Nominal Stylized Facts of Turkish Business Cycles

C. Emre Alper[†]

Department of Economics

and

Center for Economics and Econometrics

Bogazici University

This paper investigates the basic nominal stylized facts of business cycles in Turkey using monthly data from 1978:1 to 1997:7 and the methodology suggested by Kydland and Prescott (1990). In particular, correlations of the cyclical part of the data found using two different filtering techniques namely the Hodrick-Prescott filter and the twelve-month percentage change are obtained and the robustness of the results across these two techniques is evaluated. We see no clear-cut pattern for various measures of money. Price, inflation and interest rate series are all countercyclical giving support to a supply-driven model for the Turkish economy.

[†] Department of Economics, Bogazici University, P. K. 2, Bebek 80815 Istanbul, Turkey.
Fax: +90 (212) 287-2453. e-mail: alper@hamlin.boun.edu.tr

I. INTRODUCTION

The emergence of Real Business Cycle (henceforth RBC) Theory initiated by Kydland and Prescott (1982) and Long and Plosser (1983) expedited research on business cycles since early 1980s. RBC models are given the name *real business cycles* because they are supply-determined neoclassical growth models that attribute the cyclical behavior of aggregate economic activity to serially correlated technology shocks. The major impact of the RBC literature has been to propose a new methodology for macroeconomics. This has been of two folds: empirical description of business cycle phenomenon and the construction of a general equilibrium model consistent with the empirical description. The empirical description of the business cycle phenomenon refers to the determination of business cycle facts that is defined as the statistical properties of the co-movements of deviations from trend of various economic aggregates with those of real output. RBC models have performed surprisingly well in imitating the statistical properties of major macroeconomic aggregates.

RBC models abstract away from monetary phenomena and prices and cannot address questions regarding nominal side of the economy. According to Mankiw (1990), one of the major controversies involved with the RBC models is on this point that money and prices do not matter. Recent empirical research finds somewhat mixed results concerning the role of money and prices. King and Plosser (1984) report evidence in favor of the view that monetary changes do not have an important role as a source of fluctuations in real output for the U.S. economy. Kydland and Prescott (1990) present empirical evidence suggesting countercyclical prices and procyclical but lagging monetary base for the U.S. economy. Danthine and Donaldson (1993), Fiorito and Kollintzas (1994), Chadha and Prasad (1994) and Kim (1996) find non systematic

findings for the role of money, countercyclical prices but procyclical inflation. This paper investigates the effects of changes in nominal variables on aggregate economic activity for Turkey adopting the methodology introduced by Kydland and Prescott (1990).

Section 2 provides information about the data and methodology. Nominal facts for the Turkish economy are presented at Section 3. Section 4 concludes.

II. DATA AND METHODOLOGY

Our data are from the Database of Central Bank of Turkey via internet, Monthly data bank of Ozmucur (1992) and International Currency Analysis Yearbook. Majority of the monthly series at the Central Bank of Turkey start from 1986 and using the approach suggested by Tunali (1995) we combined the data at the Central Bank with the monthly data bank reported by Ozmucur (1992). Monthly Industrial Production Index, available for the period starting January 1978 ending June 1997, is used as a proxy for aggregate economic activity. The money measures employed are the Central Bank Money, M0, money easily used in transactions, M1, the broad definition of money, M2, and the broad definition including the foreign exchange denominated deposits M2Y. All monetary measures and prices are available during January 1978 - July 1997 period except for M2Y that starts from January 1985 and the treasury bill rate that is available after 1987. The exchange rate measure up until 1983 is the black market TL/USD rate from International Currency Analysis Yearbook and for the post 1983 period, it is the Central Bank's buying rate. The three-month Treasury bill rate is available through author's own calculations.

All data were originally seasonally unadjusted. Multiplicative X-11 method of the US Bureau of Census is used to seasonal adjust the data except for the inflation and the Treasury bill

rates for which the additive version of X-11 was utilized. After the seasonal adjustment, we take

natural logarithm of the series and then detrend the series.

We follow the standard practice of the RBC literature and adopt the definition of business

cycles by Lucas (1977) as deviations of aggregate real output from its smoothed trend where the

smoothed trend represents the growth component of a variable. We make use of two different

detrending techniques namely the Hodrick-Prescott (henceforth HP) filter (see Prescott, 1986) and

the 12-month percentage change filter.

HP filter is a high pass linear filter that extracts the long-run component of the series leaving

it stationary up to the fourth order. This method uses the partial realization of a stochastic process Y

of length T and the trend component of the series, τ, is selected to minimize the sum of squares

$$\sum_{t=1}^{T}(Y_t - t_t)^2 + I\sum_{t=2}^{T-1}[(t_{t+1} - t_t) - (t_t - t_{t-1})]^2$$

where the first term is the sum of the squared deviations from trend, and the second term is the

multiple λ of the sum of squares of the trend component's second differences. This second term

penalizes variations in the growth rate of the trend component, the penalty increasing with the value

of λ. For monthly data, we use $\lambda = 129,600$ as suggested in literature. Figure 1 depicts an

illustration of this HP filter using monthly seasonally adjusted Industrial Production Index in natural

logarithm. The HP filtering technique, however, is not free of shortages. King and Rebelo (1993)

and Cogley and Nason (1995) criticize the method of HP filtering technique on the grounds that it

may cause spurious cyclical behavior and may change measures of persistence and co-movement.

They also state that the HP filter, which is a high-pass filter when the data is trend-stationary, does

not operate like a high-pass filter in case of difference stationary data series. On the other hand,

Baxter and King (1995) and Krause and Serletis (1996) argue that results obtained using HP filter

are reasonably robust across business cycle filters. In order to get around possible problems associated with the HP filtering technique, we employ another filter, namely the 12-month percentage change, and evaluate the robustness of the results across these two techniques.

A variety of unit root tests are employed and the results suggest that except for the inflation rate series, all series are level and trend nonstationary. Ercoskun and Metin (1996) detect unit roots at seasonal frequencies as well as the long-run frequency for the monthly Turkish macroeconomic aggregates they analyze. A natural way to eliminate possible stochastic seasonality effects inherent in the data is to take twelve-month difference of the series. Since the series are in natural logarithm, this detrending technique corresponds approximately to taking twelve-month percentage change of the data. An illustration of the detrended series using these two techniques is given in Figure 2.

After obtaining the cyclical component of the series using the two detrending techniques described above, the next step is to describe empirically nominal business cycle facts for Turkey. This consists of reporting the degree of co-movement of the cyclical components of the nominal series with that of the cyclical component of the Industrial Production Index. The degree of co-movement is measured with the correlation coefficient *R(j)* where $j \in (0, \pm 1, \pm 2, ..., \pm 6)$. The chosen series is said to be leading, synchronous, or lagging the cycle of industrial production if the absolute value of *R(j)* is maximum for a negative, zero or positive j, respectively. If the contemporaneous correlation, *R(0),* between the series and the industrial production is positive, zero or negative, the series is said to be procyclical, acyclical or countercyclical, respectively. We next wish to test whether the chosen series is acyclic or not. If the statistic *R* denotes the correlation coefficient of a random sample from the bivariate normal distribution, then the random variable $W = 1/2 \ln((1+R)/(1-R))$ has an approximate normal distribution with mean $1/2 \ln[(1+r)/(1-r)]$ and the standard deviation $\sqrt{1/(n-3)}$. Thus using the contemporaneous correlation, *R(0),* between

the series and the IPROD, one can test whether the series is acyclical or not (H$_0$: $r = 0$) using the aforementioned distribution. If $|R(0)| \leq 0.20$ then the series is said to be acyclic. The cutoff point 0.20 was chosen because it corresponds in the samples (0.178 for the t-bill rate, 0.169 for M2Y and 0.133 in all other series) to the value required to reject at the 5% level of significance for the null hypothesis.

To recapitulate, the methodology consists of three sequential stages. First the cyclical component of each of the seasonally adjusted series in our data set is obtained using the two filters. Next, using the approximate normal distribution, acyclicality of the chosen series is tested. Finally, for those series that are not acyclic, the lag that has the highest negative correlation coefficient if the series is countercyclical or the highest positive correlation coefficient if the series is procyclical is picked to see if the series is leading, synchronous or lagging the cycle of industrial production.

III. NOMINAL STYLIZED FACTS FOR THE TURKISH ECONOMY

Table 1 reports findings of series that are seasonally adjusted, in natural logarithm and detrended using HP-filtering technique. In the second column we present the percentage standard deviation of each of the variable with the longest available sample period. The first row gives the autocorrelation function of the Industrial Production Index and the rest of the rows give cross correlations (contemporaneous and at lags and leads through six months) of this series with

the nominal monetary aggregates and prices. We do not report results for sub-periods since the smoothed trend should take care of any structural breaks inherent in the data.

Volatility measures of the series reveal that quasi-money, exchange rate and the Treasury bill rate series are more volatile than others. We see that the autocorrelation function of industrial production reveals a very low persistence of output fluctuations about its trend. The value 0.38, although significant, is lower than the findings for the G7 countries reported by Fiorito and Kollintzas (1994). They report first order autocorrelations at the range 0.85 to 0.55, the highest for the U.S. and the lowest for the U. K. economy.

Alternative money supply measures including "quasi-money" definitions such as M2Y-M2 and M2-M1 series are all acyclical with the only exception of M2Y, which is countercyclical and lags the Industrial Production Index by three to four months. This finding is consistent with the view of Kydland and Prescott (1986, 1990) that it is the technology shocks causing aggregate fluctuations and nominal variables do not matter. Danthine and Donaldson (1993) and Gavin and Kydland (1996) argue that monetary aggregates do not yield robust results due to the wide range of monetary policies implemented and the shifts in the money supply rules. This argument may be especially valid for Turkey because starting with the five-year development plans in 1963, monetary policy has been subordinate to fiscal policy as the public sector borrowing has been met by the Central Bank. Also, during 1980s financial liberalization took place and new financial instruments were introduced in the financial markets. Krause and Serletis (1996) find acyclic monetary aggregates for the U.S. economy whereas Kydland and Prescott (1990) report procyclical M0 and M1.

For price series, we see that the Wholesale Price Index, the Consumer Price Index, inflation rates derived from these, the foreign exchange rate and the interest rate are all

countercyclical. In terms of timing, price level series lag the cycle by two months, inflation rates lead the cycle by two months, Treasury bill lead by one-month and the foreign exchange rate is synchronous. The findings that both price level series and the inflation series are countercyclical with the industrial production cycle and monetary aggregates are acyclic suggest supply-driven economic model for the Turkish economy rather than a demand-driven one. Countercyclical prices are also reported by Kydland and Prescott (1990) and Serletis and Krause (1996) for the U.S. economy, Danthine and Donaldson (1993) and Fiorito and Kollintzas (1994) for the G-7 countries, Austria, Australia, South Africa and Switzerland, and Kim (1996) for Korea and Taiwan. Countercyclical inflation rates, however, is not a widely observed phenomenon (see Chadha and Prasad (1994) and Kim (1996)).

The three-month Treasury bill rate also turns out to be countercyclical. This finding is also particular for Turkey since Krause and Serletis (1996) and Danthine and Donaldson (1993) report procyclical short-term interest rates and no systematic relation vis-à-vis long-term rates for eleven countries. Countercyclical behavior of nominal interest in Turkey may be suggestive of a strong crowding effect of government consumption. Also, for a high inflation country like Turkey with high uncertainty, three-month interest rate could be regarded as a long-term rate.

Table 2 furnishes results using series that are seasonally adjusted, in natural logarithm and detrended using twelve-month percentage change filter. The results are identical. This observation is supportive of the view that that results obtained using HP filter are reasonably robust across business cycle filters.

One possible criticism of this research may arise due to the importance of the agricultural sector in Turkey. Since the Industrial Production Index excludes agricultural production, then is it a good indicator of aggregate economic activity? In order to cope with this question, bearing in mind

that monthly GNP/GDP figures are not available for Turkey, we do the same kind of analysis using monthly Turkish import data in U.S. Dollars instead of the Industrial Production Index. Tables 3 and 4 report cross correlation results using imports. We see some minor differences when compared to previous findings. The foreign exchange denominated deposits series is now countercyclical however M2Y is now acyclic. All the monetary aggregates except for M1 turn out to be acyclic, M1 is procyclical and leads the cycle by four months. The price level indices are acyclic, however, inflation rates, Treasury bill rates and the exchange rate series are again countercyclical. We again observe similar findings using the two different filtering techniques.

IV. CONCLUSION

This paper adopts the methodology of Kydland and Prescott (1982) and presents nominal stylized facts of the Turkish economy using monthly data for the period 1978:1-1997:7. Our results suggest that prices are countercyclical and there is no clear-cut pattern for money in Turkey. These findings are more or less consistent with those reported for the G-7 countries. Countercyclical behavior of inflation and the Treasury bill rates is particular for Turkey and may be suggestive of a strong crowding out effect of government consumption.

REFERENCES

BAXTER, M. and KING, R. G. (1995), "Approximate Band-Pass Filters for Economic Time Series", *NBER Working Paper,* No. 5052.

CHADHA, B. and PRASAD, E. (1994), "Are Prices Countercyclical? Evidence from the G-7", *Journal of Monetary Economics*, 34, 239-57.

COGLEY, T. F. and NASON, J. M. (1995), "Effects of the Hodrick-Prescott Filter on Trend and Difference Stationary Time Series. Implications for Business Cycle Research", *Journal of Economic Dynamics and Control*, 253-78.

DANTHINE, J. P. and DONALDSON, J. B. (1993), "Methodological and Empirical Issues in Real Business Cycle Theory", *European Economic Review,* 37 (1), 1-35.

ERCOSKUN, G. and METIN, K. (1996), "Seasonal Cointegration and Error Correction Models on Turkish Monthly Macroeconomic Aggregates", *Proceedings of Research Symposium'* 96, 129-32.

FIORITO, R. and KOLLINTZAS, T. (1994), "Stylized Facts of Business Cycles in the G-7 from a Real Business Cycles Perspective", *European Economic Review,* 38, 235-69.

GAVIN, W. T. and KYDLAND, F. E. (1996), "Endogenous Money Supply and the Business Cycle", *Working Paper 96-05*, Federal Reserve Bank Cleveland, July.

INTERNATIONAL CURRENCY ANALYSIS, *World Currency Yearbook*, Brooklyn, New York: International Currency Analysis Inc., c1985-

KIM, Y. W. (1996), "Are Prices Countercyclical? Evidence from East Asian Countries", *Federal Reserve Bank of St. Louis Review*, 78 (5), 69-82.

KING, R. G. and PLOSSER, C. I (1984), "Money, Credit and Prices in a Real Business Cycle", *American Economic Review*, 74, 365-80.

KING, R. G. and REBELO, S. (1993), "Low Frequency Filtering and Real Business Cycles", *Journal of Economic Dynamics and Control*, 207-31.

KRAUSE, D. and SERLETIS, A. (1996), "Nominal Stylized Facts of Business Cycles", *Federal Reserve Bank of St. Louis Review*, 78 (4), 49-54.

KYDLAND, F. E. and PRESCOTT, E. C. (1982), "Time to Build and Aggregate Fluctuations", *Econometrica*, 50, 1345-70.

KYDLAND, F. E. and PRESCOTT, E. C. (1990), "Business cycles: Real facts and a Monetary Myth", *Federal Reserve Bank of Minneapolis Quarterly Review*, Spring, 3-18.

LONG, J. B. and PLOSSER, C. I. (1983), "Real Business Cycles", *Journal of Political Economy*, 91, 1345-70.

LUCAS, R. E., Jr. (1977), "Understanding Business Cycles", in K. Brunner and A. H. Meltzer (eds.), *Stabilization of the Domestic and International Economy*, North Holland:Amsterdam.

MANKIW, N. G. (1990), "A Quick Refresher Course in Macroeconomics", *Journal of Economic Literature*, 28, 1645-60.

OZMUCUR, S. (1992), "Monthly Data Bank for the Turkish Economy 1978.01 – 1991.12", *Bogazici University Institute of Social Sciences Working Paper # 92 -16*.

PRESCOTT, E. C. (1986), "Theory Ahead of Measurement", *Federal Reserve Bank of Minneapolis Quarterly Review*, Fall, 9-22.

ROMER, D. (1996), *Advanced Macroeconomics,* Singapore: McGraw-Hill International Editions.

SUMMERS, L. H. (1986), "Some skeptical Observations on Real Business Cycle Theory", *Federal Reserve Bank of Minneapolis Quarterly Review*, Fall, 23-27.

TUNALI, I. (1995), *Farkli Sepetlerden Olusturulan Fiyat Endekslerini Birlestirmek Icin Bir Yontem*, mimeo, Department of Economics, Koc University.
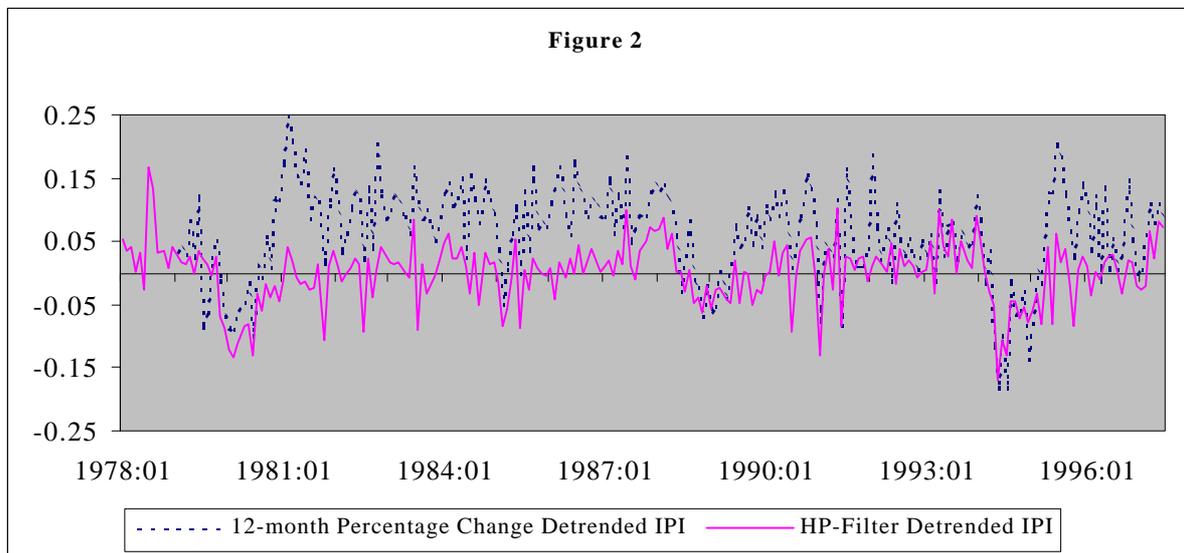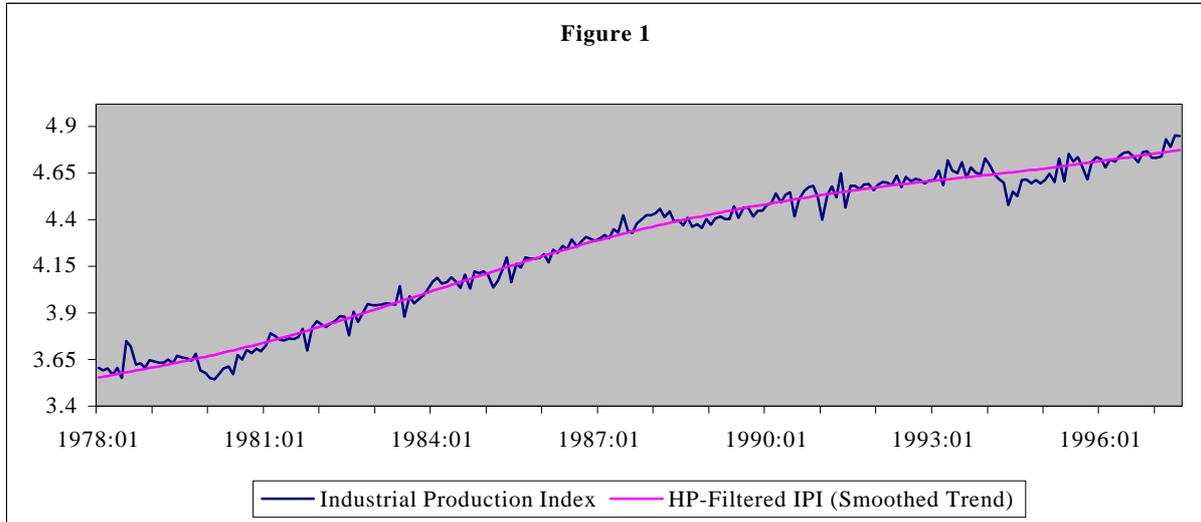
Figure 1

Industrial Production Index — HP-Filtered IPI (Smoothed Trend)

Figure 2

12-month Percentage Change Detrended IPI — HP-Filter Detrended IPI

Table 1
Correlations of HP-Filtered Nominal Variables with HP-Filtered Industrial Production

Variable[*], X	Volatility (% s. d.)	Correlation Coefficient of Industrial Production Index with												
		X_{t-6}	X_{t-5}	X_{t-4}	X_{t-3}	X_{t-2}	X_{t-1}	X_t	X_{t+1}	X_{t+2}	X_{t+3}	X_{t+4}	X_{t+5}	X_{t+6}
IPROD[**]	4.90	0.20	0.25	0.20	0.28	0.42	0.38	1.00	0.38	0.42	0.28	0.20	0.25	0.20
M0	8.46	0.01	0.02	0.07	0.09	0.09	0.06	-0.03	-0.02	-0.06	-0.08	-0.08	-0.12	-0.11
M1	6.76	0.09	0.07	0.14	0.10	0.09	0.06	-0.10	-0.11	-0.24	-0.22	-0.28	-0.29	-0.30
M2	8.17	0.27	0.23	0.23	0.17	0.13	0.06	-0.04	-0.11	-0.21	-0.22	-0.26	-0.27	-0.27
M2Y	5.62	0.13	0.10	0.07	-0.02	-0.11	-0.21	-0.31	-0.34	-0.44	-0.44	-0.45	-0.43	-0.41
M2-M1	13.84	0.28	0.25	0.23	0.19	0.15	0.10	0.05	-0.01	-0.08	-0.10	-0.12	-0.12	-0.15
M2Y-M2	13.46	-0.12	-0.07	-0.09	-0.10	-0.11	-0.08	-0.05	0.02	0.04	0.04	0.06	0.09	0.12
CPI	8.34	-0.13	-0.17	-0.23	-0.31	-0.36	-0.42	-0.46	-0.48	-0.49	-0.49	-0.46	-0.47	-0.46
WPI	7.23	-0.09	-0.14	-0.20	-0.28	-0.34	-0.42	-0.47	-0.49	-0.50	-0.48	-0.44	-0.44	-0.44
INFCPI	2.30	-0.19	-0.18	-0.18	-0.21	-0.30	-0.19	-0.26	-0.13	-0.11	-0.06	0.02	0.09	0.00
INFWPI	2.54	-0.14	-0.16	-0.14	-0.19	-0.27	-0.19	-0.24	-0.16	-0.09	-0.02	0.05	0.11	0.02
FXR	10.59	-0.20	-0.24	-0.25	-0.33	-0.40	-0.50	-0.51	-0.49	-0.47	-0.38	-0.31	-0.29	-0.23
TBILLR	12.64	-0.10	-0.14	-0.21	-0.21	-0.33	-0.36	-0.36	-0.30	-0.16	-0.06	0.07	0.23	0.20

[*] Monthly data from sample period 1978:01-1997:07 except for M2Y and TBILLR that are available after 1985:01 and 1987:01 respectively. All series except for the inflation and 3-month treasury bill rates are first seasonally adjusted using X-11 multiplicative adjustment method, and then linearized by taking the natural logarithm. Inflation and the treasury bill rates are seasonally adjusted using X-11 additive adjustment method.
[**] For the Industrial Production Index only, reported numbers are the autocorrelations.

Table 2
Correlations of 12 Month Percentage Changes of Nominal Variables with 12 Month Percentage Changes of Industrial Production

Variable[*], X	Volatility (% s. d.)	Correlation Coefficient of Industrial Production Index with												
		X_{t-6}	X_{t-5}	X_{t-4}	X_{t-3}	X_{t-2}	X_{t-1}	X_t	X_{t+1}	X_{t+2}	X_{t+3}	X_{t+4}	X_{t+5}	X_{t+6}
IPROD[**]	7.41	0.27	0.36	0.33	0.40	0.53	0.54	1.00	0.54	0.53	0.40	0.33	0.36	0.27
M0	14.79	-0.02	-0.03	0.01	0.04	0.04	0.01	-0.05	-0.07	-0.11	-0.14	-0.15	-0.20	-0.21
M1	13.04	-0.02	-0.04	-0.01	-0.01	-0.03	-0.07	-0.17	-0.21	-0.29	-0.30	-0.35	-0.38	-0.41
M2	14.86	0.10	0.07	0.06	0.02	-0.04	-0.10	-0.18	-0.25	-0.33	-0.35	-0.37	-0.37	-0.38
M2Y	14.40	-0.02	-0.07	-0.10	-0.17	-0.25	-0.31	-0.39	-0.43	-0.49	-0.50	-0.49	-0.49	-0.46
M2-M1	22.65	0.16	0.13	0.11	0.07	0.02	-0.02	-0.07	-0.13	-0.18	-0.20	-0.20	-0.20	-0.20
M2Y-M2	18.36	-0.10	-0.10	-0.13	-0.17	-0.17	-0.16	-0.12	-0.05	-0.06	-0.05	-0.01	0.01	0.06
CPI	16.11	-0.21	-0.26	-0.31	-0.38	-0.43	-0.48	-0.52	-0.54	-0.54	-0.54	-0.51	-0.51	-0.50
WPI	15.57	-0.17	-0.22	-0.27	-0.34	-0.40	-0.45	-0.50	-0.51	-0.52	-0.51	-0.48	-0.47	-0.47
INFCPI	3.55	-0.20	-0.14	-0.19	-0.26	-0.35	-0.26	-0.27	-0.19	-0.10	-0.03	0.05	0.13	0.02
INFWPI	4.04	-0.14	-0.11	-0.16	-0.22	-0.32	-0.25	-0.23	-0.23	-0.07	-0.03	0.08	0.13	0.03
FXR	19.76	-0.27	-0.32	-0.34	-0.41	-0.48	-0.56	-0.57	-0.54	-0.52	-0.44	-0.39	-0.36	-0.31
TBILLR	21.39	-0.24	-0.23	-0.29	-0.33	-0.44	-0.51	-0.48	-0.43	-0.26	-0.11	0.01	0.19	0.21

[*] As in table 1.
[**] Reported numbers are the autocorrelations.

Table 3

Correlations of HP-Filtered Nominal Variables with HP-Filtered Imports

Variable[*], X	Volatility (% s. d.)	X_{t-6}	X_{t-5}	X_{t-4}	X_{t-3}	X_{t-2}	X_{t-1}	X_t	X_{t+1}	X_{t+2}	X_{t+3}	X_{t+4}	X_{t+5}	X_{t+6}
						Correlation Coefficient of Imports with								
IMPORT[**]	16.31	0.17	0.18	0.29	0.44	0.42	0.51	1.00	0.51	0.42	0.44	0.29	0.18	0.17
M0	8.46	0.17	0.17	0.19	0.20	0.17	0.17	0.15	0.14	0.07	0.02	-0.01	-0.05	-0.08
M1	6.76	0.35	0.35	0.37	0.34	0.29	0.30	0.25	0.22	0.11	0.07	0.06	-0.02	-0.07
M2	8.17	0.29	0.29	0.30	0.28	0.23	0.21	0.15	0.10	0.02	-0.01	-0.01	-0.03	-0.03
M2Y	5.62	0.34	0.30	0.23	0.15	0.07	-0.05	-0.17	-0.23	-0.32	-0.36	-0.38	-0.37	-0.37
M2-M1	13.84	0.13	0.13	0.16	0.15	0.12	0.12	0.06	0.04	0.02	0.01	0.00	0.03	0.06
M2Y-M2	13.46	-0.29	-0.30	-0.35	-0.38	-0.41	-0.42	-0.43	-0.42	-0.39	-0.37	-0.35	-0.30	-0.26
CPI	8.34	0.38	0.37	0.35	0.29	0.24	0.18	0.14	0.13	0.09	0.06	0.05	0.03	-0.03
WPI	7.23	0.33	0.30	0.26	0.19	0.13	0.06	0.01	-0.01	-0.03	-0.06	-0.08	-0.08	-0.15
INFCPI	2.30	0.02	0.01	0.00	-0.10	-0.23	-0.20	-0.25	-0.17	-0.06	-0.17	-0.11	-0.06	-0.10
INFWPI	2.54	0.03	-0.06	-0.10	-0.15	-0.23	-0.20	-0.25	-0.15	-0.07	-0.09	-0.07	-0.06	-0.02
FXR	10.59	0.06	-0.02	-0.06	-0.14	-0.21	-0.30	-0.34	-0.32	-0.33	-0.28	-0.19	-0.23	-0.21
TBILLR	12.6398	-0.23	-0.30	-0.38	-0.41	-0.50	-0.49	-0.52	-0.47	-0.36	-0.27	-0.15	0.00	0.07

[*] As in table 1.
[**] Reported numbers are the autocorrelations.

Table 4

Correlations of 12 Month Percentage Changes of Nominal Variables with 12 Month Percentage Changes of Imports

Variable[*], X	Volatility (% s. d.)	X_{t-6}	X_{t-5}	X_{t-4}	X_{t-3}	X_{t-2}	X_{t-1}	X_t	X_{t+1}	X_{t+2}	X_{t+3}	X_{t+4}	X_{t+5}	X_{t+6}
						Correlation Coefficient of Imports with								
IMPORT[**]	26.10	0.18	0.24	0.34	0.51	0.54	0.63	1.00	0.63	0.54	0.51	0.34	0.24	0.18
M0	14.79	0.22	0.22	0.25	0.25	0.22	0.22	0.20	0.17	0.11	0.04	-0.01	-0.06	-0.11
M1	13.04	0.32	0.31	0.34	0.32	0.27	0.27	0.22	0.19	0.12	0.06	0.01	-0.06	-0.12
M2	14.86	0.31	0.28	0.28	0.25	0.18	0.16	0.09	0.03	-0.03	-0.09	-0.11	-0.13	-0.13
M2Y	14.40	0.30	0.25	0.20	0.14	0.07	-0.01	-0.11	-0.16	-0.22	-0.25	-0.26	-0.26	-0.24
M2-M1	22.65	0.19	0.16	0.16	0.13	0.07	0.06	0.01	-0.03	-0.05	-0.08	-0.08	-0.06	-0.03
M2Y-M2	18.36	-0.23	-0.28	-0.34	-0.40	-0.44	-0.45	-0.46	-0.43	-0.39	-0.35	-0.30	-0.26	-0.20
CPI	16.11	0.30	0.29	0.27	0.22	0.17	0.12	0.08	0.06	0.03	0.02	0.01	-0.01	-0.04
WPI	15.57	0.24	0.21	0.17	0.12	0.06	0.00	-0.05	-0.06	-0.08	-0.09	-0.10	-0.10	-0.13
INFCPI	3.55	0.00	0.01	-0.03	-0.14	-0.24	-0.22	-0.30	-0.19	-0.07	-0.16	-0.07	-0.05	-0.07
INFWPI	4.04	-0.03	-0.04	-0.11	-0.21	-0.25	-0.23	-0.29	-0.18	-0.08	-0.09	-0.04	-0.03	0.00
FXR	19.76	0.06	-0.01	-0.07	-0.15	-0.23	-0.31	-0.36	-0.33	-0.33	-0.27	-0.16	-0.19	-0.15
TBILLR	21.39	-0.28	-0.35	-0.45	-0.51	-0.58	-0.59	-0.59	-0.55	-0.42	-0.30	-0.15	0.03	0.12

[*] As in table 1.
[**] Reported numbers are the autocorrelations.