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EDITORIAL

The efficiency of macroeconomic policies depends on adequate business cycle approximation. The CNB's approach is aimed at estimating the deviation of real GDP from its "inflation-non-accelerating" level. Such deviation – the output gap – reflects demand-driven inflationary pressures, where the Phillips curve is of primary importance. By contrast, the production function method reflects the supply-side or "capacity" view of the economy's potential. The two approaches are subject to methodological disputes and deliver different quantitative results, thus leaving decision makers still with a considerable degree of uncertainty. That is why alternative approaches are being developed. The following articles illustrate this problem in more detail.

Vladislav Flek, Adviser to the Bank Board

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It might be beneficial to derive an alternative method of measuring the output gap which would relate it more closely to movements in the consumer price index and would possibly minimise some of the drawbacks of the existing approaches. Our measurement concept closely relates business cycle fluctuations to the current inflation environment, as it reflects the immediate market response (consumer price increases) to a sudden rise in demand, given the key exogenous variables.

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Business Cycle Estimation within the CNB's Forecasting Framework[1]

Jaromír Beneš, Tibor Hlédik and Jan Vlček *

One of the most difficult parts of monetary policy analysis is the measurement of the business cycle position of the economy. The success of this process affects the performance of many inflation targeting countries, including the Czech Republic. Failure in correctly identifying the business cycle position could result in a suboptimal setting of policy interest rates, thus bringing about additional economic and social costs. In this article we describe the business cycle estimation as applied within the Czech National Bank's Forecasting and Policy Analysis System (FPAS).

The pressures of real economic activity on inflation are captured in the output gap, which is defined as the percentage deviation of real output from its potential level. Potential output, in turn, denotes the level of real output that can be produced, *ceteris paribus*, using given production technology and factor inputs without inducing any change in inflation.

Given that potential output and the output gap are not directly observable, their values need to be estimated using filtering techniques. More specifically, the CNB's multivariate Kalman filter estimate relies on a wide data set (real GDP, inflation, import prices, the real exchange rate, the real interest rate, foreign demand, etc.), in combination with behavioural equations, aggregate demand and the Phillips curve.

The CNB introduced its currently applied FPAS in June 2001. The quarterly projection exercises are organised around a Quarterly Projection Model (QPM). The model is a highly aggregated representation of a small and very open Czech economy. It explains not only domestically generated demand pressures approximated by the output gap, but also asset prices (the exchange rate) and a quite substantial number of other determinants of inflation (import prices, administered prices, oil prices, indirect taxes).

The QPM is highly stylised, meaning that its microeconomic foundations are rather weak.[2] These properties of the QPM require us to approximate the real economic activity pressures on inflation by a single measure, the output gap. However, what matters in fact for price-setting firms and retailers, and describes these pressures better, is the more complex composite indicator of real marginal costs. The level of aggregation of the QPM does not enable us to model inflation based fully on these marginal costs, and we rely upon an implicit assumption that real marginal costs and the output gap correlate quite well on average. Real marginal costs are determined not only by the output gap, but also by the gap in the real wage and other real prices of variable input factors (such as material imports, etc.)[3].

Alternative approaches to estimating the level of potential output include a whole range of univariate filters, such as the Hodrick–Prescott filter, Prior Consistent filter or Band Pass filter, or estimating a production function[4]. The main disadvantage of univariate filters rests in their well-known poor performance at both ends of the sample. In addition, should these filtering techniques be used in a structural model framework (such as a production function), none of them ensure model-consistency.

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[1] This short article is based on Beneš, Hlédik, Vávra and Vlček (2003). A full version of this research is available at http://www.cnb.cz/pdf/Forecasting_2003_1-4.pdf and http://www.cnb.cz/pdf/Forecasting_2003_5-6.pdf

[2] That is why our estimates of the output gap based on the Kalman filter can to some extent be distorted by the ongoing structural changes in the economy and measurement errors stemming from objectively given data collection problems in constructing the real GDP estimates. A detailed description of the QPM structure and methodology can be found in Beneš, Vávra and Vlček (2002).

[3] In this regard, the marginal costs are, of course, model-specific, meaning that they might quantify the costs related to the various production factors (such as labour or intermediate inputs) that are included in the model.

[4] Another alternative research paper on the business cycle identification is Beneš and Vávra (2004), based on the time-series decomposition method. See also http://www.cnb.cz/en/pdf/CNBWP82004.pdf

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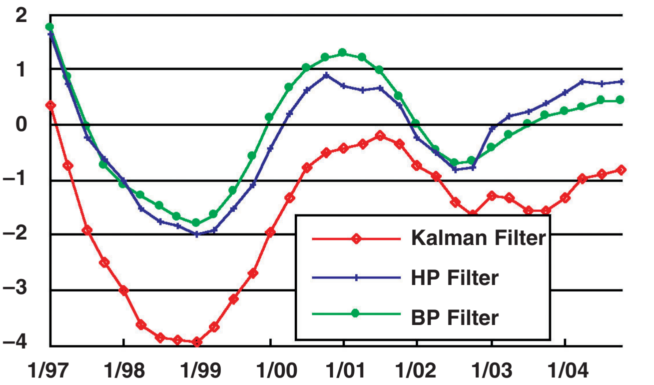
GRAPH 1: Output Gap Estimates Generated by the Kalman Filter and the Univariate Filters



By contrast, the Kalman filter estimates of the output gap may considerably reduce the end-of-sample uncertainty and guarantee some degree of consistency with the structural model in which they are ultimately used. These are the main reasons why the assessment of the business cycle position centres around the multivariate Kalman filter estimates of the output gap. Three basic restrictions arising from the model structure do exert a significant impact on the estimate of the output gap.

First, a change in the output gap, together with the assumption of relatively smooth growth of potential output, determines the real GDP growth. To put it differently, we rely on a simple identity equating the output gap to the percentage deviation of real output from its potential level. The hypothesis that potential output is evolving relatively smoothly stems from the assumption that the productive capacity of the economy is not changing dramatically from one quarter to another[5].

Second, the evolution of the output gap reflects the previous monetary conditions (determined by deviations of the real exchange and interest rates from their equilibrium values). This means that any sudden change in the real exchange rate or in the real interest rate results *ceteris paribus* in a corresponding change in the output gap with a lag of one quarter.

Third, the link between the output gap and inflation is based on a standard Phillips curve relationship, meaning that a positive (negative) value of the output gap leads *ceteris paribus* to accelerating (decelerating) core inflation[6]. To be more specific, in our specification of the Kalman filter, the output gap estimate feeds back from those determinants of inflation in the Phillips curve which are not directly cost-push related.

Our Graphs 1 and 2 depict the estimate of the output gap for the Czech economy for the period 1997–2004. In particular, they show that the period following the foreign exchange crisis in 1997 was characterised by a widening of negative output gap, i.e. revealing the build-up of excess supply in the economy. This process continued until the beginning of 1999. As the CNB was aiming to stabilise the economy after the foreign exchange rate crisis in 1997, the emergence of excess supply reflects restrictive real interest rates on the one hand, and a gradually appreciating real exchange rate on the other.

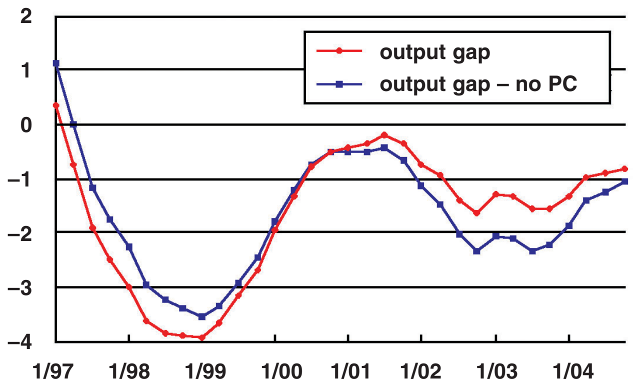
The subsequent gradual return of real output to its potential level had stopped by the end of 2001, when, due to a sharp appreciation of the exchange rate, the negative output gap widened again. The gradually narrowing negative output gap in the following period reflects the stabilising role of CNB monetary policy in terms of low nominal interest rates, resulting in accommodative overall monetary conditions. These graphs reveal, however, much more information.

Graph 1 compares the output gap estimate from the Kalman filter with the estimates generated by the Hodrick–Prescott and Band Pass filters. It is apparent that both univariate filters systematically imply considerably lower excess supply in the economy than the multivariate Kalman filter. Thus the business cycle estimates based on these univariate filters would *ceteris paribus* imply more restrictive monetary policy than those based on the Kalman filter.

[5] The reason for not smoothing potential output "too much" is motivated by the fact that our measure of potential output captures some structural changes in the economy (such as changes in relative prices of, for instance, tradable and non-tradable goods) induced by increased competition on the Czech product market, as well as measurement errors in estimating real GDP by the Czech Statistical Office.

[6] Core inflation is defined as the percentage change in the consumer price index excluding administered and energy prices.

GRAPH 2: Output Gap Estimates with and without Feedback from the Phillips Curve



Graph 2 compares the output gap estimates based on the Kalman filter with and without incorporation of the Phillips curve into the filtering process. The differences in the two estimation results are caused by a new piece of information contained in the inflation (Phillips-curve) equation. Namely, those parts of inflation behaviour which cannot be explained by import prices, inflation expectations and relative price movements are explicitly assigned to a changing business cycle position, i.e. a widening or closing output gap.

Considering the above, the fact that the negative output gap is wider for the period 1996–2000 *with* incorporation of the Phillips-curve, can be explained by a sharp fall in core inflation, even after eliminating the effect of import prices. The contribution of decelerating inflation to the estimated output gap remained negative until the beginning of 2000, when core inflation (without the contribution of import prices) started to accelerate. By contrast, for 2001–2004 the negative output gap is wider *without* incorporation of the Phillips-curve.

This can be explained by a gradual increase in core inflation from mid-2003 onwards. This increase in inflation affects the trajectory of output gap (with the Phillips-curve) not only after the mid-2003, but even backwards.

Our recent experience with the Kalman filter, reflecting the above explained theoretical restrictions, highlights some of the advantages of this multivariate filtration methodology. Namely, substantial revisions of the real GDP data carried out by the Czech Statistical Office exert a smaller impact on the estimates than would be the case with the use of univariate filters. This can largely be explained by the feedback from the Phillips curve on the estimates of the output gap.

The point is that the multivariate filter tends to interpret any change in real GDP that is not explained by the monetary conditions or inflation as a change in potential output. The change in the output gap, as well as the potential output estimate, therefore, does not solely depend on the actual estimate of real GDP. The output gap development is additionally verified by the actual inflation development. Given the reliance of the filter on the behavioural equations of the model, the estimate is inherently model-consistent.

In spite of these advantages, the multivariate filter faces disadvantages as well. A model-consistent feature of the filter makes it fragile against any error in the model structure. If the model structure or elasticities are set wrongly, the output gap identification can be critically damaged. In addition, the choice of noise variances is critical for the identification results, because this setting determines the filter uncertainty decomposition.

Based on our practical experience with the Kalman filter, we believe that the advantages of this multivariate filtering technique outweigh its potential drawbacks. Multivariate techniques like the Kalman filter substantially reduce the risks of end-point bias and provide a chance to interpret the results in the form of an economic story. ■

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Potential Output: What Can the Production Function Approach Tell Us?[1]

Jaromír Hurník *

As explained by Beneš, Hlédik and Vlček earlier in this issue, the main tool used by the CNB for estimating the output gap is the multivariate filtering approach, i.e. the Kalman filter. At the same time, however, alternative approaches are also being developed. In this article, we discuss one alternative way of estimating potential output and the output gap, namely the production function approach.

In contrast to the Kalman filter, this approach represents a predominantly supply-side view of the economy. It enables us to detect the particular factors of potential output growth, as well to obtain important additional information that is hard to extract from the Kalman filter. In particular, one must admit that the Kalman filter is appropriate for detecting the current inflationary pressure (output gap), but is of less use in efforts to discuss either the factors of potential growth (technological progress, capital and labour) or future potential output developments stemming from the evolution of the supply side.

The production function approach to potential output estimation explores a neo-classical, two factor Cobb–Douglas production function involving inputs (capital stock and potential employment), the shares of labour and capital in real GDP, and finally the contribution of technological progress, i.e. the total factor productivity (TFP). Table 1 summarises the results with respect to both potential output growth and its determining factors.

During the period 1996–2003, the capital stock grew by 7.2% a year on average, with a clear tendency to growth deceleration.[2] As a result, the capital share declined from 52% to 50% and, conversely, the labour share increased from 48% to 50%.

TABLE 1: Potential Output Growth and its Determining Factors (in per cent)

	Potential output (y-o-y)	TFP (y-o-y)	Capital stock1) (y-o-y)	Potential employment2) (y-o-y)	Labour share (level)	NAIRU (level)
1996	5.04	-11.83	15.03	0.03	48.32	5.90
1997	2.94	-11.81	12.19	-0.15	48.72	6.30
1998	1.68	-9.63	11.20	-0.27	49.17	6.80
1999	0.29	-5.31	8.89	-0.14	49.69	7.30
2000	-1.29	-0.74	1.41	-0.91	50.26	7.50
2001	1.61	2.10	2.13	-1.10	50.87	7.80
2002	2.51	3.13	4.00	-0.21	51.46	7.90
2003	3.57	3.00	2.84	-0.27	51.96	7.90
1996-2003	2.04	-3.89	7.21	-0.36	50.06	7.18

Source: Czech Statistical Office; Ministry of Labour and Social Affairs; own calculations.
Notes:
1) For measuring the capital stock we use the total stock of fixed assets at current prices. These data are available in annual frequency (end-of-year values) from 1994 to 2001. In order to obtain the quarterly time series at constant prices we first compute the “residuals”, i.e. the nominal depreciation of the capital stock based on the modified capital law of motion. This nominal depreciation captures equipment removed from the production process. We then use the gross fixed capital formation deflator to calculate the real depreciation rate. Subsequently, we interpolate the annual capital stock data in quarters. For 1Q2002–4Q2003 the capital stock data are not available so we use the standard approach known from the empirical literature and calibrate the depreciation rate to be 6% of the capital stock. Using the capital law of motion, quarterly gross fixed investment and capital depreciation at constant prices we finally obtain the capital stock at constant prices.
2) The potential labour is computed using the seasonally adjusted labour force (from the Labour Force Survey) and estimates of the NAIRU, as provided by Hurník and Navrátil (2004) or Hurník and Navrátil (2005-b).

[1] This short article is based on Hurník and Navrátil (2003) and Hurník and Navrátil (2005-a).
[2] During 2004, the Czech Statistical Office revised the national accounts several times. As a consequence, at the time all our calculations were done, consistent time series of the total stock of fixed assets (capital stock) and gross fixed investment incorporating these revisions were available only for the period 1996–2003.

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Potential employment has to be calculated using the labour force statistics in combination with the concept of equilibrium unemployment (the "non-accelerating inflation rate of unemployment" – the NAIRU, i.e. the rate of unemployment at which inflation remains constant).[3] Adjusting the actual employment data to the NAIRU developments yields the amount of potential employment. Table 1 indicates that potential employment has been declining constantly since 1997, in line with the increasing NAIRU.

As with potential employment, the TFP also cannot be measured directly. It is thus calculated as a residual in the production function formula. From Table 1 it is evident that the contribution of total factor productivity to potential output growth remained negative during 1996–2000. Just from 2001 onwards, the TFP has positively influenced the potential output dynamics. This can be explained by a continuous massive inflow of foreign direct investment, which eventually started to bring results both in newly established firms and in restructured ones.

Finally, Table 1 reports the evolution of potential output growth over time. In general, we can state that the potential output growth rate is relatively low, i.e. not exceeding 2% on average for 1996–2003. This can be explained by a continuous decline in potential employment throughout the investigated period, as well as a negative contribution of the TFP during the 1990s, and finally by relatively low growth of capital stock after 2000.

Our model simulations show that while the stability of the NAIRU would have had a relatively negligible impact on potential output growth during 1996–2003, both faster growth of the capital stock and a higher contribution of the total factor productivity would have increased the level of potential output substantially. The TFP is a particularly important accelerator of potential output: had the economy experienced an average contribution of the TFP of 2% a year during 1996–2003 (instead of -3.9%; see Table 1), the 2003 level of potential output would have been some 20% higher.[4]

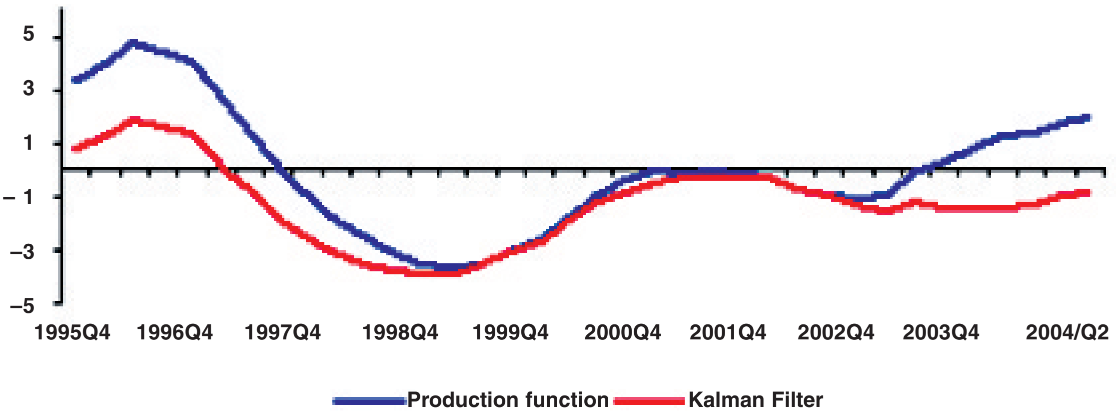
Graph 1 depicts output gaps derived from the production function and Kalman filter methodologies.[5]

Although these output gaps do not differ substantially, from the monetary policy perspective they imply different stories in two distinct periods. Consequently, two remarks can be made.

First, the estimated positive output gap in the mid-1990s is higher when using the production function approach.This suggests a larger economic overheating than the Kalman filter would indicate. A relatively high output gap during that period means a relatively low potential output growth which was driven exclusively by a rapidly increasing capital stock, while the contribution of the TFP was highly negative and potential employment stagnated (see Table 1). As a result, the negative TFP growth strongly inhibited potential output growth. By contrast, the Kalman filter registered an inflation deceleration in the mid-1990s, thus indicating lower output gap rather than an economic overheating.

Second, by the end of 2002, the estimated potential output growth derived from the production function again results in a positive output gap, whereas the Kalman filter indicates the output gap being negative. Although there is a positive contribution from the TFP, the potential employment decline and weak capital stock growth predominate

GRAPH 1: Output gaps in alternative estimations (in percentage points)



and result in rather low potential output growth (2.5%). By contrast, facing low and stable inflation, the Kalman filter translates it into a negative output gap, and the observed real output growth corresponds to the potential output growth.

Bearing this evidence in mind, the key differences between the Kalman filter and production function-based estimations probably stem from a different evaluation of the level of technological change. Whatever the true reason, when facing an inflation deceleration, the Kalman filter tends to evaluate the actual economy's position as a negative output gap. Consequently, the observed real output growth is seen as growth of potential output. Since the stock of capital and labour is given in each period for both methodologies, such growth in potential output is, in fact, implicitly attributed to TFP growth in the Kalman filter methodology.

Any random disinflationary shock that is not captured by the Kalman filter structure may therefore be incorrectly evaluated as a permanent increase in the TFP.

Instead, the production function methodology unambiguously perceives the disinflationary shocks as being of just a temporary nature.

In 1998, the Czech National Bank started to operate under the inflation-targeting regime. Since then, considerable progress has been made in developing the CNB's forecasting and policy analysis system. Within this system, precise estimation of the output gap is of primary importance.

As with any other approach, the use of the production function for potential output estimation faces some conceptual problems. In particular, it should be noted that the way the total factor productivity is calculated (i.e. the use of univariate smoothing techniques for the TFP series) and the constant return to scale assumption are the main sources of criticism.

Despite its potential shortcomings, this approach is still widely used by international institutions (such as the OECD, the IMF and the European Commission), researchers (e.g. the NBER) and governments (e.g. the Czech Ministry of Finance).

That is why in the case of the Czech National Bank, too, it could serve as a robustness check of the main method used for output gap estimation, as well as for other purposes, such as real convergence analysis. ■

[3] We rely on our own NAIRU estimations as developed within the framework of another CNB-coordinated research project. See Hurník and Navrátil (2004) or Hurník and Navrátil (2005-b). All calculations are based on the ILO definition of unemployment. See also at http://www.cnb.cz/en/pdf/CNBWP72004

[4] We simulate the consequences of annual TFP growth of 2% because this growth rate roughly corresponds with the German figures for 1963–1999.

[5] The Kalman filter results are based on the CNB's January 2005 forecasting exercise.

[6] The huge increase in the capital stock was at least partially caused by large infrastructure investment. Moreover, in spite of a rapidly increasing capital stock, the efficiency of investment remained very low. These factors probably imply the counter-intuitive development of the TFP.

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Measuring the Business Cycle through the Impulse Response of Consumer Prices[1]

Jiří Podpiera *

A widely employed business cycle measure is the output gap, which is computed as the percentage difference between trend output and the actual level of production. Output fluctuations extracted in such a way depend on the particular technique applied (univariate or multivariate) and suffer from various conceptual and data reliability drawbacks. This is why we derive a novel method which is aimed at removing some of the weaknesses of the currently used approaches.

The univariate filtration technique is based on purely statistical methods that de-trend the real GDP time series to derive the business cycle. By contrast, a multivariate method, for instance the production function approach, considers a specific structural form of production and, by estimating its parameters, aims to derive the trend product (output).[2]

Both the univariate and multivariate approaches to measuring the business cycle are used in practice.[3] Unfortunately, due to their technical construction, the univariate filters suffer from end-point bias, resulting in low reliability of the end of sample-filtered data points and thus inducing uncertainty with regard to the current business cycle position. The setup of multivariate filters to some extent uses univariate filters as well (for instance in the production function approach, the total factor productivity component is usually smoothed out by using a univariate filter), and hence the problems of end-point bias are not fully eliminated in that case either.

In addition, the results of both the univariate and multivariate methods are subject to differences in data samples used for analysis and frequent data revisions. For instance, Orphanides and Norden (2002) show on U.S. quarterly data that during 1965–1997 the subsequent output revisions caused differences of +/-4 p.p. between output gaps computed on real-time and revised data.

The output gap is a key indicator of demand-driven inflationary pressures, hence it is of key importance for monetary policy. Considering the above, it might be beneficial to derive an alternative method of measuring the output gap that would relate it more closely to movements in the consumer price index and would possibly minimise some of the drawbacks of the existing approaches. Our method is thus based on data that are consistent with the consumer price index and are not subject to revisions.

We consider a simultaneous partial equilibrium model in *n* markets for consumer products. The equilibrium prices and quantities of all consumer products are a result of the interaction between consumers and producers. Consumers create the demand for each consumer product, taking into account its price relative to the remaining products and consumers' real income.

The price of supplied consumer goods is determined by two factors, namely the marginal cost of production and the size of demand for each consumer good, assuming an imperfectly elastic supply of consumer goods.

If the supply of all consumer products were perfectly elastic, there would be no positive effect on prices stemming from an increase in consumers' nominal expenditure. However, if at least one supply was not perfectly elastic, then an increase in nominal expenditure would produce positive growth in the consumer price index.

Assuming that not all supplies are perfectly elastic, which is a very realistic assumption at least in the short term, we focus on the estimation of the simultaneous model. Using simulations we demonstrate the response of consumer prices to an increase in nominal expenditure. An above-average response signals a phase of boom, and a below-average response suggests a phase of recession.

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[1] The article is based on Podpiera (2004).
See http://www.cnb.cz/en/pdf/CNBWP42004.pdf for a full version of this CNB Working Paper.

[2] See Guarda (2002) for an overview.

[3] The multivariate approach in the form of the production function is mainly applied by the IMF (De Masi, 1997), the OECD (Giorno *et al.*, 1995), the ECB (Willman, 2002), and the European Commission (EPC Reports, 2001). The univariate method (HP-filter) is used for instance by the European Commission (EPC Reports, 2001).

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TABLE 1: Alternative Business Cycle Measures (in per cent)

	1995	1996	1997	1998	1999	2000	2001	2002	2003
CNB-KF [1]	0.22	0.39	-0.26	-0.74	-0.84	-0.43	-0.16	-0.30	-0.45
OWN [1] [2]	0.45	0.29	0.13	-0.19	-0.33	-0.36	-0.48	-0.50 *f*	-0.40 *f*
CMF [1]	0.47	0.90	0.25	-0.49	-0.71	-0.26	0.02	-0.10	-0.13
EIU [1]	0.21	0.15	0.00	-0.21	-0.49	-0.48	-0.34	-0.35	-0.37

Notes: CNB-KF denotes the Kalman Filter method used by the Czech National Bank in its analytical and predictive apparatus; OWN represents our alternative method (*f* denotes the model's forecast); CMF stands for the Czech Ministry of Finance; and EIU stands for the Economic Intelligence Unit.
1) Actual values of output gap or inflation response in per cent; normalised to the maximum of sample value.
2) Differences between the simulated inflation response at time *t* and the average simulated inflation response.

We offer an application to the Czech data (1995–2003). In particular, we estimate the model on the data sample covering the period 1995–2001. Using a scenario for the exogenous variables, we also carry out predictions for 2002 and 2003.

The comparison of our results with other available business cycle indicators for the Czech Republic is presented in Table 1. The comparison is limited to the correlation of the cycle measures and inflexions, as the meanings of the values differ with different concepts of measurement (output gaps versus a varying inflationary response, both in percentage points).

The correlation between the results of our method (OWN) and the Kalman filter method used by the CNB (CNB-KF) is relatively low (0.67). As far as the institutions officially using the production function approach are concerned, our results (OWN) are highly correlated with those obtained by the Economic Intelligence Unit (EIU). In this case, the corresponding correlation reaches 0.95. The production function indicator of the Czech Ministry of Finance (CMF) exhibits a much lower correlation with our results (0.72)

Regarding the identification of business cycle turning points, all the methods mark 1997 as the transition to a low-inflation environment. For 2001, the CMF indicator suggests a closing gap, whereas all three remaining methods maintain low inflationary conditions.

Our measurement concept closely relates business cycle fluctuations to the current inflationary environment, as it reflects the immediate market response (consumer price increases) to a sudden rise in demand, given the key exogenous variables. As a result, it appears to be a potentially useful tool for assessing the inflationary/business cycle position of the economy. ■

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CNB Research Open Day: What We Have Achieved and Where We Go

On September 14, 2005, the CNB is to hold its first-ever Research Open Day. This half-day event will provide an opportunity to see the best of the CNB's current research work, to learn about the CNB's research strategy and to meet CNB researchers informally. All presentations will be held in English. More information will be available on the CNB website in August, when it will be possible to register. The Research Open Day will be open to the general public. Places will be subject to availability due to the limited capacity of the conference facility.

CNB Interim Call for Projects 2005

The Economic Research Department of the Czech National Bank is organising an interim call for research projects. The priorities are defined for the following five research areas:

	Topic	Research co-ordinator	Email
A	Monetary policy	Martin Cincibuch	martin.cincibuch@cnb.cz
B	Macroeconomic modelling	Juraj Antal	juraj.antal@cnb.cz
C	Financial stability	Aleš Čapek	ales.capek.cnb.cz
D	Fiscal policy	Vladimír Bezděk	vladimir.bezdek@cnb.cz
E	Real sector	Vladislav Flek	vladislav.flek@cnb.cz

The project proposal form, as well as the concrete research priorities of the CNB Research Programme 2005–2006, can be downloaded from http://www.cnb.cz/en/vyz_call_for_projects.php

The deadline for submission of project proposals is 30 June 2005. Individual project proposals should be submitted to the relevant project co-ordinators. The authors are expected to present well-focused projects that will apply models and other relevant technical tools, efficiently organised empirical evidence and well-documented literature surveys. Researchers from both within and outside the CNB are advised to contact the co-ordinator before completing the form.