A SIMPLE MODEL OF THE TRANSMISSION MECHANISM OF SLOVAKIA'S ECONOMY, ITS STRUCTURE AND PROPERTIES

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Medium-term forecast of an economy (2 – 3 years) and in particular the predicted inflation, which can fundamentally influence the formation of expectations, plays an important role in regard to the orientation of monetary policy on inflation targeting. The current state of an economy depends not only on past development, but to a significant degree also on the expectations of future development. For this reason it is essential to introduce a forward-looking component into the conduct of monetary policy. A supporting and important pillar in this regard is the development of a macroeconomic model describing the main channels of the transmission mechanism. A medium-term macroeconomic model linking the main macroeconomic and monetary indicators should at the same time ensure the systematic and predictable influencing of the economy over the medium term with emphasis on the central bank's primary objective in the form of inflation.

The aim of this article is to describe the structure, philosophy, and properties of a simple, so-called "gap model" of the transmission mechanism for the Slovak economy, which takes account of the conduct of monetary policy in a regime of inflation targeting. The model's structure is based on the description of the transmission mechanism for small open economies (Laxton, Scott 2000)[1]. Key features of the model include the composition of forward-looking components and active monetary policy in the form of endogenously set monetary variables (interest rates and exchange rate). This allows forming of expectations to be used as another indirect channel of the transmission mechanism. The properties of the model are presented in the development of key economic indicators as a response to selected temporary shocks in the economy.

Functional specification and basic logic of the model

Before selecting the type of model itself it is necessary to take account of the nature of the economy, the monetary policy regime and, primarily, to define its functional specification. With regard to the fact that the primary effort was to create a model for medium-term purposes, the presented model is not intended to be a model of detailed predictive abilities over a short-term horizon. The aim was to focus on capturing the essential macroeconomic relations, primarily the impact of monetary policy on the economy and inflation. A macroeconomic model should provide a quite comprehensive view of what is happening in an economy, what steps should be taken in a given situation in order for future development to correspond with the targeted objective. A simple and understandable model provides the basis for discussion of monetary policy options in a current situation and at the same time can be of benefit in communication with the public.

The model's simplicity and comprehensibility is guaranteed by creating a model with a few equations, built at an aggregate level. This is the gap model, which is based on the premise of the monetary cycle theory. The basis of this approach is the assumption that monetary policy in practice does not have the possibility to influence long-term trends in an economy's development. It is a long-term process of increasing the quality and performance of a transitional economy, i.e. real convergence. It is manifested in the long-term faster growth of an economy in comparison with developed economies, and thereby also with a certain sustainable trend of appreciation of the real exchange rate without a negative impact on the economy's competitiveness.

Monetary policy can react only to the cyclical part of the economy, which is represented by the deviation of the development of economic indicators from the long-term (equilibrium) trend. An example may be a deviation of the gross domestic product from the potential product, termed the output gap. An output gap can signal inflationary pressures in the future (in the case of faster economic growth), or dampening pressures on price growth (in the case of slower economic growth) It is possible in this way to differentiate trend and cyclical components also in the case of other economic variables.

In accordance with the assumption of the monetary cycle theory the model is composed of two relatively independent blocks. The first is the **Quarterly Projection Model (QPM)**, which by means of simulation forecasts the cyclical behaviour of economic variables. The QPM is the main instrument which serves for creating predictions of economic indicators in the medium-term horizon. The Quarterly Prediction Model des-

[1] The model presented here was created at the monetary policy department of the NBS in the framework of technical support from the International Monetary Fund. Assistance was focused on two areas. The first was technical cooperation in building the medium-term model itself and building an information environment. The second field of cooperation was focused on the efficient managing of the implementation of the whole monitoring and forecasting process at the NBS. Particular thanks go to Jaromír Beneš and David Vávra from the Czech National Bank for their help and valuable comments in building the model.

cribes the basic transmission mechanism channels, and thereby intermediates the formal form of a unified theoretical framework in which monetary policy considerations are made.

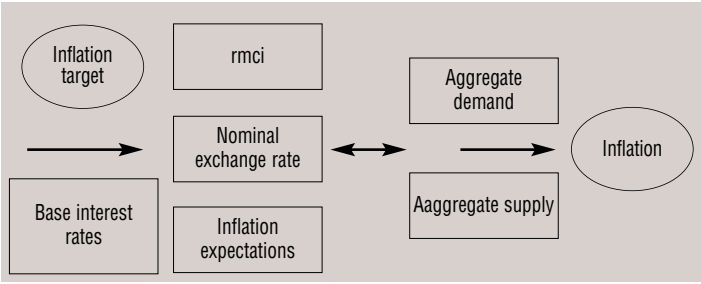
The second block represents a model which should separate the cyclical and trend component of economic variables, using historical data. An instrument used is the **Multivariate Filter with Unobserved Components (MVF-UC)**, which iteratively estimates unobserved trend and cyclical variables from measured economic indicators[2].

An important attribute of the model in the regime of inflation targeting is its ability to ensure the systematic control of inflation. This happens by means of an active monetary policy rule, meaning that a output of the model simulation is formed also by the trajectory of interest rates, a key instrument for central banks, by which economic growth and a desired level of inflation may be attained. In other words this means that the model works endogenously with mechanisms which determine the development of the main transmission mechanisms, these being primarily interest rates, the exchange rate, as well as expectations (forward-looking components). The final model prediction is thus called unconditional (the opposite being conditional, in which an exogenous trajectory of interest rates is predicted). The forward-looking component of economic subjects is captured in the model by means of expectations as to the development of the exchange rate and inflation. In the case of the central bank a forward-looking component is a reaction function which changes the setting of the interest rates in the case of deviation of expected inflation from the target.

The transmission mechanism

A central bank does not have in economic environment any direct instruments available by means of which it could set the current or future price level. The only instrument available to it comprises base rates, by means of which via a chain of economic links inflation is influenced. The transmission mechanism describes this chain, where on the one side there is the instrument of monetary policy, and on the other side there are monetary policy goals. The process itself, from interest rates through to inflation, operates via various channels with different lags. In a small open economy, as Slovakia's certainly is, monetary transmission can work via three ways, or channels: the real monetary conditions channel, the nominal exchange rate channel and the inflation expectations channel.

Diagram 1:



The effect of the **real monetary condition index (rmci)**, as the overall indicator for monetary policy, is based on the influence of its individual components on the real economy, the components being the real exchange rate and real interest rates.

The real exchange rate compares prices between domestic and foreign goods, where it expresses directly the demand for these goods. Consumers in the case of a fall in the prices of goods from abroad will give preference to the consumption of these goods, because in comparison to domestic goods they become relatively cheaper. In this case we are talking of an intratemporal substitution.

Real interest rates determine the relative price between current and future consumption, or between consumption and savings (in this case we are talking of an intertemporal substitution). Lower interest rates decrease the costs of financing credit activities, so as does the motivation to save. Businesses invest more in technology, productivity and competitiveness grow. Households spend more savings and take on more debt, whereby consumption also grows. Conversely, with a growth in interest rates the investment decisions of firms are postponed until later when interest rates will be lower. The motivation for households to save grows and the costs for new loans increase, which discourages them from increasing credit consumption.

The gradual catching up process with developed economies admits for a certain degree of balanced appreciation of the real exchange rate, and so is also connected with the gradual convergence of interest rates with those abroad. This means that the economic cycle is not affected by changes in individual real monetary variables, but rather their deviations from long-term (balanced) trends..

The impact of monetary policy on the development of the nominal exchange rate and its direct impact on prices of imported goods represents another channel of monetary transmission. This channel causes rapid changes in prices of tradable goods, and thereby also changes in the overall domestic price index. Its strength is directly proportional to the openness of the economy, which in Slovakia's case provides the premises for the significance given to this channel.

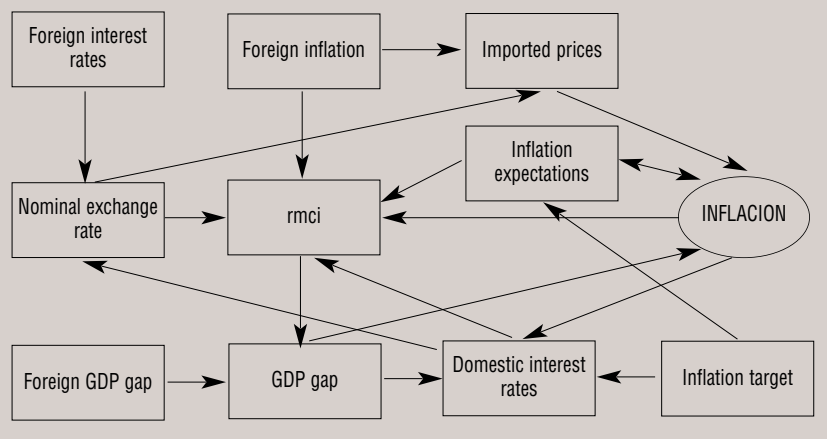
The **inflation expectations** channel influences real demand by means of changes in consumer behaviour. The central bank through declaring the inflation trajectory forms "desirable" expectations of economic subjects in order to prevent the emergence of adverse inflationary pressures and to realise a stabilisation policy with lower

[2] The MVF-UC is used only for estimating long-term trends and cyclical components in a history, and does not influence the attributes of the core model. We shall therefore in the next part devote attention to describing the transmission mechanism as it is modelled in the QPM core model.

volatility of real variables. Even if the declaration of the inflation trajectory is the first step in forming expectations, it does not mean that the public will automatically form them at the level of the inflation target. In forming their expectations, subjects will always take account of the certain degree of risk that the target will not be fulfilled. Since in a real economy agents do not know the loss function of the central bank, it is possible to eliminate this risk to a certain extent by adopting a transparent monetary policy and thereby ensuring that inflation expectations work in its favour.

The incorporation of other factors (the external sector) and the mutual interconnections of individual fundamentals connected with one another in the economy provide a view on the complex transmission mechanism of monetary policy (Diagram 2). Thus it is ensured that the constructed system of equations provides consistent results on the economy's functioning, that the links and extent of influence of individual factors on the targeted variables are identified.

Diagram 2 – Structure of the QPM



The Quarterly Projection Model

The shape of the cyclical part of the QPM model comprises 8 basic behavioural equations forming the core of the model system. Besides this, the model works with a number of equations having the nature of various transformations, identities and simple autoregressive relations. The whole model is formed by more than 100 equations. In a more detailed description of the QPM we shall however concentrate only on the behavioural part of the model, which describes the transmission mechanism.

(1) $\hat{y}_t = \alpha_1 \hat{y}_{t-1} + \alpha_2 rmci_{t-1} + \alpha_3 \hat{y}^{f}_{t-1} + \varepsilon_t^{\hat{y}}$

(2) $rmci_t = \beta \hat{r}_t + (1-\beta)\hat{z}_t$

(3) $\pi_t^{netexe} = \gamma_1(\pi_{t-1}^{m} + \Delta_4 \bar{z}_t) + (1-\gamma_1)\,[\gamma_2\, \pi_{t-1}^{netexe} + (1-\gamma_2) E_t \pi_{t-1}] + + \gamma_3 \hat{y}_{t-1} + \varepsilon_t^{\pi^{netexe}}$

(4) $\pi_t^{m} = \omega_1(\pi_t^{f} - \Delta s_t) + (1-\omega_1)\,\pi_{t-1}^{m} - \omega_2\,(p_{t-1}^{m} - p_{t-1}^{f} + s_{t-1} + + \omega_3) + \varepsilon_t^{m}$

(5) $4(-E_t s_{t+1} + s_t) = i_t - i_t^{f} - q_t + \varepsilon_t^{s}$

(6) $i_t = \delta_1 i_{t-1} + (1-\delta_1)(i_t^{*} + \theta(\delta_2(\pi 4_{t+4} - \pi 4^{*}_{t+4}) + (1-\delta_2)\hat{y}_t)) + \varepsilon_t^{i}$

(7) $E_t \pi_{t+1} = \kappa_1[\kappa_2 \pi 4_{t+3} + (1-\kappa_2)\pi 4_{t+3}^{netexe}] + (1-\kappa_1)[\kappa_2 \pi_{t-1} + + (1-\kappa_2)\pi_{t-1}^{netexe}]$

(8) $E_t s_{t+1} = \kappa_3 s_{t+1} + (1-\kappa_3)[s_{t-1} + \frac{1}{2}(\pi_{t-1}^{f} + \pi_{t-1} + \Delta \bar{z}_t)]$

Equation (1): With regard to the nature of the model the behaviour of aggregate demand is described in the IS curve, represented by the output gap. The aggregate demand curve defined in this way presupposes that the cyclical component of the economy is influenced, besides its own persistence, also by monetary policy and foreign demand. The influence of monetary policy is effected via changes in real interest rates and in the real exchange rate[3]. The equation assumes a lag in the impact of monetary policy on the output gap. Consistently with the cyclical component of the domestic economy foreign demand enters into the model in the form of the output gap (with a lag).

Equation (2) represents the aggregation of real monetary variables (the real exchange rate and real interest rates) into a summary indicator, i.e. the real monetary condition index. This indicator enables a comprehensive view on the setting of monetary policy and its influence on the economy. With regard to the nature of the economy and model, the rmci is expressed as a weighted average of deviations of individual components from their trends.

Equation (3) is a modification of the Phillips curve (a dynamic equation of aggregate supply) with rational expectations for net inflation excluding fuel prices[4]. Inflation is expressed by means of the contribution of domestic and foreign prices and position of the business cycle. Through the integration of inflation expectations the model provides links between changes in regulated prices and pressures on the rate of inflation for market services, in particular by means of secondary effects. An equilibrium appreciation of the real exchange rate serves for modelling the additional contribution to core inflation ensuing from faster price growth in non-tradable goods and services than that of tradable goods (the Balassa-Samuelson effect). An important feature of this equation is the linear homogeneity of parameters in price parameters (restriction on the parameters), which expresses that in an equilibrium any particular rate of inflation will conform to the Phillips curve (with the cor-

[3] The nominal and real exchange rate is defined in the model in the manner that appreciation represents a positive value.

[4] We presume that in an environment of significant administered measures in the price development net inflation excluding fuel prices is an important price indicator of demand pressures in the economy. With regard to its high correlation with industrial prices, this indicator serves also for an expression of the real exchange rate and real interest rates.

responding degree of appreciation in the nominal exchange rate). The only element, which determines the actual rate of inflation in an equilibrium is then the behaviour of the central bank, in this case quantified by the inflation target.

With regard to the different development of individual components of the CPI, the Phillips curve is disaggregated into four sub-aggregates. Parameters for fuel prices, foodstuffs, net inflation excluding fuel prices and administrative prices are estimated individually. All Phillips curves have retained a similar structure, nevertheless a different intensity of the individual factors is assumed. Administrative prices have a special standing, in the case of which in the long-term horizon development consistent with the development of overall inflation is expected.

Equation (4) is the equation of imported inflation. This represents a separate block, which is, consistently to structure of the domestic price level, disaggregated into two subaggregates: import energy prices and import prices excluding of energy prices. The equations describe short-term as well as long-term relationship in the form of the ECM (Error Correction Mechanism). In the long-term horizon the validity of relative purchasing power parity in the tradable sector is assumed. In the short-term horizon a certain auto-regressive character of imported prices and a direct reflection of the development of foreign inflation in the domestic currency is assumed.

Import energy prices (as the input indicator of foreign inflation in the fuel prices equation) are determined by the development of crude oil prices on world markets and the development of the SKK/USD exchange rate. Import prices excluding of the development of energy prices (these enter into the other Phillips curves) are a function of the development of prices abroad and the SKK/EUR exchange rate.

Equation (5) is the nominal UIP (Uncovered Interest Rate Parity) condition. It interconnects expectations of the development of the nominal exchange rate with the movement of interest rates and the risk premium. It says that in the case of a positive interest rate differential the exchange rate must in the long-term time horizon proportionately depreciate, otherwise arbitrage would be possible. Moreover, the equation takes into account the influence of the risk premium which investors require in deciding to allocate capital.

Equation (6) determines the reaction function of monetary policy as a modified version of the Taylor rule. It is expressed as the weighted sum of the autoregressive term and the own active rule of the central bank. The autoregressive nature of the behaviour may be explained as a cautionary element in monetary policy, which ensues from the essence itself of the conservative behaviour of the central bank. The interest rate reacts together with the aggressiveness coefficient θ to deviations of the inflation prediction from the inflation target in the manner that in the case of inflationary pressures it will exceed its politically neutral level of rates. Thus it causes an increase in the real interest rate above the equilibrium level and gives the stimulus to dampen the economy. The policy neutral level of the nominal interest rate may be understood as that level which does not change inflation. A nominal interest rate set in this way will not induce, in an equilibrium, any changes in real or nominal parameters and thus will be neutral towards the domestic economy. Including the GDP gap is primarily motivated by the fact that an economy's position in the economic cycle is a certain forward-looking component of future inflationary pressures and need not therefore necessarily express the interest of monetary policy for stabilisation of the development in GDP. Through a reaction function defined in this way, the systematic control of inflation in connection to the inflation target is ensured.

Equation (7) defines inflation expectations as a weighted average of both, rational and adaptive behaved economic agents. Each of these agents is moreover included into groups according to whether the subject adapts its expectations to net inflation excluding fuel prices or the overall CPI. In forming inflation expectations rational behaved agents take into consideration all available information on factors influencing inflation in the future, among which we can include the central bank's inflation target. The relatively complicated formation of inflation expectations is caused by the high differential and volatility between overall inflation, taking into account to a significant degree also cost factors and the market-determined growth in prices in the form of net inflation excluding fuel prices. The credibility of the central bank, the transparency of its decisions and the nature of economic shocks are a key determinant of whether inflation expectations will work in favour of the central bank, or force the central bank to take more aggressive measures.

Equation (8) determines expectations of the development of the nominal exchange rate. It is expressed as a weighted average of a forward-looking component representing rational agents and a component representing the nominal exchange rate from the preceding period, increased by the inflation differential and the equilibrium appreciation of the real exchange rate.

Forward-looking components in inflation and exchange-rate expectations are in general reflected in the model in the form of own predictions of the model.

The model transmission mechanism, as it is described in the QPM, includes all the inflation control channels operating in a small, open economy: indirect - in which a change in interest rates and a change in inflation expectations affects inflation via real economic activity (the output gap), and direct - in which a change in interest rates is reflected in inflation through a respective change in the nominal exchange rate via imported prices.

Attributes of the SR economy on the basis of the QPM model

In identifying the parameters of the model of the SR economy is based on a combined approach, bringing together econometric estimates of parameters and calibration. The

current settings of the model together with partial analyses have confirmed that the strongest and fastest channel in the transmission mechanism is the direct channel of imported inflation. The most intensive influence was identified in fuel prices (approximately a quarter of the movement of import energy prices are immediately reflected in fuel prices). The weakest effect is in net inflation excluding fuel prices. This is a reflection of the representation of market services in the given sub-aggregate, and which are not exposed to price arbitrage.

The impact of monetary policy on the economy via the rmci appears to be relatively low. For example its intensity is approximately half that of its counterpart in the Czech economy. To a certain extent this narrows the room available to the central bank for controlling inflation by means of the real economy. In the framework of individual components of the rmci the empirical results from small open economies on the prevailing influence of the real exchange rate over that of real interest rates were confirmed.

In identifying the model it was confirmed that the SR economy is relatively forward looking with approximately a third of economic subjects behaving rationally. This is implied also by historical development, where the economy has managed relatively easily to compensate for negative shocks, which it had to face in past years. The representation of forward-looking economic subjects confirms the substantiality of the inflation expectations channel.

The equilibrium appreciation of the real exchange rate is dominant in forming expectations of the development of the nominal exchange rate. In the case of any deviation of the exchange rate from the equilibrium level, the expectations of the nominal exchange rate are not formed in a tendency to eliminate any imbalance. Conversely, the expectations of the nominal exchange rate are to a significant extent determined by long-term real convergence. In the case of expectations formed in this way the process of reversion to equilibrium may be lengthened.

The ability to verify the properties of the QPM is a fundamental prerequisite of the model's possible application in the decision-making processes of the central bank. These properties can best be presented by means of simulating basic macroeconomic shocks. A shock is a non-systematic random deviation in the behaviour of a certain type of economic subjects from the systematic mechanisms in question. A shock is thus taken to mean disruptions operating one at a time, where it is assumed that the model system is in its initial period in equilibrium and that all agents are perfectly informed . (Shocks are represented by random components in the respective model equations and it is possible to mutually combine them).

For illustration we present the properties of the model for three selected shocks: a) a temporary increase in demand, b) a one-off appreciation of the nominal exchange rate, c) the delayed reaction of monetary policy in the case of a demand shock. The simulation of shocks was done for the current version of the settings of parameters for current data on the Slovak economy. The shocks in the economy last one quarter. The x-axis in the graph shows the quarters from the occurrence of the shock. The y-axis shows the percentage deviation from the initial prediction, which assumes a state of equilibrium.

a) Aggregate demand shock – an increase in the output gap by 1% (graph 1 in the graph appendix)

In the case of demand-side shock a 1% growth in the output gap is shown, which has the nature of a one-off shock. The excess demand over supply in the market for goods and services causes a growth in inflation, against which the central bank must fight. Even if the central bank reacts immediately to this shock in the form of increasing interest rates, the output gap (due to persistence) begins to react to this increase in rates only after a certain lag. The growth in the price level accompanying this shock, and which has an economic justification, is from the beginning determined only by expectations with regard to future inflation. The agents know that the expectations will grow precisely in consequence of the disequilibrium. In further periods inflation will then grow also under the influence of high demand. The central bank must increase real interest rates and keeping them positive while inflation continues to deviate from its target. The direct channel of import prices reflects development in the nominal exchange rate. The initial appreciation of the exchange rate reflects the prevalence of the interest rate differential over inflation expectations and causes a decline in the prices of imported goods. Besides positive real interest rates, the real exchange rate will also work to close the output gap. In the initial period the positive value of the real exchange rate results from the appreciation of the nominal exchange rate. Later the nominal exchange rate will depreciate, and thereby negatively contribute to the real exchange rate. Conversely, a growth in the domestic price level will contribute positively to the appreciation of the real exchange rate. Restrictive settings of real monetary conditions lead to a decline in the output gap. The latter, while positive, will have a pro-inflationary effect. In order to cause disinflation it must reach negative values, i.e. reducing the rate of economic growth to below its potential. The central bank adapts its interest rate policy to this and thereby ensures the return of inflation to the target value. Following the economy's consolidation, it will then resume its potential.

b) Shock to the nominal exchange rate – a one-off appreciation of 1% (graph 2 in the graph appendix)

In the case of a 1% shock to the nominal exchange rate it is important to monitor the development of the real exchange rate. The real exchange rate appreciates immediately, but in subsequent periods gradually falls. The initial appreciation of the real exchange rate causes a growth in the real monetary condition index (despite negative real interest rates). The price level falls thanks to negative imported inflation and the negative output gap.

Since the change in the equilibrium real exchange rate

can only be a result of changes in the real economy or in the PPP price level, the deviation of the exchange rate from its equilibrium value leads the exchange rate back to the equilibrium (faster than in the case of a demand-side shock). The central bank reacts to the change in inflation and the change in the output gap. Under the influence of negative imported inflation and partially the negative output gap, inflation falls below its target value. The central bank in the interest of maintaining its target must reduce nominal rates in order to not have a restrictive influence on the economy. The exchange rate has a tendency to depreciate following a shock, in order to compensate for the disequilibrium of relative prices. Import prices reflecting the movement in the nominal exchange rate following an initial decline begin to operate in a pro-inflationary manner. In the case of this shock the exchange rate channel has a much greater influence on the price level by means of import prices, being of demand-side nature, via the output gap. With the targeted inflation growth trajectory, nominal interest rates gradually grow, in order to avoid any significant overheating in the economy and to ensure the economy's return to equilibrium. The nominal exchange rate settles at a rate higher than that prior to the shock, due to the lower domestic price level.

c) Delayed reaction of the central bank (graph 4 in graph appendix)

This experiment compares the development of the economy following a 1% demand-side shock in 2 scenarios:

1. the central bank reacts to the shock immediately – identically as in simulation a).

2. the central bank reacts to the shock with some delay (2 quarters).

In the second scenario nominal interest rates for the first two quarters are fixed and do not operate to eliminate the excess demand over supply as in the first scenario. On the contrary, their fixing causes a decline in real interest rates via higher inflation expectations. The dynamic of inflation accelerates and the central bank must react more sharply in order to return inflation back to its target. The weakening on the influence of real monetary conditions (real interest rates are at the outset negative) on the real economy slightly extends the overheating in the economy, and thereby increases inflation. In order to suppress it the output gap must again be negative. These losses in GDP are necessary in order for inflation to return to its target.

This experiment clearly highlights what influence monetary policy has on maintaining price stability. Without monetary policy reaction inflation expectations would accelerate.

Conclusion

As with each model, the macroeconomic model presented here, too, has certain limitations (the describing of the economy based on certain simplifications, on the estimate of the reactions of economic subjects, where this is based on the past, on theoretical assumptions…). Therefore the aim of the model approach (in particular in the conditions of a transforming economy with short and unstable time series) is to try to provide a sufficient source of information for monetary policy makers. It can serve for supplementing hitherto approaches used, which used to be evaluated in decision-making on setting monetary policy and its influence on the economy over the medium term.

The current version of the QPM is very simple, nevertheless even in this phase the model is able to formally capture and process the most significant parts of the transmission mechanism of monetary policy. Despite its simplicity, the model is sufficiently flexible to incorporate information of an expert judgement, or results from other partial models.

Testing the model's properties on a series of standard shocks confirmed their consistency with the predicted economic interpretation. At the same time these simulations confirmed the ability of the central bank to influence, via the identified monetary transmission channels, price development towards the declared target. This justifies the model's use both for the purposes of prediction, as well as in monetary policy analyses, i.e. the preparation of consistent alternative scenarios of the economy's development depending on identified possible imbalance.

Using the core model (QPM) can play a role in the preparing of medium-term predictions. It is necessary to reali-

LIST OF ABBREVIATIONS USED

Format of variables

χ_t	economic parameter in quarter t
$\overline{\chi}$	equilibrium, trend parameter
$\hat{\chi}$	deviation from equilibrium, gap
$\Delta\chi$	quarterly change annualised
$\Delta_4\chi$	y/y change
$E_\tau\chi_t$	expectations created at the time τ for the parameter in time t
$\varepsilon\chi$	residual variable for the equation of endogenous variable χ

List of variables

i	domestic nominal interest rate (3M BRIBOR)
i^*	politically neutral nominal interest rate
i^f	foreign nominal interest rate (3M EURIBOR)
π^{netexe}	overall inflation, quarterly annualised
$\pi 4^{netexe}$	overall inflation, year-on-year value
$\pi 4^*$	target value, of y/y inflation
π	net inflation excl. fuels, quarterly annualised
$\pi 4$	net inflation excl. fuels, year-on-year value
π^f	foreign inflation, quarterly annualised, HICP in EMU
π^m	inflation of imported prices, quarterly annualised
q	risk premium
r	domestic real interest rate
$rmci$	real monetary condition index
s	nominal exchange rate, EUR/SKK
y	gross domestic product
y^f	foreign gross domestic product, EMU
z	bilateral real EUR/SKK exchange rate

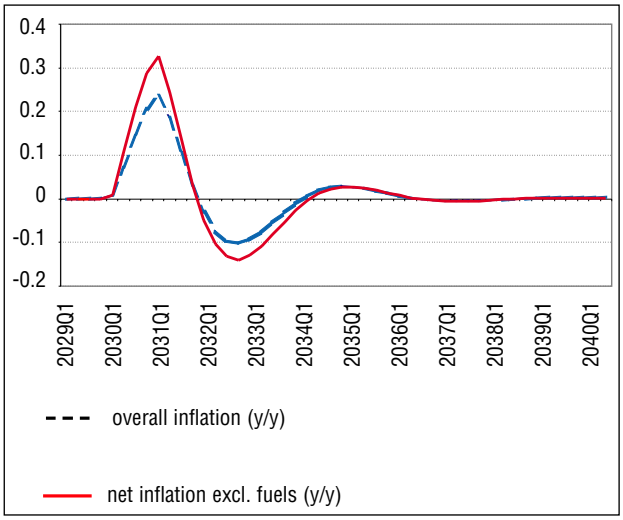
ze that the presented model of the transmission mechanism describes economic relations that are identifiable in a longer-term framework. Its robustness and predictive abilities grow with the increasing time horizon of the prediction. Conversely, the reliability of short-term predictions based on expert judgements or simpler analytical instruments is higher over the next four quarters, and their reliability declines with an increase in the time horizon. Therefore prediction of economic development is based on a combination of short- and medium-term analytical instruments. Besides this, the QPM represents only the skeleton of the transmission mechanism. To draw up a quality forecast it is necessary to use other supporting information. A system of satellite models should provide this (e.g. a model block of the public finance sector, the block of equilibrium trends), which supplement a more comprehensive view of the disaggregated development of the economy.

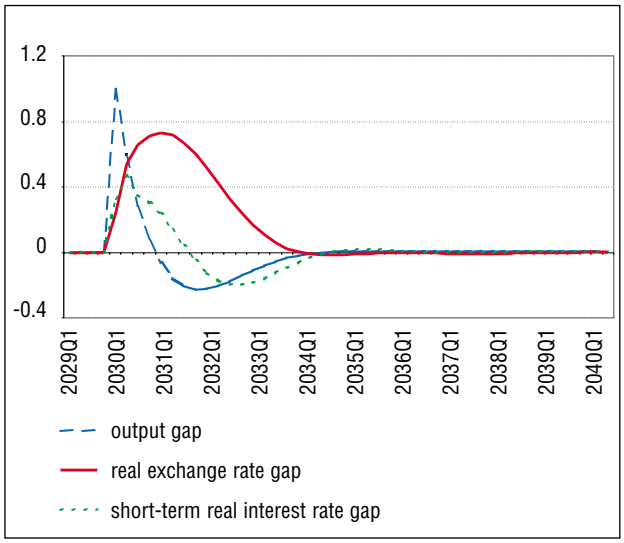
The orientation of the National Bank of Slovakia's monetary policy on inflation targeting, together with Slovakia's expected entry to the eurozone, and with this the necessary fulfilment of the Maastricht criteria, brings different, qualitatively greater demands for an analytical and forecasting system with greater emphasis on the medium term.

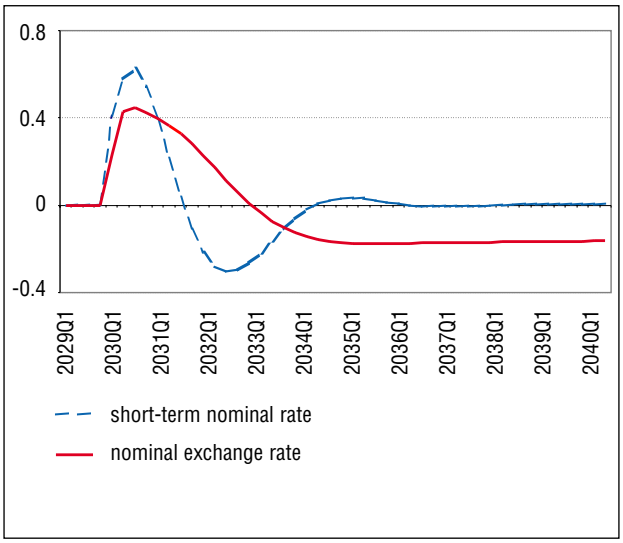
Quality analysis and the ability to forecast the main macroeconomic indicators are among the most important attributes of applying an efficient and transparent economic policy. A supporting and concurrently necessary pillar of an effective forecasting and analytical system in a central bank is the use of a macroeconomic model describing the main channels of the transmission mechanism. The contribution of such a model is an approach leading towards the systematic and predictable influencing of the economy over the medium-term, with an emphasis on fulfilling the main goal of the central bank.

Graph appendix

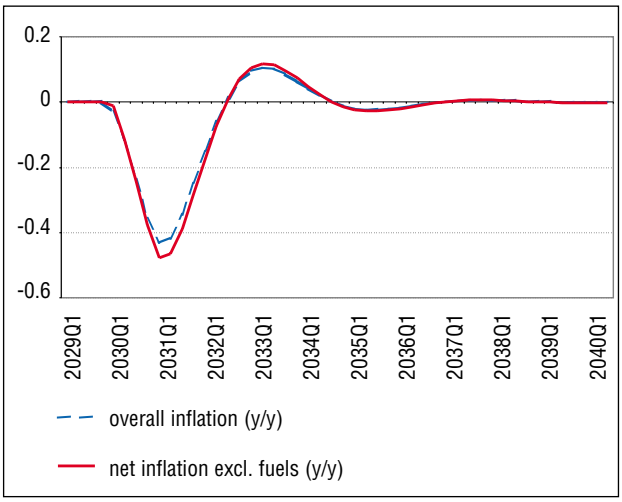
Graph 1: Reaction to 1% demand-side shock

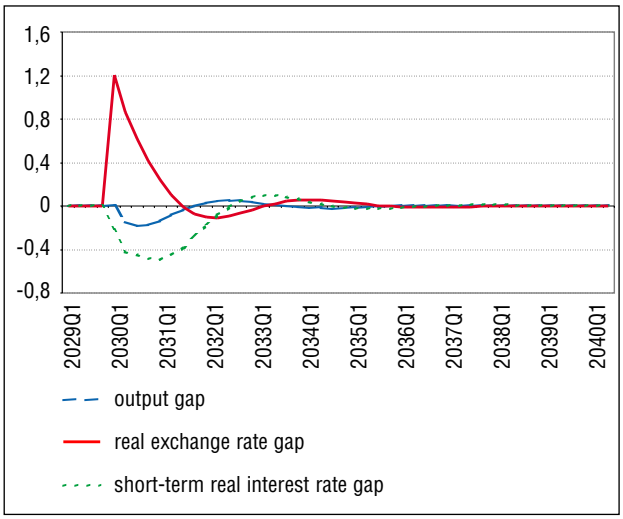


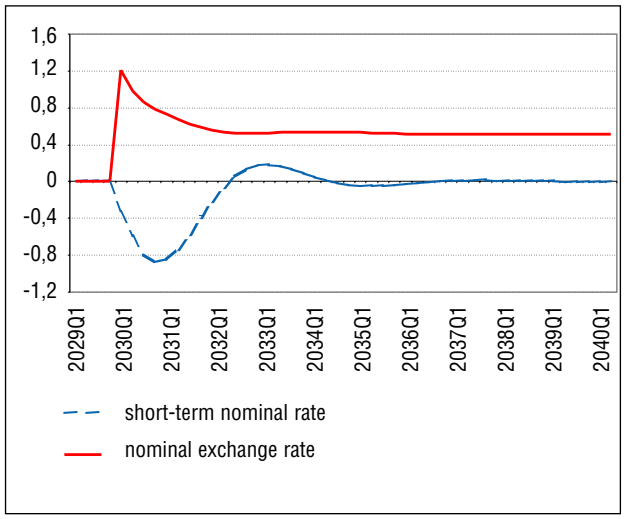




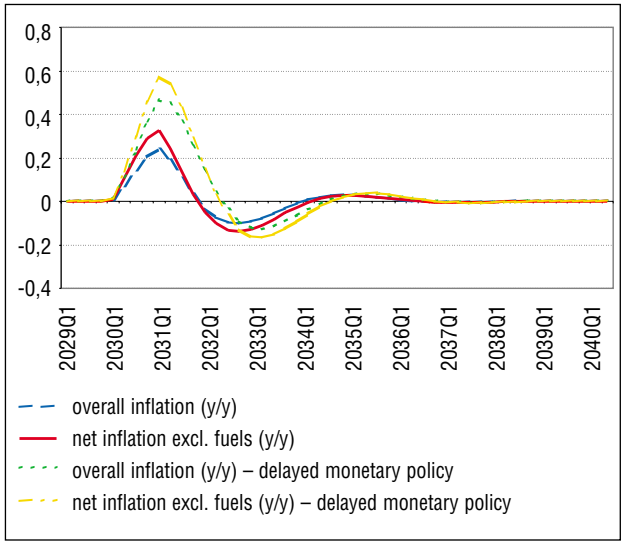
Graph 2: Reaction to a shock in nominal exchange rate – 1% appreciation

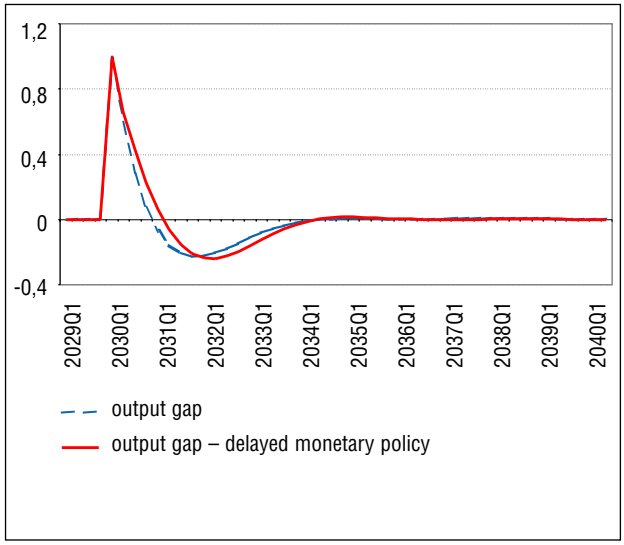




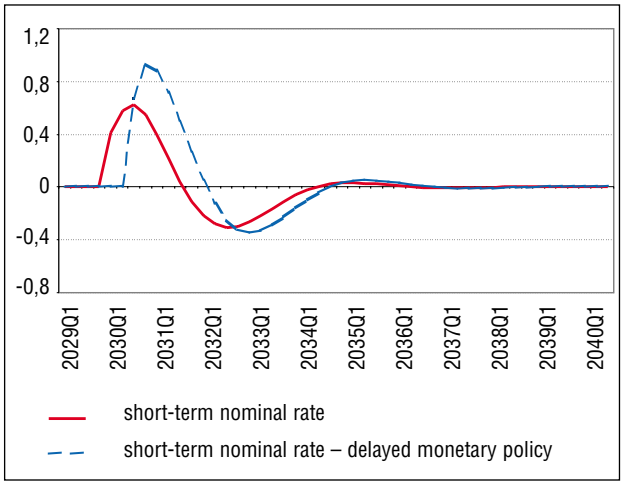


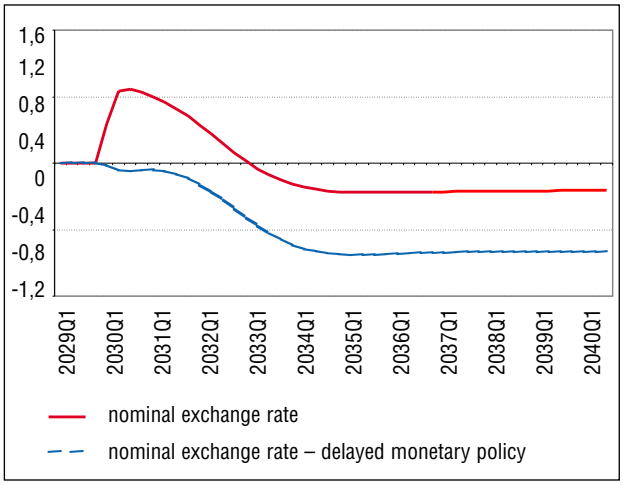
Graph 3: Reaction to a 1% demand-side shock – delayed reaction of monetary policy by 2 quarters





Graph 3: Reaction to a 1% demand-side shock – delayed reaction of monetary policy by 2 quarters





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