Economic Fluctuations in Central and Eastern Europe. The Facts[*]

PÉTER BENCZÚR[†]

National Bank of Hungary and

Central European University

ATTILA RÁTFAI[‡]

Central European University

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Abstract

We carry out a detailed analysis of quarterly frequency dynamics in macroeconomic aggregates in twelve countries of Central and Eastern Europe. The facts we document include the variability and persistence in and the co-movement among output, and other major real and nominal variables. We find that consumption is highly volatile and government spending is procyclical. Gross fixed capital formation is highly volatile. Net exports are countercyclical. Imports are procyclical, more than exports. Exports are most procyclical and persistent in open countries. Labor market variables are all highly volatile. Employment is leading or coincidental, and procyclical. Real wages are dominantly procyclical. Productivity tends to be procyclical and coincidental. Private credit is procyclical and dominantly lagging the cycle. Volatilities in M1 and M2 are relatively low. The CPI is countercyclical, and is weakly leading or coincidental. The cyclicality of inflation is unclear, but its relative volatility is low. The nominal exchange rate is more persistent than the real one. Overall, we find that fluctuations in CEE countries are larger than in industrial countries, and are of similar size than in other emerging economies. This is particularly true about private consumption. The co-movement of variables, however, shows a large degree of similarity. A notable exception is government spending: unlike in industrial economies, it is rather procyclical in transition economies. The findings also indicate that Croatia and the accession group show broadly similar cyclical behavior to industrial countries. The most frequent country outliers are Bulgaria, Romania and Russia, especially in labor market, price and exchange rate variables. Excluding these countries from the sample makes many of the observed patterns in cyclical dynamics more homogenous.

Key words: Business cycle facts, Central and Eastern Europe

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[†] Research Department, National Bank of Hungary, Szabadsag ter 8/9, Budapest 1054, Hungary, Email: benczurp@mnb.hu
[‡] Department of Economics, Central European University, Nador u 9, Budapest 1051, Hungary, Email: ratfaia@ceu.hu

1   INTRODUCTION

The pure notion of the business cycle is a novelty for many observers, policymakers and citizens in the post-socialist countries of Central and Eastern Europe. Though economic fluctuations have been severely mixed with the transition bust and boom, it seems evident by now that these economies are also subject to ups and downs, regardless of the initial transition shock and the following catch-up process.

The current project is part of a large branch of international macroeconomics, aimed at documenting within-country empirical regularities about macroeconomic fluctuations. Our main goal is to report on business cycle facts in twelve Central and Eastern European (CEE) countries over the decade long period of economic transition, arguably the largest possible and meaningful panel of such observations, in terms of time frame and country coverage. While our exploration of facts is not driven by any particular model economy, the evidence we compile is meant to inform and serve as factual bases in modeling international business cycles. Our findings can also provide valuable tools in the design of stabilization and adjustment policies. Documenting the relative cyclical movements of major macro variables can help policymakers identify the most important targets, instruments and mechanisms of cyclical policies in these countries. Indeed, in a monetary union, such as the one CEE countries are set to join to in the coming years, since monetary policy is common, regional differences in cycles are fundamentally determined by local policies. Depending on similarities and differences relative to developed economies, our results can thus allow one to better judge how much of common "smoothing" policies should be adopted, and how much "regional flavor" is needed. In this spirit, we seek to answer the following specific questions.

- Is there a common pattern in CEE business cycle fluctuations? Are the findings robust to alternative filtering procedures?

- Can we group CEE countries according to their cyclical patterns? Can we identify certain country characteristics, such as exchange rate regime, government size, openness in goods and financial markets that explain these differences?

- Are there important similarities and differences in the behavior of macroeconomic aggregates *vis-a-vis* developed countries, or other emerging market regions?

- In the process of joining the European institutions such as the EU and the EMU, can policy-makers treat CEE countries as a relatively homogeneous group? Or rather economic fluctuations in these economies fundamentally differ from each other, so they need to be considered on an individual basis?

- Can analysts and policymakers treat certain variables as systematically leading or lagging the business cycle?

To address this set of issues, we conduct a detailed unconditional analysis of quarterly frequency dynamics in major macroeconomic aggregates in individual CEE countries. Despite their similarity in geographical position and economic structure, these economies are *a priori* characterized by a significant amount of variation in the strength of trading ties to EU, policy arrangements, and country size. By examining macroeconomic data in a large group of countries with similar, still somewhat diverse history, we are seeking to establish stylized facts that highlight regularities that are more general than pure country-specific effects, and point to more general insights potentially useful for macroeconomic theory. We also shed some light on whether basic business cycle regularities in CEE countries are systematically different from those in the G7 group or other European and developing countries.[1]

As standard in modern business cycle analysis since the seminal work of Lucas (1977), we focus on deviation, as opposed to level or difference cycles. Correspondingly, we define the business cycle component of macroeconomic variables as deviation from trend. Consequently, to obtain the cyclical component, the raw data is de-trended. As no de-trending procedure is free of criticism, we employ three alternative procedures popular in the literature, such as Hodrick-Prescott (H-P) filtering, log first differencing, and fitting a quadratic time polynomial in obtaining the trend component of macroeconomic variables. While our empirical approach places no constraint on the joint determination of the variables of interest, the transformation of data, the selection of statistics and the interpretation of results are all guided by economic theory. The most important themes we address are the variability and persistence in and the co-movement among output and other fundamental real and nominal variables. More specifically, we first document the *absolute and relative volatility* of the variables involved. We also examine if de-trended macroeconomic aggregates move the same direction as (*procyclical*), the opposite direction as (*countercyclical*) or are unrelated to (*acyclical*) de-trended output; and describe phase shifts in the variables, i.e. if they *lead* or *lag* the cycle, or *synchronous* (coincidental) with it. Finally, we characterize the degree of persistence in the series by reporting on their first-order autoregressive coefficient.

Implementing this idea requires one to overcome a major hurdle, assembling a data set of quarterly frequency macroeconomic variables in transition economies. Dictated mainly by the availability of the relevant data, the countries we examine are Bulgaria, Croatia, the Czech

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[1] In a companion paper, Benczúr and Rátfai (2004), we give a detailed survey of the international evidence on quarterly frequency fluctuations.

Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russia, Slovakia and Slovenia.[2] The sample period spans over a period of about a decade, starting in 1993:1 or one or two years later, and ending in 2002:4, resulting in an average time frame of about nine years. The variables we study include measures of output (real GDP and industrial production), the price level (and inflation), components of aggregate demand (private consumption, investment, government consumption, exports, imports), wages, employment, productivity, exchange rates, credit and monetary aggregates.

The rest of this paper is organized as follows. Following a brief discussion of the related literature in Section 2, Section 3 reports on the data set in detail. Section 4 discusses the findings, while Section 5 concludes.

2   BACKGROUND

It is only a short while ago, since efforts to systematically document stylized facts of quarterly frequency aggregate fluctuations has started to appear. The classic study examining the cyclical properties of a number of H-P filtered macroeconomic time series in the US is Kydland and Prescott (1990). Their major findings, many of them having proved to be robust to alternative sampling periods and cyclical filters provided the empirical impetus for much of early Real Business Cycle (RBC) research. Among many other observations, Kydland and Prescott find that aggregate variables are in general highly persistent, output is more volatile than consumption, but less volatile than investment. Most variables appear to be procyclical including money, employment, investment, consumption, imports, exports and productivity. Important acyclical variables are the price level, net exports and the real wage. Countercyclical variables are few; they primarily include government consumption and the capital stock.

In the international context, Fiorito and Kollintzas (1994) are one of the pioneers in documenting quarterly frequency facts in countries other than the United States. Using the H-P filter, they isolate the cyclical components of quarterly frequency observations of major macroeconomic variables over the period of 1960 to 1989 in the G7 countries, Canada,

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[2] Due to for the paucity of appropriate data, several countries in the broadly defined CEE region are excluded from the current study. Countries left out include Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, FYR Macedonia, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Serbia and Montenegro, Tajikistan, Turkmenistan, Ukraine and Uzbekistan.

Germany, France, Italy, Japan, the UK and the US.[3] Conforming to most of the findings in Kydland and Prescott (1990), they show that consumption is procyclical and tends to fluctuate less than output; investment is procyclical, fluctuating more than output, net exports are countercyclical, prices are countercyclical, and government consumption and money have no unambiguous pattern. In related work, employing a number of alternative de-trending procedures including the H-P filter, first-differencing and fitting a quadratic time-trend polynomial, Christodoulakis *et al* (1993) study business cycle fluctuations in twelve EC countries. Robustly to the specifics of de-trending, they again find that output, consumption, investments, prices and net exports behave fairly similarly across countries, while monetary aggregates, government spending and terms of trade evolve with no clear pattern.

Artis and Zhang (1997) investigate the degree of business cycle conformity in countries comprising of the ERM in 1993, and some other OECD countries such as Japan, Canada, the UK, Sweden, Finland and Norway. The reference countries are the US and Germany. Using monthly data for the period of 1961:1 to 1993:12, their main focus is on documenting the contemporaneous, and lead and lag cross-correlations in a single macroeconomic variable, de-trended industrial production. Robustly to de-trending by different filters, Artis and Zhang find that before the formation of the ERM, business cycles in their sample are typically linked to the US cycle. After the ERM came into existence in April 1979, fluctuations in industrial production in ERM countries began to move together with the corresponding cycle in Germany, the same shift not having occurred in Canada or in the other non-ERM countries.[4]

While the vast majority of related research focuses on developed economies, there is also a growing literature analyzing developing countries, though often carrying out analyses in a narrow way. These papers are either limited to pairwise correlations among a small group of countries, such as Alper (2003), Mendoza (1995), Kouparitsas (1997), and Kose and Reizman (1998); or a single country, such as Bjornland (2000), Burgoeing and Soto (2000), Kydland and Zaragaza (1997), and Rodriguez-Mata (1997). Alper (2003) for instance examines the quarterly frequency cyclical properties of the Mexican and Turkish economy over the period of 1987 to 2000. Among other things, he finds that the volatility of output is

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[3] An important predecessor to Fiorito and Kollintzas (1994) is Danthine and Donaldson (1993). Ahmed *et al* (1993), Backus and Kehoe (1992), Basu and Taylor (1999) and Bergman *et al* (1998) focus on long-span samples of *annual* frequency aggregate data in a few industrial countries.

[4] Artis and Zhang (1999) follow up on their previous work by extending the sample period to 1995:10 and increasing the number of countries studied. In addition to confirming most prior findings, they also document that the degree of business cycle synchronization and exchange

significantly higher in both countries than in the United States, and that consumption expenditures are even more volatile than output. Government consumption is procyclical but is not leading the cycle. Employment and productivity are procyclical. The comovement between real activity and different measures of the money supplies show no clear-cut pattern. The price level and inflation are countercyclical.[5] Gross capital inflows are procyclical and lead the cycle.

Agénor *et al* (2000) is a large step in unifying the two branches of the literature. Using quarterly data over the period of 1978:1 through 1995:4, they document a wide set of findings of cyclical variability and covariance for 12 developing countries: Chile, Colombia, India, the Republic of Korea, Malaysia, Mexico, Morocco, Nigeria, the Philippines, Tunisia, Turkey and Uruguay. The variables analyzed include industrial output, the price level and inflation, nominal and real wages, monetary aggregates and their velocity, domestic private sector credit, fiscal variables such as gross and net government expenditures and revenues, nominal and real exchange rates, and the trade balance. For robustness, in obtaining the cyclical component of time series, after removing cyclical variation, they de-trend all variables by two alternative filters, the Hodrick-Prescott and the Baxter-King band-pass ones. Agénor *et al* find that cyclical output, as proxied by industrial production is persistent, and much more volatile in developing countries than in industrial ones. Government expenditures are countercyclical. There is no clear pattern in the cyclical behavior of nominal wages and prices, nominal and real exchange rates, but real wages are strongly procyclical. The correlation between monetary aggregates and output is in general positive, but not very strongly so. The velocity of broad money tends to be strongly countercyclical. The contemporaneous correlation between output and the terms of trade is positive.

Overall, while direct evidence on business cycle frequency economic fluctuations is becoming available from an increasing number of countries and time periods, no study to our knowledge has aimed at systematically documenting business cycle facts in a major segment of emerging markets, transition economies. In the current project, we seek to pursue this task.

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rate variability are negatively correlated across countries. Agresti and Mojon (2001) also study regularities in Euro-area business cycles.
[5] Chadha and Prasad (1994) find that inflation is procyclical in G-7 economies, though the price level is countercyclical.

3   **DATA**

We have a relatively comprehensive data set of macroeconomic variables in CEE economies. The aggregate variables we study are as follows: real GDP, industrial production, private consumption, gross fixed investment, government consumption, exports, imports, net exports, employment, productivity, real wages, private sector credit, M1, M2, velocity of M1, velocity of M2, CPI, inflation, nominal effective exchange rate, real effective exchange rate.[6] These variables include most of the standard choices in the related literature. Private sector credit, inflation and measures of the exchange rate are added to ensure meaningful comparisons with the developing country data analyzed in Agénor *et al* (2000).[7] While the variables are available in just about every country over the whole period of time, as shown in Table A1, some of the countries have an imperfect record, GDP and its components being the most notorious missing variables. In Hungary, Lithuania, Poland and Russia reliable figures for GDP and its components are available only from 1995:1 onwards, in Bulgaria, Croatia, the Czech Republic and Romania from 1994:1 onwards. As GDP components data in Slovenia are available only from 1997 onwards, they are omitted from the analysis.

As shown in Table AI, the primary data sources are the International Financial Statistics, local central banks, statistical offices and research institutes, the Emerging Market Database, the Economics Intelligence Unit, and the WIIW monthly database. Multiple sources allow for extensive and careful cross-checking of the reliability of the data, we thus believe that the quality of the sample is not only as good as one can possibly to hope for in this context, it is also comparable to similar ones used for the purposes of empirical analyses in most other countries. Our sample ideally consists of 40 quarterly observations from 1993:01 to 2002:04. Excluding pre-1993 data from the sample is explained by a number of considerations. First, some of the transition countries simply did not exist before 1993, or just did not systematically collect quarterly frequency aggregate data. Second, major data revisions taking place in the early 1990s render the quality of data in countries actually collecting such data questionable. Third, the big transition shock having happened just before 1993, showing up as a structural break in output would makes the interpretation of the cycle as deviation from a smooth trend difficult (see Artis *et al* (2004)). For countries like Hungary

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[6] The Appendix contains further details of the definition of the variables.
[7] Fiorito and Kollintzas (1994) also analyze the properties of real interest rates, defined as the difference between nominal rates and realized future inflation. Such a procedure of calculating the real interest rate would be questionable in our sample, due to typically high and volatile inflation, thus we omit this variable of the study. Other relevant variables like hours worked, terms of trade, FDI or portfolio investment flows, more detailed productivity data tend to be unavailable at the quarterly frequency.

or Poland, many relevant variables are available at the quarterly frequency even before 1990. At the same time, in these same countries GDP and its components were not collected until 1995. To ensure comparability in terms of the time period, external shocks and data quality, we use only the post-1993 sample in these cases.

Prior to the empirical analysis, the raw data are transformed. First, all variables are de-seasonalized using the X11 procedure, with multiplicative adjustment (the only exception being inflation, where the adjustment is additive). The reason for selecting the X11 procedure is to ensure comparability with the literature. For the same reason, we use the adjusted series even if seasonality is rejected -- in such cases, the adjusted series remain almost identical to the original anyway. For ratios (and other generated variables), we divide the adjusted series with each other, and work with these variables; i.e. the ratios are not adjusted further.

Next, we handle stationarity in the series. Some of the macro variables have a trend even in developed economies but such a behavior is much more prevalent in emerging ones. As argued by Canova (1998), and confirmed in Agénor *et al* (2000), cyclical patterns might depend on the particular de-trending procedure adopted. In order to arrive at a robust measure of cyclical variation, we employ several approaches, and report the main statistics for all of them. Our choices are the H-P filter with parameter 1600 (the standard choice for quarterly data), log first differences (potentially problematic with trending variables, but the results often turn out to be similar with this choice as well), and fitting a quadratic time polynomial. These choices coincide with the ones used in Christodoulakis *et al* (1993) and Fiorito and Kollintzas (1994).[8]

In almost all cases, filtering is applied to the natural logarithm of the series. One of the exceptions is inflation, which is already in log-difference form, so the series itself could be filtered. Another exception is net exports, which can be both negative and positive. For this reason, similarly to Kydland and Zarazaga (1997) and Agénor *et al* (2000), we employ the ratio of net exports to output in percentage terms.[9] Notice that in the latter case, the use of a pure output index is problematic for volatilities (though not for correlations); the scale is invariant within a country, but not across countries; we thus scale net export volatility by nominal GDP volatility. In all other cases, taking logs and then de-trending takes care of

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[8] Agénor *et al* (2000) use the band-pass filter of Baxter and King. We refrain from the band-pass procedure, since our near-forty quarterly observations may constitute too short of a period to adopt this approach.

country-specific scaling. Finally, to conform to the employment data representing total hours only in the manufacturing sector, productivity is computed as the log difference between industrial production and industrial employment. In the Czech Republic, Estonia and Lithuania where all the relevant data are available, the productivity measure is calculated from real GDP and total employment data.

4   RESULTS

Before looking at the variances and covariances in more detail, it is useful to have a bird-eye view of the output data to see if they show any cyclical pattern of the classical type. As randomly selected examples, Figures 1 to 3 show the evolution of GDP and industrial output in Estonia, Poland and Slovenia. Despite the relatively short sample period, the graphs confirm that GDP, and especially industrial output indeed follow a strong upward trend with notable ups and downs. One can clearly see an initial transition bust, followed by a robust expansion, in some instances broken by the apparent effect of the Russian crisis. In some quarters, growth has picked up, with an unclear cyclical behavior through the global slowdown recession starting around 2000. Overall, this is the standard picture one could expect, showing some visible though not absolutely clear cyclical pattern.

It is instructive to look at summary statistics of output fluctuations in CEE countries and compare them to ones documented in other regions. Table I reports measures of volatility and persistence in H-P-filtered output. Overall, output is somewhat more volatile in transition countries than in developed economies, and is about as volatile as in other developing ones. Some of this phenomenon might be related to differences in sample size; most other results in the literature are obtained from 15-30 years of quarterly data, where the trend component can be extracted more precisely, and the endpoints are less influential. Average GDP volatility in transition countries is a bit lower than in the small number of developing countries there exist data for, and slightly higher than in the EU countries.[10] Hungary and Slovenia appear to be clear outliers with relatively low GDP volatility statistics.

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[9] Instead of removing the trend component and then examining variances, covariances, leads and lags, an alternative approach to follow is the turning point methodology of Harding and Pagan (2002). The idea here is to define turning point events in a statistically precise manner and relate them to actual changes in the series of interest, as opposed to the study of the evolution of trend-deviations. Exploring the data in CEE economies using this approach is the subject of ongoing research.

[10] The relatively high GDP volatility in non-G7 members of the EU might be partly due to data construction. In particular, the GDP volatility figures reported by Christodoukalis *et al*

The persistence in H-P filtered output is similar across all countries in the table; the first two autocorrelations are typically significant, and the third one is marginally significant. Persistence is particularly high in G7 economies as compared to any other group of countries. The degree of persistence in general appears to be related to country size with the clear exceptions of the Czech Republic in the transition group and Belgium in the EU one. Persistence is particularly low only in Spain and Slovenia.[11] All in all, one of the major conclusions here is that the dynamic properties of output fluctuations in transition economy are not drastically different from the similar fluctuations in other developing countries, but are somewhat more pronounced than in more developed ones.

A number of related studies report facts of economic fluctuations by proxying output with industrial production. In contrast, we use real GDP as a measure of output. In order to provide a basis of comparison for our findings to the rest of the literature, we first examine the properties of industrial production data. Table II displays the degree of volatility, cyclicality and persistence in industrial production in CEE countries.[12] The data indicate that industrial production is highly volatile, about as volatile as in other developing countries. Relative volatility is reasonably stable across countries, indicating a certain degree of uniformity in industrial sectors. Industrial output is also strongly procyclical and synchronous.[13] The major outlier in cyclicality is Slovenia with the lowest correlation coefficients of 0.37. Regarding the degree of persistence, Russia stands out by having an autoregressive coefficient of 0.37. While the H-P filtered series are highly persistent, first differenced industrial production data are not; indeed, they tend to be close to a white noise process.

Tables III through XX summarize the results for three major groups of variables, output components (consumption, investment, government consumption, net exports, real imports, real exports), variables related to the labor market (industrial employment, real wages, productivity), and monetary and nominal variables (private sector credit, M1, M2, M1 velocity, M2 velocity, CPI level, CPI inflation, nominal and real effective exchange rates). For all variables, the following statistics are reported: absolute volatility (standard deviation), volatility relative to output, contemporaneous correlation with output, measures of the phase

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(1993) are based on quarterly frequency data constructed from annual frequency GDP figures by creating seasonal patterns in quarterly GDP that match the observed seasonal patterns in Industrial Production.

[11] For Slovenia and Spain, this observation can be attributed to the statistical properties of the H-P filter (cf. Marcet and Ravn (2004)).

[12] We have all subsequent results of industrial production as a measure of output, as opposed to GDP computed. These results are available upon request.

shift (correlations between the variable itself, and lagged and leaded output) and persistence (first-order autocorrelation coefficient). While we always obtain result using all three alternative filtering procedures (H-P, first difference and time polynomial), the first three statistics are reported for all the three alternative de-trending procedures, the latter ones only for the H-P filter. As most of our results are robust to filtering techniques, especially the H-P and the time polynomial filter tend to produce qualitatively identical outcomes, the interpretation of findings is always based only on one of the filters, the H-P one.

GDP Components

       Consumption. The absolute and relative volatility of consumption is higher in all transition countries where the data available than in the US. Some of the countries have even higher consumption volatility than other developing countries such as Argentina, Mexico and Turkey. At the same time, relative consumption volatility in Lithuania is about the same as similar figures in industrial countries, 0.87; indeed, it falls short of many of them. Apart from Lithuania, the comparison is also striking with the EU and the G7 country group. For instance, the UK has the largest relative volatility of 1.15 in G7, a figure being on the same order of magnitude as the smallest relative volatilities in the CEE sample with 1.04 for Poland and 1.07 for Russia. One may conclude here that excessively high volatility contradicts the theoretical prior of consumption smoothing. Explanations of this puzzle can potentially be manifold. One of them is the dominance of durable consumption, a particularly important and volatile component of private consumption in transition economies, characterized by rapid income growth and changing consumer behavior (see Backus, Kehoe and Kydland (1995)). Alternative, or even complementary argument is the presence of liquidity constraint in economies with highly imperfect financial systems. It might also be the case that consumers have particularly strong precautionary motive to save, resulting in excess sensitivity in consumption responses to income. Finally, high volatility in consumption can stem from the dominance of permanent shocks to trend growth, a particularly pervasive feature of many developing economies (see Aguiar and Gopinath (2004)).

       With the exceptions of Latvia being countercyclical and Lithuania only mildly procyclical, private consumption is highly procyclical. The contemporaneous correlation between consumption and GDP is positive, often significantly so. The magnitude of the coefficients appears to be similar to ones found in industrial countries. There are many significantly positive, synchronous phase shift coefficients, though the pattern is not

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[13] Since the number of observations is around forty, we take 0.3 as the 95% significance level benchmark in the correlation coefficients.

unequivocal, similarly to EU countries. Moreover, whether output is proxied by real GDP or industrial output does not seem to alter the cyclical properties of consumption. The persistence in consumption is non-negligible, though lower than in the US. The two notable outliers are again Latvia and Lithuania, with virtually no persistence in consumption.

Investment. Investment is strongly procyclical and is often coincidental. It is also the most volatile component of aggregate spending in all countries in the sample. Though we measure investment as gross fixed capital formation, excluding inventories, clearly the most volatile component of GDP, the volatility of investment in CEE countries is very high in international comparison, especially relative to industrial countries, both in relative and absolute terms. Nonetheless, excessive volatilities might stem from data issues, like measurement problems (classification of certain items); or the privatization of a large portion of previously government owned physical assets. Investment tends to be persistent, with the exceptions of Hungary, Latvia, Romania and Russia. Indeed, Latvia and Romania happen to be countries with particularly low persistence and low correlation in investment.

Government consumption. Governments play a large and central role in all transition economies, and their prudence is one of the key criteria of EU and EMU accession. For this reason, budget items are often moved across years or budget categories, creating extra artificial volatility of spending, transforming its dynamics in an uncertain way. Given this caveat, government consumption appears to be more volatile than in industrial countries, and about as volatile than in developing countries. In addition, government spending tends to be more volatile than private consumption, and less volatile than investment in the sample. If anything, government consumption tends to be procyclical, though often just weakly so.[14] Croatia is clearly countercyclical, and Estonia and Hungary acyclical. The persistence in government consumption is in general low.

Net exports. With the exception of Romania with an acyclical trade balance, all signs of the cyclicality statistics are negative, in line with the experience in developing and G7 economies. Latvia and Russia, both primary exporters of raw materials exhibit a number of sizeable and positive lead coefficients. The magnitude of relative volatility is dramatically higher than the corresponding statistic in the US, the latter being 0.45 (see Kydland and Prescott (1990)). While net exports tend to be the least volatile component of GDP, less volatile than private consumption in most countries, Poland, Russia and Slovakia still exhibit

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[14] In examining fiscal policy in four CEE countries, Coricelli and Ercolani (2002) also find a procyclical fiscal stance.

higher consumption than net export volatility.[15] Russia and Slovakia also happen to be the countries with the highest degree of persistence in net exports.

Imports. The volatility of imports relative to GDP tends to be larger than the one for industrial countries, the largest being France with a ratio of 4.57. In our sample, imports in Hungary, Poland and Slovakia are the most volatile ones in relative terms. In absolute terms, Croatia, Lithuania and Russia show particularly strong volatilities, and Slovenia particularly low absolute volatility. Large relative volatilities might be related to heavy re-exporting activities in these countries. Just like in G7 countries, imports are always strongly procyclical and approximately coincidental in all countries. Bulgaria is an exception here, with no significant correlation coefficient.

Exports. Again, relative export volatilities in CEE countries exceed those in industrial countries. Exports are least volatile in Russia, both in absolute and relative terms. Exports are in general procyclical, though much less so than real imports are. Exports are especially procyclical and persistent in countries with the most open goods and capital markets, such as the Baltic countries and Hungary, but is also procyclical in major commodity exporter countries, such as Romania and Russia. None of the observed phase shift patterns are inconsistent with G7 results. For example, the US has a strong negative leading correlation, Canada has a medium-high positive lead, and Italy has a medium-high negative lagged correlation.

Labor market

Employment. Employment in CEE countries tends to be more variable than in industrial ones, Bulgaria showing a very high degree of absolute volatility. Indeed, employment variability exceeding GDP variability appears to be the rule rather than the exception. Cyclical patterns in employment are very similar to G7 results; with the exception of Lithuania, employment is highly procyclical, and often synchronous in a statistically significant way. Unlike to G7 economies where employment lags output (see Fiorito and Kollintzas (1994)), phase shift patterns in CEE countries are more mixed, with leading or coincidental coefficients being slightly more prevalent than lagging ones. In this sense, phase shift patterns in employment are favorable to theories of the business cycle abstracting from labor hoarding considerations. With the exception of Russia, cyclical employment is also quite persistent.

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[15] Strangely, Poland and Russia are countries with relatively closed goods markets.

Real wages. The relative volatility of real wages is again significantly higher here than in G7 economies, particularly so in Russia. Apart from potential measurement issues, high volatility might be attributed to the interaction of cyclical fluctuations and the trend real convergence process in these countries. In contrast to the evidence in industrial countries, significant positive correlation coefficients dominate negative and zero ones, though the phase shifts show no unequivocal pattern. Economic theory suggests that procyclical wages are consistent with technological shocks, while preference or government expenditure shocks can lead to countercyclical wages. Cross-country differences in this respect may thus indicate the relative importance of these shocks. Real wages tend to be persistent, with the exception of Estonia.

Productivity. With the exceptions of Bulgaria, Russia, Slovakia, Slovenia, this variable is dominantly procyclical and coincidental. Even in the former group of countries, the highest correlation of a negative sign is accompanied by positive or insignificant contemporaneous correlations. Productivity is most procyclical in the Czech Republic, Estonia and Lithuania, countries in which an economy-wide measure of productivity is calculated, as opposed to one restricted to the industrial sector. Absolute and relative volatilities in cyclical productivity are in general fairly high in many countries, well exceeding similar statistics in developed economies. With the clear exception of Russia, the data also point to persistence in cyclical productivity dynamics.

Monetary and nominal variables

Private sector credit. Unlike Agénor *et al* (2000), we find some pronounced pattern in these countries. The relative volatilities in many countries appear to be fairly high, though there is no international comparison available in this respect. Absolute volatility in Bulgaria is truly astronomic, potentially explained by the hyperinflation experience in 1997. Private sector credit is procyclical with the exception of Lithuania, and is uniformly highly persistent. As pointed out by Agénor *et al*, a strong positive sign can have important consequences for the cost of restrictive monetary policy if credit leads the cycle. In the current sample however private credit is dominantly lagging the cycle, or concurrent with it.

M1. Relative volatilities in M1 in our sample are similar to, or larger than the ones in the US or G7 economies. Absolute volatility is again particularly high in Bulgaria, and to a lesser extent in Croatia, the Czech Republic and Russia. Given the high or moderate inflation history in most CEE countries, large volatility should come as no surprise. M1 is least volatile in countries having a certain degree of flexibility in their exchange rate regimes, Hungary, Poland, Romania and Slovenia. M1 is in general highly persistent, procyclical, and rather

leading or coincidental. Though in many countries one can observe large cyclical coefficients of both signs at various leads and lags. Slovenia again shows a somewhat strange pattern with correlations being insignificant at all leads and lags. Bulgaria and Estonia are exceptions in terms of cyclicality with a significant negative correlation between M1 and output. While Kydland and Zarazaga (1997) also find M1 to be countercyclical using their "new version" of GDP estimates in Argentina, money moving the opposite direction to output is unprecedented in industrial countries.

M2. Apart from Hungary and Slovakia, absolute volatilities are large, larger than for the G7 group, but never as high as in Argentina. M2 is highly volatile in Bulgaria, Croatia, Latvia and Russia. Overall, M2 behaves similarly to M1; it tends to be procyclical or acyclical, like in the G7. Nonetheless, M2 in Bulgaria, Hungary, Latvia and Romania all show significantly countercyclical behavior, a pattern being similar to the one in Argentina. M2 in Estonia and Slovenia is rather acyclical.

M1 velocity. While M1 velocity is rather procyclical, it is countercyclical in Russia and acyclical in Estonia and Slovenia. Its relative volatility varies across countries, but its range is not too different from that of G7 countries. Patterns in leads and lags show mixed patterns. Unlike to G7 countries with velocities being more volatile than M1, and with the exception of Romania, velocity tends to fluctuate about as much as money itself.

M2 velocity. M2 velocity in general fluctuates less than M2. M2 velocity also tends to be procyclical, but shows no clear pattern in leading or lagging the cycle.

CPI. Since a large and changing fraction of prices is in the regulated category in CEE economies, one would not expect a very clear and interpretable cyclical pattern of the CPI. Surprisingly, most of the countries still exhibit countercyclical, and weakly leading or coincidental behavior of the price level. This behavior is similar to that of the G7, and it is usually interpreted as supporting the RBC approach with a shifting aggregate supply and a stable aggregate demand. Prices are procyclical only in Russia and acyclical in Lithuania and Poland. With Croatia and the Czech Republic being exceptions, the CPI in the current sample exhibits a much larger absolute volatility than the CPI in industrial countries. Reflecting the large nominal shock associated with the hyperinflation period in 1997 and the crises in 1998, prices are particularly volatile in Bulgaria and Russia, respectively. Presumably associated with the high trend inflation and the inflation surge episode in 1997, Romania also exhibits highly volatile prices. The Baltic countries appear to constitute another group with moderately high absolute volatility figures. The CPI is in general highly persistent in most countries. Croatia has the least persistent *and* least volatile CPI.

Inflation. Chadha and Prasad (1994) argue that it is the behavior of inflation and output that reflects the relative importance of demand- versus supply-driven versus supply-driven disturbances. Though the relevant negative correlation coefficients outnumber the positive ones, the small size of the largest coefficients and the highly mixed pattern in leads and lags make inflation in CEE economies show no unambiguous cyclical properties. Inflation is not particularly volatile in most countries, the exceptions being Bulgaria, Romania and Russia. These countries also stand out by having inflation series that are not only persistent but also negatively correlated with GDP.[16] It is also notable that inflation is procyclical in countries with relatively more flexible exchange regimes, such as Hungary, Poland and Slovenia. There is little persistence in inflation.

Nominal effective exchange rates. Exchange rate data in Bulgaria and Russia show exceptionally high absolute *and* relative volatilities. Absolute volatilities are also high in Estonia, Lithuania and Romania. These observations are partly explained simply by the few large discrete jumps in the nominal exchange rate associated with policy regime changes, partly by high the high inflation episodes, especially in Bulgaria, Romania and Russia. Still, even the highest relative volatilities are smaller than the one documented in Argentina. On the other hand, the relevant data in Croatia and the Czech Republic show particularly low relative volatilities. Country size and openness do not seem to have a bearing on the degree of volatility; it must be rather associated with the impact of single events. In general, countries with less volatile nominal effective exchange rate also appear to have less volatile price levels. While all series are highly persistent, the cyclical correlations and phase shifts show a mixed pattern, with Estonia, Latvia, Lithuania, Poland and Russia being countercyclical, Hungary and Slovenia being acyclical, and the rest of the countries procyclical.

Real effective exchange rates. Absolute and relative volatilities are in general on the same order of magnitude as the ones for nominal rates. Bulgaria is an exception here with cyclical fluctuations in real exchange rates being much more muted than fluctuations in nominal exchange rates. Countries in which absolute volatility in real effective exchange rates exceeds or very close to the corresponding nominal figure are Latvia, Poland and Slovenia. Real exchange rates in Bulgaria, Romania and Russia are again particularly volatile in absolute term. Relative volatility is particularly high in Russia, indicating that the exchange rate is rather a source than an absorber of shocks here. Real exchange rates appear to be mostly countercyclical, with the exception of Bulgaria, Croatia, the Czech Republic and Russia being procyclical, and Slovenia acyclical. Comparing cyclicality in real with nominal exchange rates, we find significant sign switches for Romania, Russia and Slovakia;

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[16] The cyclical properties of non-detrended inflation show virtually identical patterns.

otherwise signs, and often phase shifts remain intact. Other than this, phase shifts again show no systematic behavior. Finally, real exchange rates are persistent, though the degree of persistence is slightly lower than the one in nominal exchange rates.

5   CONCLUDING REMARKS

CEE economic fluctuations exhibit a number of interesting patterns. First, industrial production is highly volatile, strongly procyclical, synchronous and persistent. Consumption is excessively volatile, even relative to output, typically procyclical, and persistent. Investment also tends to be volatile, procyclical, and in general coincidental. Government consumption is dominantly procyclical, and it is more volatile than in other countries. Net exports are countercyclical and are again highly volatile, although they are the least volatile component of GDP. Overall, investment is the most volatile component of GDP, followed by government consumption, private consumption and net exports. Exports are typically coincidental, and are most procyclical in countries with open goods and capital markets and in major commodity exporter countries.

Employment is highly volatile, procyclical and persistent. Real wages are typically procyclical; they are also volatile, persistent. Productivity is procyclical and shows no clear direction in phase shifts. Volatility in productivity in CEE economies well exceeds the one in developed economies. Persistence in productivity is present but moderate. The behavior of the standard labor market variables (employment, real wages and productivity) is in many respects similar to related patterns in industrial countries, emphasizing the role of real shocks. In fact, employment in transition economies is explained better by classic RBC theory than employment in industrial countries.

Private sector credit is highly volatile, persistent, and procyclical in most countries. The money stock is in general volatile, highly persistent, procyclical, and rather leading or coincidental. Velocity tends to be procyclical. The price level is countercyclical, and weakly leading or coincidental with GDP, supporting the importance of shocks of the supply type. The CPI is highly persistent in most countries. Inflation is not particularly persistent and volatile, and shows mixed cyclical patterns. Countries with less volatile nominal effective exchange rate also appear to have less volatile price levels. While nominal exchange rate series are highly persistent, cyclical correlations exhibit no common pattern. Real exchange rates appear to be mostly countercyclical. Volatilities in nominal and real effective exchange

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rates are often on the same order of magnitude. Phase shifts in real exchange rates show no systematic pattern.

Overall, economic variables in CEE countries tend to be more volatile both in absolute terms and relative to output than in developed economies. Nonetheless, many countries in our sample, including Croatia and the accession group (the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia) show broadly similar cyclical behavior to industrial countries. The most frequent country outliers are Bulgaria, Romania and Russia, especially in labor market, price and exchange rate variables. Excluding these countries from the sample makes many of the observed patterns in cyclical dynamics more homogenous.

In addition to the more detailed international comparison offered in Benczúr and Rátfai (2004), there are a number of directions to which the current analysis is extended. First, we plan to investigate further countries and variables, as the relevant data constitute a meaningful object of investigation. Second, we plan to investigate further the robustness of our qualitative results to alternative de-trending procedures, such as the band-bass filter of Baxter and King. Third, we are about to examine economic fluctuations in CEE countries using the 'turning point' approach developed by Harding and Pagan (2002). Fourth, we continue on seeking to cluster countries more systematically according to their cyclical patterns, and connect the results to country characteristics, such as size of the shadow economy, exchange rate regime, financial integration, fiscal and monetary policies etc. Fifth, in some of the countries quarterly data goes back before 1993:1, often to the mid- or late-1980s. For certain countries, even longer time series can be available at the annual frequency. What does such historical data show? While it is clear that one has to be very cautious and modest when looking at old data from the former Soviet block, some pattern may still show up.

APPENDIX

Real GDP. For Bulgaria, the Czech Republic, Estonia, Hungary and Lithuania, real GDP is a fixed price GDP from the Statistical Office. For Croatia, it is the combination of official fixed price GDP data of the Statistical Office (from 1997) and estimates of the Economic Institute Zagreb (1995-1996). For Latvia, real GDP is the fixed price GDP series of the Statistical Office (from 1995), which is traced back to 1993 and 1994 with the GDP volume index of the IFS (series 99bvp). For Poland, the OECD Quarterly National Accounts data on fixed price GDP is extended using the Emerging Markets Economic Database data on fixed price GDP (annual changes). For Romania, it is the fixed price GDP from the Statistical Office (from 1998) and estimates of the Institute of Economic Forecasting (1994-1997). For Russia, 1995- and 2000-prices GDP series of the Emerging Markets Economic Database are chained together: starting from 2000-prices GDP at the end, annual changes of the 1995-prices GDP are traced back before 2000. For Slovakia, we use the fixed price GDP series of the Emerging Markets Economic Database. For Slovenia, it is the GDP volume index from the IFS (series 99bvp).

Industrial production. For Croatia, the Czech Republic, Hungary, Romania, Slovakia and Slovenia, industrial production is a volume index (IFS series 66). For Estonia, the quarterly series are obtained from the monthly index of industrial sales (provided by the Central Bank), each quarter being the 3-month average. For Latvia, the change in the constant-price industrial production index of the Statistical Office is cumulated. For Lithuania, the fixed price manufacturing value added data of the Statistical Office give the longest reliable series (1995-2002). For Poland, the WIIW series of monthly changes in industrial production is cumulated, and the last month is taken as the quarterly observation. For Bulgaria, the WIIW series of annual changes in the quarterly average of industrial production is matched with the corresponding level series of the Statistical Office. For Russia, the Economic Intelligence Unit's four industrial production series (91 prices, 95 prices, 97 prices, changes in the index with 1999 prices) are merged into a common series of quarterly changes, which is then cumulated. Each sub-series is used till its last observation, and then the change in the next variant continues.

Private consumption. Except for Poland, private consumption includes Non-Profit Institutions Serving Households (NPISH). There is insufficient coverage for Slovenia (starting only in 1999). For all other countries, private consumption is a fixed price GDP expenditure data, from the same sources as real GDP. For Russia, the chaining of the 1995-

and the 2000-price series is applied to household consumption and the consumption of NPISH separately, and the two series are added up to yield private consumption.

Investment. Investment is gross fixed capital formation, in fixed prices. It is obtained from the same sources as real GDP. Investment data in Slovenia are unavailable.

Government consumption. Government consumption is government consumption expenditures in fixed prices. For Poland, it also includes Non-Profit Institutions Serving Households (NPISH). It is obtained from the same sources as real GDP. Government consumption data in Slovenia are unavailable.

Exports. With the exception of Bulgaria and Slovenia, we use fixed price national accounts data on exports of goods and services, from the same sources as real GDP. For Bulgaria, fixed price exports data are available only from 1996, so we use the current price data: it is first seasonally adjusted, then deflated by the seasonally adjusted producer price index. For Slovenia, we use the monthly figures on merchandise exports in dollars of the Central Bank. These are converted into local currency using monthly average exchange rates from the Central Bank. Quarterly observations then correspond to the 3-month sum of exports.

Imports. For all countries, data are from the same sources as for exports.

Wages. For Bulgaria, Croatia, the Czech Republic, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia, wages are the series 65 of the IFS; while for Russia, it is the change in the same index (65x), cumulated. For Estonia, we use the Central Bank series on average quarterly wages, in national currency.

Employment and productivity. For Croatia, Hungary, Latvia, Lithuania, Poland, Russia and Slovenia, employment is the industrial employment index of the IFS (series 67). For Bulgaria, Romania and Slovakia, employment is industrial employment from WIIW: in thousands for Romania, while a monthly change for Bulgaria and Slovakia (cumulated). Quarterly observations for Bulgaria and Romania correspond to the last month of the quarter, while for Slovakia they correspond to the first month. Productivity is the ratio of industrial production to industrial employment.

For the Czech Republic and Estonia, employment is total employment (in thousands), provided by the Statistical Office and Central Bank, respectively. We also use the total employment data of the Statistical Office for Lithuania. In the Czech Republic, there exists quarterly frequency series of industrial employment; however, it excludes medium-size firms (with 20-100 employees) in the years of 1995 and 1996. For this reason, we do not employ this series. Correspondingly, productivity is defined as the ratio of real GDP to total

employment for these two countries. For Lithuania, we use both employment and productivity measures, but report only on figures computed using GDP and total employment data.

Private sector credit. For Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Russia, Slovakia and Slovenia, this variable is bank claims on other resident sectors (IFS series 22d). For Romania, the series of claims of non-government sector is obtained from the Central Bank.

M1. For Bulgaria, Croatia, the Czech Republic, Hungary, Latvia, Lithuania, Poland, Romania, Russia, Slovakia and Slovenia, M1 is the money series of the IFS (series 34). For Estonia, it is the series provided by the Central Bank in local currency.

M2. For Bulgaria, Croatia, the Czech Republic, Hungary, Latvia, Lithuania, Poland, Romania, Russia, Slovakia and Slovenia, M2 is the sum of the IFS series 34 (money) and 35 (quasi-money). For Estonia, it is provided directly by the Central Bank in local currency.

Velocities of M1 and M2. Velocities are defined as the ratio of the monetary variable and nominal output. Nominal output is obtained as the product of real GDP and the CPI.

CPI. For Bulgaria, Croatia, the Czech Republic, Hungary, Latvia, Poland, Romania, Slovakia and Slovenia, it is the price index series (64) of the IFS. For Russia, it is cumulated from changes (series 64x) in the IFS. For Estonia, it is the consumer price index provided by the Statistical Office. For Lithuania, we use the end-of-quarter observation of the monthly CPI-change series of the Central Bank.

Inflation. It is defined as the quarterly change in log of CPI. For the Czech Republic and Slovakia, the first observation is missing since there is no CPI data before 1993:1, the time for the breakup of Czechoslovakia.

Nominal and real effective exchange rates. For Bulgaria, Croatia, the Czech Republic, Hungary, Poland, Romania, Russia and Slovakia, effective exchange rates are trade weighted nominal and real exchange rate indices from the IFS (series *nec* and *rec*). For Estonia and Latvia, we use the quarterly effective exchange rates series of the Central Bank, cumulated in Estonia. For Lithuania and Slovenia, we use the monthly nominal and real effective exchange rate series of the Central Bank, taking the last month in the quarter as the quarterly observation. Real exchange rates are CPI-based in all cases.

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Figure 1: Estonia
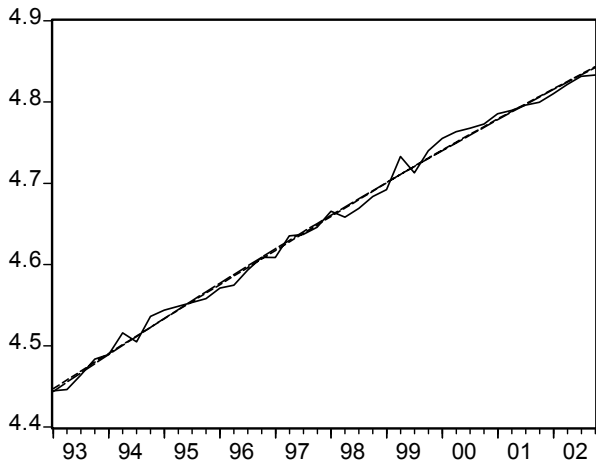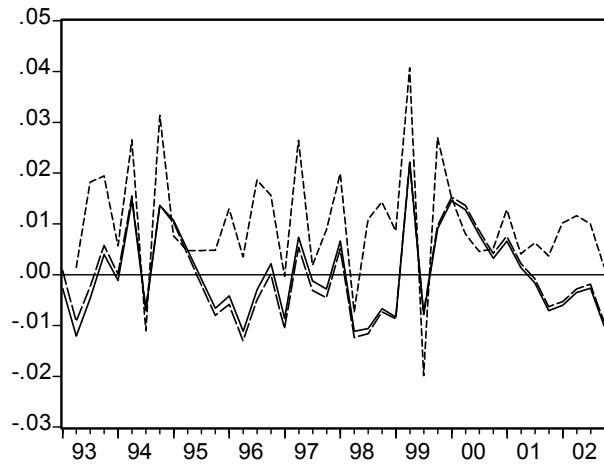
Figure 2: Slovenia

Figure 3: Poland

TABLE I
SUMMARY STATISTICS FOR OUTPUT

Country	Sample Period	GDP Volatility	IP Volatility	Autocorrelation			
				lag1	lag2	lag3	lag4
Argentina	1970:1 / 1980:1 – 1990:4	3.06 / 4.59	5.57				
Chile	1986:1 – 1998:4	2.00	4.53	0.68	0.51	0.27	0.00
Colombia	1978:1 – 1995:4		2.33	0.51	0.27	0.17	0.02
India	1978:1 – 1995:4		2.45	0.48	0.35	0.10	0.02
Korea	1978:1 – 1995:4		3.47	0.71	0.44	0.20	-0.14
Malaysia	1978:1 – 1995:4		4.06	0.69	0.30	0.07	-0.16
Mexico	1987:1 – 2000:2	2.34	3.31	0.72	0.40	0.14	-0.13
Morocco	1978:1 – 1995:4		2.77	0.06	0.25	0.08	-0.18
Nigeria	1978:1 – 1995:4		6.69	0.45	0.09	-0.06	-0.12
Philippines	1978:1 – 1995:4		7.45	0.63	0.42	0.10	-0.15
Tunisia	1978:1 – 1995:4		2.72	0.63	0.42	0.13	0.06
Turkey	1987:1 – 2000:2	3.48	3.62	0.38	0.14	0.06	-0.12
Uruguay	1978:1 – 1995:4		4.94	0.63	0.50	0.27	-0.01
Developing average		**2.77 / 3.10**	**4.15**	**0.55**	**0.34**	**0.13**	**-0.08**
Bulgaria	1994:1 – 2002:4	4.46	6.99	0.67	0.33	0.03	-0.17
Croatia	1994:1 – 2002:4	2.34	2.56	0.54	0.26	0.11	0.07
Czech Republic	1994:1 – 2002:4	1.91	3.31	0.76	0.58	0.39	0.32
Estonia	1993:1 – 2002:4	2.58	4.22	0.70	0.43	0.17	-0.09
Hungary	1995:1 – 2002:4	1.06	3.93	0.67	0.32	0.03	0.13
Latvia	1993:1 – 2002:4	2.03	4.95	0.68	0.36	0.10	0.04
Lithuania	1995:1 – 2002:4	2.53	4.05	0.50	0.33	0.33	0.18
Poland	1995:1 – 2002:4	1.28	3.50	0.86	0.60	0.35	0.12
Romania	1994:1 – 2002:4	3.84	7.91	0.68	0.45	0.37	0.29
Russia	1995:1 – 2002:4	3.33	3.69	0.81	0.53	0.27	0.07
Slovakia	1993:1 – 2002:4	1.22	2.84	0.57	0.49	0.43	0.41
Slovenia	1993:1 – 2002:4	0.86	2.19	0.15	0.30	0.15	-0.15
CEE average		**2.29**	**4.18**	**0.63**	**0.41**	**0.23**	**0.10**
US	1960:1 – 1989:3	1.74	3.70	0.85	0.65	0.41	0.21
Canada	1960:1 – 1989:3	1.39	3.79	0.78	0.51	0.27	0.04
Japan	1960:1 – 1989:3	1.53	4.07	0.78	0.59	0.38	0.19
Germany	1960:1 – 1989:2	1.69	3.06	0.67	0.46	0.35	0.23
France	1960:1 – 1989:3	0.90	2.70	0.77	0.54	0.30	0.10
UK	1960:1 – 1989:1	1.54	2.85	0.55	0.37	0.20	0.07
Italy	1960:1 – 1989:3	1.70	3.58	0.80	0.52	0.22	-0.04
G7 average		**1.50**	**3.39**	**0.74**	**0.52**	**0.30**	**0.11**
Belgium	1960:1 – 1989:4	2.68	2.75	0.72	0.49	0.22	-0.04
Denmark	1960:1 – 1989:4	2.30	2.24	0.26	0.05	0.00	0.13
Greece	1962:1 – 1990:4	2.85	3.04	0.64	0.36	0.17	-0.01
Ireland	1976:1 – 1989:4	2.31	3.11	0.35	0.03	0.10	0.05
Luxembourg	1960:1 – 1989:4	3.20	5.07	0.54	0.30	0.11	0.00
Netherlands	1960:1 – 1989:4	1.79	2.27	0.32	0.09	0.11	0.06
Portugal	1968:1 – 1989:4	3.05	3.52	0.52	0.37	0.19	0.16
Spain	1975:1 – 1989:4	1.47	1.80	0.13	0.17	0.18	0.03
EU average		**2.12**	**3.07**	**0.52**	**0.31**	**0.18**	**0.06**

Note: Variables are Hodrick-Prescott filtered components of GDP and Industrial Production (IP). Autocorrelations are computed in IP in the developing group, and in real GDP otherwise. 'EU average' includes G7 members of EU as well.
Source: Kydland and Zarazaga (1997) for GDP and IP in Argentina (old / new estimates); Agenor *et al* (2000) for IP in all other developing countries; Alper (2003) for GDP in Mexico and Turkey; Burgoeing and Soto (2000) for GDP in Chile; Fiorito and Kollintzas (1994) for GDP and IP in G7 countries; Christodoulakis *et al* (1995) for GDP and IP in EU countries; authors' calculation for GDP and IP in transition countries.

TABLE II
INDUSTRIAL OUTPUT

	Bulgaria	Croatia	Czech Rep	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Russia	Slovakia	Slovenia
Absolute Volatility[1]												
HP	6.99	2.56	3.31	4.22	3.93	4.95	4.05	3.50	7.91	3.69	2.84	2.19
FD	5.18	2.43	2.84	3.30	2.09	3.97	4.05	3.52	4.23	3.36	2.42	1.70
TP	9.10	2.65	3.70	4.24	4.72	5.13	4.09	3.43	9.92	3.64	3.27	2.34
Relative Volatility[2]												
HP	1.57	1.09	1.73	1.70	3.73	2.60	1.59	2.74	2.06	1.11	2.32	2.53
FD	1.35	1.06	2.07	1.60	2.56	2.93	1.57	4.59	1.37	1.49	2.11	1.50
TP	2.09	1.05	1.66	1.61	4.19	2.61	1.52	3.71	2.25	1.24	2.34	2.63
Cyclicality[3]												
HP	**0.41**	**0.71**	0.43	**0.77**	**0.74**	**0.70**	**0.69**	**0.73**	**0.81**	**0.74**	**0.52**	0.27
FD	0.45	0.64	0.01	0.74	0.65	0.57	0.59	0.46	0.41	0.78	0.35	0.09
TP	0.22	0.77	0.54	0.79	0.80	0.68	0.70	0.67	0.83	0.84	0.61	0.21
Leads and Lags[4]												
-4	-0.28	-0.16	-0.20	0.01	0.23	-0.11	0.04	0.03	0.27	-0.12	0.48	-0.29
-3	-0.08	-0.04	0.06	0.37	0.35	-0.02	0.36	0.32	0.49	0.01	0.31	-0.34
-2	0.04	0.18	0.20	0.37	0.53	0.17	0.39	0.53	0.62	0.19	0.35	-0.10
-1	0.14	0.42	0.32	0.57	0.69	0.52	0.40	0.62	0.66	0.49	0.48	0.06
+1	0.40	0.43	0.52	0.55	0.57	0.64	0.43	0.62	0.79	0.62	0.22	**0.37**
+2	0.33	0.18	**0.54**	0.28	0.36	0.40	0.20	0.41	0.64	0.47	0.03	0.33
+3	0.22	0.25	0.42	-0.01	0.13	0.09	0.11	0.15	0.53	0.26	-0.14	0.35
+4	0.13	0.06	0.42	-0.19	0.00	-0.21	-0.23	-0.03	0.40	0.11	-0.29	0.13
Persistence[5]	0.75	0.55	0.65	0.70	0.87	0.68	0.51	0.51	0.87	0.37	0.64	0.71

Notes:

1 'Absolute Volatility' is measured as the standard deviation of industrial output.
2 'Relative Volatility' is measured as the ratio of the standard deviation of industrial output and real GDP.
3 'Cyclicality' is measured as the contemporaneous correlation between of industrial output and real GDP.
4 'Lead (lag)' is measured as the correlation between leads (lags) in HP-filtered industrial output and real GDP.
5 'Persistence' is measured as the AR(1) coefficient in HP-filtered industrial output.
6 Bold figures indicate the largest correlation coefficient (in absolute value) in HP-filtered industrial output.
7 All data are at the quarterly frequency, de-seasonalized and de-trended. De-trending methods include the Hodrick-Prescott filter (*HP*), log first-differencing (*FD*) and fitting a quadratic time-trend polynomial (*TP*).

TABLE III
PRIVATE CONSUMPTION

		Bulgaria	Croatia	Czech Rep	Estonia	Hungary	Lithuania	Latvia	Poland	Romania	Russia	Slovakia	Slovenia
Absolute Volatility[1]	HP	5.78	5.57	2.23	3.27	1.95	2.20	2.48	1.33	5.20	3.58	2.55	
	FD	5.55	3.72	1.95	2.99	1.55	2.73	3.23	1.19	5.25	2.58	2.64	
	TP	5.82	6.11	2.57	3.49	1.31	2.23	2.53	0.98	5.58	2.98	2.69	
Relative Volatility[2]	HP	1.30	2.38	1.17	1.27	1.85	0.87	1.30	1.04	1.35	1.07	2.08	
	FD	1.46	1.63	1.43	1.46	1.87	1.06	2.39	1.53	1.67	1.15	2.29	
	TP	1.33	2.42	1.16	1.30	1.16	0.83	1.29	1.06	1.27	1.02	1.93	
Cyclicality[3]	HP	**0.80**	**0.57**	**0.75**	**0.70**	0.44	0.11	0.25	0.65	**0.72**	0.50	0.32	
	FD	0.64	0.34	0.48	0.40	0.01	0.19	0.26	0.37	0.51	0.41	0.24	
	TP	0.79	0.61	0.80	0.68	0.50	0.14	0.26	0.28	0.77	0.20	0.36	
Leads and Lags[4]	-4	-0.06	0.14	0.06	0.11	-0.32	0.04	0.39	0.57	0.01	-0.57	-0.02	
	-3	-0.08	0.25	0.13	0.33	-0.24	**0.34**	0.40	0.73	0.06	-0.35	0.08	
	-2	0.11	0.34	0.36	0.48	0.07	-0.01	0.35	**0.75**	0.26	-0.04	0.08	
	-1	0.45	0.51	0.55	0.59	0.37	-0.05	0.20	0.73	0.58	0.22	0.17	
	+1	0.66	0.40	0.67	0.52	**0.45**	0.06	0.12	0.52	0.47	**0.63**	0.28	
	+2	0.44	0.33	0.71	0.33	0.34	-0.25	-0.20	0.20	0.43	0.60	0.56	
	+3	0.17	0.10	0.72	0.07	0.44	-0.15	-0.46	-0.09	0.31	0.62	**0.59**	
	+4	0.08	-0.10	0.55	-0.07	0.32	0.06	**-0.58**	-0.21	0.18	0.51	0.50	
Persistence[5]		0.57	0.79	0.64	0.59	0.72	0.13	0.17	0.64	0.50	0.57	0.47	

Notes:

1 'Absolute Volatility' is measured as the standard deviation of private consumption.
2 'Relative Volatility' is measured as the ratio of the standard deviation of private consumption and real GDP.
3 'Cyclicality' is measured as the contemporaneous correlation between of private consumption and real GDP.
4 'Lead (lag)' is measured as the correlation between leads (lags) in HP-filtered private consumption and real GDP.
5 'Persistence' is measured as the AR(1) coefficient in HP-filtered private consumption.
6 Bold figures indicate the largest correlation coefficient (in absolute value) in HP-filtered private consumption.
7 All data are at the quarterly frequency, de-seasonalized and de-trended. De-trending methods include the Hodrick-Prescott filter (*HP*), log first-differencing (*FD*) and fitting a quadratic time-trend polynomial (*TP*).

TABLE IV
INVESTMENT

	Bulgaria	Croatia	Czech Rep	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Russia	Slovakia	Slovenia
Absolute Volatility[1]												
HP	15.10	8.36	4.83	12.94	3.24	11.05	9.74	8.72	8.85	9.82	10.72	
FD	16.43	5.65	3.46	14.52	3.92	14.82	8.96	9.96	12.55	11.10	8.50	
TP	15.40	9.05	5.34	13.21	3.30	10.87	10.10	6.31	9.21	8.78	11.61	
Relative Volatility[2]												
HP	3.38	3.57	2.53	5.01	3.07	5.80	3.83	6.82	2.30	2.95	8.76	
FD	4.32	2.48	2.54	7.12	4.72	10.93	3.47	12.78	4.00	4.94	7.39	
TP	3.53	3.59	2.40	4.94	2.93	5.53	3.74	6.84	2.09	2.99	8.32	
Cyclicality[3]												
HP	0.39	**0.70**	**0.87**	**0.68**	0.47	0.22	**0.68**	0.62	**0.39**	0.71	0.46	
FD	0.17	0.52	0.55	0.41	0.19	-0.06	0.35	0.23	0.61	0.23	0.19	
TP	0.38	0.74	0.91	0.67	0.54	0.18	0.74	0.24	0.46	0.64	0.48	
Leads and Lags[4]												
-4	0.15	0.29	0.32	0.04	0.27	-0.04	-0.08	0.30	0.14	0.17	0.10	
-3	**0.50**	0.39	0.34	0.18	0.25	-0.12	0.36	0.41	0.22	0.30	0.23	
-2	0.43	0.45	0.47	0.24	0.22	0.06	0.34	0.61	0.24	0.39	0.34	
-1	0.30	0.56	0.70	0.57	**0.58**	0.19	0.44	**0.68**	0.16	0.61	0.36	
+1	0.35	0.53	0.77	0.41	0.14	0.20	0.61	0.47	-0.15	**0.72**	0.48	
+2	0.41	0.45	0.50	0.31	-0.33	**0.27**	0.52	0.44	-0.03	0.52	0.47	
+3	0.39	0.38	0.30	0.02	-0.03	0.16	0.60	0.36	0.29	0.37	**0.50**	
+4	0.21	0.34	0.16	-0.10	-0.24	0.12	0.34	0.19	0.33	0.13	0.38	
Persistence[5]	0.43	0.81	0.76	0.37	0.27	0.09	0.59	0.40	-0.08	0.33	0.71	

Notes:

1 'Absolute Volatility' is measured as the standard deviation of investment.
2 'Relative Volatility' is measured as the ratio of the standard deviation of investment and real GDP.
3 'Cyclicality' is measured as the contemporaneous correlation between of investment and real GDP.
4 'Lead (lag)' is measured as the correlation between the leads (lags) in HP-filtered investment and real GDP.
5 'Persistence' is measured as the AR(1) coefficient in HP-filtered investment.
6 Bold figures indicate the largest correlation coefficient (in absolute value) in HP-filtered investment.
7 All data are at the quarterly frequency, de-seasonalized and de-trended. De-trending methods include the Hodrick-Prescott filter (*HP*), log first-differencing (*FD*) and fitting a quadratic time-trend polynomial (*TP*).

TABLE V
GOVERNMENT CONSUMPTION

	Bulgaria	Croatia	Czech Rep	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Russia	Slovakia	Slovenia
Absolute Volatility[1]												
HP	8.30	3.25	2.90	3.92	2.25	2.30	5.79	2.13	5.06	1.50	6.12	
FD	8.12	3.44	2.94	4.50	2.97	2.56	8.29	2.98	6.30	1.64	6.95	
TP	8.21	3.07	2.88	4.07	2.06	2.35	5.89	2.13	5.00	1.52	6.30	
Relative Volatility[2]												
HP	1.86	1.39	1.52	1.52	2.14	1.21	2.28	1.66	1.32	0.45	5.00	
FD	2.13	1.51	2.16	2.20	3.58	1.89	3.21	3.83	2.01	0.73	6.04	
TP	1.88	1.22	1.29	1.52	1.83	1.19	2.18	2.30	1.14	0.52	4.52	
Cyclicality[3]												
HP	0.53	-0.02	0.32	-0.17	**0.20**	0.13	**0.52**	0.27	0.45	0.18	0.24	
FD	0.31	-0.01	0.20	0.17	-0.05	0.28	0.42	0.04	0.13	0.08	-0.02	
TP	0.46	-0.15	0.50	-0.19	0.10	0.11	0.55	0.30	0.45	0.24	0.29	
Leads and Lags[4]												
-4	0.15	**-0.65**	0.27	-0.26	0.10	-0.37	0.28	-0.03	0.35	**0.43**	-0.05	
-3	0.37	-0.05	0.26	-0.29	-0.10	-0.43	0.03	0.10	0.30	0.22	0.12	
-2	0.49	-0.07	0.39	-0.19	0.03	-0.33	0.03	0.10	0.23	0.12	0.08	
-1	**0.63**	0.01	0.24	-0.20	0.18	-0.24	0.38	0.14	**0.49**	0.16	0.16	
+1	0.25	-0.12	0.29	-0.24	0.10	0.36	0.07	**0.43**	0.35	0.18	0.34	
+2	-0.01	-0.08	**0.42**	**-0.31**	-0.01	0.40	0.24	0.33	0.12	0.01	**0.36**	
+3	-0.10	0.18	0.32	-0.27	-0.30	**0.45**	0.28	0.06	0.11	-0.04	0.29	
+4	-0.22	0.21	0.30	-0.07	-0.24	0.42	-0.15	-0.06	-0.16	-0.16	0.27	
Persistence[5]	0.54	0.43	0.52	0.33	0.07	0.38	-0.01	0.04	0.24	-0.06	0.37	

Notes:

1 'Absolute Volatility' is measured as the standard deviation of government consumption.
2 'Relative Volatility' is measured as the ratio of the standard deviation of government consumption and real GDP.
3 'Cyclicality' is measured as the contemporaneous correlation between of government consumption and real GDP.
4 'Lead (lag)' is measured as the correlation between the leads (lags) in HP-filtered government consumption and real GDP.
5 'Persistence' is measured as the AR(1) coefficient in HP-filtered government consumption.
6 Bold figures indicate the largest correlation coefficient (in absolute value) in HP-filtered government consumption.
7 All data are at the quarterly frequency, de-seasonalized and de-trended. De-trending methods include the Hodrick-Prescott filter (*HP*), log first-differencing (*FD*) and fitting a quadratic time-trend polynomial (*TP*).

TABLE VI
NET EXPORTS TO GDP

	Bulgaria	Croatia	Czech Rep	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Russia	Slovakia	Slovenia
Absolute Volatility[1]												
HP	4.58	4.21	1.76	2.55	2.03	2.62	1.85	3.23	2.21	4.44	4.78	1.74
FD	5.54	4.61	1.88	2.97	1.88	2.88	2.47	4.34	2.47	3.29	4.13	2.54
TP	4.83	4.54	1.96	2.85	2.10	2.63	1.75	3.17	2.22	4.66	5.10	1.73
Relative Volatility[2]												
HP	1.03	1.80	0.92	0.99	1.93	1.37	0.73	2.53	0.57	1.33	3.91	2.03
FD	1.46	2.02	1.38	1.46	2.27	2.12	0.96	5.57	0.79	1.46	3.59	2.23
TP	1.11	1.80	0.88	1.07	1.86	1.34	0.65	3.43	0.50	1.59	3.65	1.97
Cyclicality[3]												
HP	**-0.54**	**-0.58**	-0.44	-0.19	-0.45	0.05	0.13	-0.16	0.07	-0.43	-0.38	**-0.46**
FD	-0.48	-0.27	0.24	0.28	-0.37	-0.11	0.31	0.01	-0.01	-0.41	-0.07	-0.50
TP	-0.51	-0.64	-0.56	-0.16	-0.48	0.07	0.11	0.04	0.08	-0.34	-0.45	-0.45
Leads and Lags[4]												
-4	-0.08	-0.09	-0.14	0.00	-0.44	0.13	0.24	-0.44	-0.03	0.48	-0.21	-0.07
-3	-0.24	-0.19	-0.30	-0.05	-0.32	0.28	-0.12	**-0.44**	-0.04	0.45	-0.28	-0.03
-2	-0.20	-0.39	-0.29	-0.08	-0.35	0.42	0.06	-0.35	-0.05	0.30	-0.20	-0.12
-1	-0.40	-0.46	-0.49	-0.33	**-0.49**	0.36	-0.07	-0.22	-0.09	-0.05	-0.35	0.03
+1	-0.25	-0.44	**-0.56**	**-0.35**	-0.03	-0.21	-0.11	-0.16	**0.21**	**-0.68**	-0.38	-0.01
+2	-0.05	-0.25	-0.52	-0.26	0.33	-0.36	-0.22	0.00	0.18	**-0.68**	-0.42	-0.18
+3	0.17	-0.07	-0.50	-0.19	0.23	**-0.44**	**-0.38**	0.09	0.08	-0.55	**-0.44**	-0.08
+4	0.21	-0.04	-0.41	-0.18	0.09	-0.29	-0.21	0.11	-0.06	-0.44	-0.31	0.08
Persistence[5]	0.24	0.42	0.42	0.34	0.52	0.41	0.14	0.13	0.37	0.66	0.64	-0.04

Notes:

1 'Absolute Volatility' is measured as the standard deviation of net exports to GDP.
2 'Relative Volatility' is measured as the ratio of the standard deviation of net exports to GDP and real GDP.
3 'Cyclicality' is measured as the contemporaneous correlation between of net exports to GDP and real GDP.
4 'Lead (lag)' is measured as the correlation between the leads (lags) in HP-filtered net exports to GDP and real GDP.
5 'Persistence' is measured as the AR(1) coefficient in HP-filtered net exports to GDP.
6 Bold figures indicate the largest correlation coefficient (in absolute value) in HP-filtered net exports to GDP.
7 All data are at the quarterly frequency, de-seasonalized and de-trended. De-trending methods include the Hodrick-Prescott filter (*HP*), log first-differencing (*FD*) and fitting a quadratic time-trend polynomial (*TP*).

TABLE VII
REAL IMPORTS

	Bulgaria	Croatia	Czech Rep	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Russia	Slovakia	Slovenia
Absolute Volatility[1]												
HP	6.63	9.51	4.07	7.62	4.93	6.31	9.42	7.10	6.54	14.66	7.08	3.76
FD	7.63	7.23	3.47	5.31	3.20	6.17	6.11	7.70	6.64	10.30	7.43	5.18
TP	6.67	10.26	4.35	7.85	4.99	6.39	10.61	5.71	6.94	14.97	7.36	3.84
Relative Volatility[2]												
HP	1.49	4.07	2.13	2.95	4.68	3.31	3.71	5.55	1.70	4.40	5.79	4.40
FD	2.01	3.17	2.55	2.60	3.85	4.55	2.36	9.89	2.12	4.59	6.46	4.56
TP	1.53	4.07	1.95	2.93	4.43	3.25	3.93	6.18	1.57	5.10	5.27	4.38
Cyclicality[3]												
HP	0.10	**0.66**	0.70	0.53	0.65	0.48	**0.71**	0.44	0.28	0.52	0.16	**0.64**
FD	0.01	0.41	0.01	0.30	0.33	0.37	0.49	0.17	-0.08	0.41	-0.14	0.71
TP	0.07	0.70	0.75	0.57	0.84	0.41	0.74	-0.04	0.38	0.39	0.19	0.65
Leads and Lags[4]												
-4	0.28	0.09	0.20	-0.30	0.34	0.20	0.44	0.28	0.34	-0.46	0.08	-0.30
-3	0.22	0.28	0.44	-0.12	0.34	0.18	0.67	0.39	0.49	-0.39	0.11	-0.16
-2	**0.31**	0.42	0.54	0.17	0.55	0.13	0.68	0.45	**0.50**	-0.18	0.09	0.07
-1	0.19	0.58	**0.72**	0.42	**0.70**	0.22	0.64	**0.56**	0.42	0.18	0.23	-0.07
+1	0.04	0.44	0.68	**0.56**	0.40	**0.50**	0.47	0.31	0.23	**0.75**	0.27	0.07
+2	0.25	0.10	0.46	0.39	0.14	0.33	0.26	0.30	0.17	0.72	0.34	0.34
+3	0.30	-0.05	0.29	0.20	-0.05	0.08	0.14	0.32	0.12	0.66	**0.46**	0.35
+4	0.30	-0.10	0.10	-0.02	-0.20	-0.23	-0.10	-0.02	0.12	0.51	0.27	0.10
Persistence[5]	0.36	0.70	0.63	0.76	0.79	0.54	0.80	0.44	0.47	0.66	0.46	0.08

Notes:

1 'Absolute Volatility' is measured as the standard deviation of real imports.
2 'Relative Volatility' is measured as the ratio of the standard deviation of real imports and real GDP.
3 'Cyclicality' is measured as the contemporaneous correlation between of real imports and real GDP.
4 'Lead (lag)' is measured as the correlation between the leads (lags) in HP-filtered real imports and real GDP.
5 'Persistence' is measured as the AR(1) coefficient in HP-filtered real imports.
6 Bold figures indicate the largest correlation coefficient (in absolute value) in HP-filtered real imports.
7 All data are at the quarterly frequency, de-seasonalized and de-trended. De-trending methods include the Hodrick-Prescott filter (*HP*), log first-differencing (*FD*) and fitting a quadratic time-trend polynomial (*TP*).

TABLE VIII
REAL EXPORTS

	Bulgaria	Croatia	Czech Rep	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Russia	Slovakia	Slovenia
Absolute Volatility[1]												
HP	9.02	7.88	3.74	7.71	4.47	5.58	10.10	11.64	6.43	3.60	4.57	3.71
FD	10.57	8.99	3.54	5.66	3.63	3.46	6.49	16.04	6.09	4.05	4.06	3.17
TP	8.91	7.92	3.81	8.51	4.16	5.88	11.40	11.63	6.88	3.47	4.77	3.77
Relative Volatility[2]												
HP	2.08	3.37	1.96	2.99	4.23	2.93	3.98	9.10	1.67	1.08	3.73	4.34
FD	2.66	3.94	2.60	2.78	4.38	2.55	2.51	20.60	1.94	1.80	3.53	2.79
TP	2.15	3.14	1.71	3.18	3.69	2.99	4.23	12.59	1.56	1.18	3.42	4.29
Cyclicality[3]												
HP	0.01	0.13	**0.41**	**0.51**	0.27	**0.63**	**0.76**	0.13	0.31	0.32	**-0.35**	0.22
FD	0.04	0.00	0.20	0.53	-0.13	0.44	0.74	0.09	-0.20	0.03	-0.38	0.35
TP	-0.04	0.13	0.38	0.53	0.49	0.53	0.78	0.04	0.41	0.19	-0.43	0.26
Leads and Lags[4]												
-4	-0.29	0.03	0.11	-0.33	-0.08	0.37	0.54	-0.23	0.44	0.32	-0.23	**-0.39**
-3	-0.07	0.17	0.27	-0.14	0.06	0.49	0.64	-0.16	**0.56**	0.42	-0.33	-0.21
-2	0.24	0.09	0.37	0.16	0.32	0.58	0.73	-0.04	0.50	**0.59**	-0.20	-0.05
-1	0.10	**0.23**	**0.41**	0.33	0.34	0.62	0.63	0.14	0.35	0.54	-0.19	-0.05
+1	-0.07	-0.05	0.28	0.45	0.40	0.40	0.44	0.05	0.44	0.08	-0.18	0.08
+2	-0.11	-0.21	0.10	0.30	**0.45**	0.06	0.18	0.17	0.33	-0.05	-0.15	0.19
+3	**-0.33**	-0.12	-0.05	0.13	0.18	-0.30	-0.01	**0.25**	0.19	0.04	-0.01	0.31
+4	-0.09	-0.16	-0.18	-0.10	-0.10	-0.54	-0.20	0.09	0.03	-0.04	-0.14	0.19
Persistence[5]	0.34	0.30	0.55	0.74	0.67	0.82	0.80	0.08	0.55	0.40	0.61	0.64

Notes:

1 'Absolute Volatility' is measured as the standard deviation of real exports.
2 'Relative Volatility' is measured as the ratio of the standard deviation of real exports and real GDP.
3 'Cyclicality' is measured as the contemporaneous correlation between of real exports and real GDP.
4 'Lead (lag)' is measured as the correlation between the leads (lags) in HP-filtered real exports and real GDP.
5 'Persistence' is measured as the AR(1) coefficient in HP-filtered real exports.
6 Bold figures indicate the largest correlation coefficient (in absolute value) in HP-filtered real exports.
7 All data are at the quarterly frequency, de-seasonalized and de-trended. De-trending methods include the Hodrick-Prescott filter (*HP*), log first-differencing (*FD*) and fitting a quadratic time-trend polynomial (*TP*).

TABLE IX
EMPLOYMENT

	Bulgaria	Croatia	Czech Rep	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Russia	Slovakia	Slovenia
Absolute Volatility[1]												
HP	7.32	3.62	0.79	1.38	1.93	2.78	1.78	1.18	3.03	3.42	2.12	0.56
FD	4.15	3.01	0.35	1.06	1.08	1.88	1.59	0.75	1.94	4.24	1.35	0.44
TP	8.23	3.70	1.08	1.27	2.72	2.79	1.14	1.05	3.46	3.60	2.54	0.56
Relative Volatility[2]												
HP	1.64	1.59	0.42	0.54	1.81	1.30	0.70	0.92	0.79	1.03	1.63	0.65
FD	1.09	1.34	0.58	0.53	1.30	0.95	0.61	0.96	0.62	1.89	1.17	0.39
TP	1.89	1.55	0.36	0.47	2.38	1.35	0.42	1.13	0.78	1.23	1.74	0.64
Cyclicality[3]												
HP	-0.05	0.28	**0.60**	0.46	**0.57**	**0.75**	-0.15	0.45	0.38	0.40	0.60	0.05
FD	-0.05	0.24	0.14	0.12	0.23	0.48	-0.04	0.29	-0.05	0.05	0.36	-0.20
TP	-0.13	0.35	0.68	0.41	0.64	0.73	-0.30	0.02	0.49	0.42	0.67	0.27
Leads and Lags[4]												
-4	-0.29	**0.35**	0.21	-0.09	0.40	0.34	-0.14	**0.61**	-0.23	0.37	0.58	-0.10
-3	-0.21	0.24	0.23	0.17	0.49	0.47	-0.17	0.52	-0.06	0.35	0.57	0.07
-2	-0.15	0.28	0.25	0.29	0.53	0.38	-0.23	0.47	0.10	0.37	0.59	-0.09
-1	-0.09	0.28	0.29	0.40	0.56	0.59	-0.21	0.45	0.30	**0.43**	**0.61**	0.04
+1	0.02	0.15	0.36	0.47	0.51	0.62	-0.03	0.43	0.48	0.37	0.38	0.27
+2	0.34	-0.13	0.38	**0.57**	0.31	0.42	0.08	0.35	**0.52**	0.31	0.28	**0.48**
+3	0.64	-0.12	0.37	0.40	0.08	0.12	**0.26**	0.26	0.45	0.06	0.07	0.22
+4	**0.79**	0.02	0.35	0.22	-0.09	-0.17	0.23	0.10	0.49	-0.25	-0.11	0.33
Persistence[5]												
	0.86	0.67	0.96	0.75	0.88	0.79	0.66	0.89	0.81	0.33	0.80	0.73

Notes:

1 'Absolute Volatility' is measured as the standard deviation of employment.
2 'Relative Volatility' is measured as the ratio of the standard deviation of employment and real GDP.
3 'Cyclicality' is measured as the contemporaneous correlation between of employment and real GDP.
4 'Lead (lag)' is measured as the correlation between the leads (lags) in HP-filtered employment and real GDP.
5 'Persistence' is measured as the AR(1) coefficient in HP-filtered employment.
6 Bold figures indicate the largest correlation coefficient (in absolute value) in HP-filtered employment.
7 All data are at the quarterly frequency, de-seasonalized and de-trended. De-trending methods include the Hodrick-Prescott filter (*HP*), log first-differencing (*FD*) and fitting a quadratic time-trend polynomial (*TP*).

TABLE X
REAL WAGES

	Bulgaria	Croatia	Czech Rep	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Russia	Slovakia	Slovenia
Absolute Volatility[1]												
HP	8.02	5.43	2.29	2.51	2.36	3.55	6.38	1.33	7.59	11.69	3.53	1.10
FD	6.94	3.76	1.70	3.63	2.27	2.73	4.69	2.81	5.25	6.47	3.86	1.08
TP	7.94	4.86	2.73	2.54	2.06	3.66	5.81	1.26	8.28	11.89	3.93	1.19
Relative Volatility[2]												
HP	1.80	2.32	1.20	0.97	2.24	1.75	2.51	1.04	1.98	3.51	2.89	1.28
FD	1.82	1.65	1.25	1.78	2.28	1.59	1.82	1.88	1.68	2.70	3.36	0.95
TP	1.82	1.93	1.23	0.95	1.83	1.85	2.15	1.37	1.88	4.05	2.82	1.34
Cyclicality[3]												
HP	0.57	**0.28**	0.62	0.01	0.25	0.26	0.37	0.04	0.56	0.24	**0.57**	0.18
FD	0.33	0.35	0.16	0.01	0.29	0.10	-0.06	0.11	0.19	0.31	0.13	0.38
TP	0.55	0.28	0.71	-0.02	0.34	0.27	0.49	-0.30	0.64	0.28	0.66	-0.03
Leads and Lags[4]												
-4	-0.28	0.09	0.41	**-0.29**	0.54	**-0.49**	-0.24	**0.68**	0.37	-0.55	0.30	-0.22
-3	-0.30	-0.01	0.48	0.19	0.42	-0.33	0.00	0.58	0.55	-0.46	0.43	-0.01
-2	-0.09	-0.07	**0.67**	0.04	**0.56**	-0.06	0.20	0.39	0.67	-0.32	0.52	-0.10
-1	0.27	0.12	0.62	0.03	0.46	0.21	0.28	0.14	**0.69**	-0.07	0.52	0.07
+1	**0.74**	0.19	0.57	0.00	0.03	0.23	0.53	-0.08	0.33	0.50	0.49	-0.13
+2	0.68	0.13	0.49	-0.15	-0.11	0.31	0.62	-0.17	0.06	**0.61**	0.54	-0.03
+3	0.38	-0.01	0.47	-0.21	-0.25	0.35	0.64	-0.30	-0.09	0.57	0.33	**-0.35**
+4	0.33	-0.03	0.19	0.14	-0.30	0.37	**0.65**	-0.43	-0.19	0.47	0.39	-0.23
Persistence[5]	0.64	0.80	0.75	-0.02	0.72	0.71	0.77	0.45	0.77	0.72	0.42	0.54

Notes:

1 'Absolute Volatility' is measured as the standard deviation of real wages.
2 'Relative Volatility' is measured as the ratio of the standard deviation of real wages and real GDP.
3 'Cyclicality' is measured as the contemporaneous correlation between of real wages and real GDP.
4 'Lead (lag)' is measured as the correlation between the leads (lags) in HP-filtered real wages and real GDP.
5 'Persistence' is measured as the AR(1) coefficient in HP-filtered real wages.
6 Bold figures indicate the largest correlation coefficient (in absolute value) in HP-filtered real wages.
7 All data are at the quarterly frequency, de-seasonalized and de-trended. De-trending methods include the Hodrick-Prescott filter (*HP*), log first-differencing (*FD*) and fitting a quadratic time-trend polynomial (*TP*).

TABLE XI
PRODUCTIVITY

	Bulgaria	Croatia	Czech Rep	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Russia	Slovakia	Slovenia
Absolute Volatility[1]												
HP	6.90	4.09	1.51	2.24	2.67	3.65	3.32	3.34	7.23	4.17	2.22	2.32
FD	6.65	3.22	1.35	2.17	1.86	3.74	3.09	3.48	4.85	4.68	2.24	1.79
TP	6.91	4.50	1.63	2.40	2.75	3.73	3.23	3.41	8.21	4.21	2.28	2.47
Relative Volatility[2]												
HP	1.55	1.75	0.79	0.87	2.53	1.92	1.31	2.61	1.88	1.25	1.81	2.68
FD	1.75	1.41	0.99	1.06	2.27	2.76	1.20	4.49	1.54	2.09	1.95	1.58
TP	1.58	1.79	0.73	0.90	2.44	1.90	1.20	3.69	1.86	1.44	1.63	2.78
Cyclicality[3]												
HP	0.43	**0.72**	**0.92**	**0.85**	**0.68**	**0.57**	**0.85**	**0.61**	**0.73**	0.33	0.09	0.24
FD	0.38	0.72	0.97	0.87	0.59	0.42	0.86	0.41	0.38	0.51	0.19	0.14
TP	0.45	0.77	0.92	0.88	0.75	0.57	0.94	0.67	0.79	0.37	0.09	0.13
Leads and Lags[4]												
-4	-0.03	0.34	0.43	-0.05	0.01	-0.17	0.22	-0.14	0.30	**-0.44**	0.05	-0.25
-3	0.07	0.42	0.40	0.10	0.10	-0.12	0.36	0.18	0.53	-0.33	-0.11	**-0.33**
-2	0.15	0.51	0.56	0.32	0.31	0.04	0.39	0.39	0.64	-0.18	-0.12	-0.07
-1	0.19	0.60	0.70	0.56	0.54	0.41	0.50	0.47	0.59	0.06	0.05	0.05
+1	0.34	0.35	0.56	0.48	0.48	0.50	0.40	0.50	0.69	0.24	-0.10	0.30
+2	-0.05	0.15	0.28	0.11	0.31	0.27	0.21	0.31	0.51	0.16	-0.34	0.22
+3	-0.48	0.14	0.08	-0.07	0.13	-0.01	0.12	0.06	0.41	0.18	-0.36	0.30
+4	**-0.72**	0.09	0.07	-0.26	0.07	-0.18	0.02	-0.07	0.25	0.31	**-0.42**	0.06
Persistence[5]	0.55	0.70	0.61	0.54	0.76	0.46	0.59	0.47	0.78	0.23	0.51	0.71

Notes:

1 'Absolute Volatility' is measured as the standard deviation of productivity.
2 'Relative Volatility' is measured as the ratio of the standard deviation of productivity and real GDP.
3 'Cyclicality' is measured as the contemporaneous correlation between of productivity and real GDP.
4 'Lead (lag)' is measured as the correlation between the leads (lags) in HP-filtered productivity and real GDP.
5 'Persistence' is measured as the AR(1) coefficient in HP-filtered productivity.
6 Bold figures indicate the largest correlation coefficient (in absolute value) in HP-filtered productivity.
7 All data are at the quarterly frequency, de-seasonalized and de-trended. De-trending methods include the Hodrick-Prescott filter (*HP*), log first-differencing (*FD*) and fitting a quadratic time-trend polynomial (*TP*).

TABLE XII
PRIVATE SECTOR CREDIT

		Bulgaria	Croatia	Czech Rep	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Russia	Slovakia	Slovenia
Absolute Volatility[1]													
	HP	55.60	8.13	5.33	10.58	6.40	22.38	9.94	5.39	18.99	13.07	17.08	4.63
	FD	38.51	5.05	4.66	6.22	4.24	12.79	5.84	2.54	9.91	9.45	10.49	2.51
	TP	61.13	8.86	3.85	10.79	6.92	23.50	10.05	7.47	22.84	12.12	20.10	4.69
Relative Volatility[2]													
	HP	12.46	3.52	2.79	4.10	6.06	11.14	3.91	4.22	4.94	3.92	13.97	5.35
	FD	10.12	2.18	3.46	3.05	5.18	7.34	2.26	3.31	3.20	4.20	9.12	2.21
	TP	14.01	3.51	1.73	4.03	6.14	11.77	3.72	8.08	5.18	4.13	14.40	5.26
Cyclicality[3]													
	HP	0.21	0.53	**0.27**	0.34	0.60	0.37	-0.02	**0.72**	**0.69**	0.08	0.34	-0.10
	FD	0.16	0.21	0.10	-0.01	0.50	0.26	-0.05	0.35	0.21	-0.01	0.06	-0.12
	TP	0.25	0.59	0.33	0.47	0.70	0.34	-0.07	0.19	0.76	-0.13	0.26	-0.10
Leads and Lags[4]													
	-4	-0.59	-0.33	-0.09	-0.21	0.24	-0.52	**-0.67**	0.30	0.10	-0.47	-0.18	0.05
	-3	-0.44	-0.21	0.12	-0.07	0.32	-0.37	-0.56	0.55	0.38	-0.44	-0.07	0.01
	-2	-0.16	0.07	0.18	0.09	0.53	-0.17	-0.45	0.71	0.56	-0.33	0.00	0.01
	-1	-0.05	0.36	**0.27**	0.25	**0.63**	0.06	-0.26	0.75	0.64	-0.16	0.15	-0.10
	+1	0.38	**0.60**	0.23	0.54	0.39	0.61	0.20	0.70	0.65	0.34	0.47	-0.05
	+2	0.56	0.56	0.18	**0.64**	0.21	**0.70**	0.31	0.69	0.53	0.47	0.55	0.09
	+3	**0.63**	0.50	0.13	0.55	-0.03	**0.70**	0.49	0.60	0.36	**0.55**	0.65	0.19
	+4	**0.63**	0.50	0.11	0.40	-0.29	0.58	0.56	0.39	0.20	0.43	**0.68**	**0.32**
Persistence[5]		0.77	0.82	0.72	0.86	0.84	0.87	0.84	0.90	0.87	0.79	0.82	0.86

Notes:

1 'Absolute Volatility' is measured as the standard deviation of private sector credit.
2 'Relative Volatility' is measured as the ratio of the standard deviation of private sector credit and real GDP.
3 'Cyclicality' is measured as the contemporaneous correlation between of private sector credit and real GDP.
4 'Lead (lag)' is measured as the correlation between the leads (lags) in HP-filtered private sector credit and real GDP.
5 'Persistence' is measured as the AR(1) coefficient in HP-filtered private sector credit.
6 Bold figures indicate the largest correlation coefficient (in absolute value) in HP-filtered private sector credit.
7 All data are at the quarterly frequency, de-seasonalized and de-trended. De-trending methods include the Hodrick-Prescott filter (*HP*), log first-differencing (*FD*) and fitting a quadratic time-trend polynomial (*TP*).

TABLE XIII
M1

	Bulgaria	Croatia	Czech Rep	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Russia	Slovakia	Slovenia
Absolute Volatility[1]												
HP	43.53	9.46	9.96	6.78	3.49	6.56	7.50	5.58	6.00	13.11	7.63	4.72
FD	19.20	5.38	6.16	4.74	1.86	5.24	4.54	4.03	4.96	7.17	4.07	4.12
TP	49.40	11.30	13.39	7.16	4.54	6.64	8.07	5.61	7.17	15.73	9.56	4.45
Relative Volatility[2]												
HP	9.75	4.09	5.21	2.62	3.31	3.26	2.96	4.37	1.56	3.93	6.23	5.46
FD	5.12	2.33	3.38	2.32	2.06	3.01	1.76	5.26	1.52	3.24	3.54	3.63
TP	11.33	4.48	6.02	2.68	4.03	3.33	2.99	6.07	1.63	5.36	6.85	4.99
Cyclicality[3]												
HP	-0.33	**0.65**	0.30	0.04	0.07	0.32	0.69	0.20	0.16	0.65	0.47	**0.23**
FD	-0.07	0.27	0.19	0.03	0.24	0.01	0.33	0.24	-0.04	0.27	0.23	0.42
TP	-0.24	0.72	0.47	0.06	0.25	0.37	0.74	-0.19	0.38	0.45	0.58	0.13
Leads and Lags[4]												
-4	0.19	0.39	**0.64**	0.26	0.63	-0.50	0.00	**0.86**	0.08	-0.06	0.75	0.06
-3	0.15	0.49	0.59	0.26	**0.68**	-0.36	0.15	0.80	0.23	0.11	**0.76**	0.12
-2	0.08	0.61	0.51	0.31	0.65	0.01	0.32	0.69	0.27	0.33	0.61	0.12
-1	-0.06	0.61	0.39	0.21	0.35	0.14	0.55	0.46	0.20	0.54	0.58	0.08
+1	-0.61	0.57	0.24	-0.04	-0.10	0.46	0.65	-0.06	0.13	**0.67**	0.27	-0.09
+2	-0.79	0.35	0.14	-0.12	-0.20	**0.51**	**0.72**	-0.30	0.33	0.60	0.14	0.04
+3	**-0.81**	0.22	0.02	-0.27	-0.43	0.48	0.56	-0.45	0.53	0.51	-0.05	-0.15
+4	-0.69	0.00	0.00	**-0.49**	-0.55	0.26	0.34	-0.52	**0.55**	0.39	-0.23	-0.09
Persistence[5]												
	0.92	0.85	0.91	0.80	0.89	0.68	0.83	0.81	0.76	0.81	0.87	0.66

Notes:

1 'Absolute Volatility' is measured as the standard deviation of M1.
2 'Relative Volatility' is measured as the ratio of the standard deviation of M1 and real GDP.
3 'Cyclicality' is measured as the contemporaneous correlation between of M1 and real GDP.
4 'Lead (lag)' is measured as the correlation between the leads (lags) in HP-filtered M1 and real GDP.
5 'Persistence' is measured as the AR(1) coefficient in HP-filtered M1.
6 Bold figures indicate the largest correlation coefficient (in absolute value) in HP-filtered M1.
7 All data are at the quarterly frequency, de-seasonalized and de-trended. De-trending methods include the Hodrick-Prescott filter (*HP*), log first-differencing (*FD*) and fitting a quadratic time-trend polynomial (*TP*).

TABLE XIV

M2

		Bulgaria	Croatia	Czech Rep	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Russia	Slovakia	Slovenia
Absolute Volatility[1]													
	HP	30.35	9.52	5.01	6.30	1.60	9.47	4.36	3.87	6.36	14.09	2.52	4.66
	FD	16.14	4.73	2.96	4.67	1.20	5.77	3.20	3.06	5.48	5.88	2.08	2.87
	TP	32.40	10.67	6.42	6.14	1.69	9.61	4.41	2.40	6.06	17.05	2.62	5.34
Relative Volatility[2]													
	HP	6.80	4.12	2.62	2.44	1.52	4.72	1.72	3.03	1.65	4.23	2.06	5.39
	FD	4.26	2.05	2.18	2.29	1.46	3.31	1.24	3.93	1.67	2.41	1.81	2.53
	TP	7.43	4.23	2.88	2.29	1.50	4.81	1.64	2.60	1.38	5.81	1.88	6.00
Cyclicality[3]													
	HP	-0.49	0.62	**0.75**	0.14	-0.44	0.37	0.45	0.50	-0.44	0.61	0.19	-0.04
	FD	-0.33	0.11	0.45	0.07	-0.24	0.04	0.22	0.30	-0.34	0.13	0.03	0.09
	TP	-0.43	0.69	0.79	0.23	-0.29	0.35	0.44	-0.05	-0.24	0.33	0.25	-0.27
Leads and Lags[4]													
	-4	0.20	0.27	0.51	0.13	0.52	**-0.56**	-0.20	0.45	-0.30	0.22	0.59	-0.24
	-3	0.15	0.42	0.62	0.12	0.42	-0.33	0.01	0.57	-0.20	0.40	**0.60**	**-0.32**
	-2	0.10	0.58	0.71	0.25	0.14	0.05	0.08	**0.58**	-0.28	0.56	0.44	-0.22
	-1	-0.13	**0.63**	0.73	0.23	-0.18	0.24	0.30	0.51	**-0.46**	**0.64**	0.40	-0.11
	+1	-0.74	0.60	0.62	0.16	-0.47	0.49	0.44	0.48	-0.21	0.54	0.13	-0.07
	+2	**-0.84**	0.54	0.41	0.19	-0.42	0.54	**0.48**	0.50	0.02	0.46	0.00	-0.04
	+3	-0.74	0.45	0.22	0.05	-0.43	0.48	0.41	0.45	0.21	0.40	-0.07	0.03
	+4	-0.53	0.29	0.06	**-0.27**	**-0.52**	0.29	0.27	0.35	0.36	0.31	-0.18	0.09
Persistence[5]													
		0.88	0.90	0.85	0.78	0.76	0.81	0.74	0.84	0.81	0.93	0.70	0.89

Notes:

1 'Absolute Volatility' is measured as the standard deviation of M2.

2 'Relative Volatility' is measured as the ratio of the standard deviation of M2 and real GDP.

3 'Cyclicality' is measured as the contemporaneous correlation between of M2 and real GDP.

4 'Lead (lag)' is measured as the correlation between the leads (lags) in HP-filtered M2 and real GDP.

5 'Persistence' is measured as the AR(1) coefficient in HP-filtered M2.

6 Bold figures indicate the largest correlation coefficient (in absolute value) in HP-filtered M2.

7 All data are at the quarterly frequency, de-seasonalized and de-trended. De-trending methods include the Hodrick-Prescott filter (*HP*), log first-differencing (*FD*) and fitting a quadratic time-trend polynomial (*TP*).

TABLE XV
M1 VELOCITY

	Bulgaria	Croatia	Czech Rep	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Russia	Slovakia	Slovenia
Absolute Volatility[1]												
HP	14.97	8.80	9.10	5.51	2.71	5.93	5.24	6.31	11.11	9.59	7.49	4.85
FD	12.02	5.29	5.52	5.10	2.42	5.52	3.87	4.69	8.94	6.08	4.83	3.89
TP	15.95	10.58	10.85	5.69	2.66	6.05	5.04	6.78	12.77	10.26	8.84	5.03
Relative Volatility[2]												
HP	3.36	3.81	4.76	2.13	2.50	2.95	2.06	4.94	2.89	2.88	6.13	5.61
FD	3.16	2.29	3.97	2.50	2.83	3.17	1.50	6.02	2.85	2.54	4.20	3.43
TP	3.66	4.19	4.88	2.13	2.35	3.03	1.87	7.34	2.90	3.50	6.34	5.65
Cyclicality[3]												
HP	0.56	0.44	0.20	-0.19	0.38	0.26	0.31	-0.15	0.61	-0.19	0.33	-0.01
FD	0.38	-0.20	-0.08	-0.42	-0.35	-0.12	-0.04	-0.13	0.09	-0.24	-0.12	0.16
TP	0.48	0.56	0.41	-0.25	0.37	0.27	0.36	-0.37	0.71	-0.18	0.50	-0.01
Leads and Lags[4]												
-4	0.16	0.51	**0.66**	0.12	-0.07	-0.36	-0.37	**0.81**	0.40	**-0.77**	**0.66**	0.25
-3	0.23	0.60	0.63	0.12	0.19	-0.22	-0.25	0.73	0.61	-0.76	0.67	**0.26**
-2	0.22	**0.64**	0.51	0.19	0.44	-0.04	-0.09	0.57	**0.75**	-0.62	0.53	0.14
-1	0.33	0.56	0.35	0.08	0.41	0.03	0.18	0.23	**0.75**	-0.41	0.52	0.02
+1	**0.59**	0.45	0.15	-0.05	0.53	0.57	0.44	-0.38	0.42	0.15	0.21	-0.20
+2	0.31	0.26	0.08	-0.05	**0.58**	**0.66**	**0.64**	-0.53	0.33	0.39	0.13	-0.09
+3	-0.19	0.15	-0.07	-0.07	0.34	0.62	0.50	-0.50	0.21	0.54	-0.03	**-0.26**
+4	-0.46	-0.08	-0.09	**-0.28**	-0.10	0.43	0.36	-0.48	0.03	0.57	-0.25	-0.11
Persistence[5]	0.69	0.83	0.86	0.54	0.61	0.58	0.74	0.72	0.68	0.59	0.81	0.69

Notes:

1 'Absolute Volatility' is measured as the standard deviation of M1 velocity.
2 'Relative Volatility' is measured as the ratio of the standard deviation of M1 velocity and real GDP.
3 'Cyclicality' is measured as the contemporaneous correlation between of M1 velocity and real GDP.
4 'Lead (lag)' is measured as the correlation between the leads (lags) in HP-filtered M1 velocity and real GDP.
5 'Persistence' is measured as the AR(1) coefficient in HP-filtered M1 velocity.
6 Bold figures indicate the largest correlation coefficient (in absolute value) in HP-filtered M1 velocity.
7 All data are at the quarterly frequency, de-seasonalized and de-trended. De-trending methods include the Hodrick-Prescott filter (*HP*), log first-differencing (*FD*) and fitting a quadratic time-trend polynomial (*TP*).

TABLE XVI
M2 VELOCITY

		Bulgaria	Croatia	Czech Rep	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Russia	Slovakia	Slovenia
Absolute Volatility[1]	HP	14.55	8.64	4.15	5.11	2.07	8.29	6.97	2.92	7.88	6.14	2.88	3.22
	FD	10.62	5.11	3.73	4.80	2.46	5.70	4.15	3.18	5.81	5.08	3.19	2.38
	TP	13.74	9.87	4.56	5.20	2.09	8.18	6.22	2.79	8.45	6.76	2.93	3.70
Relative Volatility[2]	HP	3.26	3.74	2.17	1.98	1.91	4.13	2.74	2.29	2.05	1.84	2.35	3.73
	FD	2.79	2.21	2.18	2.35	2.87	3.27	1.61	4.08	1.85	2.29	2.77	2.10
	TP	3.15	3.91	2.05	1.94	1.84	4.10	2.31	3.02	1.92	2.31	2.10	4.15
Cyclicality[3]	HP	0.46	0.41	0.62	-0.08	-0.34	0.35	-0.23	-0.15	0.41	-0.29	-0.22	**-0.41**
	FD	0.05	-0.39	0.01	-0.40	-0.64	-0.09	-0.24	-0.22	-0.14	-0.52	-0.45	-0.36
	TP	0.40	0.52	0.69	-0.09	-0.32	0.30	-0.35	-0.56	0.58	-0.49	-0.18	-0.56
Leads and Lags[4]	-4	-0.12	0.38	0.46	-0.06	-0.13	-0.50	**-0.38**	0.22	0.16	-0.59	0.23	-0.05
	-3	-0.03	0.53	0.66	-0.07	0.07	-0.26	-0.32	0.20	0.50	-0.51	**0.26**	-0.25
	-2	0.08	**0.63**	**0.71**	0.09	-0.01	0.01	-0.34	0.14	**0.63**	-0.39	0.15	-0.29
	-1	0.17	0.59	0.70	0.09	-0.13	0.18	-0.27	-0.05	0.53	-0.34	0.18	-0.24
	+1	0.77	0.50	0.53	0.19	0.12	0.60	-0.09	-0.13	0.34	0.03	-0.05	-0.30
	+2	**0.85**	0.49	0.34	0.30	0.40	**0.69**	0.04	0.08	0.26	0.32	-0.02	-0.26
	+3	0.65	0.41	0.08	**0.31**	**0.50**	0.62	0.03	0.37	0.08	0.58	0.01	-0.15
	+4	0.47	0.23	-0.13	0.02	0.09	0.43	0.09	**0.48**	-0.10	**0.70**	-0.21	0.06
Persistence[5]		0.79	0.85	0.75	0.52	0.31	0.78	0.86	0.39	0.74	0.58	0.38	0.76

Notes:

1 'Absolute Volatility' is measured as the standard deviation of M2 velocity.
2 'Relative Volatility' is measured as the ratio of the standard deviation of M2 velocity and real GDP.
3 'Cyclicality' is measured as the contemporaneous correlation between of M2 velocity and real GDP.
4 'Lead (lag)' is measured as the correlation between the leads (lags) in HP-filtered M2 velocity and real GDP.
5 'Persistence' is measured as the AR(1) coefficient in HP-filtered M2 velocity.
6 Bold figures indicate the largest correlation coefficient (in absolute value) in HP-filtered M2 velocity.
7 All data are at the quarterly frequency, de-seasonalized and de-trended. De-trending methods include the Hodrick-Prescott filter (*HP*), log first-differencing (*FD*) and fitting a quadratic time-trend polynomial (*TP*).

TABLE XVII
CPI

		Bulgaria	Croatia	Czech Rep	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Russia	Slovakia	Slovenia
Absolute Volatility[1]	HP	48.85	0.92	1.58	5.59	2.30	4.68	4.34	2.66	14.79	22.35	2.34	2.29
	FD	28.34	0.77	1.11	3.26	1.75	2.84	2.35	1.68	7.57	9.09	1.29	1.24
	TP	48.75	1.01	1.41	5.74	1.45	4.66	3.59	2.40	15.71	28.05	2.53	2.63
Relative Volatility[2]	HP	10.95	0.39	0.82	2.16	2.18	2.31	1.71	2.08	3.85	6.71	1.91	2.65
	FD	7.45	0.34	0.80	1.60	1.99	1.65	0.91	1.99	2.38	3.44	1.12	1.09
	TP	11.18	0.40	0.63	2.15	1.29	2.36	1.33	2.60	3.56	9.56	1.81	2.95
Cyclicality[3]	HP	-0.59	-0.24	-0.20	-0.35	-0.33	**-0.52**	0.19	0.18	-0.73	0.39	-0.46	0.12
	FD	-0.45	-0.08	-0.02	-0.21	-0.33	-0.43	0.02	0.45	-0.36	-0.02	-0.11	-0.02
	TP	-0.56	-0.40	-0.33	-0.28	-0.65	-0.43	0.34	0.03	-0.78	0.10	-0.53	-0.11
Leads and Lags[4]	-4	0.23	**-0.36**	**-0.68**	0.28	-0.34	-0.14	**0.32**	-0.07	-0.31	0.40	0.07	**-0.36**
	-3	0.15	-0.33	-0.66	0.09	-0.31	-0.19	**0.32**	-0.12	-0.56	0.48	-0.06	-0.35
	-2	0.04	-0.30	-0.57	-0.08	**-0.41**	-0.30	**0.32**	-0.07	-0.73	**0.53**	-0.16	-0.15
	-1	-0.20	-0.30	-0.33	-0.25	-0.37	-0.47	0.26	0.05	**-0.77**	0.51	-0.24	0.05
	+1	-0.81	-0.09	-0.07	**-0.36**	-0.25	-0.48	0.20	0.17	-0.56	0.23	-0.56	0.22
	+2	**-0.85**	-0.02	-0.05	-0.32	-0.24	-0.40	0.16	0.08	-0.31	0.12	-0.61	0.20
	+3	-0.67	0.05	0.08	-0.26	-0.20	-0.33	0.13	-0.08	-0.10	0.05	**-0.67**	0.27
	+4	-0.44	-0.06	0.23	-0.25	-0.16	-0.31	0.09	**-0.22**	0.09	0.02	-0.51	0.16
Persistence[5]		0.86	0.65	0.84	0.95	0.93	0.94	0.92	0.96	0.88	0.94	0.86	0.92

Notes:

1 'Absolute Volatility' is measured as the standard deviation of CPI.
2 'Relative Volatility' is measured as the ratio of the standard deviation of CPI and real GDP.
3 'Cyclicality' is measured as the contemporaneous correlation between of CPI and real GDP.
4 'Lead (lag)' is measured as the correlation between the leads (lags) in HP-filtered CPI and real GDP.
5 'Persistence' is measured as the AR(1) coefficient in HP-filtered CPI.
6 Bold figures indicate the largest correlation coefficient (in absolute value) in HP-filtered CPI.
7 All data are at the quarterly frequency, de-seasonalized and de-trended. De-trending methods include the Hodrick-Prescott filter (*HP*), log first-differencing (*FD*) and fitting a quadratic time-trend polynomial (*TP*).

TABLE XVIII
INFLATION

		Bulgaria	Croatia	Czech Rep	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Russia	Slovakia	Slovenia
Absolute Volatility[1]	HP	25.28	0.77	0.84	1.40	0.84	1.35	1.25	0.73	7.58	7.53	1.10	0.76
	FD	29.43	1.19	1.09	1.31	0.84	1.83	1.35	0.88	7.36	5.84	1.55	1.00
	TP	26.07	0.77	0.85	1.45	0.91	1.38	1.15	0.75	8.08	8.66	1.19	0.78
Relative Volatility[2]	HP	5.66	0.33	0.44	0.54	0.79	0.67	0.49	0.57	1.97	2.26	0.89	0.88
	FD	7.84	0.52	0.81	0.64	1.01	1.06	0.52	1.14	2.30	2.61	1.37	0.88
	TP	5.98	0.30	0.38	0.54	0.81	0.70	0.43	0.81	1.83	2.95	0.86	0.88
Cyclicality[3]	HP	**-0.72**	0.10	0.15	-0.04	0.41	-0.20	-0.09	**0.37**	0.13	-0.52	-0.33	0.10
	FD	-0.63	0.03	-0.19	0.23	0.01	-0.13	0.16	0.19	0.00	-0.35	-0.17	-0.12
	TP	-0.74	0.05	0.17	-0.14	0.25	-0.29	-0.16	0.54	0.10	-0.46	-0.43	0.21
Leads and Lags[4]	-4	0.11	**-0.21**	**-0.26**	-0.16	-0.39	-0.12	-0.05	-0.28	**-0.56**	0.23	**-0.41**	0.10
	-3	-0.13	0.07	-0.01	-0.32	-0.17	0.13	0.01	-0.10	-0.39	0.12	**-0.41**	-0.01
	-2	-0.17	0.06	0.08	**-0.38**	-0.08	0.04	-0.23	0.14	-0.23	0.01	-0.36	**0.40**
	-1	-0.43	0.00	**0.26**	-0.22	0.31	**-0.32**	**-0.27**	0.35	-0.11	-0.24	-0.23	0.14
	+1	-0.40	0.13	**0.26**	0.01	0.39	0.08	-0.12	0.24	0.38	**-0.65**	-0.20	0.26
	+2	-0.05	-0.03	0.05	0.13	0.12	0.26	-0.20	-0.04	0.47	-0.49	-0.10	0.02
	+3	0.36	-0.05	0.23	0.15	0.37	0.25	-0.14	-0.05	0.38	-0.30	-0.12	0.11
	+4	0.46	**-0.21**	0.19	0.04	**0.44**	0.03	-0.19	0.00	0.33	-0.09	0.30	-0.19
Persistence[5]		0.33	-0.17	0.16	0.58	0.48	0.11	0.42	0.28	0.56	0.73	0.03	0.17

Notes:

1 'Absolute Volatility' is measured as the standard deviation of inflation.
2 'Relative Volatility' is measured as the ratio of the standard deviation of inflation and real GDP.
3 'Cyclicality' is measured as the contemporaneous correlation between of inflation and real GDP.
4 'Lead (lag)' is measured as the correlation between the leads (lags) in HP-filtered inflation and real GDP.
5 'Persistence' is measured as the AR(1) coefficient in HP-filtered inflation.
6 Bold figures indicate the largest correlation coefficient (in absolute value) in HP-filtered inflation.
7 All data are at the quarterly frequency, de-seasonalized and de-trended. De-trending methods include the Hodrick-Prescott filter (*HP*), log first-differencing (*FD*) and fitting a quadratic time-trend polynomial (*TP*).

TABLE XIX
NOMINAL EFFECTIVE EXCHANGE RATE

		Bulgaria	Croatia	Czech Rep	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Russia	Slovakia	Slovenia
Absolute Volatility[1]	HP	48.95	2.68	3.16	6.53	3.87	4.15	8.60	4.03	11.30	24.49	3.54	2.61
	FD	25.58	1.67	2.42	3.69	3.01	2.26	4.96	3.07	8.70	14.16	2.60	2.21
	TP	52.84	3.20	3.42	6.63	2.49	4.17	9.54	3.86	11.56	26.23	3.76	2.65
Relative Volatility[2]	HP	10.97	1.15	1.65	2.53	3.66	2.31	3.39	3.15	2.94	7.35	2.90	3.02
	FD	6.81	0.73	1.80	1.81	3.51	1.80	1.92	3.86	2.60	6.26	2.26	1.95
	TP	12.12	1.27	1.54	2.48	2.21	2.26	3.54	4.18	2.62	8.94	2.69	2.97
Cyclicality[3]	HP	0.67	0.61	0.14	**-0.70**	-0.06	**-0.54**	-0.43	-0.33	0.52	0.05	**0.53**	-0.15
	FD	0.50	0.24	-0.20	-0.22	0.28	-0.37	-0.11	-0.28	0.26	0.01	0.37	0.01
	TP	0.58	0.68	0.34	-0.71	-0.21	-0.60	-0.49	-0.36	0.58	0.01	0.52	-0.12
Leads and Lags[4]	-4	-0.22	0.35	0.36	-0.08	0.30	0.04	-0.63	-0.38	0.26	**-0.69**	0.10	-0.01
	-3	-0.08	0.53	0.34	-0.32	0.06	-0.14	-0.71	-0.46	0.42	-0.61	0.28	0.06
	-2	0.08	0.40	0.20	-0.51	0.17	-0.25	**-0.72**	**-0.49**	0.59	-0.51	0.24	-0.14
	-1	0.34	0.46	0.14	-0.66	0.06	-0.44	-0.60	-0.38	**0.62**	-0.29	0.34	**-0.18**
	+1	**0.83**	**0.62**	0.27	-0.65	-0.29	-0.47	-0.21	-0.18	0.25	0.41	0.44	-0.10
	+2	0.81	0.40	**0.40**	-0.53	**-0.32**	-0.35	0.04	-0.06	0.05	0.59	0.38	-0.05
	+3	0.62	0.11	0.28	-0.32	-0.28	-0.20	0.19	0.08	-0.06	0.60	0.24	-0.05
	+4	0.39	-0.15	0.14	0.02	-0.16	-0.02	0.41	0.20	-0.09	0.48	0.20	-0.02
Persistence[5]		0.89	0.82	0.72	0.86	0.84	0.87	0.84	0.74	0.74	0.79	0.73	0.61

Notes:

1 'Absolute Volatility' is measured as the standard deviation of the nominal effective exchange rate.

2 'Relative Volatility' is measured as the ratio of the standard deviation of nominal effective exchange rate and real GDP.

3 'Cyclicality' is measured as the contemporaneous correlation between of nominal effective exchange rate and real GDP.

4 'Lead (lag)' is measured as the correlation between the leads (lags) in HP-filtered nominal effective exchange rate and real GDP.

5 'Persistence' is measured as the AR(1) coefficient in HP-filtered nominal effective exchange rate.

6 Bold figures indicate the largest correlation coefficient (in absolute value) in HP-filtered nominal effective exchange rate.

7 All data are at the quarterly frequency, de-seasonalized and de-trended. De-trending methods include the Hodrick-Prescott filter (*HP*), log first-differencing (*FD*) and fitting a quadratic time-trend polynomial (*TP*).

TABLE XX
REAL EFFECTIVE EXCHANGE RATE

	Bulgaria	Croatia	Czech Rep	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Russia	Slovakia	Slovenia
Absolute Volatility[1]												
HP	8.72	1.98	3.12	4.54	2.91	6.01	4.87	4.11	9.13	16.00	3.28	2.90
FD	7.72	1.79	2.43	3.21	1.90	3.64	3.45	3.00	5.89	9.33	2.82	2.30
TP	9.25	2.11	3.35	4.43	2.88	6.80	4.76	4.30	9.69	18.17	3.31	3.07
Relative Volatility[2]												
HP	1.95	0.84	1.63	1.76	2.75	3.10	1.92	3.22	2.38	4.80	2.68	3.36
FD	1.96	0.79	1.81	1.57	2.28	2.11	1.33	3.90	1.87	4.22	2.45	2.03
TP	2.12	0.84	1.51	1.66	2.56	3.46	1.76	4.65	2.20	6.19	2.37	3.44
Cyclicality[3]												
HP	0.53	0.36	-0.05	-0.27	-0.38	-0.23	-0.10	-0.21	-0.59	0.19	0.11	0.00
FD	0.51	0.03	-0.26	-0.12	0.10	-0.21	-0.02	-0.07	-0.12	0.04	0.21	0.02
TP	0.57	0.46	0.10	-0.16	-0.51	-0.09	-0.18	-0.32	-0.65	0.10	0.08	-0.12
Leads and Lags[4]												
-4	-0.13	0.32	-0.14	0.12	0.11	-0.28	**-0.61**	-0.37	-0.19	-0.60	0.14	-0.24
-3	0.24	0.47	-0.16	0.06	-0.07	-0.32	-0.53	-0.49	-0.41	-0.49	0.21	-0.14
-2	0.44	0.25	-0.21	-0.13	-0.07	**-0.37**	-0.47	**-0.52**	-0.48	-0.37	0.05	**-0.15**
-1	**0.66**	0.18	-0.13	-0.24	-0.22	-0.31	-0.29	-0.35	-0.50	-0.15	0.07	-0.08
+1	0.04	**0.53**	0.18	**-0.35**	-0.58	-0.05	0.10	-0.08	**-0.63**	0.55	-0.06	0.09
+2	-0.37	0.36	**0.37**	-0.31	**-0.60**	0.09	0.30	-0.02	-0.48	**0.73**	-0.13	0.09
+3	-0.59	0.08	0.36	-0.15	-0.50	0.15	0.37	0.02	-0.23	0.70	**-0.31**	0.11
+4	-0.59	-0.23	0.33	0.17	-0.30	0.21	0.51	0.06	0.00	0.57	-0.23	0.04
Persistence[5]	0.65	0.61	0.70	0.76	0.82	0.83	0.77	0.73	0.80	0.73	0.64	0.69

Notes:

1 'Absolute Volatility' is measured as the standard deviation of the real effective exchange rate.
2 'Relative Volatility' is measured as the ratio of the standard deviation of real effective exchange rate and real GDP.
3 'Cyclicality' is measured as the contemporaneous correlation between of real effective exchange rate and real GDP.
4 'Lead (lag)' is measured as the correlation between the leads (lags) in HP-filtered real effective exchange rate and real GDP.
5 'Persistence' is measured as the AR(1) coefficient in HP-filtered real effective exchange rate.
6 Bold figures indicate the largest correlation coefficient (in absolute value) in HP-filtered real effective exchange rate.
7 All data are at the quarterly frequency, de-seasonalized and de-trended. De-trending methods include the Hodrick-Prescott filter (*HP*), log first-differencing (*FD*) and fitting a quadratic time-trend polynomial (*TP*).

TABLE AI

	Bulgaria	Croatia	Czech Rep	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Russia	Slovakia	Slovenia
Real GDP	SO	SO and EIZ	SO	SO	SO	IFS	SO	OECD and EMED	SO and IEFB	EMED	EMED	IFS
Industrial Production	WIIW and SO	IFS	IFS	CB, 1994:1 – 2002:4	IFS	SO, 1995:1 – 2002:4	SO	WIIW	IFS	EIU	IFS	IFS
Consumption	SO	SO and EIZ	SO	SO	SO	SO, 1995:1 – 2002:4	SO	OECD and EMED	SO and IEFB	EMED	EMED	N/A
Investment	SO	SO and EIZ	SO	SO	SO	SO, 1995:1 – 2002:4	SO	OECD and EMED	SO and IEFB	EMED	EMED	N/A
Government Consumption	SO	SO and EIZ	SO	SO	SO	SO, 1995:1 – 2002:4	SO	OECD and EMED	SO and IEFB	EMED	EMED	N/A
Exports	IFS and SO	SO and EIZ	SO	SO	SO	SO, 1995:1 – 2002:4	SO	OECD and EMED	SO and IEFB	EMED	EMED	CB
Imports	IFS and SO	SO and EIZ	SO	SO	SO	SO, 1995:1 – 2002:4	SO	OECD and EMED	SO and IEFB	EMED	EMED	CB
Nominal Wage	IFS	IFS	IFS	SO	IFS	IFS	IFS	IFS	IFS	IFS	IFS	IFS
Industrial Employment	WIIW	IFS	N/A	N/A	IFS	IFS	IFS, 1993:1 – 2002:1	IFS	WIIW	IFS	WIIW	IFS
Employment	N/A	N/A	SO	CB	N/A	N/A	SO	N/A	N/A	N/A	N/A	N/A
Private Sector Credit	IFS	IFS	IFS	IFS	IFS	IFS, 1993:3 – 2002:4	IFS	IFS	CB	IFS	IFS	IFS
M1	IFS	IFS	IFS	CB	IFS	IFS, 1993:3 – 2002:4	IFS	IFS	IFS	IFS	IFS	IFS
M2	IFS	IFS	IFS	CB	IFS	IFS, 1993:3 – 2002:4	IFS	IFS	IFS	IFS	IFS	IFS
CPI	IFS	IFS	IFS	SO	IFS	IFS	CB	IFS	IFS	IFS	IFS	IFS
Nominal Effective Exchange Rate	IFS	IFS	IFS	CB	IFS	CB, 1995:4- 2002:4	CB	IFS	IFS	IFS	IFS	CB
Real Effective Exchange Rate	IFS	IFS	IFS	CB	IFS	CB, 1993:4 – 2002:4	CB	IFS	IFS	IFS	IFS	CB
Range	1994:1 – 2002:4	1994:1 – 2002:4	1994:1 – 2002:4	1993:1 – 2002:4	1995:1 – 2002:4	1993:1 – 2002:4	1995:1 – 2002:4	1995:1 – 2002:4	1994:1 – 2002:4	1995:1 – 2002:4	1993:1 – 2002:4	1993:1 – 2002:4

Notes
i. Unless otherwise indicated, the default sample period is determined by the availability of GDP data, as shown in the last row of the table.
ii. Data sources: IFS stands for the IFS of the IMF, CB for local central bank, SO for local statistical office, EIZ for Economic Institute, Zagreb, IEFB for Institute of Economic Forecasting, Bucharest, EMED for Emerging Market Economic Database, EIU for Economic Intelligence Unit, OECD for the OECD Quarterly National Accounts database, WIIW for WIIW dataset. N/A indicates missing or inadequately short series.