurrent deviations of macroeconomic series from their trends. This analysis requires “detrending” the series before computing related statistics such as volatility or correlations. The choice of appropriate detrending method is important because different filters may extract different types of information from the data and the implied business cycle facts vary considerably with the applied filtering procedure (Canova, 1998).

## **2.3. Trend-cycle decomposition**

### **2.3.1. Hodrick- Prescott Filter**

In this study, among the filtering methods that are mentioned in Table 3, we employ Hodrick-Prescott (HP, thereafter) filter, which is commonly used in the business cycle literature<sup>11</sup>. The HP filter is a

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<sup>10</sup> This procedure is originally formulated for monthly data. Since we work with quarterly GDP series, we modified this procedure in line with Harding and Pagan (2002) and Everts (2005).

<sup>11</sup> For example Kaiser and Maravall (2001) call HP filtering as “the present paradigm for business cycle estimation”.



two-sided optimization procedure and it basically decomposes a time series  $y_t$ , into a trend component  $\tau_t$ , as well into a cyclical component through the minimization of the following expression:

$$(1) \quad \sum_{t=1}^T (y_t - \tau_t)^2 + \lambda \sum_{t=2}^{T-1} \{(\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t-1})\}^2$$

where  $\lambda$  is the smoothing parameter taking value in  $[0, \infty)$ . Here, the first term,  $(y_t - \tau_t)$  corresponds to the cyclical component, while the second term penalizes variations in the growth rate of the trend component, with the penalty increasing with the value of  $\lambda$ .

The smoothness of the trend can be determined by choosing the value of the parameter  $\lambda$ . When  $\lambda=0$ , minimizing (1) implies first term to be zero making cycle component zero. On the other hand, in the limit when  $\lambda=\infty$ , second term becomes zero in order to minimize (1) and the trend component becomes linear. So the higher the  $\lambda$  value is, the smoother the trend will be. The trend term is found to be smooth i.e. not move much with actual cycles in the data when  $\lambda$  gets a high value, whereas it follows the data more closely when  $\lambda$  gets a small value. The methodology itself cannot provide the choice over how stiff the filter should be but rather the user must infer it from other information or criteria. In the HP filter, as in all other similar filters, the user must supply some judgment regarding the smoothness of the trend and value of  $\lambda$ .

Hodrick and Prescott (1997) point out that under some regularity conditions, optimal value of  $\lambda$  is the ratio of variance of innovations in cycle component to the variance of innovations in trend component. Based on postwar quarterly U.S. data, they choose  $\lambda=1600$ , on which an implicit consensus emerged later in the literature and this value is employed for quarterly data in other economies as well. However, as Ravn and Uhlig (2002) point out, the choice of  $\lambda=1600$  for quarterly data actually reflects a specific definition for the duration of business cycles, which may be longer than what is generally observed in emerging market countries. Indeed, Rand and Tarp (2002) find that business cycles in developing countries, as opposed to cycles in developed countries, are significantly shorter in duration. Hence setting  $\lambda=1600$  may be inappropriate for developing countries. Moreover, Aguiar and Gopinath (2007) argue that trend components in emerging market countries are more volatile than the trends observed in developed countries, which serves as another motivation for considering a lower value than 1600 for the smoothing parameter in HP filter. Therefore in this paper, we use  $\lambda=1600$  to make our results comparable with the literature, but in addition we also use the estimated smoothing parameter for Turkey.

The value of the smoothing parameter is estimated by two different methodologies: The method provided by Pedersen (2001) and the one proposed by Dermoune et al. (2007). These methods give estimate of the smoothing parameter for Turkey as 117 and 14, respectively<sup>12</sup>. Although these numbers, 117 and 14, may look small compared to the value of 1600, it should be stated that these values are consistent with the findings in the literature. For example, Rand and Tarp (2002) find optimal  $\lambda$  to be between 310 and 340 for 15 developing countries, possibly reflecting a more volatile trend component than those found for the developed countries<sup>13</sup>. Also Du-Toit (2008) finds smoothing parameter for South Africa as 352. Another point to be stated is that, despite the numerical differences in the estimates for  $\lambda$  suggested by our methods, i.e. the first method implying  $\lambda = 117$  and the second method implying  $\lambda = 14$ , we obtain very similar trend and cycle components for the time series (Figure 2 and 3). Therefore, continuing the analysis with either of them would not matter for the analysis. It should also be noted that the use of 14 rather than 1600 is extremely important for documenting the variations in cyclical terms, because the HP filter with  $\lambda = 1600$  attributes part of the variations in the trend to the variations in the cycle component. In addition, we show that using the appropriate smoothing parameter is important for the documentation of the relationship between real economic activity and the variables that experienced significant and sharp variations in Turkey, such as inflation or nominal interest rates.

## 2.4. Methodology

We follow the standard practice of the real business cycle literature, summarized for example in King and Rebelo (1999), by transforming the variables as percentage deviations from their smoothed trend, where the smoothed trend represents the growth component of a variable. In particular, we focus on three main statistics regarded in the literature as standard statistics to assess business cycle properties of the relevant times series: (i) volatility, defined as the standard deviation of the detrended component, (ii) cross-correlations of detrended variables with the detrended versions of some basic variable such as real GDP, price level and interest rate and (iii) persistency, defined as the AR(1) coefficient of the cyclical components of the time series.

Looking at these cross-correlations, we decide also the direction of the comovement between a variable and real GDP. We proceed as follows: A correlation coefficient is statistically significant if it is greater than the calculated critical value in absolute terms. A variable is *acyclical* if none of the cross-correlation coefficients are significant. If some of the significant cross-correlation coefficients are negative and some are positive and the largest of these are close to each other then, the cyclical

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<sup>12</sup> See Alp et.al (2011) for estimation details.

<sup>13</sup> In addition, Nelson and Plosser (1982) and Canova (1998) indicate that the  $\lambda$  consistent with the ratio of variance of cycle to the variance of trend term in U.S. should be much smaller than 1600. In particular, Canova (1998) argues that even  $\lambda = 4$  can be plausible for U.S.

properties of this variable is *not clear*. If the significant cross-correlation coefficients are almost exclusively positive or the significant positive correlation is much larger than the significant negative correlation in absolute value, then the variable is *procyclical*, i.e. it goes in the same direction as real GDP. If the significant cross-correlation coefficients are almost exclusively negative or the significant negative correlation is much larger than the significant positive correlation in absolute value, then the variable is *countercyclical*, i.e. it goes in the opposite direction as real GDP. We also check the timing of the most significant correlation coefficient to decide on the dynamics of the relationship between a variable and real GDP, namely phase shift. If the largest significant cross-correlation coefficient with real GDP appears in the time period  $t=0$ , that variable is *coincidental*. If the significant cross-correlation coefficient(s) appear in the columns corresponding to  $(t-i)$ , where  $i > 0$ , that variable *leads* the cycle. If the significant cross-correlation coefficient(s) appear in the columns corresponding to  $(t+i)$ , where  $i > 0$ , that variable *lags* the cycle. If the comovement pattern of the variables is not clear, than phase shift will be also *not clear*. Furthermore, if the countercyclicality or procyclicality is observed both at  $(t-i)$  and  $(t+i)$  periods at similar levels, then phase shift will be again *not clear*.<sup>14</sup>

### 3. Results

In this section, we summarize our findings regarding the business cycle facts in Turkey, by separately focusing on real GDP and its components, monetary aggregates and interest rates, prices, main inputs in manufacturing industry, financial variables and some selected international variables. Results found by using  $\lambda=14$  and  $\lambda=1600$  in the HP Filter are presented in Tables 4-11. Then Tables 12-15 give more detailed statistics of the related variables.

#### 3.1. Components of Real GDP

Table 4a and 4b present the results for the GDP components with  $\lambda=14$  and  $\lambda=1600$ , respectively. The first thing to notice is the observed high volatility of real GDP in Turkey. The percentage standard deviation of the cyclical component of real GDP with  $\lambda=1600$  (3.737) is around 2 times larger than that of the US (1.71).<sup>15</sup> However, one can observe a significant drop in the volatility of real GDP in the post-2001 period, which could be associated with either changes in the volatility of exogenous shocks or structural changes in the economy and policy or the mix of these two factors.

**Consumption:** With  $\lambda=14$  in Table 4a, the relative volatility of total consumption is high in all periods and it is even greater than one (1.055) in post-2001 period, which is an interesting pattern that is also

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<sup>14</sup> We follow Kydland and Zarazaga (1997) and Aruoba (2001) in deciding the direction of the comovements and the phase shift.

<sup>15</sup> The statistics for U.S. are taken from Kydland and Zarazaga (1997).

pointed out in Kydland and Zarazaga (1997) for Argentina<sup>16</sup>. With  $\lambda=1600$  in Table 4b, the volatility of total consumption is higher than that of real GDP in all periods except post-2001. Although this finding is in contrast with the idea of consumption smoothing, as Kydland and Zarazaga (1997) note, the excess relative consumption volatility is also observed in countries such as Japan and some European countries. Such a behavior of the consumption, which is inconsistent with the standard theory of permanent income hypothesis, basically arises from the behavior of the durable consumption. Underdeveloped financial markets (Özbilgin, 2010) and the possibility of different shocks such as trend shocks or risk premium shocks hitting the economy can be among the factors driving the high volatility of consumption expenditure in Turkey.

When we look at the cross correlation between consumption and real GDP, the empirical results suggest relatively high contemporaneous correlation in Turkey (0.860 in Table 4a and 0.911 in Table 4b) for the whole sample period. Such a high correlation between output and consumption may imply that the shocks to the economy are mostly perceived as permanent and therefore affect consumption significantly. Another possible explanation for this regularity is that consumption depends heavily on the *current* income due to financial frictions and limited availability of financial instruments that would allow the households to smooth their consumption pattern over time. It should be noted that this empirical finding is very high for the business cycle models to explain. However, the correlation shows a reduction for post-2001 period, which may imply a significant improvement in the depth of domestic financial markets for Turkish economy, where credit over GDP ratio increased from around 15 percent to 40 percent between 2001 and 2009.

**Gross Fixed Investment:** Consistent with the findings for both developed and developing countries, investment is one of the most volatile components of real GDP. The gross fixed investment is around 3 times more volatile than real GDP in Turkey. We also observe that there is a high positive correlation between gross fixed investment and real GDP. In addition, the variations in these two series occur coincidentally.

**Government Consumption:** The results indicate that government consumption follows a procyclical pattern in 1987-2009 period and an acyclical pattern after 2001 with  $\lambda=14$  and  $\lambda=1600$ . We also observe that the government consumption is much more volatile than real GDP, in both pre-2001 and post-2001 periods.

**Net Exports:** We observe that both exports and imports seem to have positive contemporaneous correlation with real GDP and are more volatile than real GDP. But, imports have much higher

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<sup>16</sup> Higher volatility of consumption observed in developing countries is also stated in other studies such as Alper (1998), Rand and Tarp (2002), Male (2009).

correlation and are far more volatile than exports. An important finding to underline is that net exports as a percentage of real GDP show significant countercyclical behavior and the volatility of net exports is close to the volatility of real GDP, similar to the other developing countries.

### **3.2. Consumer Prices, Interest Rates and Monetary Aggregates**

**Consumer Prices and Overnight Interest Rates:** Consumer prices are countercyclical for the whole period (Table 5a). But with  $\lambda=1600$ , in pre-2001 period prices turn to be procyclical (Table 5b). Except post-2001 period relative volatility of prices is larger than one for both parameter values and for all time periods.

Results in Table 5a shows that the volatility of consumer prices have declined in post-2001 period, both in absolute terms and relative to real GDP reflecting low and stable inflation rates with the change in monetary policy regime and structural reforms. Moreover, prices have become more persistent in post-2001 period, possibly reflecting the decrease in the cost of infrequent price adjustments in the low inflation environment (Tables 5a and 5b).

For the overnight interest rates we find that for the whole period between 1987 and 2009, overnight interest rates are countercyclical with a lead and the relative volatility is 13.6 with  $\lambda=14$  in Table 5a and is 8.8 with  $\lambda=1600$  in Table 5b. Another observation that deserves to be mentioned about the behavior of the overnight interest rate is that its volatility in the post-2001 period is substantially lower than the pre-2001 period. This observation possibly reflects the improvements in the financial stability as well as the increase in the predictability of Central Bank's actions with the inflation-targeting regime.

**M1, M2, and Interest Rates on TL Denominated Deposits:** With  $\lambda=1600$ , we find that M1 and M2 are both procyclical and they lead the cycle in all periods except post-2001. But with  $\lambda=14$ , we observe nominal monetary aggregates show a countercyclical behavior.

Results for nominal deposit rate with  $\lambda=1600$  give contradicting results. Nominal interest rate on TL denominated deposits turns to be procyclical and not clearly related with real GDP in post and pre 2001 periods, respectively. But in full sample period, we find a countercyclical behavior. With  $\lambda=14$ , we do not get such contradicting results and observe that the nominal interest rate on TL denominated deposits is countercyclical with a lead in all sample periods.

**Properties of Selected Variables in relation to Consumer Prices:** After experiencing high and volatile inflation rates for 3 decades, Turkey has gone through a regime change in early 2000s. With

the inflation targeting regime and comprehensive structural reforms in various areas, such as public finance and banking sector, supporting the disinflation process, the inflation rate in Turkey showed a steady decline in post-2001 period. To see the relationship between consumer prices and other variables of interest, in Tables 6a and 6b, we check the business cycle properties of selected variables in relation to consumer prices.

Consumer prices are negatively related with real variables of consumption and investment in 1987-2009 period with both parameter values. This means that during the positive deviations of cycle from the trend or during boom times, consumer prices are decreasing and during recession times, consumer prices are increasing. This is an interesting observation and there might be several reasons behind this fact. Another strong relationship is the positive correlation between consumer prices and nominal exchange rates. When there is a depreciation of the currency, i.e. nominal dollar exchange rate (TL/\$) increases, consumer prices increase as well. This relationship offers a mechanism for the countercyclicality of the prices. In Turkey, during the normal times, usually exchange rate is stable but there are large devaluations during the crisis. With a high-level of pass-through, movements in the exchange rate can be reflected largely on price level and that can induce the negative relationship between prices and real variables as in Tables 6a and 6b. However, with lower volatilities in exchange rates and lower pass-through, importance of this mechanism would diminish.

### **3.3. Labor and Physical Capital**

For labor market variables we've data from OECD for 1987:1-2007:3 period. So the analysis for this section covers this limited sample period.

**Hours per worker, Employment and Total Hours in Manufacturing Industry:** Hours per worker is procyclical and moves coincidentally with real GDP in the whole sample and in pre-2001 period (Tables 7a and 7b). But employment in manufacturing industry is countercyclical with  $\lambda=14$  in Table 7a and procyclical with  $\lambda=1600$  in Table 7b for 1987:1-2007:3.

In terms of volatility, hours per worker are less volatile than GDP. In contrast, the total employment and total hours are more volatile than GDP in the whole sample. This means that firms use both extensive margin, i.e. employment, and intensive margin, i.e. hours per worker, over the cycle, but the volatility in the extensive margin is higher.

**Real Wages per Hour:** In Turkey, with  $\lambda=14$  we find that real average wages per hour in manufacturing industry is procyclical in all sample periods except post-2001 in Table 7a. But with  $\lambda=1600$  we get contradicting results: Real average wages per hour in manufacturing industry is

procyclical in pre and post 2001 periods but is countercyclical in 1987-2009 period in Table 7b.<sup>17</sup> We also observe that hourly real wages are more volatile than real GDP. The comparison of pre-2001 and post-2001 periods indicates changes in lead-lag relations of real wages as well as their volatility relative to GDP, and observed persistence.

**Labor Productivity:** The measurement of labor productivity is a challenging task, as it is not directly observable in the data. Therefore, we use GDP per worker and industrial production per hour in manufacturing industry as crude proxies to the latent productivity term. Needless to say, these proxies are potentially associated with some sources of misinterpretation. For example, during times of increases in capital stock not accompanied with increases in employment, our measures may overestimate the labor productivity. However, these measures are also good enough to give a first insight about how productivity is related with economic activity. The GDP per worker and the production per hour in manufacturing industry are both procyclical and highly volatile (Table 7a and 7b). The changes in the latter series appear to have small degree of persistency, indicated with an autoregression coefficient of 0.101 (Table 7a). However, the low degree of persistency in productivity per hours may reflect the increase in economic activity that is accompanied also by expansion in the employment. Under the assumption that workers with unstable employment pattern over the business cycles are less skilled than those with stable employment, the expansion in employment following an upswing in the economic activity may involve mostly the workers with lower productivity, as a result of which increases in average productivity per hour may not be long-lasting.

**Capital Formation and Capacity Utilization:** In all periods, the capacity utilization rate shows a procyclical and coincidental pattern and its relative volatility is higher than 1 with both parameter values (See Tables 7a and 7b). Capital stock does not display a clear business cycle pattern and give contradicting results with  $\lambda=14$  in Table 7a but it is procyclical with  $\lambda=1600$  in Table 7b. Volatility of capital stock is much lower than that of real GDP. Similar to labor inputs, firms use both intensive margin, i.e. capacity utilization, and extensive margin, i.e. capital stock, over the business cycle. But in contrast to labor input, intensive margin is more volatile for capital input.

### 3.4. Financial Markets

Turkey liberalized its capital account in 1989 and thereby got access to the international credit markets. In the period after financial liberalization, Turkey experienced two financial crises, one in

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<sup>17</sup> However, since these figures have been obtained as averages over the working population in manufacturing industry, this number may not be sufficient to reach definite conclusion about cyclicity of wages, especially if the average skill level of the workers are countercyclical. Therefore, we believe that more research is necessary to understand the cyclical behavior of wages in Turkey.

1994 and one in 2001, and real sector is considered as financially constrained.<sup>18</sup> Consequently, in contrast to perfect financial markets environment where financial variables do not play important roles, we expect a number of financial variables to be related with aggregate business cycles in Turkey. Kydland and Prescott (1990) also emphasized this point by stating "...credit arrangements could play a significant role in future business cycle theory". Therefore, we include real credit and real deposits as financial variables and evaluate their relation with aggregate business cycles.

**Credit:** Table 8a and 8b present the cyclical properties of different real credit classifications according to different filtering parameters. First row shows the properties of aggregate real credit in relation to the real output. These series include credit to all sectors of the economy and credit to the households. It covers both Turkish lira (TL) and foreign currency (FX) denominated credit.

Variations in aggregate real credit are closely related with variations in economic activity. There is a high positive correlation between these series, indicating a strong procyclical behavior. The close relationship of credit with output possibly suggests the relevance of credit variables for the aggregate business cycles. Combined with the evidence that Turkey has a developing financial market and agents face credit constraints, the importance of credit mechanisms becomes evident. Also aggregate real credit is around 2 times more volatile relative to real GDP in Table 8a. Figure 4 shows deviations of output and credit from their respective HP trends in percentage terms. This figure shows that the credit movements largely coincide with the business cycles.

In Table 8a, we also look at the decomposition of the credit according to the borrower type, i.e. whether it is a credit to households or the firms in private sector. Both credit to households and credit to firms are procyclical and positively correlated with output in 1987-2009 period. Relative volatility of household credit (12.202) is much higher compared to the relative volatility of firm credit (2.292). If we suppose that household credit is used mostly for durable consumption and firm credit is used for investment, then credit volatilities become similar to the volatilities of expenditures they finance. This is especially noticeable for firm investment in the sense that the volatility of private investment expenditures (2.572) and credits to firms (2.292) are similar to each other. Another interesting feature that we observe is the high volatility of household credit in Turkey. A closer look at the series in Figure 5 shows that there were substantial credit booms in 1993 and 2000. In both of these years, the exchange rates were used, either implicitly or explicitly, as a nominal anchor for inflation stabilization. Both programs were abandoned and there were large devaluations afterwards. As noted by Reinhart and Vegh (1995), when agents view the exchange rate policy as temporary and think that it will be abandoned, there may be a consumption boom and a following contraction. This mechanism might

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<sup>18</sup> See Gunay and Kilinc (2011) for credit constraints in Turkey.



have been effective in the credit booms and the consumption increases in 1993 and 2000, where the two highest positive deviations of consumption coincide with the exchange rate stabilization programs.

A particular feature of Turkish economy is the existence of both TL and FX denominated credits. Even though the share of FX denominated credit has fallen steadily in 2000s, extending foreign currency credit is still quite common in Turkey.<sup>19</sup> In Table 9a, we look at the decomposition of the credit according to its denomination. Data on the currency denomination of credit is available at CBRT's database for the period after 1996, presented in two groups: Turkish Lira denominated credit and the FX denominated credit. In the original data source, FX denominated credit is also presented in terms of Turkish Lira and one can get the total credit by simple sum of TL denominated credit and FX denominated credit presented in TL. Consequently, the changes in the nominal exchange rates are fully reflected in the total credit and FX denominated credit series. Therefore, it is necessary to control for the effects of changes in nominal exchange rates. For this reason, in addition to the FX denominated credit presented in TL, we also include FX denominated credit presented in U.S. dollars. We use end of the quarter nominal U.S. dollar exchange rate to convert TL values to U.S. dollar values.

As presented in Table 9a, real credits are procyclical and are around 2 times more volatile than output. Furthermore, the relative volatility of TL credit (2.586) is lower than that of foreign currency denominated credit (3.735) when presented in Turkish Lira and U.S. dollar. As we mentioned above, extra movements in the latter variable are coming from changes in nominal exchange rates. When we use a higher filtering parameter in Table 9b, we still get procyclical credit with higher volatility in TL denominated credit.

**Deposits:** Cyclical properties of real deposits are presented in Tables 9a and 9b. When we look at real deposit series in the first three columns of Table 9a, we find that deposits presented in TL units are procyclical. In contrast, foreign currency deposits presented in dollar units are countercyclical. Such a difference indicates the possibility that households use TL denominated deposits and FX denominated deposits for different motives. During a boom, agents may increase their domestic currency assets while decrease FX denominated assets. Holding FX assets might be driven by diversification motives and hedging purposes against FX denominated borrowing and inflation uncertainty. However, the differences in the cyclical behavior might be due to the cyclical behavior of nominal exchange rates as well. Since nominal exchange rates are strongly countercyclical (See Table 11a), during a boom domestic currency appreciates and attractiveness of FX denominated assets decrease. Because of these

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<sup>19</sup> See Metin-Özcan, K and V. Us (2007); Akıncı, Ö. et al (2005).

valuation effects, FX denominated deposits might behave countercyclical whereas TL denominated deposits behave procyclical in Table 9a and 9b.

Finally, as the analysis on credit and deposits suggest; changes in the exchange rates have important implications such as wealth effects and balance sheet effects, when both liability and asset dollarization are present. Therefore, any analysis of financial variables would necessitate controlling for the changes in nominal exchange rates for FX denominated variables.

### 3.5. International Variables

Being a small open economy, the international variables are potentially very important for business cycles in Turkey. Tables 10a and 10b present the characteristics of foreign debt variables where Tables 11a and 11b present the cyclical characteristics of some other international variables relevant for Turkey.

**Foreign Debt:** Tables 10a and 10b present the business cycle properties of the foreign debt stock. We analyze foreign debt series by its maturity and by the type of borrower. Aggregate foreign debt stock is procyclical with  $\lambda=14$  in Table 10a but countercyclical  $\lambda=1600$  in Table 10b for the whole sample period. In post-2001 period it becomes countercyclical for both parameter values. The volatility of debt is similar to that of output. To see the decomposition, we look at the maturity of debt. Relative volatility of short-term debt is higher than that of long-term debt. With  $\lambda=1600$  long-term foreign debt is countercyclical and in contrast to long-term debt, short-term foreign debt is procyclical with lag in the whole period. Although more research effort is necessary to understand the differences in cyclical properties of the short-term and long-term foreign debt, one possible reason might be that long-term debt is for hedging purposes and it behaves countercyclical due to valuation effects similar to FX denominated deposits, whereas the short-term foreign debt might be used for financing investment and operations and therefore exhibiting a procyclical pattern.

**Exchange Rates:** For the exchange rates, we observe that both nominal and real exchange rates are more volatile than output in all sample periods (Tables 11a and 11b). Nominal exchange rate is countercyclical in all periods and real exchange rate is procyclical except post-2001 period<sup>20</sup>. Strong procyclicality of real exchange rate can be attributed to a number of factors including procyclical capital flows, procyclical productivity (Balassa-Samuelson Effect) or countercyclical risk premiums (EMBI spreads).

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<sup>20</sup> An increase in nominal exchange rate is a nominal depreciation and an increase in real exchange rate is a real appreciation of domestic currency.

**Other International Variables:** Tables 11a and 11b also present cyclical features of terms of trade and EMBI spreads, which constitute possible exogenous sources of business cycle fluctuations in Turkey. In Table 11a and 11b, we find that the variations in terms of trade are procyclical and volatility is lower than that of output in 1987-2009. EMBI spreads are widely regarded as reflecting the risk of the relevant country and are often used as an important explanatory indicator for other variables such as exchange rates, inflation and interest rates. We find that EMBI spreads are countercyclical and are volatile (Figure 6). Finally, we observe a procyclical pattern between the real GDP in Turkey and the foreign demand proxied by G7 output in Table 11a or in Table 11b. U.S. Fed policy rates are procyclical and spot oil price index does not exhibit clear business cycle patterns with real GDP with  $\lambda=14$ .

#### **4. Conclusion**

This paper documents the statistical properties of the business cycles observed in Turkish economy in 1987-2009 period. In the analysis, we present the links between variations in economic activity and variations in the GDP components, the consumer prices, nominal variables, the labor market, the international variables and the financial variables at the business cycle frequencies, as well as the volatility and the persistency of the movements in these variables.

We find that the stylized business cycle facts for Turkey are different from those for the developed countries and similar to the case of a number of developing countries. Main sources of differences from developed countries involve higher degree of volatility in economic activity, a high degree of consumption volatility relative to the GDP volatility, a high degree of correlation between imports and exports as well as countercyclical net exports in line with the role of imported inputs and capital goods in production. In addition, both the cyclical features of components of GDP and the behavior of credits support the view that financial variables have important implications for business cycles in Turkey. Moreover, we underline the potential information value of variations in international variables such as terms of trade, and country risk premium for the fluctuations in the economic activity in the proceeding periods. Finally, compared to pre-2001 period, post-2001 period demonstrates a much lower volatility in all variables possibly reflecting the role of both structural shocks and policy reforms.

In the interpretations of these results, we need to state explicitly the caveat that the relationships documented in this study are unconditional relationships, and they mostly outline the list of possible explanations for the data observations, rather than implying causal relationships. Therefore, they need to be regarded as a starting point for more elaborated steps aimed at identifying the exact channels and the direction of the causal relationships.

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**Table 1: List of Variables and Sources**

Name	Time Interval (Quarterly)	Units	#	Source
Real GDP	1987:1 – 2009:4	1000 TL	92	CBRT
Real Consumption Expenditures and Components	1987:1 – 2009:4	1000 TL	92	CBRT
Real Government Expenditures and Components	1987:1 – 2009:4	1000 TL	92	CBRT
Real Investment Expenditures and Components	1987:1 – 2009:4	1000 TL	92	CBRT
Real GDP (New Series)	1998:1 – 2009:4	1000 TL	48	CBRT
Real Consumption Expenditures and Components (New Series)	1998:1 – 2009:4	1000 TL	48	CBRT
Real Government Expenditures and Components (New Series)	1998:1 – 2009:4	1000 TL	48	CBRT
Real Investment Expenditures and Components (New Series)	1998:1 – 2009:4	1000 TL	48	CBRT
Real Exports	1987:1 – 2009:4	1000 TL	92	CBRT
Real Imports	1987:1 – 2009:4	1000 TL	92	CBRT
M1 and M2	1987:1 – 2009:4	1000 TL	92	CBRT
Consumer Price Index (Quarterly Average)	1987:1 – 2009:4	1987=100	92	CBRT
Overnight Interest Rate	1987:1 – 2009:4	%	92	CBRT
Nominal Exchange Rate for US Dollar	1987:1 – 2009:4	TL/\$	92	CBRT
Real Capital Stock	1987:1 – 2007:3	1000 TL	83	Cihan and Saygılı (2008)
Real Exchange Rate	1987:1 – 2009:4	1995=100	92	CBRT
Capacity Utilization	1987:1 – 2009:4	index	92	CBRT
Credit	1996:2 – 2009:4	1000 TL	55	CBRT
Credit to Households	1996:2 – 2009:4	1000 TL	55	CBRT
Credit to Firms	1996:2 – 2009:4	1000 TL	55	CBRT

Credit (TL denominated)	1996:2 – 2009:4	1000 TL	55	CBRT
Credit (FX denominated)	1996:2 – 2009:4	1000 TL	55	CBRT
Deposits	1996:2 – 2009:4	1000 TL	55	CBRT
Deposits (TL denominated)	1996:2 – 2009:4	1000 TL	55	CBRT
Deposits (FX denominated)	1996:2 – 2009:4	1000 TL	55	CBRT
Deposits Interest Rates (12 Months)	1987:1 – 2009:4	%	92	CBRT
Foreign Debt	1989:4 – 2009:4	mIn \$	81	CBRT
Total Hours Worked in Manufacturing	1987:1 – 2007:3	mIn Hours	83	OECD
Total Employees in Manufacturing	1987:1 – 2007:3	1000	83	OECD
Hours per Worker in Manufacturing	1987:1 – 2007:3	hrs/work	83	Calculated
Real Hourly Wage in Manufacturing	1987:1 – 2007:3	index	83	CBRT
Productivity (GDP/ Employment)	1987:1 – 2007:3	ratio	83	Calculated
Productivity (Real Output/ Total Hours)	1988:1 – 2007:3	ratio	79	Calculated
Terms of Trade	1995:1 – 2009:4	index	60	TURKSTAT
EMBI for Turkey	1998:1 – 2009:4	Basis Points	48	Bloomberg
GDP of G7 Countries	1987:1 – 2009:4	PPP, US \$	92	OECD
US Federal Funds Rate	1987:1 – 2009:4	%	92	FED
Spot Oil Price Index	1987:1 – 2009:4	index	92	IMF-IFS

Sources for the variables are CBRT (Central Bank of Republic of Turkey), TURKSTAT (Turkish Statistics Institute), OECD (Organization for Economic Co-operation and Development), Bloomberg, FED (Federal Reserve Board), IMF-IFS (International Monetary Fund –International Financial Statistics) and Cengiz and Saygılı (2008).



**Table 2: Main Statistics about Duration of Business Cycles in Turkey 1987: 1-2009:4 (Quarters)**

Number of peak-to-peak cycles	4
Number of trough-to-trough cycles	4
Minimum cycle length	8 quarters
Maximum cycle length	30 quarters
Mean cycle length	20 quarters
Mean trough-to-peak phases	16.3 quarters
Mean peak-to-trough phases	4 quarters
Dates of peaks	1987:4 1993:3 1998:3 2000:4 2008:1
Dates of troughs	1989:2 1994:2 1999:3 2001:3 2009:1

**Table 3: Properties of Main Detrending Methods**

<b>Method</b>	<b>Properties</b>
Baxter-King Band-pass Filter	Passes through components with fluctuations between pre-specified minimum and maximum cycle lengths and removes components at higher and lower frequencies. It removes first and last 12-quarter observations, which is a problem for small sample size. The right choice of business cycle lengths is crucial for the results.
Beveridge-Nelson Decomposition	Relies on the assumption that the cyclical and the secular components are perfectly correlated and the trend and cycle are driven by the same shock.
Deterministic Detrending	Does not eliminate stochastic trends in macroeconomic time series and relies on the assumption that one can predict long-run path of the series.
First Differences	Removes unit root components but, tends to overweight high frequency at the expense of lower frequency variations.
Hodrick-Prescott Filter	Eliminates low frequency variation and emphasizes cycles of medium or short term duration. At end points accuracy of the filter diminishes. Results of the filter depend on choosing the right value for the smoothing parameter.

**TABLES 4-15**

Tables 4-15 provide the statistical relationships between real GDP and the variables for the time period mentioned in the first row of each table. The variables are seasonally adjusted with Tramo Seats and taken natural logarithms before calculating the volatility and correlation. The critical values for deciding the significance of the correlations are given at the bottom of each table.

**Table 4a: Business Cycle Properties of GDP and Its Components ( $\lambda=14$ )**

	Old National Accounts	Old National Accounts	Old National Accounts	Old National Accounts	New National Accounts
	1987:1-2009:4	1987:1-2001:4	2002:1-2009:4	1998:1-2009:4	1998:1-2009:4
<b>Real GDP</b>					
Volatility	2.182	2.248	1.76	2.211	2.027
Autocorrelation (t, t-1)	0.390	0.345	0.395	0.444	0.439
<b>Consumption</b>					
Relative Volatility	0.954	0.958	1.055	0.929	0.88
Contemporaneous correlation	0.86	0.895	0.758	0.825	0.753
Cyclicalilty	Procyclical	Procyclical	Procyclical	Procyclical	Procyclical
Phase Shift	Coincidental	Coincidental	Coincidental	Coincidental	Coincidental
Autocorrelation (t, t-1)	0.399	0.428	0.257	0.387	0.268
<b>Gross Fixed Investment</b>					
Relative Volatility	2.572	2.549	2.535	2.668	3.112
Contemporaneous correlation	0.776	0.768	0.716	0.822	0.810
Cyclicalilty	Procyclical	Procyclical	Procyclical	Procyclical	Procyclical
Phase Shift	Coincidental	Coincidental	Coincidental	Coincidental	Coincidental
Autocorrelation (t, t-1)	0.486	0.45	0.484	0.589	0.505
<b>Government Consumption</b>					
Relative Volatility	1.192	1.084	1.486	1.269	1.068
Contemporaneous correlation	0.357	0.366	0.135	0.363	0.181
Cyclicalilty	Procyclical	Not clear	Acyclical	Countercyclical	Not clear
Phase Shift	Coincidental	Not Clear	Not Clear	Lag (-0.434)	Lead (0.354)
Autocorrelation (t, t-1)	0.036	0.003	-0.118	0.042	-0.117
<b>Net Exports*</b>					
Relative Volatility	0.929	0.939	1.02	1.041	0.600
Contemporaneous correlation	-0.674	-0.655	-0.673	-0.652	-0.656
Cyclicalilty	Countercyclical	Countercyclical	Countercyclical	Countercyclical	Countercyclical
Phase Shift	Coincidental	Coincidental	Coincidental	Coincidental	Coincidental
Autocorrelation (t, t-1)	0.317	0.283	0.333	0.078	0.321
<b>Imports</b>					
Relative Volatility	3.004	3.271	2.412	2.528	2.932
Contemporaneous correlation	0.827	0.826	0.820	0.856	0.831
Cyclicalilty	Procyclical	Procyclical	Procyclical	Procyclical	Procyclical
Phase Shift	Coincidental	Coincidental	Coincidental	Coincidental	Coincidental
Autocorrelation (t, t-1)	0.512	0.505	0.444	0.485	0.408

**Exports**

Relative Volatility	1.434	1.547	1.336	1.242	1.528
Contemporaneous correlation	0.258	0.156	0.580	0.541	0.499
Cyclical Phase Shift	Procyclical Coincidental	Countercyclical Lag (-0.229)	Procyclical Coincidental	Countercyclical Lead (-0.551)	Countercyclical Lead (-0.591)
Autocorrelation (t, t-1)	0.077	0.099	-0.039	0.206	0.177

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The critical values for the significance of cross correlations at 10% level are 0.173, 0.211 and 0.296 for 1987:1-2009:4, 1987:1-2001:4 and 2002:1-2009:4 periods, respectively.

\* Trade balance as a percentage of GDP.

**Table 4b: Business Cycle Properties of GDP and Its Components ( $\lambda=1600$ )**

	Old National Accounts 1987:1-2009:4	Old National Accounts 1987:1-2001:4	Old National Accounts 2002:1-2009:4	Old National Accounts 1998:1-2009:4	New National Accounts 1998:1-2009:4
<b>Real GDP</b>					
Volatility	3.737	3.547	3.151	3.894	3.758
Autocorrelation (t, t-1)	0.738	0.664	0.772	0.768	0.788
<b>Consumption</b>					
Relative Volatility	1.083	1.079	0.992	1.046	0.991
Contemporaneous correlation	0.911	0.929	0.871	0.889	0.87
Cyclicalities	Procyclical	Procyclical	Procyclical	Procyclical	Procyclical
Phase Shift	Coincidental	Coincidental	Coincidental	Coincidental	Coincidental
Autocorrelation (t, t-1)	0.789	0.747	0.696	0.796	0.787
<b>Gross Fixed Investment</b>					
Relative Volatility	3.165	2.79	3.209	3.543	3.409
Contemporaneous correlation	0.865	0.868	0.882	0.873	0.912
Cyclicalities	Procyclical	Procyclical	Procyclical	Procyclical	Procyclical
Phase Shift	Coincidental	Coincidental	Coincidental	Coincidental	Coincidental
Autocorrelation (t, t-1)	0.836	0.721	0.864	0.88	0.831
<b>Government Consumption</b>					
Relative Volatility	1.012	1.091	1.196	1.051	0.748
Contemporaneous correlation	0.374	0.562	0.125	0.224	0.223
Cyclicalities	Procyclical	Procyclical	Acyclical	Countercyclical	Procyclical
Phase Shift	Coincidental	Coincidental	Not Clear	Lead (-0.335)	Lead (0.335)
Autocorrelation (t, t-1)	0.48	0.532	0.369	0.463	0.279
<b>Net Exports*</b>					
Relative Volatility	1.264	1.077	1.821	1.208	0.571
Contemporaneous correlation	-0.538	-0.598	-0.369	-0.613	-0.71
Cyclicalities	Countercyclical	Countercyclical	Countercyclical	Procyclical	Countercyclical
Phase Shift	Coincidental	Coincidental	Coincidental	Lag (0.823)	Coincidental
Autocorrelation (t, t-1)	0.245	0.493	-0.059	0.601	0.727
<b>Imports</b>					
Relative Volatility	3.094	3.329	2.675	2.846	2.921
Contemporaneous correlation	0.889	0.876	0.862	0.898	0.874
Cyclicalities	Procyclical	Procyclical	Procyclical	Procyclical	Procyclical
Phase Shift	Coincidental	Coincidental	Coincidental	Coincidental	Coincidental
Autocorrelation (t, t-1)	0.778	0.729	0.815	0.811	0.767

**Exports**

Relative Volatility	1.442	1.637	1.348	1.287	1.331
Contemporaneous correlation	0.44	0.265	0.794	0.687	0.653
Cyclical	Procyclical	Procyclical	Procyclical	Procyclical	Procyclical
Phase Shift	Coincidental	Coincidental	Coincidental	Coincidental	Coincidental
Autocorrelation (t, t-1)	0.626	0.605	0.642	0.692	0.625

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The critical values for the significance of cross correlations at 10% level are 0.173, 0.211 and 0.296 for 1987:1-2009:4, 1987:1-2001:4 and 2002:1-2009:4 periods, respectively.

\* Trade balance as a percentage of GDP.

**Table 5a: Business Cycle Properties of Prices, Interest Rates and Monetary Aggregates ( $\lambda=14$ )**

	1987:1-2009:4	1987:1-2001:4	2002:1-2009:4
<b>Consumer Prices (87-Based)</b>			
Relative Volatility	1.013	1.153	0.490
Contemporaneous Correlation	-0.265	-0.282	-0.065
Cyclical	Countercyclical	Countercyclical	Countercyclical
Phase Shift	Lag (-0.426)	Lag (-0.460)	Lead (-0.326)
Autocorrelation (t, t-1)	0.263	0.219	0.594
<b>Overnight Interest Rates</b>			
Relative Volatility	13.623	16.413	0.761
Contemporaneous Correlation	0.167	0.193	-0.276
Cyclical	Countercyclical	Countercyclical	Countercyclical
Phase Shift	Lead (-0.368)	Lead (-0.441)	Lead (-0.588)
Autocorrelation (t, t-1)	-0.231	-0.232	0.380
<b>M1</b>			
Relative Volatility	1.407	1.552	1.195
Contemporaneous Correlation	0.069	0.060	0.312
Cyclical	Countercyclical	Procyclical	Countercyclical
Phase Shift	Lead (-0.256)	Lead (0.375)	Lead (-0.393)
Autocorrelation (t, t-1)	0.403	0.334	0.590
<b>M1 (Real)</b>			
Relative Volatility	1.984	2.190	1.602
Contemporaneous Correlation	0.212	0.231	0.279
Cyclical	Procyclical	Procyclical	Countercyclical
Phase Shift	Lead (0.231)	Lead (0.365)	Lead (-0.381)
Autocorrelation (t, t-1)	0.344	0.291	0.471
<b>M2</b>			
Relative Volatility	1.967	2.277	1.140
Contemporaneous Correlation	-0.264	-0.314	0.041
Cyclical	Countercyclical	Countercyclical	Acyclical
Phase Shift	Lag (-0.379)	Lag (-0.475)	Not Clear
Autocorrelation (t, t-1)	0.135	0.101	0.479
<b>M2 (Real)</b>			
Relative Volatility	1.766	1.972	1.405
Contemporaneous Correlation	-0.107	-0.143	0.019
Cyclical	Procyclical	Procyclical	Countercyclical
Phase Shift	Lead (0.223)	Lead (0.302)	Lag (-0.189)
Autocorrelation (t, t-1)	0.326	0.299	0.479
<b>Nominal Deposits Rate</b>			
Relative Volatility	2.874	3.360	1.161
Contemporaneous Correlation	-0.463	-0.497	-0.167
Cyclical	Countercyclical	Countercyclical	Countercyclical
Phase Shift	Lead (-0.594)	Lead (-0.607)	Lead (-0.579)
Autocorrelation (t, t-1)	0.265	0.245	0.222

The critical values for the significance of cross correlations at 10% level are 0.173, 0.211 and 0.296 for 1987:1-2009:4, 1987:1-2001:4 and 2002:1-2009:4 periods, respectively.

**Table 5b: Business Cycle Properties of Prices, Interest Rates and Monetary Aggregates ( $\lambda=1600$ )**

	1987:1-2009:4	1987:1-2001:4	2002:1-2009:4
<b>Consumer Prices (87-Based)</b>			
Relative Volatility	1.319	1.660	0.987
Contemporaneous Correlation	-0.363	-0.125	0.005
Cyclicity	Countercyclical	Procyclical	Countercyclical
Phase Shift	Lag (-0.454)	Lead (0.251)	Lag (-0.628)
Autocorrelation (t, t-1)	0.803	0.802	0.901
<b>Overnight Interest Rates</b>			
Relative Volatility	8.793	11.410	1.421
Contemporaneous Correlation	0.066	0.128	-0.061
Cyclicity	Countercyclical	Countercyclical	Procyclical
Phase Shift	Lead (-0.354)	Lead (-0.400)	Lag (0.594)
Autocorrelation (t, t-1)	-0.056	-0.070	0.901
<b>M1</b>			
Relative Volatility	1.573	1.795	1.982
Contemporaneous Correlation	0.114	0.228	0.387
Cyclicity	Procyclical	Procyclical	Not Clear
Phase Shift	Lead (0.202)	Lead (0.414)	Not Clear
Autocorrelation (t, t-1)	0.782	0.728	0.918
<b>M1 (Real)</b>			
Relative Volatility	2.077	2.097	1.896
Contemporaneous Correlation	0.360	0.330	0.382
Cyclicity	Procyclical	Procyclical	Procyclical
Phase Shift	Coincidental	Lead (0.362)	Lead (0.548)
Autocorrelation (t, t-1)	0.740	0.624	0.832
<b>M2</b>			
Relative Volatility	2.111	2.776	1.271
Contemporaneous Correlation	-0.093	-0.022	0.456
Cyclicity	Procyclical	Procyclical	Procyclical
Phase Shift	Lead (0.222)	Lead (0.485)	Lag (0.530)
Autocorrelation (t, t-1)	0.707	0.707	0.804
<b>M2 (Real)</b>			
Relative Volatility	2.081	2.164	1.487
Contemporaneous Correlation	0.174	0.099	0.341
Cyclicity	Procyclical	Procyclical	Procyclical
Phase Shift	Lead (0.258)	Lead (0.457)	Lag (0.427)
Autocorrelation (t, t-1)	0.787	0.698	0.780
<b>Nominal Deposits Rate</b>			
Relative Volatility	2.652	3.321	1.601
Contemporaneous Correlation	-0.347	-0.419	-0.085
Cyclicity	Countercyclical	Not Clear	Procyclical
Phase Shift	Lead (-0.458)	Not Clear	Lag (0.609)
Autocorrelation (t, t-1)	0.640	0.621	0.826

The critical values for the significance of cross correlations at 10% level are 0.173, 0.211 and 0.296 for 1987:1-2009:4, 1987:1-2001:4 and 2002:1-2009:4 periods, respectively.

**Table 6a: Business Cycle Properties of Selected Variables in Turkey  
in Relation to Consumer Prices ( $\lambda=14$ )**

	1987:1-2009:4	1987:1-2001:4	2002:1-2009:4
<b>Private Consumption</b>			
Contemporaneous Correlation	-0.327	-0.344	-0.220
Direction of the Movement	Opposite	Opposite	Same
Phase Shift	Lead (-0.389)	Lead (-0.421)	Lag (0.329)
Autocorrelation (t, t-1)	0.399	0.428	0.257
<b>Private Gross Fixed Capital Formation</b>			
Contemporaneous Correlation	-0.328	-0.312	-0.239
Direction of the Movement	Opposite	Opposite	Same
Phase Shift	Lead (-0.425)	Lead (-0.435)	Lag (0.412)
Autocorrelation (t, t-1)	0.510	0.483	0.462
<b>Nominal Dollar Exchange Rate</b>			
Contemporaneous Correlation	0.483	0.578	0.025
Direction of the Movement	Same	Same	No Relation
Phase Shift	Same	Same	Not Clear
Autocorrelation (t, t-1)	0.409	0.394	0.377
<b>Nominal Deposit Rates</b>			
Contemporaneous Correlation	-0.101	-0.101	0.443
Direction of the Movement	Opposite	Opposite	Opposite
Phase Shift	Lag (-0.387)	Lag (-0.387)	Lag (-0.632)
Autocorrelation (t, t-1)	0.245	0.245	0.157
<b>Overnight Interest Rates</b>			
Contemporaneous Correlation	-0.434	-0.450	0.042
Direction of the Movement	Opposite	Opposite	Opposite
Phase Shift	Same	Same	Lead (-0.453)
Autocorrelation (t, t-1)	-0.231	-0.235	0.053

The critical values for the significance of cross correlations at 10% level are 0.173, 0.211 and 0.296 for 1987:1-2009:4, 1987:1-2001:4 and 2002:1-2009:4 periods, respectively.



**Table 6b: Business Cycle Properties of Selected Variables in Turkey  
in Relation to Consumer Prices ( $\lambda=1600$ )**

	1987:1-2009:4	1987:1-2001:4	2002:1-2009:4
<b>Private Consumption</b>			
Contemporaneous Correlation	-0.425	-0.053	0.027
Direction of the Movement	Opposite	Same	Opposite
Phase Shift	Lead (-0.473)	Lag (0.300)	Lead (-0.489)
Autocorrelation (t, t-1)	0.789	0.747	0.696
<b>Private Gross Fixed Capital Formation</b>			
Contemporaneous Correlation	-0.485	-0.044	0.131
Direction of the Movement	Opposite	Same	Opposite
Phase Shift	Lead (-0.521)	Lead (0.440)	Lead (-0.620)
Autocorrelation (t, t-1)	0.861	0.726	0.866
<b>Nominal Dollar Exchange Rate</b>			
Contemporaneous Correlation	0.570	0.495	0.063
Direction of the Movement	Same	Same	Same
Phase Shift	Lead (0.643)	Lead (0.579)	Lead (0.310)
Autocorrelation (t, t-1)	0.785	0.752	0.621
<b>Nominal Deposit Rates</b>			
Contemporaneous Correlation	0.171	0.101	-0.447
Direction of the Movement	Same	Same	Opposite
Phase Shift	Lead (0.444)	Lead (0.526)	Lag (-0.774)
Autocorrelation (t, t-1)	0.640	0.621	0.826
<b>Overnight Interest Rates</b>			
Contemporaneous Correlation	-0.255	-0.281	-0.267
Direction of the Movement	Same	Opposite	Opposite
Phase Shift	Lead (0.263)	Same	Lag (-0.411)
Autocorrelation (t, t-1)	-0.048	-0.069	0.334

The critical values for the significance of cross correlations at 10% level are 0.173, 0.211 and 0.296 for 1987:1-2009:4, 1987:1-2001:4 and 2002:1-2009:4 periods, respectively.

**Table 7a: Business Cycle Properties of Employment and Capital in Turkey ( $\lambda=14$ )**

	1987:1-2007:3	1987:1-2001:4	2002:1-2007:3
<b>Hours per Worker</b>			
Relative Volatility	0.498	0.505	0.619
Contemporaneous Correlation	0.56	0.593	-0.001
Cyclical	Procyclical	Procyclical	Countercyclical
Phase Shift	Coincidental	Coincidental	Lag (-0.520)
Autocorrelation (t, t-1)	0.078	0.04	0.256
<b>Employment</b>			
Relative Volatility	1.069	0.688	3.209
Contemporaneous Correlation	0.356	0.464	0.061
Cyclical	Countercyclical	Procyclical	Countercyclical
Phase Shift	Lag (-0.433)	Coincidental	Lag (-0.584)
Autocorrelation (t, t-1)	0.237	0.19	0.202
<b>Total Hours in Manufacturing Industry</b>			
Relative Volatility	1.244	0.79	3.749
Contemporaneous Correlation	0.528	0.781	0.059
Cyclical	Not Clear	Procyclical	Countercyclical
Phase Shift	Not Clear	Coincidental	Lag (-0.573)
Autocorrelation (t, t-1)	0.327	0.39	0.223
<b>Real Wages per Hour</b>			
Relative Volatility	1.568	1.581	2.076
Contemporaneous Correlation	0.381	0.433	0.348
Cyclical	Procyclical	Procyclical	Countercyclical
Phase Shift	Coincidental	Coincidental	Lag (-0.417)
Autocorrelation (t, t-1)	0.205	0.175	0.142
<b>Labor Productivity (GDP per worker)</b>			
Relative Volatility	1.144	1.17	0.94
Contemporaneous Correlation	0.782	0.794	0.369
Cyclical	Procyclical	Procyclical	Procyclical
Phase Shift	Coincidental	Coincidental	Lag (0.455)
Autocorrelation (t, t-1)	0.46	0.46	0.464
<b>Labor Productivity (Per-hour production in Manufacturing Industry)</b>			
Relative Volatility	1.326	0.996	3.658
Contemporaneous Correlation	0.292	0.512	0.08
Cyclical	Procyclical	Procyclical	Procyclical
Phase Shift	Coincidental	Coincidental	Lag (0.564)
Autocorrelation (t, t-1)	0.101	0.1	0.068
<b>Capacity Utilization</b>			
Relative Volatility	1.283	1.133	1.686
Contemporaneous Correlation	0.823	0.808	0.845
Cyclical	Procyclical	Procyclical	Procyclical
Phase Shift	Coincidental	Coincidental	Coincidental
Autocorrelation (t, t-1)	0.277	0.262	0.246

**Capital Stock**

Relative Volatility	0.092	0.098	0.085
Contemporaneous Correlation	0.191	0.189	0.35
Cyclical	Countercyclical	Not Clear	Procyclical
Phase Shift	Lead (-0.663)	Not Clear	Lag (0.597)
Autocorrelation (t, t-1)	0.618	0.597	0.638

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The critical values for the significance of cross correlations at 10% level are 0.18, 0.22 and 0.34 for 1987:1-2007:3, 1987:1-2001:4 and 2002:1-2007:3 periods, respectively.

**Table 7b: Business Cycle Properties of Employment and Capital in Turkey ( $\lambda=1600$ )**

	1987:1-2007:3	1987:1-2001:4	2002:1-2007:3
<b>Hours per Worker</b>			
Relative Volatility	0.389	0.399	0.608
Contemporaneous Correlation	0.628	0.655	-0.036
Cyclical	Procyclical	Procyclical	Countercyclical
Phase Shift	Coincidental	Coincidental	Lag (-0.528)
Autocorrelation (t, t-1)	0.387	0.325	0.502
<b>Employment</b>			
Relative Volatility	1.147	1.006	3.056
Contemporaneous Correlation	0.446	0.455	-0.075
Cyclical	Procyclical	Procyclical	Countercyclical
Phase Shift	Lag (0.451)	Coincidental	Lead (-0.394)
Autocorrelation (t, t-1)	0.714	0.807	0.471
<b>Total Hours in Manufacturing Industry</b>			
Relative Volatility	1.282	1.103	3.372
Contemporaneous Correlation	0.588	0.651	-0.069
Cyclical	Procyclical	Procyclical	Countercyclical
Phase Shift	Coincidental	Coincidental	Lead (-0.378)
Autocorrelation (t, t-1)	0.718	0.823	0.428
<b>Real Wages per Hour</b>			
Relative Volatility	2.525	2.777	1.952
Contemporaneous Correlation	0.269	0.304	0.153
Cyclical	Countercyclical	Procyclical	Procyclical
Phase Shift	Lead (-0.306)	Coincidental	Lag (0.477)
Autocorrelation (t, t-1)	0.86	0.844	0.427
<b>Labor Productivity (GDP per worker)</b>			
Relative Volatility	1.121	1.169	1.08
Contemporaneous Correlation	0.851	0.843	0.612
Cyclical	Procyclical	Procyclical	Procyclical
Phase Shift	Coincidental	Coincidental	Coincidental
Autocorrelation (t, t-1)	0.722	0.706	0.677
<b>Labor Productivity (Per-hour production in Manufacturing Industry)</b>			
Relative Volatility	1.101	0.89	3.503
Contemporaneous Correlation	0.304	0.384	0.286
Cyclical	Procyclical	Procyclical	Procyclical
Phase Shift	Coincidental	Coincidental	Lead (0.441)
Autocorrelation (t, t-1)	0.484	0.517	0.395
<b>Capacity Utilization</b>			
Relative Volatility	1.328	1.153	1.66
Contemporaneous Correlation	0.919	0.9	0.94
Cyclical	Procyclical	Procyclical	Procyclical
Phase Shift	Coincidental	Coincidental	Coincidental
Autocorrelation (t, t-1)	0.723	0.64	0.719

**Capital Stock**

Relative Volatility	0.237	0.172	0.702
Contemporaneous Correlation	0.148	0.369	-0.369
Cyclicity	Procyclical	Procyclical	Countercyclical
Phase Shift	Lag (0.561)	Lag (0.636)	Lead (-0.509)
Autocorrelation (t, t-1)	0.948	0.886	0.944

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The critical values for the significance of cross correlations at 10% level are 0.18, 0.22 and 0.34 for 1987:1-2007:3, 1987:1-2001:4 and 2002:1-2007:3 periods, respectively.

**Table 8a: Business Cycle Properties of Credit ( $\lambda=14$ )**

	1987:1-2009:4	1987:1-2001:4	2002:1-2009:4
<b>Real Credit</b>			
Relative Volatility	2.002	2.066	1.873
Contemporaneous Correlation	0.385	0.53	0.379
Cyclicalilty	Procyclical	Procyclical	Procyclical
Phase Shift	Lag (0.491)	Lag (0.578)	Lag (0.533)
Autocorrelation (t, t-1)	0.446	0.411	0.204
<b>Real Credit – Households</b>			
Relative Volatility	12.202	14.613	2.343
Contemporaneous Correlation	0.371	0.415	0.346
Cyclicalilty	Procyclical	Procyclical	Countercyclical
Phase Shift	Lag (0.504)	Lag (0.560)	Lead (-0.420)
Autocorrelation (t, t-1)	0.34	0.334	0.639
<b>Real Credit – Firms</b>			
Relative Volatility	2.292	2.187	2.337
Contemporaneous Correlation	0.339	0.507	0.274
Cyclicalilty	Procyclical	Procyclical	Procyclical
Phase Shift	Lag (0.489)	Lag (0.615)	Lag (0.429)
Autocorrelation (t, t-1)	0.463	0.415	0.074

The critical values for the significance of cross correlations at 10% level are 0.173, 0.211 and 0.296 for 1987:1-2009:4, 1987:1-2001:4 and 2002:1-2009:4 periods, respectively.

**Table 8b: Business Cycle Properties of Credit ( $\lambda =1600$ )**

	1987:1-2009:4	1987:1-2001:4	2002:1-2009:4
<b>Real Credit</b>			
Relative Volatility	3.573	3.001	2.815
Contemporaneous Correlation	0.611	0.761	0.592
Cyclicalilty	Procyclical	Procyclical	Procyclical
Phase Shift	Lag (0.703)	Lag (0.774)	Lag (0.781)
Autocorrelation (t, t-1)	0.897	0.821	0.807
<b>Real Credit – Households</b>			
Relative Volatility	11.837	14.603	4.066
Contemporaneous Correlation	0.37	0.356	0.624
Cyclicalilty	Procyclical	Procyclical	Procyclical
Phase Shift	Lag (0.500)	Lag (0.494)	Lag (0.664)
Autocorrelation (t, t-1)	0.702	0.666	0.907
<b>Real Credit – Firms</b>			
Relative Volatility	3.671	3.237	2.565
Contemporaneous Correlation	0.666	0.762	0.669
Cyclicalilty	Procyclical	Procyclical	Procyclical
Phase Shift	Lag (0.753)	Lag (0.777)	Lag (0.822)
Autocorrelation (t, t-1)	0.883	0.826	0.706

The critical values for the significance of cross correlations at 10% level are 0.173, 0.211 and 0.296 for 1987:1-2009:4, 1987:1-2001:4 and 2002:1-2009:4 periods, respectively.

**Table 9a: Business Cycle Properties of Financial Variables ( $\lambda=14$ )**

<b>1996:2-2009:4</b>	<b>Real Credit</b>	<b>Real Credit (TL)</b>	<b>Real Credit (Foreign Currency, Presented in TL)</b>	<b>Real Credit (Foreign Currency, Presented in dollar)</b>
Relative Volatility	2.137	2.001	3.241	1.973
Contemporaneous Correlation	-0.354	-0.239	-0.304	0.202
Cyclicalities	Procyclical	Procyclical	Procyclical	Countercyclical
Phase Shift	Lag (0.371)	Lead (0.407)	Lag (0.356)	Lead (-0.453)
Autocorrelation (t, t-1)	0.054	0.214	0.029	0.171

<b>1996:2-2009:4</b>	<b>Real Credit</b>	<b>Real Credit (TL)</b>	<b>Real Credit (Foreign Currency, Presented in TL)</b>	<b>Real Credit (Foreign Currency, Presented in dollar)</b>
Relative Volatility	2.130	2.586	3.735	3.735
Contemporaneous Correlation	0.031	0.385	-0.330	0.043
Cyclicalities	Procyclical	Procyclical	Procyclical	Countercyclical
Phase Shift	Lag (0.454)	Lag (0.519)	Lag (0.587)	Lead (-0.429)
Autocorrelation (t, t-1)	0.356	0.546	0.149	0.107

The critical value for the significance of cross correlations at 10% level is 0.231 for 1996:2-2009:4 period.

**Table 9b: Business Cycle Properties of Financial Variables ( $\lambda=1600$ )**

<b>1996:2-2009:4</b>	<b>Real Credit</b>	<b>Real Credit (TL)</b>	<b>Real Credit (Foreign Currency, Presented in TL)</b>	<b>Real Credit (Foreign Currency, Presented in dollar)</b>
Relative Volatility	1.894	2.311	2.898	1.737
Contemporaneous Correlation	-0.268	0.143	-0.441	0.115
Cyclicalities	Procyclical	Procyclical	Countercyclical	Countercyclical
Phase Shift	Lag (0.336)	Lag (0.528)	Coincidental	Lead (-0.652)
Autocorrelation (t, t-1)	0.581	0.775	0.583	0.605

<b>1996:2-2009:4</b>	<b>Real Credit</b>	<b>Real Credit (TL)</b>	<b>Real Credit (Foreign Currency, Presented in TL)</b>	<b>Real Credit (Foreign Currency, Presented in dollar)</b>
Relative Volatility	3.949	5.369	3.029	3.176
Contemporaneous Correlation	0.387	0.527	-0.144	0.325
Cyclicalities	Procyclical	Procyclical	Procyclical	Procyclical
Phase Shift	Lag (0.674)	Lag (0.625)	Lag (0.434)	Lag (0.652)
Autocorrelation (t, t-1)	0.891	0.920	0.496	0.547

The critical value for the significance of cross correlations at 10% level is 0.231 for 1996:2-2009:4 period.

**Table 10a: Business Cycle Properties of Foreign Debt ( $\lambda=14$ )**

	<b>1989:4-2009:4</b>	<b>1989:4-2001:4</b>	<b>2002:1-2009:4</b>
<b>Foreign Debt</b>			
Relative Volatility	1.097	1.060	1.170
Contemporaneous Correlation	0.365	0.438	0.324
Cyclical	Procyclical	Procyclical	Countercyclical
Phase Shift	Lag (0.534)	Lag (0.518)	Lead (-0.644)
Autocorrelation (t, t-1)	0.324	0.240	0.422
<b>Foreign Debt – Long Term</b>			
Relative Volatility	0.939	0.897	1.087
Contemporaneous Correlation	0.144	0.170	0.244
Cyclical	Procyclical	Not Clear	Countercyclical
Phase Shift	Lag (0.242)	Not Clear	Laed (-0.532)
Autocorrelation (t, t-1)	0.147	0.011	0.350
<b>Foreign Debt – Short Term</b>			
Relative Volatility	3.143	3.238	2.820
Contemporaneous Correlation	0.428	0.504	0.316
Cyclical	Procyclical	Procyclical	Countercyclical
Phase Shift	Lag (0.643)	Lag (0.686)	Lead (-0.554)
Autocorrelation (t, t-1)	0.523	0.526	0.390
<b>Foreign Debt – Long Term -Public</b>			
Relative Volatility	1.154	0.893	0.972
Contemporaneous Correlation	0.341	0.291	0.098
Cyclical	Countercyclical	Countercyclical	Procyclical
Phase Shift	Lag (-0.431)	Lag (-0.319)	Lead (0.309)
Autocorrelation (t, t-1)	0.236	0.069	0.206
<b>Foreign Debt – Long Term -Private</b>			
Relative Volatility	1.403	1.372	1.455
Contemporaneous Correlation	0.126	0.149	0.262
Cyclical	Countercyclical	Countercyclical	Countercyclical
Phase Shift	Lead (-0.349)	Lead (-0.321)	Lead (-0.549)
Autocorrelation (t, t-1)	0.400	0.388	0.361
<b>Foreign Debt – Short Term - Private</b>			
Relative Volatility	3.335	3.425	3.117
Contemporaneous Correlation	0.420	0.508	0.302
Cyclical	Procyclical	Procyclical	Countercyclical
Phase Shift	Lag (0.617)	Lag (0.664)	Lead (-0.558)
Autocorrelation (t, t-1)	0.513	0.519	0.380

The critical values for the significance of cross correlations at 10% level are 0.195, 0.211 and 0.352 for 1989:4-2009:4, 1989:4-2001:4 and 2002:1-2009:4 periods, respectively.



**Table 10b: Business Cycle Properties of Foreign Debt ( $\lambda = 1600$ )**

	1989:4-2009:4	1989:4-2001:4	2002:1-2009:4
<b>Foreign Debt</b>			
Relative Volatility	1.192	1.016	1.624
Contemporaneous Correlation	0.034	0.196	0.296
Cyclical	Countercyclical	Countercyclical	Countercyclical
Phase Shift	Lead (-0.607)	Lead (-0.605)	Lead (-0.752)
Autocorrelation (t, t-1)	0.733	0.603	0.829
<b>Foreign Debt – Long Term</b>			
Relative Volatility	1.296	0.912	2.012
Contemporaneous Correlation	-0.295	-0.263	0.185
Cyclical	Countercyclical	Countercyclical	Countercyclical
Phase Shift	Lead (-0.500)	Lead (-0.493)	Lead (-0.708)
Autocorrelation (t, t-1)	0.788	0.587	0.878
<b>Foreign Debt – Short Term</b>			
Relative Volatility	3.963	3.560	2.957
Contemporaneous Correlation	0.441	0.553	0.333
Cyclical	Procyclical	Procyclical	Procyclical
Phase Shift	Lag (0.603)	Lag (0.658)	Lead (0.571)
Autocorrelation (t, t-1)	0.834	0.715	0.764
<b>Foreign Debt – Long Term -Public</b>			
Relative Volatility	1.411	1.198	1.161
Contemporaneous Correlation	-0.080	-0.189	-0.164
Cyclical	Countercyclical	Countercyclical	Countercyclical
Phase Shift	Lag (-0.561)	Not Clear	Lag (-0.460)
Autocorrelation (t, t-1)	0.790	0.761	0.739
<b>Foreign Debt – Long Term -Private</b>			
Relative Volatility	3.505	2.947	4.427
Contemporaneous Correlation	0.119	0.272	0.373
Cyclical	Procyclical	Procyclical	Procyclical
Phase Shift	Lag (0.571)	Lag (0.476)	Lag (0.707)
Autocorrelation (t, t-1)	0.927	0.893	0.930
<b>Foreign Debt – Short Term - Private</b>			
Relative Volatility	4.212	3.697	3.187
Contemporaneous Correlation	0.438	0.571	0.365
Cyclical	Procyclical	Procyclical	Procyclical
Phase Shift	Lag (0.601)	Lag (0.674)	Lead (0.535)
Autocorrelation (t, t-1)	0.832	0.707	0.745

The critical values for the significance of cross correlations at 10% level are 0.195, 0.211 and 0.352 for 1989:4-2009:4, 1989:4-2001:4 and 2002:1-2009:4 periods, respectively.

**Table 11a: Business Cycle Properties of International Variables ( $\lambda=14$ )**

	<b>1987:1-2009:4</b>	<b>1987:1-2001:4</b>	<b>2002:1-2009:4</b>
<b>Nominal Exchange Rate TL/\$</b>			
Relative Volatility	2.926	2.858	3.112
Contemporaneous Correlation	-0.687	-0.673	-0.596
Cyclicalities	Countercyclical	Countercyclical	Countercyclical
Phase Shift	Coincidental	Coincidental	Coincidental
Autocorrelation (t, t-1)	0.409	0.394	0.377
<b>Real Exchange Rate</b>			
Relative Volatility	2.514	2.320	3.083
Contemporaneous Correlation	0.516	0.618	0.183
Cyclicalities	Procyclical	Procyclical	Countercyclical
Phase Shift	Coincidental	Coincidental	Not Clear
Autocorrelation (t, t-1)	0.258	0.284	0.129
<b>Terms of Trade*</b>			
Relative Volatility	0.813		0.804
Contemporaneous Correlation	-0.035	-	0.219
Cyclicalities	Countercyclical		Not Clear
Phase Shift	Lead (-0.610)		Not Clear
Autocorrelation (t, t-1)	0.443		0.447
<b>EMBI Spread**</b>			
Relative Volatility	0.386		0.425
Contemporaneous Correlation	-0.417		-0.447
Cyclicalities	Countercyclical		Not Clear
Phase Shift	Lead (-0.648)		Not Clear
Autocorrelation (t, t-1)	0.343		0.207
<b>GDP of G7 Countries</b>			
Relative Volatility	0.176	0.116	0.314
Contemporaneous Correlation	0.357	0.045	0.786
Cyclicalities	Procyclical	Not Clear	Not Clear
Phase Shift	Coincidental	Not Clear	Not Clear
Autocorrelation (t, t-1)	0.457	0.4	0.485
<b>US Fed Rate</b>			
Relative Volatility	0.143	0.142	0.142
Contemporaneous Correlation	0.266	0.201	0.266
Cyclicalities	Procyclical	Countercyclical	Procyclical
Phase Shift	Coincidental	Lag (-0.263)	Lead (0.497)
Autocorrelation (t, t-1)	0.613	0.62	0.491
<b>Spot Oil Price Index</b>			
Relative Volatility	5.288	4.33	8.013
Contemporaneous Correlation	0.287	-0.023	0.753
Cyclicalities	Not Clear	Procyclical	Procyclical
Phase Shift	Not Clear	Lead (0.412)	Coincidental
Autocorrelation (t, t-1)	0.359	0.246	0.442

\*Data for Terms of Trade and EMBI Spread cover 1995:1-2009:4 and 1998:1-2009:4 periods, respectively. Before 2001 statistics are not reported due to short sample problem. The critical values for the significance of cross correlations at 10% level are 0.173, 0.211, 0.296, 0.231 and 0.257 for 1987:1-2009:4, 1987:1-2001:4, 2002:1-2009:4, 1995:1-2009:4 and 1998:1-2009:4 periods, respectively.

**Table 11b: Business Cycle Properties of International Variables ( $\lambda=1600$ )**

	<b>1987:1-2009:4</b>	<b>1987:1-2001:4</b>	<b>2002:1-2009:4</b>
<b>Nominal Exchange Rate TL/\$</b>			
Relative Volatility	3.272	3.265	2.508
Contemporaneous Correlation	-0.71	-0.57	-0.609
Cyclical	Countercyclical	Countercyclical	Countercyclical
Phase Shift	Coincidental	Coincidental	Coincidental
Autocorrelation (t, t-1)	0.785	0.752	0.621
<b>Real Exchange Rate</b>			
Relative Volatility	2.165	2.575	2.146
Contemporaneous Correlation	0.598	0.625	0.373
Cyclical	Procyclical	Procyclical	Countercyclical
Phase Shift	Coincidental	Coincidental	Lead (-0.385)
Autocorrelation (t, t-1)	0.597	0.655	0.369
<b>Terms of Trade*</b>			
Relative Volatility	0.963	-	0.677
Contemporaneous Correlation	0.402		-0.044
Cyclical	Procyclical		Countercyclical
Phase Shift	Coincidental		Lag (-0.582)
Autocorrelation (t, t-1)	0.834		0.668
<b>EMBI Spread*</b>			
Relative Volatility	0.363		0.377
Contemporaneous Correlation	-0.645	-	-0.551
Cyclical	Countercyclical		Countercyclical
Phase Shift	Lead (-0.804)		Lead (-0.682)
Autocorrelation (t, t-1)	0.697		0.614
<b>GDP of G7 Counties</b>			
Relative Volatility	0.349	0.222	0.582
Contemporaneous Correlation	0.343	0.008	0.806
Cyclical	Procyclical	Countercyclical	Procyclical
Phase Shift	Lag (0.398)	Lag (-0.297)	Lag (0.894)
Autocorrelation (t, t-1)	0.914	0.88	0.914
<b>US Fed Rate</b>			
Relative Volatility	0.335	0.313	0.385
Contemporaneous Correlation	0.218	-0.053	0.68
Cyclical	Procyclical	Countercyclical	Procyclical
Phase Shift	Coincidental	Lag (-0.365)	Lead (0.708)
Autocorrelation (t, t-1)	0.938	0.909	0.94
<b>Spot Oil Price Index</b>			
Relative Volatility	5.076	5.122	6.246
Contemporaneous Correlation	0.307	0.085	0.758
Cyclical	Procyclical	Countercyclical	Procyclical
Phase Shift	Coincidental	Lag (-0.497)	Coincidental
Autocorrelation (t, t-1)	0.703	0.711	0.659

\*Data for Terms of Trade and EMBI Spread cover 1995:1-2009:4 and 1998:1-2009:4 periods, respectively. Before 2001 statistics are not reported due to short sample problem. The critical values for the significance of cross correlations at 10% level are 0.173, 0.211, 0.296, 0.231 and 0.257 for 1987:1-2009:4, 1987:1-2001:4, 2002:1-2009:4, 1995:1-2009:4 and 1998:1-2009:4 periods, respectively.

**Table 12-a Cyclical Behavior of Some Variables ( $\lambda=14$ , 1987:1-2009:4)**

	CORRELATION															AUTOCORRELATION					
	Volatility	Rel. Vol.	t-6	t-5	t-4	t-3	t-2	t-1	t	t+1	t+2	t+3	t+4	t+5	t+6	t-1	t-2	t-3	t-4	t-5	t-6
<b>Real GDP</b>	2.182	1.000	-0.006	-0.246	-0.582	-0.451	-0.077	0.390	1.000	0.390	-0.077	-0.451	-0.582	-0.246	-0.006	0.39	-0.077	-0.451	-0.582	-0.246	-0.006
<b>Private Consumption</b>	2.082	0.954	-0.096	-0.325	-0.586	-0.338	-0.019	0.403	0.860	0.358	-0.054	-0.350	-0.563	-0.217	0.033	0.399	-0.045	-0.352	-0.617	-0.288	-0.032
<b>Government Consumption</b>	2.602	1.192	-0.117	-0.158	-0.120	-0.119	-0.084	0.173	0.357	0.269	0.137	-0.321	-0.269	-0.110	-0.151	0.036	-0.244	-0.194	-0.199	-0.018	0.127
<b>Gross Fixed Investment</b>	5.613	2.572	0.030	-0.270	-0.545	-0.485	-0.154	0.379	0.776	0.522	0.105	-0.341	-0.513	-0.310	-0.174	0.486	-0.017	-0.485	-0.622	-0.306	-0.052
<b>Gross Fixed Investment (Private)</b>	5.965	2.733	-0.049	-0.344	-0.543	-0.393	-0.169	0.350	0.716	0.552	0.184	-0.285	-0.536	-0.396	-0.191	0.51	0.004	-0.396	-0.598	-0.383	-0.181
<b>Exports</b>	3.129	1.434	-0.065	-0.142	-0.209	-0.174	0.002	0.104	0.258	0.043	0.028	-0.001	-0.018	0.063	-0.136	0.077	-0.063	-0.163	-0.384	-0.193	0.057
<b>Imports</b>	6.556	3.004	-0.145	-0.418	-0.546	-0.294	0.101	0.529	0.827	0.347	-0.107	-0.462	-0.532	-0.302	-0.023	0.512	0.016	-0.406	-0.613	-0.440	-0.148
<b>Capacity Utilization Rate</b>	2.801	1.283	-0.058	-0.223	-0.506	-0.344	-0.064	0.370	0.823	0.372	-0.045	-0.405	-0.596	-0.243	0.079	0.277	-0.103	-0.342	-0.528	-0.241	0.073
<b>Net Exports</b>	2.028	0.929	0.104	0.394	0.446	0.184	-0.124	-0.481	-0.674	-0.232	0.141	0.383	0.498	0.288	-0.042	0.317	-0.072	-0.223	-0.502	-0.440	-0.060
<b>Real Credit</b>	4.369	2.002	0.064	-0.077	-0.304	-0.423	-0.260	0.001	0.385	0.491	0.313	0.179	-0.160	-0.338	-0.330	0.446	0.103	-0.178	-0.395	-0.377	-0.324
<b>Real Credit (Firms)</b>	5.002	2.292	0.001	-0.042	-0.211	-0.335	-0.267	-0.044	0.339	0.489	0.317	0.206	-0.106	-0.334	-0.399	0.463	-0.022	-0.214	-0.334	-0.365	-0.309
<b>Real Credit (Households)</b>	26.631	12.202	0.073	-0.036	-0.226	-0.450	-0.232	0.034	0.371	0.504	0.198	-0.158	-0.188	-0.155	-0.069	0.34	-0.305	-0.346	-0.158	-0.085	-0.125
<b>M1</b>	3.070	1.407	-0.081	-0.256	-0.153	0.078	0.215	0.202	0.069	-0.102	-0.142	-0.089	-0.150	-0.010	0.137	0.403	-0.163	-0.406	-0.472	-0.196	0.092
<b>M2</b>	4.293	1.967	-0.074	0.017	0.212	0.292	0.241	0.056	-0.264	-0.379	-0.148	-0.087	0.055	0.145	0.181	0.135	-0.079	-0.444	-0.048	-0.381	0.008
<b>M1 (Real)</b>	4.331	1.984	0.049	-0.118	-0.210	-0.147	0.042	0.231	0.212	0.015	0.016	0.008	-0.182	-0.173	-0.024	0.344	-0.203	-0.354	-0.417	-0.179	0.092
<b>M2 (Real)</b>	3.855	1.766	0.022	0.067	0.223	0.171	0.042	0.048	-0.107	-0.207	-0.034	-0.038	-0.044	0.008	0.065	0.326	-0.201	-0.363	-0.433	-0.148	0.098
<b>CPI</b>	2.210	1.013	-0.212	-0.045	0.152	0.249	0.366	0.124	-0.265	-0.426	-0.296	-0.128	0.161	0.304	0.213	0.263	-0.046	-0.235	-0.434	-0.313	-0.035
<b>Nominal Exchange Rate</b>	6.387	2.926	-0.018	0.207	0.405	0.339	0.137	-0.299	-0.687	-0.416	-0.068	0.332	0.495	0.215	0.024	0.409	-0.099	-0.383	-0.467	-0.214	-0.065
<b>Real Exchange Rate</b>	5.487	2.514	-0.183	-0.359	-0.354	-0.100	0.059	0.407	0.516	0.182	-0.077	-0.438	-0.381	-0.022	0.146	0.258	-0.178	-0.324	-0.430	-0.159	0.020
<b>Deposit Rate</b>	6.272	2.874	0.274	0.435	0.305	-0.039	-0.311	-0.594	-0.463	0.102	0.206	0.474	0.388	-0.013	-0.135	0.265	-0.120	-0.212	-0.387	-0.384	0.033
<b>Overnight Int. Rate</b>	29.731	13.623	0.121	0.143	0.018	-0.081	-0.294	-0.368	0.167	0.225	0.286	0.155	-0.089	-0.193	-0.038	-0.231	-0.182	-0.092	-0.051	-0.033	0.007
<b>GDP of G7 Countries</b>	0.384	0.176	0.045	0.046	-0.109	-0.224	-0.213	0.020	0.357	0.303	0.117	-0.203	-0.272	-0.125	0.002	0.457	-0.218	-0.525	-0.373	-0.070	-0.046
<b>FED Funds Rate</b>	0.311	0.143	-0.134	-0.156	-0.152	-0.042	0.058	0.190	0.266	0.115	0.002	-0.166	-0.236	-0.135	-0.086	0.613	0.124	-0.270	-0.551	-0.508	-0.330
<b>Oil Price</b>	11.540	5.288	-0.046	-0.074	-0.062	-0.017	-0.047	0.171	0.287	0.149	0.040	-0.211	-0.287	-0.116	-0.012	0.359	-0.263	-0.291	-0.337	-0.286	0.024
<b>Terms of Trade</b>	1.541	0.813	0.359	0.247	0.049	-0.083	-0.118	-0.033	-0.035	-0.191	-0.221	-0.118	0.118	0.400	0.391	0.443	-0.102	-0.505	-0.574	-0.276	0.039
<b>EMBI spread</b>	0.854	0.386	0.337	0.367	0.275	-0.032	-0.356	-0.648	-0.417	0.105	0.487	0.579	0.357	-0.200	-0.458	0.343	-0.280	-0.355	-0.312	-0.357	-0.104

TOT and EMBI spread data exist for 1995:1-2009:4 and 1998:1-2009:4 periods, respectively.

**Table 12-b Cyclical Behavior of Some Variables ( $\lambda=1600$ , 1987:1-2009:4)**

	CORRELATION															AUTOCORRELATION					
	Volatility	Rel. Vol.	t-6	t-5	t-4	t-3	t-2	t-1	t	t+1	t+2	t+3	t+4	t+5	t+6	t-1	t-2	t-3	t-4	t-5	t-6
<b>Real GDP</b>	3.737	1.000	-0.088	-0.110	-0.096	0.125	0.436	0.738	1.000	0.738	0.436	0.125	-0.096	-0.110	-0.088	0.738	0.436	0.125	-0.096	-0.110	-0.088
<b>Private Consumption</b>	4.045	1.083	-0.108	-0.108	-0.055	0.194	0.457	0.720	0.911	0.719	0.475	0.224	-0.003	-0.028	-0.030	0.789	0.535	0.277	0.022	-0.043	-0.075
<b>Government Consumption</b>	3.780	1.012	-0.377	-0.327	-0.189	-0.059	0.083	0.285	0.374	0.315	0.204	-0.047	-0.051	0.023	0.040	0.48	0.227	0.124	-0.006	0.004	0.008
<b>Gross Fixed Investment</b>	11.825	3.165	-0.084	-0.112	-0.079	0.095	0.368	0.670	0.865	0.794	0.587	0.314	0.096	0.009	-0.034	0.836	0.589	0.300	0.088	0.012	-0.027
<b>Gross Fixed Investment (Private)</b>	13.674	3.660	-0.039	-0.072	-0.028	0.150	0.371	0.641	0.809	0.763	0.578	0.310	0.070	-0.040	-0.069	0.861	0.635	0.376	0.147	0.030	-0.037
<b>Exports</b>	5.387	1.442	0.032	-0.010	-0.006	0.051	0.214	0.331	0.440	0.392	0.354	0.265	0.140	0.038	-0.140	0.626	0.432	0.213	-0.067	-0.163	-0.160
<b>Imports</b>	11.561	3.094	-0.167	-0.190	-0.086	0.188	0.498	0.764	0.889	0.652	0.342	0.032	-0.170	-0.212	-0.160	0.778	0.448	0.085	-0.207	-0.313	-0.288
<b>Capacity Utilization Rate</b>	4.963	1.328	-0.096	-0.079	-0.034	0.190	0.454	0.723	0.919	0.724	0.455	0.164	-0.074	-0.079	-0.028	0.723	0.473	0.224	-0.020	-0.069	-0.038
<b>Net Exports</b>	3.367	0.901	0.179	0.201	0.075	-0.200	-0.455	-0.675	-0.747	-0.512	-0.238	0.004	0.171	0.163	0.047	0.688	0.388	0.127	-0.186	-0.315	-0.254
<b>Real Credit</b>	13.351	3.573	-0.162	-0.126	-0.074	0.028	0.211	0.414	0.611	0.703	0.671	0.582	0.401	0.229	0.113	0.897	0.739	0.533	0.310	0.119	-0.038
<b>Real Credit (Firms)</b>	13.718	3.671	-0.132	-0.064	0.009	0.117	0.280	0.473	0.666	0.753	0.695	0.581	0.366	0.153	0.006	0.883	0.693	0.490	0.278	0.087	-0.057
<b>Real Credit (Households)</b>	44.228	11.837	-0.201	-0.276	-0.326	-0.321	-0.128	0.116	0.370	0.500	0.412	0.249	0.170	0.107	0.077	0.702	0.318	0.116	0.000	-0.140	-0.277
<b>M1</b>	5.879	1.573	0.025	-0.014	0.047	0.155	0.202	0.189	0.114	0.021	-0.036	-0.056	-0.103	-0.066	-0.011	0.782	0.482	0.231	0.027	-0.049	-0.076
<b>M2</b>	7.887	2.111	-0.029	0.076	0.185	0.222	0.176	0.063	-0.093	-0.153	-0.078	-0.022	0.074	0.168	0.239	0.707	0.543	0.303	0.284	0.100	0.127
<b>M1 (Real)</b>	7.759	2.077	-0.014	-0.024	0.008	0.105	0.233	0.349	0.360	0.277	0.229	0.160	0.029	-0.030	-0.023	0.74	0.42	0.175	-0.047	-0.143	-0.187
<b>M2 (Real)</b>	7.776	2.081	-0.064	0.067	0.209	0.258	0.236	0.236	0.174	0.131	0.172	0.170	0.174	0.200	0.234	0.787	0.531	0.321	0.131	0.064	0.017
<b>CPI</b>	4.870	1.303	-0.005	0.016	0.043	0.038	-0.019	-0.174	-0.363	-0.454	-0.423	-0.340	-0.190	-0.059	-0.002	0.803	0.619	0.402	0.170	0.059	0.013
<b>Nominal Exchange Rate</b>	12.225	3.272	0.045	0.069	0.032	-0.116	-0.309	-0.548	-0.710	-0.593	-0.383	-0.120	0.071	0.089	0.078	0.785	0.506	0.241	0.030	-0.059	-0.117
<b>Real Exchange Rate</b>	8.091	2.165	-0.260	-0.290	-0.175	0.081	0.283	0.525	0.598	0.423	0.221	-0.038	-0.114	-0.025	0.036	0.597	0.248	0.011	-0.191	-0.162	-0.109
<b>Deposit Rate</b>	9.910	2.652	0.227	0.233	0.081	-0.158	-0.335	-0.458	-0.347	-0.015	0.161	0.369	0.385	0.214	0.101	0.64	0.318	0.069	-0.206	-0.353	-0.269
<b>Overnight Int. Rate</b>	32.857	8.793	-0.031	-0.070	-0.185	-0.261	-0.354	-0.323	0.066	0.193	0.284	0.223	0.060	-0.046	-0.003	-0.052	-0.086	-0.078	-0.089	-0.091	-0.054
<b>GDP of G7 Countries</b>	1.305	0.349	-0.158	-0.136	-0.112	-0.056	0.066	0.206	0.343	0.398	0.371	0.271	0.158	0.101	0.094	0.914	0.723	0.478	0.221	0.006	-0.142
<b>FED Funds Rate</b>	1.253	0.335	-0.038	-0.018	0.015	0.060	0.129	0.184	0.218	0.206	0.177	0.131	0.094	0.103	0.133	0.938	0.798	0.607	0.385	0.162	-0.041
<b>Oil Price</b>	18.966	5.076	-0.124	-0.106	-0.012	0.107	0.164	0.279	0.307	0.213	0.091	-0.095	-0.213	-0.192	-0.136	0.703	0.309	0.078	-0.171	-0.340	-0.321
<b>Terms of Trade</b>	3.479	0.963	0.352	0.383	0.358	0.360	0.372	0.391	0.402	0.330	0.230	0.170	0.156	0.235	0.164	0.834	0.561	0.242	0.011	-0.023	-0.044
<b>EMBI Spread</b>	1.415	0.363	0.093	0.000	-0.185	-0.459	-0.684	-0.804	-0.645	-0.316	-0.012	0.124	0.062	-0.138	-0.216	0.697	0.313	0.123	0.023	-0.072	-0.045

TOT and EMBI spread data exist for 1995:1-2009:4 and 1998:1-2009:4 periods, respectively.

**Table-13a: Cyclical Behavior of Real Deposits and Real Credits ( $\lambda=14$ , 1996:2-2009:4)**

	CORRELATION															AUTOCORRELATION					
	Volatility	Rel. Vol.	t-6	t-5	t-4	t-3	t-2	t-1	t	t+1	t+2	t+3	t+4	t+5	t+6	t-1	t-2	t-3	t-4	t-5	t-6
<b>Real Credit</b>	4.221	2.130	0.130	0.134	-0.075	-0.415	-0.306	-0.288	0.031	0.445	0.407	0.454	0.046	-0.232	-0.381	0.356	0.136	-0.127	-0.412	-0.242	-0.246
<b>Real Credit (TL)</b>	5.123	2.586	0.026	-0.202	-0.361	-0.503	-0.196	0.176	0.385	0.519	0.237	0.060	-0.185	-0.266	-0.232	0.546	0.094	-0.223	-0.236	-0.181	-0.378
<b>Real Credit (FX, in TL)</b>	7.399	3.735	0.161	0.384	0.254	-0.125	-0.239	-0.519	-0.330	0.095	0.305	0.587	0.232	-0.093	-0.280	0.149	-0.116	-0.266	-0.531	-0.151	0.133
<b>Real Credit (FX, in \$)</b>	7.400	3.735	0.187	0.220	-0.025	-0.288	-0.274	-0.429	0.043	0.398	0.323	0.285	-0.106	-0.114	-0.138	0.107	-0.13	-0.289	-0.460	0.008	-0.088
<b>Real Deposits</b>	4.234	2.137	0.079	0.219	0.341	0.092	-0.094	-0.329	-0.354	-0.058	0.108	0.371	0.169	-0.076	-0.219	0.054	-0.272	-0.356	-0.279	0.262	0.116
<b>Real Deposits (TL)</b>	3.964	2.001	0.191	0.275	0.407	-0.071	-0.214	-0.372	-0.239	0.090	0.174	0.187	0.117	-0.062	-0.124	0.214	-0.238	-0.374	-0.397	-0.012	0.209
<b>Real Deposits (FX, in TL)</b>	6.420	3.241	-0.011	0.116	0.194	0.156	-0.010	-0.168	-0.304	-0.124	0.037	0.356	0.150	-0.072	-0.219	0.029	-0.294	-0.329	-0.165	0.274	0.043
<b>Real Deposits (FX, in\$)</b>	3.910	1.973	-0.235	-0.453	-0.316	0.260	0.192	0.431	0.202	-0.059	-0.168	-0.309	-0.167	0.061	0.097	0.171	-0.162	-0.293	-0.393	-0.084	0.057

**Table-13b: Cyclical Behavior of Real Deposits and Real Credits ( $\lambda=1600$ , 1996:2-2009:4)**

	CORRELATION															AUTOCORRELATION					
	Volatility	Rel. Vol.	t-6	t-5	t-4	t-3	t-2	t-1	t	t+1	t+2	t+3	t+4	t+5	t+6	t-1	t-2	t-3	t-4	t-5	t-6
<b>Real Credit</b>	14.107	3.949	-0.276	-0.234	-0.198	-0.148	0.011	0.166	0.387	0.580	0.651	0.674	0.563	0.416	0.275	0.891	0.736	0.524	0.292	0.108	-0.058
<b>Real Credit (TL)</b>	19.181	5.369	-0.271	-0.258	-0.193	-0.079	0.131	0.347	0.527	0.635	0.625	0.581	0.492	0.375	0.273	0.92	0.758	0.549	0.342	0.136	-0.060
<b>Real Credit (FX, in TL)</b>	10.822	3.029	-0.041	0.070	0.006	-0.196	-0.236	-0.288	-0.144	0.104	0.297	0.434	0.201	0.061	-0.076	0.496	0.191	-0.058	-0.343	-0.253	-0.124
<b>Real Credit (FX, in \$)</b>	11.347	3.176	0.001	0.037	-0.041	-0.134	-0.049	-0.008	0.325	0.611	0.652	0.580	0.272	0.169	0.035	0.547	0.302	0.086	-0.124	-0.012	-0.111
<b>Real Deposits</b>	6.765	1.894	-0.299	-0.216	-0.143	-0.239	-0.289	-0.315	-0.268	-0.114	0.071	0.303	0.336	0.332	0.308	0.581	0.353	0.211	0.133	0.237	0.066
<b>Real Deposits (TL)</b>	8.255	2.311	-0.155	-0.052	0.058	-0.024	0.002	0.029	0.143	0.305	0.417	0.506	0.528	0.499	0.452	0.775	0.564	0.404	0.257	0.205	0.117
<b>Real Deposits (FX, in TL)</b>	10.355	2.898	-0.276	-0.243	-0.231	-0.288	-0.378	-0.395	-0.441	-0.379	-0.245	-0.038	-0.015	-0.009	-0.008	0.583	0.36	0.227	0.168	0.214	0.008
<b>Real Deposits (FX, in\$)</b>	6.204	1.737	-0.560	-0.652	-0.530	-0.198	-0.129	0.076	0.115	0.073	0.073	0.022	0.138	0.201	0.194	0.605	0.337	0.091	-0.138	-0.186	-0.246

**Table-14a: Cyclical Behavior of International Variables ( $\lambda=14$ , 1989:4-2009:4)**

	CORRELATION															AUTOCORRELATION					
	Volatility	Rel. Vol.	t-6	t-5	t-4	t-3	t-2	t-1	t	t+1	t+2	t+3	t+4	t+5	t+6	t-1	t-2	t-3	t-4	t-5	t-6
Foreign Debt	2.327	1.097	0.099	-0.025	-0.282	-0.368	-0.362	-0.047	0.365	0.534	0.397	-0.085	-0.278	-0.362	-0.138	0.324	-0.198	-0.362	-0.378	-0.129	0.008
Foreign Debt (Short Term)	6.665	3.143	0.044	0.023	-0.289	-0.400	-0.450	-0.077	0.428	0.643	0.488	0.029	-0.283	-0.387	-0.266	0.523	0.057	-0.353	-0.477	-0.389	-0.305
Foreign Debt (Short Term, Private)	7.072	3.335	-0.002	-0.014	-0.294	-0.371	-0.445	-0.053	0.420	0.617	0.471	0.026	-0.257	-0.363	-0.264	0.513	0.059	-0.361	-0.458	-0.395	-0.292
Foreign Debt (Long Term)	1.991	0.939	0.098	-0.038	-0.149	-0.152	-0.145	-0.054	0.144	0.242	0.208	-0.109	-0.140	-0.203	0.007	0.147	-0.268	-0.215	-0.131	-0.041	0.006
Foreign Debt (Long Term, Private)	2.976	1.403	0.186	-0.035	-0.243	-0.349	-0.251	-0.041	0.126	0.330	0.313	0.034	-0.092	-0.196	-0.077	0.4	-0.044	-0.317	-0.363	-0.102	0.057
Foreign Debt (Long Term, Public)	2.446	1.154	0.018	-0.169	-0.207	-0.120	0.008	0.156	0.341	0.324	0.069	-0.360	-0.431	-0.265	0.047	0.236	-0.151	-0.333	-0.331	-0.192	-0.148

**Table-14b: Cyclical Behavior of International Variables ( $\lambda=1600$ , 1989:4-2009:4)**

	CORRELATION															AUTOCORRELATION					
	Volatility	Rel. Vol.	t-6	t-5	t-4	t-3	t-2	t-1	t	t+1	t+2	t+3	t+4	t+5	t+6	t-1	t-2	t-3	t-4	t-5	t-6
Foreign Debt	4.363	1.192	-0.339	-0.472	-0.607	-0.604	-0.507	-0.267	0.034	0.250	0.304	0.186	0.142	0.042	0.090	0.733	0.397	0.109	-0.132	-0.216	-0.251
Foreign Debt (Short Term)	14.513	3.963	-0.204	-0.169	-0.207	-0.145	-0.059	0.161	0.441	0.603	0.585	0.413	0.240	0.100	0.050	0.834	0.57	0.257	0.005	-0.159	-0.258
Foreign Debt (Short Term, Private)	15.425	4.212	-0.230	-0.195	-0.225	-0.152	-0.070	0.160	0.438	0.601	0.592	0.431	0.270	0.129	0.071	0.832	0.572	0.255	0.011	-0.154	-0.242
Foreign Debt (Long Term)	4.747	1.296	-0.178	-0.340	-0.453	-0.500	-0.493	-0.424	-0.295	-0.160	-0.068	-0.062	0.020	-0.005	0.074	0.788	0.561	0.357	0.125	-0.081	-0.251
Foreign Debt (Long Term, Private)	12.836	3.505	-0.504	-0.513	-0.482	-0.403	-0.260	-0.075	0.119	0.320	0.464	0.529	0.571	0.534	0.511	0.927	0.787	0.603	0.402	0.221	0.049
Foreign Debt (Long Term, Public)	5.165	1.411	0.169	0.043	-0.027	-0.047	-0.072	-0.081	-0.080	-0.145	-0.297	-0.503	-0.561	-0.505	-0.353	0.790	0.606	0.443	0.325	0.249	0.161

**Table-15a: Business Cycle Properties of Selected Variables in Turkey in relation to Consumer Prices ( $\lambda=14$ , 1987:1-2009:4)**

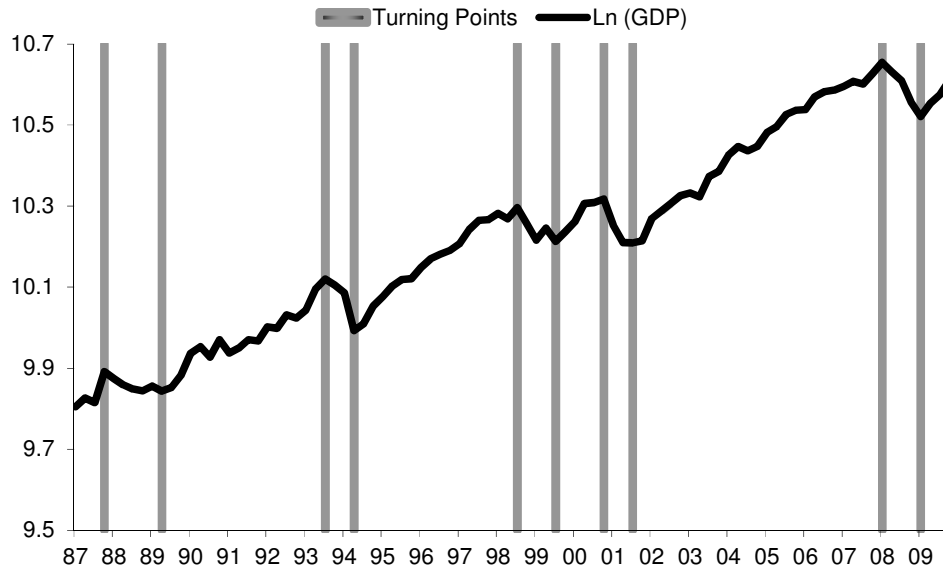
1987:1-2009:4	CORRELATIONS WITH CPI															AUTOCORRELATIONS					
	Vol	Rel.Vol	t-6	t-5	t-4	t-3	t-2	t-1	t	t+1	t+2	t+3	t+4	t+5	t+6	t-1	t-2	t-3	t-4	t-5	t-6
Private Consumption	2.082	0.942	0.219	0.321	0.218	-0.101	-0.300	-0.389	-0.327	0.093	0.292	0.198	0.195	-0.031	-0.253	0.399	-0.045	-0.352	-0.617	-0.288	-0.032
Gross Fixed Investment (Private)	5.965	2.699	0.203	0.377	0.162	-0.067	-0.182	-0.425	-0.328	-0.019	0.107	0.268	0.265	-0.008	-0.045	0.51	0.004	-0.396	-0.598	-0.383	-0.181
Nominal Exchange Rate	6.387	2.890	-0.105	-0.230	-0.283	0.052	0.228	0.459	0.483	-0.057	-0.271	-0.292	-0.347	-0.038	0.044	0.409	-0.099	-0.383	-0.467	-0.214	-0.065
Overnight Interest Rates	28.608	12.945	-0.044	-0.025	0.194	0.104	0.162	0.157	-0.434	-0.187	0.058	-0.099	0.186	0.110	0.044	-0.231	-0.18	-0.053	-0.106	-0.047	0.021
Deposit Rate	6.272	2.838	-0.326	-0.121	0.147	0.345	0.338	0.320	-0.060	-0.368	-0.235	-0.154	-0.024	0.262	0.193	0.265	-0.120	-0.212	-0.387	-0.384	0.033

**Table-15b: Business Cycle Properties of Selected Variables in Turkey in relation to Consumer Prices ( $\lambda=1600$ , 1987:1-2009:4)**

1987:1-2009:4	CORRELATIONS WITH CPI															AUTOCORRELATIONS					
	Vol	Rel.Vol	t-6	t-5	t-4	t-3	t-2	t-1	t	t+1	t+2	t+3	t+4	t+5	t+6	t-1	t-2	t-3	t-4	t-5	t-6
Private Consumption	4.045	0.831	0.004	-0.058	-0.184	-0.342	-0.438	-0.473	-0.425	-0.261	-0.125	-0.051	0.010	0.008	0.003	0.789	0.535	0.277	0.022	-0.043	-0.075
Gross Fixed Investment (Private)	13.674	2.808	0.035	-0.028	-0.187	-0.345	-0.440	-0.521	-0.485	-0.367	-0.252	-0.112	-0.021	0.004	0.059	0.861	0.635	0.376	0.147	0.030	-0.037
Nominal Exchange Rate	12.225	2.510	0.226	0.305	0.394	0.542	0.607	0.643	0.570	0.317	0.131	0.005	-0.088	-0.061	-0.052	0.785	0.506	0.241	0.030	-0.059	-0.117
Overnight Interest Rates	31.719	6.513	0.127	0.166	0.263	0.190	0.145	0.063	-0.255	-0.190	-0.103	-0.161	-0.017	-0.027	-0.052	-0.048	-0.082	-0.046	-0.138	-0.107	-0.044
Deposit Rate	9.910	2.035	-0.051	0.130	0.323	0.444	0.438	0.379	0.171	-0.029	-0.090	-0.137	-0.139	-0.093	-0.133	0.640	0.318	0.069	-0.206	-0.353	-0.269



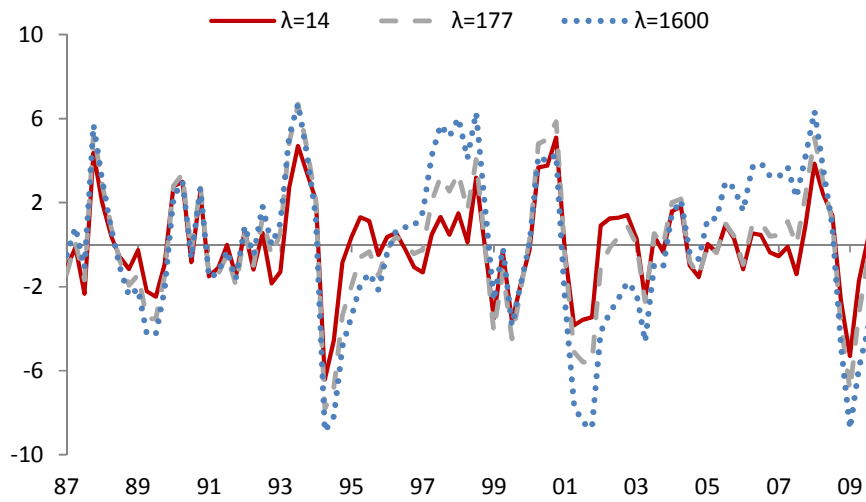
**Figure 1: Turning Points in Turkish Real GDP\* (1987:1-2009:4)**



Source: CBRT

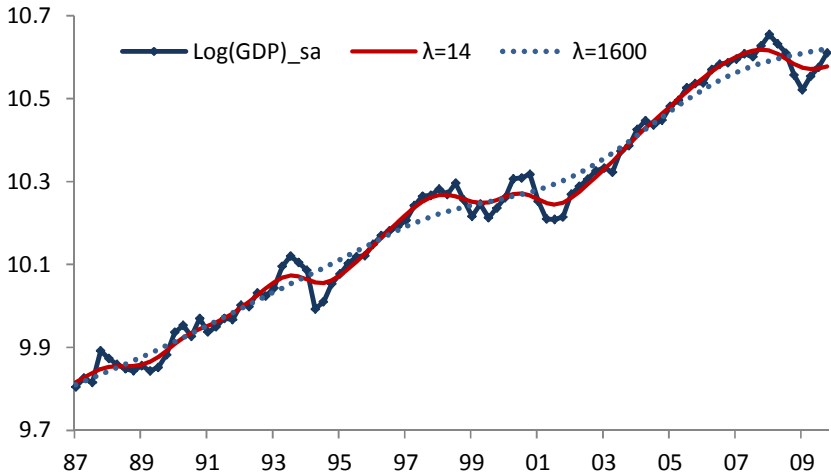
\* Seasonally adjusted with Tramo Seats after taking natural logarithms

**Figure 2: Cyclical Components of Real GDP with Different HP Smoothing Parameters**



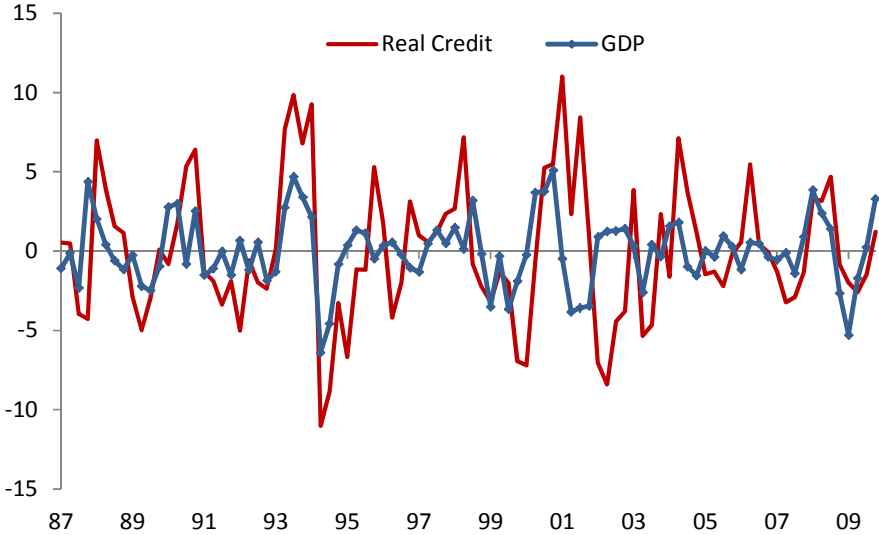
Source: CBRT

**Figure 3: Trend Components of Real GDP with Different HP Smoothing Parameters**



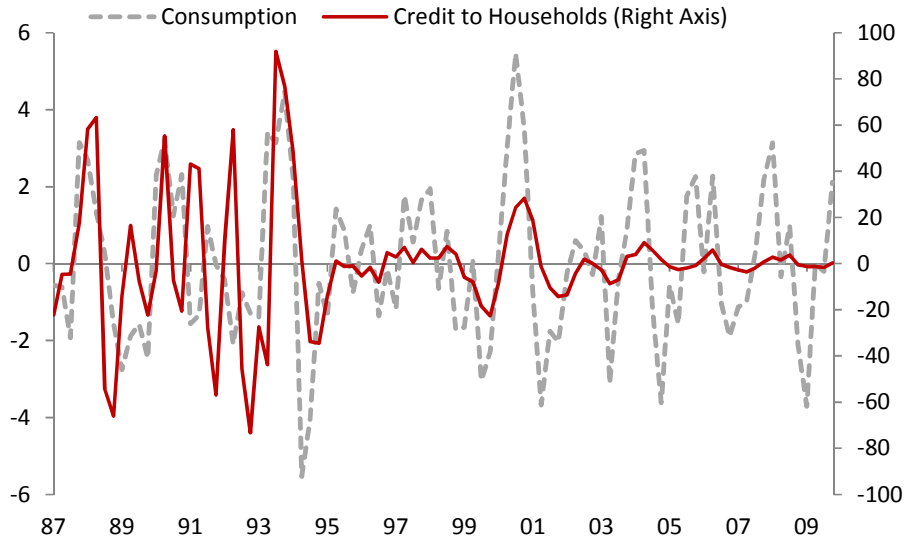
Source: CBRT

**Figure 4: Percentage Deviations from HP Trend (λ=14): GDP and Real Credit**



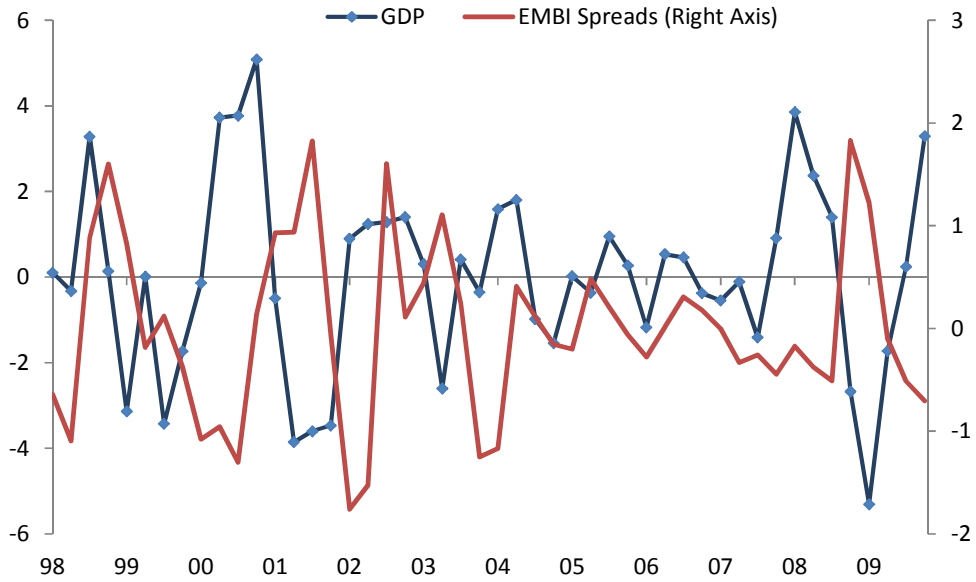
Source: CBRT

**Figure 5: Percentage Deviations from HP Trend ( $\lambda=14$ ): Consumption and Credit to Households**



Source: CBRT

**Figure 6: Percentage Deviations from HP Trend ( $\lambda=14$ ): GDP and EMBI Spreads**



Source: CBRT, Bloomberg.

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