

Romania: Selected Issues

This Selected Issues paper for Romania was prepared by a staff team of the International Monetary Fund as background documentation for the periodic consultation with the member country. It is based on the information available at the time it was completed on May 7, 2007. The views expressed in this document are those of the staff team and do not necessarily reflect the views of the government of Romania or the Executive Board of the IMF.

The policy of publication of staff reports and other documents by the IMF allows for the deletion of market-sensitive information.

To assist the IMF in evaluating the publication policy, reader comments are invited and may be sent by e-mail to publicationpolicy@imf.org.

Copies of this report are available to the public from

International Monetary Fund • Publication Services
700 19th Street, N.W. • Washington, D.C. 20431
Telephone: (202) 623 7430 • Telefax: (202) 623 7201
E-mail: publications@imf.org • Internet: <http://www.imf.org>

Price: \$18.00 a copy

**International Monetary Fund
Washington, D.C.**

INTERNATIONAL MONETARY FUND

ROMANIA

Selected Issues

Prepared by Costas Christou, Alexander Klemm, and Andrew Tiffin, (all EUR)

Approved by the European Department

May 7, 2007

	Page
Contents	
I. Modeling Monetary Policy in Romania	3
A. Introduction.....	3
B. The Model	4
C. Inflation Targeting	12
D. Using the Model.....	16
E. Sensitivity Analysis.....	20
F. Conclusion.....	23
Figures	
1. Exchange Rates, Intervention, and Interest Rates.....	14
2. Policy Scenario Summary, 2005–2010.....	19
3. Sensitivity Analysis	22
Boxes	
1. Modeling the Equilibrium Real Exchange Rate	6
2. Estimating Potential Output using the LRX Filter.....	11
Appendices	
I. Calibration	24
II. Complete Model Equations.....	29
References.....	32
II. Wage Dynamics in the Romanian Economy.....	34
A. Introduction.....	34
B. Stylized Facts	36
C. Econometric Analysis	46
D. Conclusions.....	49

Figures

1. Wage and Fiscal Developments, and Macroeconomic Performance, 2000–06.....	35
2. Unemployment Rates in Selected EU New Member States, 1991–2005	40
3. Labor Force Participation in Selected EU New Member States, 1991–2005.....	41
4. Employment in Selected EU New Member States, 1991–2005	42

Tables

1. Wage Policy of the General Government in 2004–07	38
2. Gross Wage by Sector.....	39
3. Pay Structures for Civil Servants.....	45
4. Granger-casualty Tests for Private Sector and General Government.....	48
5. Granger-casualty Tests for Private Sector, Public Enterprises, and Government	49

References.....	51
-----------------	----

III. The Impact of Aging on the Public Sector in Romania	52
A. Introduction.....	52
B. Demographic Developments	52
C. The Pension System	55
D. Options for Further Reform	61
E. Conclusion.....	65

Figure

1. Old-aged Persons per Working Adult.....	63
--	----

Tables

1. Demographic Statistic for Romania and Selected Other Countries.....	53
2. Population Data and Projections.....	55
3. Simulation Based on Current Pension System and Planned Reforms	60
4. Primary Balances under Different Fertility Scenarios.....	61
5. Savings from Increasing the Retirement Age by 1 Year	62
6. Savings from Increasing the Employment Rate to EU Best Performance.....	64

Boxes

1. Main Features of the Romania Public Pensions Systems	56
2. Assumptions Underlying the Baseline Scenario of the Simulation	59

References.....	66
-----------------	----

I. MODELING MONETARY POLICY IN ROMANIA¹

A. Introduction

1. **In August 2005, Romania adopted an explicit inflation-targeting (IT) framework for monetary policy.** This has become an increasingly-popular approach across a growing range of countries, and entails a commitment to a quantitative inflation target as the central bank's primary objective. Policy in this type of framework is relatively clear; but rarely simple. Owing to unexpected shocks and lags in the monetary-transmission mechanism, it is generally impossible to keep inflation exactly on target. Instead, in practice, inflation targeting essentially boils down to *inflation-forecast* targeting—where the authorities endeavor to bring inflation close to target within a reasonable timeframe, and where policy is assessed depending on whether the forecast inflation path, contingent on that policy, is acceptable. As part of their preparations for the new framework, therefore, the NBR have developed a medium-term forecasting model that captures the impact of policy on key macroeconomic variables, including inflation.

2. **This presents a new challenge for Fund staff.** In the context of surveillance, it is not enough to base our assessments simply on whether inflation falls within the target range—indeed, even relatively-stable and “successful” inflation targeters miss their targets about $\frac{1}{3}$ of the time (Roger and Stone, 2005). Instead, staff need to understand *why* inflation is inside or outside the range. We need to be able to discuss issues such as whether the current interest rate is sufficient to bring the economy back on track; how the NBR should react to unexpected shocks; how the inflation forecast depends on various assumptions, and so on. To analyze these types of issues, and to engage the authorities in a more-meaningful policy dialogue, the staff need their own model of how the economy works.

3. **In this chapter, we present a simple Forecasting and Policy Analysis System (FPAS) for the Romanian economy.** The model aims to provide a high-level description of the core dynamics of the macro economy, and serves as a helpful organizing framework for the staff's near- and medium-term baseline forecasts.

4. **A key strength of this approach is that it encourages a more-structured and transparent discussion of policy, and allows for the systematic treatment of different options.** The model also allows for the rapid generation of alternative scenarios, and so provides a valuable tool in assessing key risks to the baseline forecast, and in analyzing the importance of various assumptions.

¹ Prepared by Andrew Tiffin.

5. **Section B will outline the model, providing an intuitive explanation for the model’s structure.** Section C will provide some context for the model’s application, briefly outlining Romania’s experience with inflation targeting, and using the framework of the model to discuss the recent policy decisions of the NBR. Section D will discuss the current policy mix in more detail, outlining the likely implications of the authorities’ intentions, and providing some background for the Staff’s recommended policy setting. As mentioned, the ability to easily simulate different policy options is a major strength of this type of approach. Section E will provide a further example of the model’s flexibility, by providing sensitivity analysis around one of the key assumptions behind the current baseline forecast—the staff’s estimate of the output gap. Section F will conclude.

B. The Model

Overview

6. **At core, the FPAS model has four simple equations:** (i) a dynamic aggregate-demand or IS curve that relates the level of real activity to the real interest rate and real exchange rate; (ii) a price-setting or Phillips curve that relates current inflation to past and expected future inflation, as well as to the output gap and the exchange rate; and (iii) an interest-parity condition for the exchange rate, with some allowance for backward-looking expectations. These three equations do not, in themselves, provide a solution for inflation. Rather, stable inflation requires that a central bank raise or lower interest rates whenever inflation gets out of hand. This commitment by the central bank is reflected in (iv), a monetary-policy “reaction” rule that sets the policy interest rate as a function of the output gap and expected future inflation, and so closes the model.

7. **The chosen specification is a “gaps” model, in that each variable is expressed in terms of its deviation from equilibrium.** The model itself does not attempt to explain equilibrium movements in real output, the real exchange rate, the real interest rate, or the inflation target. Rather, the model takes these as given, and for forecasting purposes, they are provided exogenously by the analyst.

8. **The model is based closely on a standard FPAS model employed widely in the Fund,² but has been modified to account for important features specific to Romania.** Firstly, a large portion of the CPI basket in Romania is determined administratively by the authorities, whereas a further portion is dominated by a small number of volatile harvest-

² For a comprehensive guide to the standard model, see Epstein and others (2006), and Berg, Laxton, and Karam (2006a, 2006b).

related food items (principally: vegetables, fruit, and eggs) and fuel. These typically have a weak relationship with aggregate demand, and so the model focuses on a measure of core inflation that excludes these items. For forecasting purposes, once the model accounts for the core inflation rate, the path of administered prices is provided exogenously by the analyst, and volatile-food inflation is assumed to gradually close on the general rate of CPI inflation. Secondly, the model accounts for the fact that Romania's real exchange rate will likely continue to appreciate, on average, as the economy converges with the European Union (EU). This reflects an ongoing process of structural change and rising productivity, and is consistent with a steady state of balanced growth and stable inflation. The equations of the model have been modified to explicitly reflect this feature, and include trend appreciation of the equilibrium real exchange rate (see Box 1). The full model entails 61 dynamic equations,³ but most of these are simple identities or definitions, relating growth rates to levels, etc (see Appendix II). In essence, then, the model revolves around four easy pieces.

Basic building blocks

Aggregate demand (IS curve)

$$\begin{aligned}
 ygap_t = & \beta_{ld} ygap_{t+1} + \beta_{lag} ygap_{t-1} - \beta_{RRgap} (RR_{t-1} - RR_{t-1}^{eq}) \\
 & + \beta_{zgap} (z_{t-1} - z_{t-1}^{eq}) + \beta_{EUR} ygap_t^{EUR} + \varepsilon_t^y
 \end{aligned} \tag{1}$$

9. **Equation (1) is a behavioral equation that relates the output gap to its own lead and lagged values, as well as to the lagged value of the real interest rate, the lagged value of the real exchange rate, and the level of excess demand in Romania's main trading partners.** Again, all variables are expressed as gaps or deviations from their equilibrium values, and the real exchange rate is defined so that a decline represents a real appreciation.⁴ The own-lag term allows for inertia in the system, and permits shocks to have persistent effects. The lead term, however, allows for more complex business-cycle dynamics and captures the presence of forward-looking elements in demand. The real-exchange-rate and foreign-demand terms allow for the impact of foreign shocks. And the interest-rate term captures the idea that higher interest rates will encourage saving and discourage consumption and investment, providing a crucial link between monetary policy and the economy.

³ The model code is written using TROLL and FAME for database management, model solution, simulations, and reports.

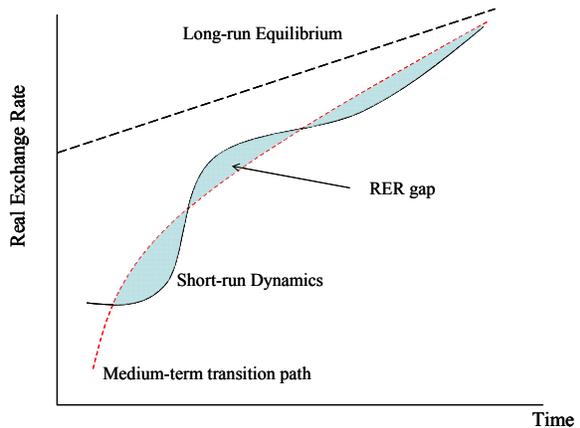
⁴ In this equation, $ygap$ is the output gap, RR is the real short-term interest rate, and z is the real exchange rate.

Box 1: Modeling the Equilibrium Real Exchange Rate

Estimating the real exchange-rate gap ($z_t - z_t^{eq}$) in a transition country like Romania raises a number of special issues. One key issue is that, as in many other transition countries, Romania's real exchange rate is undervalued by international standards—implying that the real exchange rate will likely continue on a path of trend appreciation as an inevitable part of real convergence.⁵ This pattern is relatively common throughout the region. Most transition countries entered the 1990s with low prices, extremely competitive costs and undervalued real exchange rates, and in this context, most experienced a substantial trend appreciation as they converged with their neighbors in western Europe. Indeed, one estimate suggests that, for central-European transition countries over 1992-2002, the cumulative real appreciation vis-à-vis the deutsche mark averaged over 230 percent (Lipschitz and others, 2002). Part of this process reflects an equilibrium response to rising productivity in the tradables sector (the Balassa-Samuelson Effect). A larger part, however, reflects: the impact of price liberalization; the removal of market distortions; demand-induced increases in non-tradable prices owing to growing incomes; and catch-up from previous undervaluation.

In the context of convergence and trend appreciation, therefore, care must be taken when defining the “equilibrium” real exchange rate. Looking at historical time-series data to estimate the equilibrium is unlikely to be helpful, as data is scarce and this type of approach generally (and incorrectly) assumes that the economy has been in equilibrium, on average, over the past sample period. For our purposes, therefore, we take a cross-country approach to gauge an appropriate level for Romania's real exchange rate. This level represents a long-run equilibrium, and is determined by standard macroeconomic fundamentals, such as Romania's income and productivity. We then estimate a reasonable medium-term convergence path to this longer-run equilibrium, based on the experience of other transition countries.

We associate the equilibrium real exchange rate (z_t^{eq}) with this medium-term convergence path. The FPAS model, therefore, attempts to explain the short-run dynamics of the actual real exchange rate about this path.



⁵ For further details and discussion, see Tiffin (2004) and the chapter on “Competitiveness,” in *Romania: Selected Issues, 2006* (IMF Country Report No.06/169).

Core inflation (Phillips curve)

$$\begin{aligned} \pi c_t = & \alpha_{\pi id} \pi c 4_{t+4} + (1 - \alpha_{\pi id}) \pi c 4_{t-1} + \alpha_{ygap} (\frac{1}{2} ygap_t + \frac{1}{2} ygap_{t-1}) \\ & + \alpha_z \left[(z_t - z_{t-1}) - (z_t^{eq} - z_{t-1}^{eq}) \right] + \alpha_{pt} (\pi 4_{t-1} - \pi c 4_{t-1}) + \varepsilon_t^{\pi c} \end{aligned} \quad (2)$$

10. **Equation (2) is a standard open-economy “new-Keynesian” Phillips Curve.** In this equation, the dynamics of quarterly core inflation depend on both expected future inflation, as well as on other sources of inertia.⁶ Forward-looking expectations are fully model-consistent (i.e. “rational”); and yet there is a lagged-inflation term in the Phillips curve coming from other sources of rigidity, such as indexation, regulation, or contracts. Inflation also depends on current and lagged excess demand, and on the pass-through from the real exchange rate, taking into account the equilibrium trend rate of real appreciation—this specification allows for a steady state in which the output gap is zero, inflation is stable, and where the pace of real appreciation is equal to its equilibrium trend rate. The model also allows for some feedback from headline CPI inflation into core inflation.

11. **The inflation equation is based on the natural-rate hypothesis, which implies that there is no long-run tradeoff between output and inflation.** In equation (2), the coefficients on expected and lagged inflation sum to one, implying that *any* steady level of inflation is consistent with an output gap and real-exchange rate gap equal to zero. The fundamental role of monetary policy, therefore, is to provide an anchor for inflation and inflationary expectations. In an inflation-targeting context, the monetary authority must anchor expectations to the target, and does this indirectly by influencing inflation through output and the exchange rate.

12. **The modeled rate of headline inflation is determined principally by a weighted average of core and administered-price inflation.** Again, administered prices are given exogenously. In equation (3) headline inflation is also influenced by the *relative* price of oil. In a steady state, where oil prices are rising in line with prices generally, these terms would have no effect. When relative oil prices are changing, however, we capture the pass-through effects using current and lagged rates of change. The equation also includes the (largely unpredictable) pace of volatile-food inflation, which is captured by the residual term ε_t^{π} .

⁶ Here, πc is the annualized quarterly rate of core inflation, $\pi c 4$ is the annual rate of core inflation, $\pi 4$ is the annual rate of headline CPI inflation, $\pi^{ad\ min}$ is the annualized quarterly rate of administered-price inflation; and $\pi^{rel\ oil}$ is the inflation rate for oil relative to the CPI.

$$\pi_t = \left[\alpha_{\text{admin}} \pi_t^{\text{admin}} + (1 - \alpha_{\text{admin}}) \pi c_{t-1} \right] + \left[\alpha_{\text{rpo1}} \pi_t^{\text{reloil}} + \alpha_{\text{rpo2}} \pi_{t-1}^{\text{reloil}} \right] + \varepsilon_t^\pi \quad (3)$$

The exchange rate (uncovered interest parity)

$$z_t = E_t [z_{t+1}] - \frac{1}{4} (RR_t - RR_t^{\text{EUR}} - \rho_t^*) + \varepsilon_t^z$$

where

$$E_t [z_{t+1}] = \delta_{zld} z_{t+1} + (1 - \delta_{zld}) \left[z_{t-1} + 2(z_t^{\text{eq}} - z_{t-1}^{\text{eq}}) \right]$$

13. **The exchange rate and interest rates are linked by an interest-parity condition.** This states that, with international capital mobility, the expected return on a short-term investment should be the same at home and abroad, ignoring country-risk premiums. If the exchange rate is expected to depreciate, therefore, an investor will demand compensation in the form of a higher domestic interest rate. Similarly, when the central bank raises short-term rates, the interest parity condition predicts an appreciation, and because other prices do not adjust immediately, this implies a short-term appreciation in real terms.

14. **For forward-looking exchange-rate expectations, we permit, but do not impose, model-consistent (“rational”) expectations.** In equation (4), the rational-expectations term is represented by $E_t [z_{t+1}] = z_{t+1}$ and is given a weight δ_{zld} . When $\delta_{zld} = 1$, expectations are purely rational and the model will have Dornbusch (1976) overshooting dynamics. In practice, however, overshooting often seems to take place in slower motion, so we allow for backward-looking expectations to generate more realistic dynamics. In an environment of trend appreciation, backward-looking agents don’t just forecast next period’s exchange rate by taking *last* period’s value (adaptive expectations). Instead, they adjust their expectations to the presence of a trend, and so add in the observed rate of trend appreciation as a guide to where the currency will be *next* period.⁷

15. **A time-varying risk premium is included to account for observed deviations from parity.** If interest rates in Romania are higher than those in the EU, even after accounting for expected appreciation, the model assumes that this reflects an added risk premium for Romania (ρ_t^*). However, it should be noted that no consensus exists in the

⁷ This type of modification has been used in other transition countries with a convergence-related pattern of trend real appreciation. See Coats, Laxton, and Rose (2003), *The Czech National Bank’s Forecasting and Policy Analysis System*.

literature on the causes of deviations from interest parity, and the interpretation of the risk premium does not have to be literal.⁸

The interest rate (policy reaction function)

$$RS_t = \gamma_{RSlag} RS_{t-1} + (1 - \gamma_{RSlag}) [RR_t^{eq} + \pi 4_t + \gamma_\pi [\pi 4_{t+4} - \pi_{t+4}^{target}] + \gamma_{ygap} ygap_t] + \varepsilon_t^{RS} \quad (5)$$

16. **Finally, equation (5) is the central bank's policy reaction function.** The key policy instrument is the short-term nominal interest rate (RS), and the bank adjusts this rate in order to anchor inflationary expectations around the announced inflation target (π^{target}). In addition, the equation allows for the possibility that the central bank is also concerned about deviations of output from equilibrium, and further assumes that that the bank may prefer to adjust rates smoothly over time.⁹

17. **The lag structure of the combined model highlights the challenges and limitations of monetary policy in an inflation-targeting framework.** As there is inertia in the reaction function (with some weight given to the current output gap), and as there is also inertia in the transmission of the policy rate to the output gap, and as there is yet a further delay before changes in the output gap begin to impact headline inflation, it is not possible for the central bank to set interest rates so that inflation will always be on target. Indeed, it is not even possible to always ensure that forecast inflation, one year ahead, will always equal the target. *Instead, the role of policy is to set interest rates so that inflation is projected to return to target over a reasonably short horizon.*

Supply side

18. **This model has only a rudimentary supply side.** As mentioned, output and the real interest rate appear in all the behavioral equations in gap terms. The model itself does not attempt to explain movements in equilibrium levels for real output, the real exchange rate, the real interest rate, or the inflation target. Rather, these are taken as given. For baseline forecasts and analysis of specific risks or policies, therefore, this means that the analyst must make explicit assumptions about equilibrium levels. Using output as an example, the estimated level of overall output will depend on the output gap from equation (1) and the assumed level of potential output (y^{eq}):

⁸ See Bacchetta and van Wincoop (2006) for an explanation based on information imperfections.

⁹ The lagged interest-rate term allows the bank to gradually adjust rates toward the desired level. This feature is not easily rationalized, but is widely observed.

$$y_t \equiv ygap_t + y_t^{eq}$$

19. **In this context, therefore, the analyst must be clear in outlining the specific assumptions underlying the model’s equilibrium-level projections.** The assumptions and procedures behind the staff’s estimate of potential GDP are described in Box 2.

Rest of the world

20. **Given that Romania is a small open economy, the model allows for the impact of foreign shocks on the domestic environment.** As an approximation, the rest of the world is represented by Europe (EU25), and the model includes a parallel series of equations for the EU economy, except that the direction of causation is assumed to be one way only—events in Europe will affect Romania, but Romanian developments are assumed to have no impact on Europe. For this paper, we have not modeled any scenarios entailing a shock to external demand or an unexpected hike in EU interest rates, although this is certainly possible.

21. **However, in constructing our baseline scenario, we note that the business cycle in the EU, and the setting of EU policies, has typically not been in line with conditions in Romania.** Whereas Romania is overheating, output has been relatively sluggish in Europe over the past year or so, and interest rates have been relatively low. Looking forward, EU growth rates have been picking up, and EU policy rates have increased accordingly—in this context, the model will automatically project a path in which Europe returns to equilibrium, and this will then help shape the evolution of activity, exchange rates, and prices in Romania.

Calibration

22. **The results of our model will depend crucially on the parameter values of the above equations.** A key question, therefore, is how to choose these parameters to accurately reflect the nature of the Romanian economy. We have taken an eclectic approach, following current modeling practice in many policymaking institutions. The basic idea is to choose coefficients that seem reasonable based on economic principles, available econometric evidence, and an understanding of the functioning of the economy, and then to look at how sensible the properties of the resulting model are. Given that the inflation-targeting framework in Romania is relatively new, and that time-series data often incorporates an ongoing process of profound structural change, we are also strongly guided by the Fund staff’s accumulated experience with similar models. We then engage in an iterative calibration process, in which the properties of the model are examined and changes made to the coefficient values, or the structure of the model, until the model behaves appropriately. Of course, this is an ongoing process; so that as more data arrive, and as we understand more about the transmission process in Romania, we will most likely update the model accordingly. A more detailed treatment of the current calibration is provided in Appendix I.

Box 2: Estimating Potential Output Using the LRX Filter

The output gap ($y_t - y_t^{eq}$) plays a central role in the FPAS model, and is defined as the difference between actual output, which is observable, and potential output, which is not. Arriving at an estimate of potential output, therefore, is crucial. Conceptually, the definition is straight forward—potential output is a summary indicator of aggregate supply, and simply represents the level of GDP that the economy can produce without generating inflationary pressures. However, the task of actually estimating this indicator is often less straight forward, and has generated a broad array of techniques and methodologies.¹⁰

One of the most commonly-used methodologies for estimating potential output is the Hodrick-Prescott (HP) filter. This aims at extracting a long-term trend from real output, under the assumption that actual GDP data reflect the influence of both supply and demand shocks, and further assuming that supply shocks are persistent and demand shocks are relatively short-lived. Formally, the technique chooses a path for y_t^{eq} that minimizes the following expression:

$$\sum_t (y_t - y_t^{eq})^2 + \lambda \sum_t [(y_{t+1}^{eq} - y_t^{eq}) - (y_t^{eq} - y_{t-1}^{eq})]^2$$

The first term is the square of gap between actual and potential output, and the second term is the square of the change in potential output growth. The “smoothness” parameter λ determines the extent of permissible variations in potential output growth, and implicitly reflects a judgment as to the weight of supply shocks relative to demand shocks. The larger the value of λ , the smoother the estimate of potential output (aggregate supply), and so the larger the proportion of output variability ascribed to demand shocks. If $\lambda = 0$, on the other hand, all shocks are assumed to stem from the supply side, and so the estimated output gap will always be zero. For quarterly data, a value of $\lambda = 1600$ is usually chosen.

The HP filter is easy to use, but has some disadvantages. A key issue is the so-called “end-point” problem. Because it takes some time to determine the persistence of recent shocks, the HP filter cannot easily distinguish between transitory demand shocks and more-permanent supply shocks toward the end of the sample period. As more data is received, a GDP movement that was initially assumed to be a temporary demand shock may turn out to be more persistent than expected, and so may have to be reclassified as a supply shock. This can often result in a substantial revision to end-of-sample measures of potential output; and because current estimates of the output gap underpin the model’s forecast for near-term inflation, this can be a serious issue. In the case of Romania, stronger-than-expected growth in 2006 caught most forecasters unawares, and prompted the NBR to revise its potential-output estimates upward on a number of occasions.

¹⁰ See Claus and others (2000) for a survey and discussion.

(Continued...)

To offset these issues, the model augments the HP approach with the judgment of the staff. Firstly, the end point issue is ameliorated, to some extent, by extending the GDP data series into the future; using the staff's most-recent near-term GDP forecast. Secondly, the HP filter is modified to include a number of judgment-based conditioning constraints. The modified version is known as the Laxton-Rose-Xie (LRX) filter and chooses a path for y_t^{eq} that minimizes:

$$\sum_t \omega_{1t} (y_t - y_t^{eq})^2 + \lambda \sum_t [(y_{t+1}^{eq} - y_t^{eq}) - (y_t^{eq} - y_{t-1}^{eq})]^2 \\ + \sum_t \omega_{2t} [(y_t^{eq} - y_{t-1}^{eq}) - dprior_t]^2 + \sum_t \omega_{3t} [(y_t - y_t^{eq}) - prior]^2$$

The two new terms allow the staff to i) impose a particular growth-rate estimate for potential output (*dprior*) for any part of the modeled timeframe, with the relative importance of this constraint given by ω_2 ; and similarly ii) to impose a particular output-gap estimate (*prior*) for any point in time, with a relative weight of ω_3 .

The judgments and constraints included in the estimation reflect the best assessment of the staff, in close consultation with the authorities. More specifically, staff estimates of potential output assume:

- i) a positive output gap in 2004, which closes by the end of that year to give a negative output gap in 2005;
- ii) and that potential growth will return to the staff's baseline estimate of 5½ percent by 2010.
- iii) In addition, staff estimates are generally conditioned on the NBR's most-recently published output-gap assessment—NBR staff use a broad range of increasingly-sophisticated methodologies to arrive at their best estimate of potential output. For 2006Q3, we assume that the output gap was 1.0 percent of GDP, which implies that the potential growth rate in 2006Q3 was about 6.3 percent. These estimates are broadly in line with the NBR's February 2007 inflation report.

C. Inflation Targeting in Romania

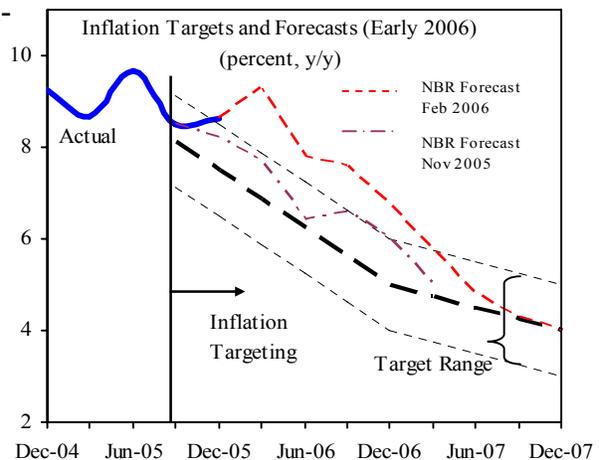
23. **The NBR announced a shift to inflation targeting in August 2005.** Previously, the NBR had attempted to maintain a generally-steady level for the real exchange rate, leaning against building pressure for real appreciation (See Figure 1). The announcement of the new framework, however, coincided with an immediate test of the central bank's resolve. In September 2005, with a newly-liberalized capital account, the NBR faced an accelerating wave of inflows. Rather than accept appreciation, the bank instead intervened heavily in the foreign exchange market and reduced its sterilization efforts—refusing to absorb the full amount of excess liquidity at the policy interest rate, and so leaving any remaining liquidity to flow into the extremely low-yielding deposit facility.¹¹

¹¹ The policy interest rate determines the maximum allowable rate paid on the NBR's key policy instruments, which are a one-month deposit facility and a three-month certificate of deposit. Any remaining bank liquidity is (continued...)

24. **In this manner, one of the NBR’s first actions under the new framework was to push the effective interest rate (the average rate at which it accepts bank deposits) significantly below its key policy rate.** This not only threatened to weaken the signaling role of the policy rate, but also raised concern that the NBR was still focused on the exchange rate, perhaps at the expense of its inflation goals. The drop in the effective interest rate was largely successful in arresting short-term pressure on the exchange rate, but represented a significant pro-cyclical easing of policy—throughout the final quarter of 2005, the effective interest rate was deeply negative in real terms.

25. **With less pressure on the exchange rate, the NBR was able to refrain from further intervention after November 2005.** The bank also gradually increased the volume of sterilization, bringing the effective interest rate up to meet the official policy rate—by early 2006, the two rates were roughly in line at 7½ percent. While this represented a significant tightening, inflationary expectations were still around 7-8 percent, so the real effective rate was barely positive in real terms.¹²

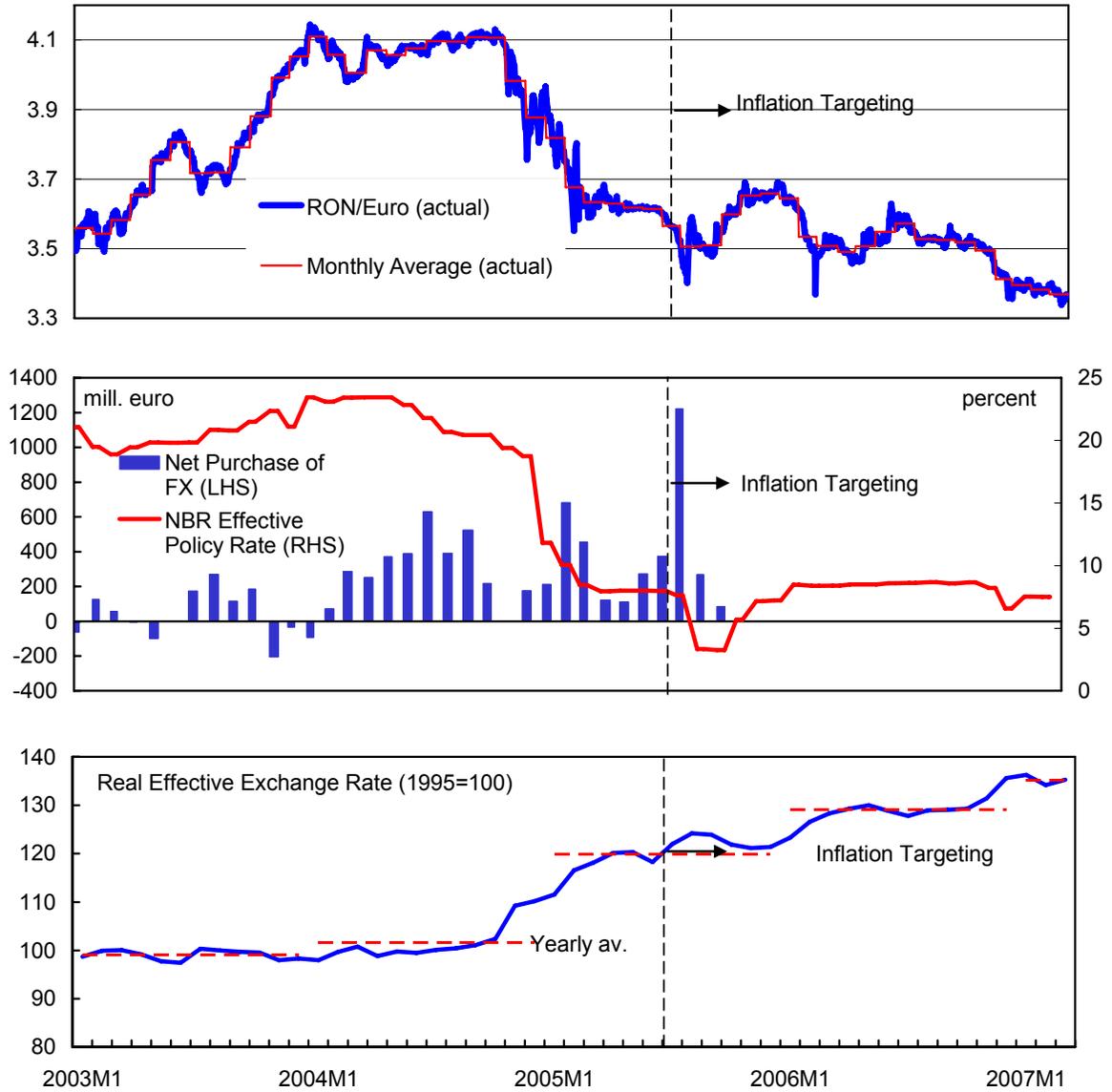
26. **In terms of inflation performance, four months after the new framework was introduced, inflation exceeded the upper band of the end-2005 target range, and appeared unlikely to fall within the target range for 2006.** This pessimistic outlook reflected the likely impact of monetary easing and higher wages on aggregate demand. Also, administered prices were projected to add 2½-3 percentage points to the headline inflation rate. Moreover, the fact that the inflation target had been missed just four months after its announcement, together with the NBR’s apparent focus on the exchange rate, had sent mixed signals to the market, complicating efforts to successfully anchor expectations.



typically placed in the NBR’s one-percent overnight facility, and the weighted average of these three facilities defines an “effective” interest rate, which directly impacts the short-term interbank rate.

¹² Inflation in 2006 fell much more quickly than expected, reaching about four percent by the end of the year. Ex post, therefore, real rates were also higher than expected.

Figure 1. Romania: Exchange Rates, Intervention, and Interest Rates



Source: National Authorities, IMF INS Database, staff calculations.

27. **Nonetheless, the NBR considered that there was little benefit in adjusting the inflation targets for 2006-07.** The bank's own modeling simulations suggested that, on balance, a revision of the 2006 target would be more costly in terms of the NBR's credibility, and would significantly dampen the pace of disinflation over the forecast horizon. In this context, the NBR instead shifted its public focus to the inflation forecast for 2007, endeavoring to provide a credible action plan to achieve the 4-percent target by the end of this period. The plan correctly stressed the need for supporting fiscal and incomes policy.

28. **As part of a renewed effort to further strengthen credibility, the NBR hiked the policy rate by 100 bps to 8½ percent in February 2006.** And as expected, this generated renewed, if moderate, pressure on the currency. Throughout the course of the year, a steady pace of nominal appreciation helped restrain core inflation. Nonetheless, strong output growth and expanding excess demand raised concern about future inflationary pressures, prompting the NBR to nudge interest rates up further by another 25 bps in July.

Toward the end of 2006, three key developments had become clear.

- Firstly, GDP growth had surpassed all expectations, and was well above any reasonable estimate of potential—in terms of the model, therefore, the output gap had widened significantly.
- Second, despite the growing output gap, inflation had dropped much more rapidly than expected—end-2006 inflation finished well within target at just under 5 percent. In part, this reflected a leakage of demand into imports. But mostly, lower headline inflation reflected continued appreciation; a bumper harvest with a resulting drop in volatile-food prices; together with delayed administered-price increases. Core inflation had fallen more modestly, however, reflecting the strength of excess demand
- And finally, with a marked, if unexpected, drop in inflation, the interest-rate setting of the NBR had tightened in real terms—so that by end-2006, the real effective rate was clearly above the estimated equilibrium neutral rate.¹³

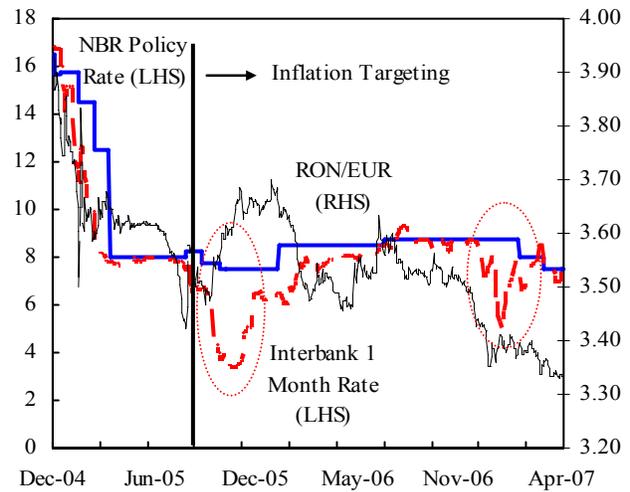
29. **Looking forward, however, the prospects for inflation in 2007 appear less promising.** The drop in food prices is unlikely to be repeated again this year, and excess demand is still strong. On policy, although the monetary stance is tighter than anticipated, the

¹³ With expected inflation at around 5 percent, a nominal policy rate of 8¾ implies a real rate of about 3-4 percent—above the estimated neutral rate of 2 percent.

authorities' 2007 target for fiscal and wages policy implies an opposite, and dramatic, stimulus for future demand.

30. **Moreover, in early-2007 the NBR cut interest rates dramatically.** A sharp appreciation prompted the authorities to once again limit the amount of liquidity absorbed at the policy rate, again driving the effective interest rate below the policy rate. This time, rather than raise the effective rate to meet the policy rate, the NBR instead dropped the policy rate by 75 bps to 8 percent in February, and by a further 50 bps in March to 7½ percent—at which point the effective and policy rates were back in line. Market participants were

particularly surprised by the latter move, which was perceived as highlighting the NBR's enduring focus on current appreciation, rather than on future inflation. From a modeling framework, such an aggressive loosening of monetary policy is premature. An effective nominal rate of 7½ percent is, in real terms, only marginally above the estimated neutral rate, and will do little to close the current output gap.



D. Using the Model

31. **We are now in a position to analyze the authorities' current policy mix.** More specifically, a key goal of the model is to allow a structured and consistent discussion of current policies, in light of recent trends and the authorities' goals; and to provide a useful tool to simulate the impact of different policy settings.

32. **The model can be helpful in the preparation of baseline forecasts.** Typically, the model itself does not make the short-term baseline forecast. This comes from Fund-staff specialists, using a range of tools and all available information—the model is, by design, a relatively simple and tractable representation of the economy, and so cannot hope to capture the full complexity of current developments. Still, the model can serve to frame the discussion about the baseline forecast, by ensuring a coherent story. At this point, once the staff has settled on their best short-term projection, a variety of techniques are available to tune the model solution to a judgment-based path over the immediate run. Then, the model helps shape the medium- and long-term section of the baseline forecast, where issues of consistency and dynamics are resolved in a process of convergence to the estimated equilibrium path.

33. **The model comes into its own, however, in evaluating risks to the forecast, and in allowing the rapid analysis of alternative policy scenarios.** In most central banks that use an FPAS-like methodology, analysts will run a wide range of different risk scenarios before a formal baseline is chosen. Then, some of these experiments will be selected and documented as risks to the baseline scenario. For our forecast, a key assumption involves the (exogenous) pace of future administered-price inflation. We endeavor to keep our projections in line with those of the NBR,¹⁴ but the future path is subject to considerable uncertainty. With smaller increases in administrative prices, headline inflation would be lower, and so there would be less immediate pressure on the central bank to tighten policy. Similarly, an unexpectedly-strong appreciation of the exchange rate—which would be modeled as a negative shock to Romania’s interest-parity risk premium—would also help ease inflationary pressure. For the purposes of this paper, however, we will illustrate the usefulness of the model by simulating different policy settings, and contrasting the impact of the current policy mix with the adjustment policies recommended by Fund staff.

34. **At present, the economy is overheating.** This is reflected in output growth well above potential, stalled disinflation for core prices, and a dramatically-widening external deficit. Under current policies, however:

1. The authorities are intent on widening the fiscal deficit, to a target level of 2.8 percent of GDP;
2. the government has promised to allow additional generous hikes in public-sector wages (up to 20 percent on average).
3. interest rates have been cut significantly to 7½ percent.

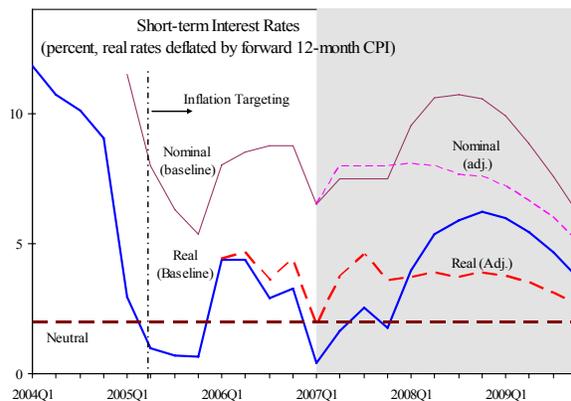
35. **Under the authorities’ policy mix, the output gap will most likely widen further, significantly complicating the NBR’s efforts to keep inflation within the target range.** The baseline scenario—which takes these policies as given and assumes that the NBR will keep interest rates steady at their current level—projects that, under these circumstances, growth will probably reach 7 percent for 2007, well above potential. Similarly, under current policies it is most unlikely that end-year inflation will remain under 5 percent; the upper band of the NBR’s target range. Again, this is a central forecast and is subject to various risks. With smaller increases in administered prices, or an unexpected shock to the exchange rate, headline inflation may be lower. But, ultimately the underlying strength of excess demand will have an impact, unless the authorities take corrective action.

¹⁴ Our baseline projection assumes an administered-price inflation rate of about 6½ percent for 2007.

36. **Over the medium term, the model demonstrates the full cost of this policy mix, by outlining the future effort required to bring the economy back on track.** As mentioned, inflation within this framework has no natural anchor. Instead, stable inflation requires commitment, and action, from the central bank. Once inflation starts to rise, as it will in 2007, the central bank must step in to bring the rate back down again. Clearly, this task is much more difficult if the bank is fighting against expansionary fiscal and incomes policies. Similarly, the longer the bank delays in taking action, the harder the ultimate task of bringing about stabilization.

37. **Under the baseline, we assume that the NBR will keep rates steady for 2007, but will then take whatever steps necessary to bring inflation back into the target range within a reasonable timeframe.** Under this

scenario, with a widening gap between actual inflation and the official target, the central bank will have to raise rates sharply in 2008, perhaps higher than 10 percent. This implies a dramatic hike in real interest rates which will help close the output gap. Then, as the output gap turns negative, inflationary pressures will recede, and the headline rate will once again be brought into line with the official target (see Figure 2).

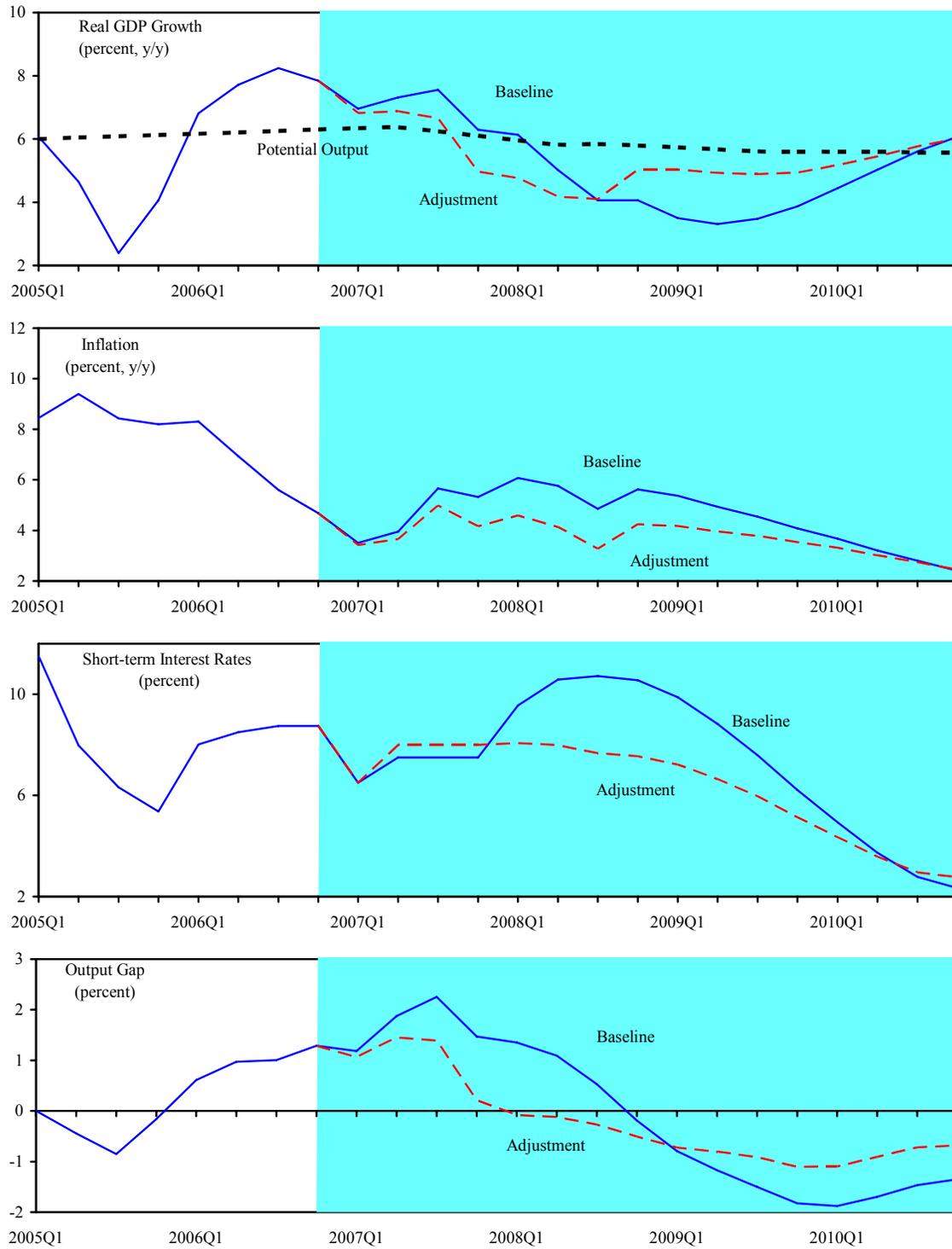


38. **Under the adjustment scenario, however, the policy mix in 2007 is less expansionary.** As outlined in the staff report, the recommended policies include:

1. A fiscal deficit no larger than 1 percent of GDP, effected principally through reduced current spending;¹⁵
2. Public-sector wage increases that are more in line with the authorities' single-digit inflation goals; and
3. An immediate hike in the NBR's policy interest rate, to about 8 percent.

¹⁵ As evident from Section B, the framework does not explicitly model the impact of fiscal policy. Instead, the impact of a lower/higher budget deficit is represented by a negative/positive shock to aggregate demand.

Figure 2. Romania: Policy Scenario Summary, 2005–2010



Sources: National authorities; staff calculations

39. **These policies will prevent the further expansion of excess demand, ensuring that the output gap is eliminated by end-2007.** With less inflationary pressure, the headline inflation rate is projected to remain broadly within the target range, implying that less effort will be required from monetary policy in 2008. Indeed, the adjustment scenario foresees a relatively-smooth path for real and nominal rates—in which falling inflation allows for a gentle decline in the nominal interest rate in 2008, consistent with a steady real rate until late 2009. At that point, both nominal- and real-interest rates can be allowed to fall.

40. **The adjustment scenario entails a much “softer” landing than under the baseline projection.** By taking early action and forgoing the fiscal impulse implied by the authorities’ 2007 deficit target, the authorities can avoid an unnecessarily abrupt adjustment in the future. It is true that output growth is lower in 2007 under the adjustment scenario, but growth is generally higher from mid-2008 onward, and evolves along a much more stable path. Similarly, the output gap closes more quickly under the adjustment scenario, but does not turn so sharply negative over 2009-2010—implying that the baseline forecast entails a significantly more-severe recession over the medium term.

41. **Although the model focuses principally on monetary policy, the key difference between the two scenarios is the stance of fiscal and incomes policies.** An immediate increase in the interest rate to 8 percent represents a modest tightening, and would also be a useful signal of the NBR’s inflation-targeting commitment. However, this represents only part of an overall, more-balanced, policy mix. The main thrust of the staff’s recommendations is that the authorities should avoid introducing a procyclical fiscal stimulus at a point when the economy is already overheating. In this context, the sharp boost in future interest rates under the baseline is not so much the result of earlier delays in monetary tightening. *Instead, higher interest rates tomorrow reflect the inflationary consequences of fiscal expansion today.*

E. Sensitivity Analysis

42. **A further advantage of the model is that it allows staff to quickly determine the impact of key assumptions on forecasts and recommendations.** These assumptions might concern, for example, the level of future EU interest rates, or the path of administered prices in Romania, or even the authorities’ inflation target. They might even concern the value of a key parameter, such as the lead term in the inflation equation.¹⁶

¹⁶ The importance of forward-looking expectations in the Phillips curve has sometimes been interpreted as an indicator of the credibility of the Central Bank’s commitment to inflation-targeting.

43. **For our purposes, however, perhaps one of the most central assumptions concerns the current estimate of potential output.** As highlighted in Box 2, this estimate is key in determining the current level of excess demand, which in turn drives the inflation forecast. It is important, therefore, that the analyst be relatively confident in the estimate, and have a sense of how her recommendation might change under different assumptions.

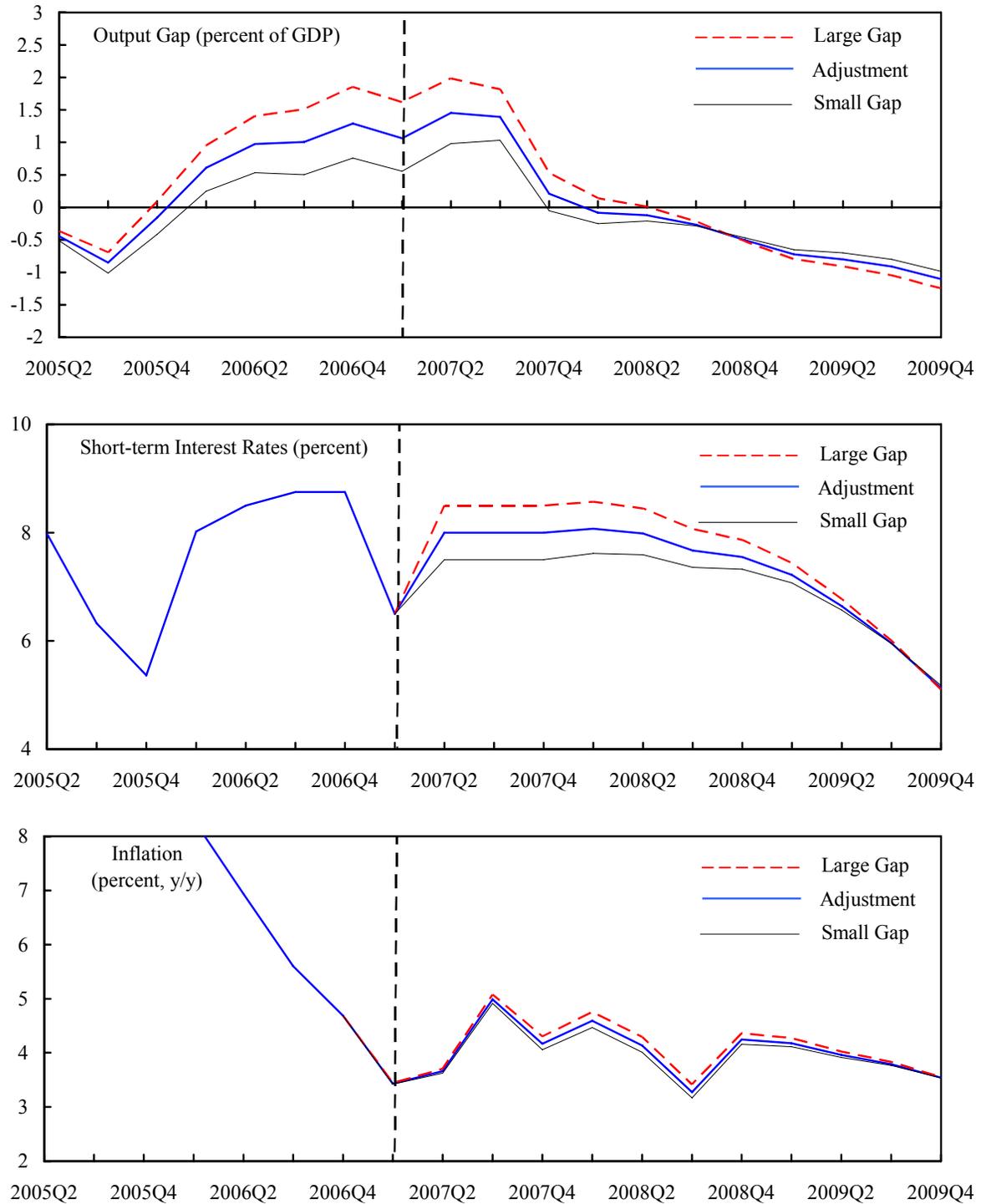
44. **We therefore test the sensitivity of our policy recommendations to our assumptions on potential output, drawing heavily from ongoing quantitative analysis conducted by the NBR.** The NBR modeling staff, noting the short span of available time series, employs a wide range of univariate and multivariate methodologies in extracting potential output from recent GDP data.¹⁷ Despite the variety of estimation techniques, however, estimates for potential-output growth still tend to fall within a relatively-small range. For mid-2006, the central estimate for equilibrium growth was 6.3 percent, corresponding to a positive output gap in 2006Q3 of about 1 percent of GDP. The standard deviation of these growth estimates was about 0.4 percentage points.

45. **As an example, we explore the implications of a one-standard deviation change in the estimated potential growth rate in mid 2006.** Adding one standard deviation would imply that the growth rate of potential output was 6.7 percent during this period, rather than 6.3 percent. This in turn implies that a larger portion of observed GDP growth was the result of an expansion in aggregate supply, rather than aggregate demand—with the net result being a lower output gap. Similarly, a lower estimate for potential output growth would imply a higher output gap in 2006. The implications of changing this assumption on our adjustment scenario are illustrated in Figure 3 below.

	Large Gap	Adj. Scen.	Small Gap
Potential Output Growth in 2006Q3	5.9	6.3	6.7
Implied Output Gap in 2006Q3	1.4	1	0.7

¹⁷ As many as 28 strategies are used, including univariate band-pass, Hodrick-Prescott, and Kalman-filter techniques, together with various multivariate Kalman-filter and structural-VAR models, as well as a production-function approach.

Figure 3. Romania: Sensitivity Analysis



Sources: National authorities; staff calculations.

46. **The figure shows how, ideally, monetary policy should change to maintain the same general path for inflation.** With a higher output gap, there is more inflationary pressure in the economy, and so the central bank needs to increase rates in order to achieve the same inflation target. From our estimates, the NBR would need to hike interest rates by another 50 bps, to 8½ percent.¹⁸ With a lower output gap, on the other hand, there would be less inflationary pressure and so rates could be lowered, perhaps to 7½ percent, which is the current policy setting.

F. Conclusion

47. **This chapter has presented a simple Forecasting and Policy Analysis System (FPAS) for Romania, which has been designed to help in the preparation of the staff's forecasts and policy assessments.** The FPAS is based closely on a similar model in widespread use at the Fund, but has been calibrated and modified to reflect specific features of the Romanian economy. The model embodies the key principle that, in an inflation-targeting framework, the role of monetary policy is to provide an anchor for inflation and inflationary expectations, and mirrors a similar modeling effort underway at the NBR

48. **A major advantage of this approach is that it allows the systematic and rapid analysis of different policy options.** In this context, the chapter has provided background for the staff's current policy recommendations, outlining in particular the challenges of restraining inflation in the face of an overheating economy and expansionary fiscal and incomes policies.

49. **The development and calibration of this model is an ongoing process.** As the economy evolves, and as we understand more about the transmission mechanism in Romania, we will no doubt refine the model further—the current version has benefited greatly from discussions with NBR staff, and we look forward to equally-fruitful collaboration in the future.

¹⁸ We assume the same restrictive fiscal stance under all scenarios; so that all of the adjustment between scenarios falls on monetary policy.

APPENDIX I. CALIBRATION

Output gap equation

$$ygap_t = \beta_{ld}ygap_{t+1} + \beta_{lag}ygap_{t-1} - \beta_{RRgap}(RR_{t-1} - RR_{t-1}^{eq}) \\ + \beta_{zgap}(z_{t-1} - z_{t-1}^{eq}) + \beta_{EUR}ygap_t^{EUR} + \varepsilon_t^y$$

Parameter	Lower Range	Upper range	Romania/EU
β_{ld}	0.05	0.15	0.10/0.10
β_{lag}	0.50	0.90	0.75/0.60
β_{RRgap}			0.12/0.15
	Sum	Sum	
β_{zgap}	0.10	0.30	0.03/n.a.
β_{yEUR}	---	---	0.15/n.a.

50. **For most economies, there are lags in the transmission of monetary policy.** In terms of the aggregate demand equation, this would lead us to expect that the sum of β_{RRgap} and β_{zgap} will be small relative to the parameter on the lagged output gap. Berg, Karam and Laxton (BKL) suggest that that the sum of β_{RRgap} and β_{zgap} is between 0.10 and 0.20 for most economies.¹⁹ For Romania, we begin with a sum at the lower end of this range, as it appears that policy may operate relatively slowly in this case. BKL further opine that the parameter on the lagged gap term, β_{lag} , would typically lie between 0.50 and 0.90. We begin with 0.75, towards the upper end of the range, for the same reason. For the weight on the lead of the output gap, β_{ld} , we have picked 0.1, which is in the middle of the range applied for other countries. Together, these settings provide a model economy with a generally high degree of inertia, which we would argue is an appropriate characterization of Romania.

51. **Considering the effect of the price variables.** Coefficient β_{RRgap} determines the direct effect of the interest rate on the output gap (with a one quarter lag). Our starting point for this value in Romania model is 0.12, which reflects our view that policy does have a direct impact in Romania, but perhaps less so than in the more industrialized EU. This is also broadly in line with similar estimates by the NBR. For industrial economies, we would expect that β_{zgap} would typically be smaller than β_{RRgap} and would depend on the degree of

¹⁹ See Berg, Karam, and Laxton (2006a).

openness. We have calibrated the model with β_{zgap} at 0.05, about one-quarter the value taken for β_{RRgap} .²⁰ The degree of openness would also influence the relative importance of the direct effect of world excess demand through β_{yEUR} ; normally this effect would be expected to be less than the direct effect of domestic demand conditions. We have set this parameter to 0.15, one-fifth of the domestic (lagged) output-gap coefficient.

Core Phillips curve

$$\pi c_t = \alpha_{\pi ld} \pi c_{t+4} + (1 - \alpha_{\pi ld}) \pi c_{t-1} + \alpha_{ygap} \left(\frac{1}{2} ygap_t + \frac{1}{2} ygap_{t-1} \right) + \alpha_z \left[(z_t - z_{t-1}) - (z_t^{eq} - z_{t-1}^{eq}) \right] + \alpha_{pt} (\pi 4_{t-1} - \pi c_{t-1}) + \varepsilon_t^{\pi c}$$

Parameter	Range	Considerations	Romania/EU
$\alpha_{\pi ld}$	0-1.0	Sacrifice ratio	0.20/0.20
α_{ygap}	.25-0.5	Sacrifice ratio	0.4/0.30
α_z	Short-run pass-through effect: depends on openness, pricing to market, monetary policy credibility, etc.		0.06
α_{pt}	---	Degree of relative price and real wage resistance	0.25/0.25

52. **The behavior of the economy depends critically on the value of $\alpha_{\pi ld}$.** If there is a high weight on the forward component ($\alpha_{\pi ld}$ is 1), then inflation is equal to the sum of all *future* output and exchange rate gaps. In that case, a small but persistent hike in interest rates will have a large and immediate effect on current inflation. If on the other hand, there is a lot of inertia ($\alpha_{\pi ld}$ is close to 0), then current inflation is a function of lagged values of the gaps, and it may require a lengthy period of monetary pressure to move inflation toward the desired path. Where price setting is flexible and the monetary authorities are very credible, high values of $\alpha_{\pi ld}$ might be reasonable, but for most countries values of $\alpha_{\pi ld}$ significantly below 0.50 seem to produce results that are more consistent with data.²¹ For Romania, we begin with $\alpha_{\pi ld}$ at 0.2—a moderately high, but not extreme, degree of inertia in inflation.

²⁰ Note, however, that the relative size of this parameter does not determine alone the relative importance of the two channels of monetary policy. The exchange rate and the interest rate are linked, and the speed and strength of the response of the exchange rate will be very important.

²¹ The choice of parameters like this may change over time. For example, if the successful implementation and communication of a policy regime like inflation targeting results in gains in credibility, we would expect to see more weight to be placed on the forward component.

53. **The value of α_{ygap} plays a large role in determining the short-term responsiveness of core inflation to excess demand.** Economies with more rigidity in price setting (regulation, contracts, etc.) would be expected to have lower values, whereas more dynamic economies—or those undergoing rapid structural changes and shifts in relative prices—may tend to have higher values, all else equal.²² We begin with α_{ygap} set to 0.4. This applies to a simple moving average of the current and lagged gaps so that, all else equal, an output gap of 1 percentage point will result in the inflation rate rising by 0.2 percentage points, with a similar effect next quarter.

54. **The value of α_z determines the effects of exchange-rate changes on inflation, and would typically be larger in economies that are very open.** Higher pass-through is also observed in countries where monetary policy credibility is low, and where the value-added of the distribution sector is low. There is evidence of pricing-to-market behavior in many economies, suggesting that α_z would be considerably smaller than the import (or traded goods) weight in the CPI basket. Based on preliminary work on this issue, we have set α_z to 0.08. On the feedback effect from headline inflation to core inflation, α_{pt} is set to 0.05, so that if headline inflation increases to one percentage point above core inflation, the latter responds with a one-quarter lag by 0.05 percentage points.

55. **Looking to headline inflation, the oil-price terms (α_{rpo1} and α_{rpo2}) allow for a direct effect of oil prices on the CPI when the relative price of oil is changing.** In the Romanian context, both parameters are set to 0.0076, which reflects a preliminary estimate of the relevant elasticity. The weight of administered prices in headline inflation ($\pi^{ad\ min}$) is set at 0.25.

Exchange rate

$$z_t = E_t [z_{t+1}] - \frac{1}{4} (RR_t - RR_t^{EUR} - \rho_t^*) + \varepsilon_t^z$$

where

$E_t [z_{t+1}] = \delta_{zld} z_{t+1} + (1 - \delta_{zld}) [z_{t-1} + 2(z_t^{eq} - z_{t-1}^{eq})]$			
parameter	Lower range	Upper range	Romania
δ_{zld}	>0	1.0 - Dornbusch Overshooting <0.5 (more prudent) - Isard and Laxton	0.25

²² It is important to understand, however, that the general issue of the nature and speed of response to excess demand is not primarily determined by this parameter. We must also take into account the policy response to excess demand, the influence of that response on the exchange rate, and the degree of inertia in expectations.

56. **Again, the value of the parameter on lead expectations (δ_{zld}) determines the relative strength of rational expectations in exchange-rate determination.** If $\delta_{zld} = 1$, expectations are purely rational, and the exchange rate becomes a function of the future sum of real interest differentials (and risk premia), providing a direct and rapid channel through which monetary policy operates. Unfortunately, there is little consensus on a reasonable value for δ_z . For policy, it may be imprudent to rely heavily on these forward-looking linkages in the face of uncertainty. Isard and Laxton (2000) suggest that policy could be made more robust in an uncertain world by assuming that δ_z is slightly below 0.5, because of larger and asymmetric costs that would result from assuming extreme values. For the Romania model, we begin cautiously with δ_{zld} set to 0.25.

Monetary policy rule

$$RS_t = \gamma_{RSlag} RS_{t-1} + (1 - \gamma_{RSlag}) \left[RR_t^{eq} + \pi 4_t + \gamma_\pi [\pi 4_{t+4} - \pi_{t+4}^{target}] + \gamma_{ygap} ygap_t \right] + \varepsilon_t^{RS}$$

Parameter	Lower range	Upper range	Romania/EU
γ_{RSlag}	0- typically >0.5	1.0	0.65/0.50
γ_π	>0	5.0 -relate to $\alpha_{\pi ld}$	2.5/2.0
γ_{ygap}	>0		0.5/0.5

57. **An important lesson from the 1970s, and one embedded in the structure of this model, is that a stable inflation rate requires concrete action on the part of the monetary authorities, and so requires a positive coefficient on inflation (γ_π).**²³ Beyond this, although our framework does not allow for explicit analysis of optimality,²⁴ it may be useful to note that the strength of the authorities' reaction should depend on other features of the economy. If the economy is very forward-looking, for example, then mild but persistent reactions to expected inflation should be enough to keep inflation close to target. We begin

²³ This restriction, which is necessary to provide an anchor for the system, has come to be known as the Taylor principle, after John Taylor who popularized the idea of using interest rate reaction functions to characterize monetary policy in macro models.

²⁴ The analyst could create a loss function, for example one that depends on the variance of output and inflation and possibly interest rates, and then simulate the model to determine how, in the face of a given pattern of shocks, a particular rule performs under different weights.

with γ_π set at 2.5, which implies a fairly aggressive response, but well below what has been used to characterize very aggressive central banks.²⁵ In a similar fashion, we have chosen 0.5 for γ_{ygap} , which is an average weighting. We assume that the central bank smoothes interest rates, adjusting them gradually to the desired value based on deviations of inflation and output from equilibrium. We have set this parameter, γ_{RSlag} , to 0.65, which is a moderate-to-low value, compared to the range reported by BKL.

²⁵ In the model for the Czech Republic, for example, this parameter was set to 5 (Coats, Laxton, and Rose, 2003).

APPENDIX II. COMPLETE MODEL EQUATIONS

The following are the key equations for the Romanian economy. The equations for the EU economy have similar structure except the open-economy linkages have been turned off. The complete set of equations and code to run the model requires TROLL and FAME to do database management, run the simulations, and generate the reports.

A. Behavioral Equations

$$ygap_t = \beta_{ld} ygap_{t+1} + \beta_{lag} ygap_{t-1} - \beta_{RRgap} RRgap_{t-1} + \beta_{zgap} zgap_{t-1} + \beta_{EUR} ygap_t^{EUR} + \varepsilon_t^{ygap}$$

$$\pi_t = \left[\alpha_{admin} \pi_t^{admin} + (1 - \alpha_{admin}) \pi c_{t-1} \right] + \left[\alpha_{rpo1} \pi_t^{reloil} + \alpha_{rpo2} \pi_{t-1}^{reloil} \right] + \varepsilon_t^\pi$$

$$\begin{aligned} \pi c_t &= \alpha_{\pi ld} \pi c_{t+4} + (1 - \alpha_{\pi ld}) \pi c_{t-1} + \alpha_{ygap} (\frac{1}{2} ygap_t + \frac{1}{2} ygap_{t-1}) \\ &+ \alpha_z \left[(z_t - z_{t-1}) - (z_t^{eq} - z_{t-1}^{eq}) \right] + \alpha_{pt} (\pi 4_{t-1} - \pi c_{t-1}) + \varepsilon_t^{\pi c} \end{aligned}$$

$$RS_t = \gamma_{RSlag} RS_{t-1} + (1 - \gamma_{RSlag}) \left[RR_t^{eq} + \pi 4_t + \gamma_\pi [\pi 4_{t+4} - \pi_{t+4}^{target}] + \gamma_{ygap} ygap_t \right] + \varepsilon_t^{RS}$$

$$z_t = \delta_{zld} z_{t+1} + (1 - \delta_{zld}) \left[z_{t-1} + 2(z_t^{eq} - z_{t-1}^{eq}) \right] - \frac{1}{4} (RR_t - RR_t^{EUR} - \rho_t^*) + \varepsilon_t^z$$

B. Steady State and Equilibrium Equations

$$400[ygap_t^{eq} - ygap_{t-1}^{eq}] = g_t^{eq} - \nu_{rpoil} \pi 4_t^{rpoil} + \varepsilon_t^{y^{eq}}$$

$$g_t^{eq} = (1 - \lambda_{g^{eq}}) \bar{g}_t + \lambda_{g^{eq}} g_{t-1}^{eq} + \varepsilon_t^{g^{eq}}$$

$$\pi_t^{target} = (1 - \lambda_{\pi^{eq}}) \pi^{sstable} + \lambda_{\pi^{eq}} \pi_{t-1}^{target} + \varepsilon_t^{\pi^{eq}}$$

$$RR_t^{eq} = (1 - \lambda_{RR^{eq}}) RR^{sstable} + \lambda_{RR^{eq}} RR_{t-1}^{eq} + \varepsilon_t^{RR^{eq}}$$

$$z_t^{eq} = (1 - \lambda_{z^{eq}}) z_t^{sstable} + \lambda_{z^{eq}} z_{t-1}^{eq} + \varepsilon_t^{z^{eq}}$$

$$\rho_t^* = 4(z_t^{eq} - z_{t+1}^{eq}) + (RR_t^{eq} - RR_t^{eqEUR})$$

C. Identities

$$ygap_t = 100(y_t - y_t^{eq})$$

$$RRgap_t = RR_t - RR_t^{eq}$$

$$zgap_t = z_t - z_t^{eq}$$

$$\pi_t = 400[\log(CPI_t) - \log(CPI_{t-1})]$$

$$\pi 4_t = 1/4(\pi_t + \pi_{t-1} + \pi_{t-2} + \pi_{t-3})$$

$$\pi c_t = 400[\log(CPI_t^{CORE}) - \log(CPI_{t-1}^{CORE})]$$

$$\pi c 4_t = 1/4(\pi c_t + \pi c_{t-1} + \pi c_{t-2} + \pi c_{t-3})$$

$$\pi_t^{ad\ min} = 400[\log(CPI_t^{ad\ min}) - \log(CPI_{t-1}^{ad\ min})]$$

$$\pi 4_t^{ad\ min} = 1/4(\pi_t^{ad\ min} + \pi_{t-1}^{ad\ min} + \pi_{t-2}^{ad\ min} + \pi_{t-3}^{ad\ min})$$

$$RR_t = RS_t - \pi_{t+1}$$

$$z_t = 100[\log(S_t) + \log(CPI_t^{EUR}) - \log(CPI_t)]$$

D. Variable Definitions

$ygap$	output gap, percentage points
y_t	log of real GDP
y_t^{eq}	log of potential real GDP
g_t^{eq}	growth rate of potential GDP, quarter/quarter at annual rate, percentage point
g^{sseq}	steady state growth rate of potential GDP, Q/Q at annual rate, percentage point
π	cpi inflation, quarterly at annualized rate, percentage points
π^{target}	target inflation rate, annualized rate, percentage points
$\pi 4_t$	four-quarter change in the CPI, annualized rate, percentage points
$\pi^{sstarget}$	Steady state inflation target, annualized rate, percentage points
π_t^{reloil}	change in the relative price of oil, quarterly at annualized rate, percentage points
$\pi 4_t^{reloil}$	four-quarter (moving average) change in the relative price of oil, percentage points
CPI_t	level of the domestic consumer price index
CPI_t^{EUR}	level of the European consumer price index

RR_{gap}	real interest rate gap, percentage points
RR	real interest rate, in percentage points
RR^{eq}	equilibrium real interest rate, in percentage points.
RR^{sseq}	steady state equilibrium interest rate, in percentage points
RR^{EUR}	US real interest rate, in percentage points
RR^{ssEUR}	equilibrium US real interest rate, in percentage points
z_{gap}	real exchange rate gap, percentage points
z	log of the real exchange (an increase implies a depreciation)
S	nominal exchange rate, value of foreign currency in local currency
z^{eq}	log of the equilibrium real exchange rate (an increase implies a depreciation)
	z^{sseq} log of the steady state equilibrium exchange rate

References

- Adler, G. and A. J. Tiffin, 2006, “Competitiveness,” in *Romania: Selected Issues*, Country Report No. 06/169 (Washington: International Monetary Fund).
- Bacchetta, P. and E. van Wincoop, 2006. “Can Information Heterogeneity Explain the Exchange-Rate Determination Puzzle,” *American Economic Review*, Vol.96 No.3, pp.552-576
- Berg, A., P. Karam, and D. Laxton, 2006a, “A Practical Model-Based Approach to Monetary Policy Analysis—Overview,” IMF Working Paper (Washington: International Monetary Fund).
- , 2006b, “Practical Model-Based Monetary Policy Analysis—A How-to Guide,” IMF Working Paper (Washington: International Monetary Fund).
- Bjørnland, H.C., L. Brubakk, and A.S. Jore, 2006. “Forecasting Inflation with an Uncertain Output Gap,” *Norges Bank Working Paper*, No. 2006/2. (Oslo: Norges Bank)
- Claus, I., P. Conway, and A. Scott, 2000. “The Output Gap: Measurement, Comparisons, and Assessment,” *RBNZ Research Paper*, No.44. (Wellington: Reserve Bank of New Zealand).
- Coats, W., D. Laxton, and D. Rose, 2003. *The Czech National Bank’s Forecasting and Policy Analysis System*. (Prague: Czech National Bank)
- Dejong, D.N. and C. Dave, 2007. *Structural Macroeconometrics*. (Princeton University Press).
- Epstein, N., P. Karam, D. Laxton, and D. Rose, 2006, “A Simple Forecasting and Policy Analysis System for Israel: Structure and Applications,” in *Israel: Selected Issues*, Country Report No. 06/121 (Washington: International Monetary Fund).
- Gali, J., and T. Monacelli, 2005, “Monetary Policy and Exchange Rate Volatility in a Small Open Economy ,” *Review of Economic Studies*, Vol. 72 (3), pp. 707-734.
- Harjes, T., and L Ricci, 2005. “A Quantitative Analysis of Inflation Dynamics in South Africa,” in *South Africa: Selected Issues*, Country Report No. 06/121 (Washington: International Monetary Fund).
- Isard, P., D. Laxton, and A. Eliasson, 2001, “Inflation Targeting with NAIRU Uncertainty and Endogenous Policy Credibility,” *Journal of Economic Dynamics & Control*, Vol. 25, pp. 115-148.
- Laxton, D., and P. Pesenti, 2003, “Monetary Policy Rules for Small, Open, Emerging Economies,” *Journal of Monetary Economics*, Vol. 50 (July), pp. 1109-46.

- Laxton, D., and P. N'Diaye, 2002, "Monetary Policy Credibility and the Unemployment-Inflation Trade-Off: Some Evidence from 17 Industrial Countries," IMF Working Paper (Washington: International Monetary Fund).
- Lipschitz, L., T. Lane, and A. Mourmoras, 2002. "Capital Flows to Transition Countries: Master or Servant?," IMF Working Paper (Washington: International Monetary Fund).
- Keen Meng, C. and E. Tanuwidjaja, 2005, "Central Bank Credibility and Monetary Policy: Evidence from Small Scale Macroeconomic Model of Indonesia," Singapore Centre for Applied and Policy Economics Working Paper 2005/14.
- Roger, S., and M. Stone, 2005. "On Target? The International Experience with Achieving Inflation Targets," IMF Working Paper (Washington: International Monetary Fund).
- Smets, F., and R. Wouters, 2003, "An Estimated Stochastic Dynamic General Equilibrium Model of the Euro Area," *Journal of European Economics*, Vol. 49, pp. 947-981.
- Svensson, L.E.O., 2000, "Open-Economy Inflation Targeting," *Journal of International Economics*, Vol. 50, pp. 155-183.
- Tiffin, A.J., 2005. "Competitiveness, Convergence, and the Real Exchange Rate," in *Ukraine: Selected Issues*, Country Report No. 05/20 (Washington: International Monetary Fund).
- Walsh, C.E., 2003. *Monetary Theory and Policy*, 2nd Ed. (MIT Press)
- Woodford, M., 2003. *Interest and Prices: Foundations of a Theory of Monetary Policy*, (Princeton University Press)

II. WAGE DYNAMICS IN THE ROMANIAN ECONOMY²⁶

A. Introduction

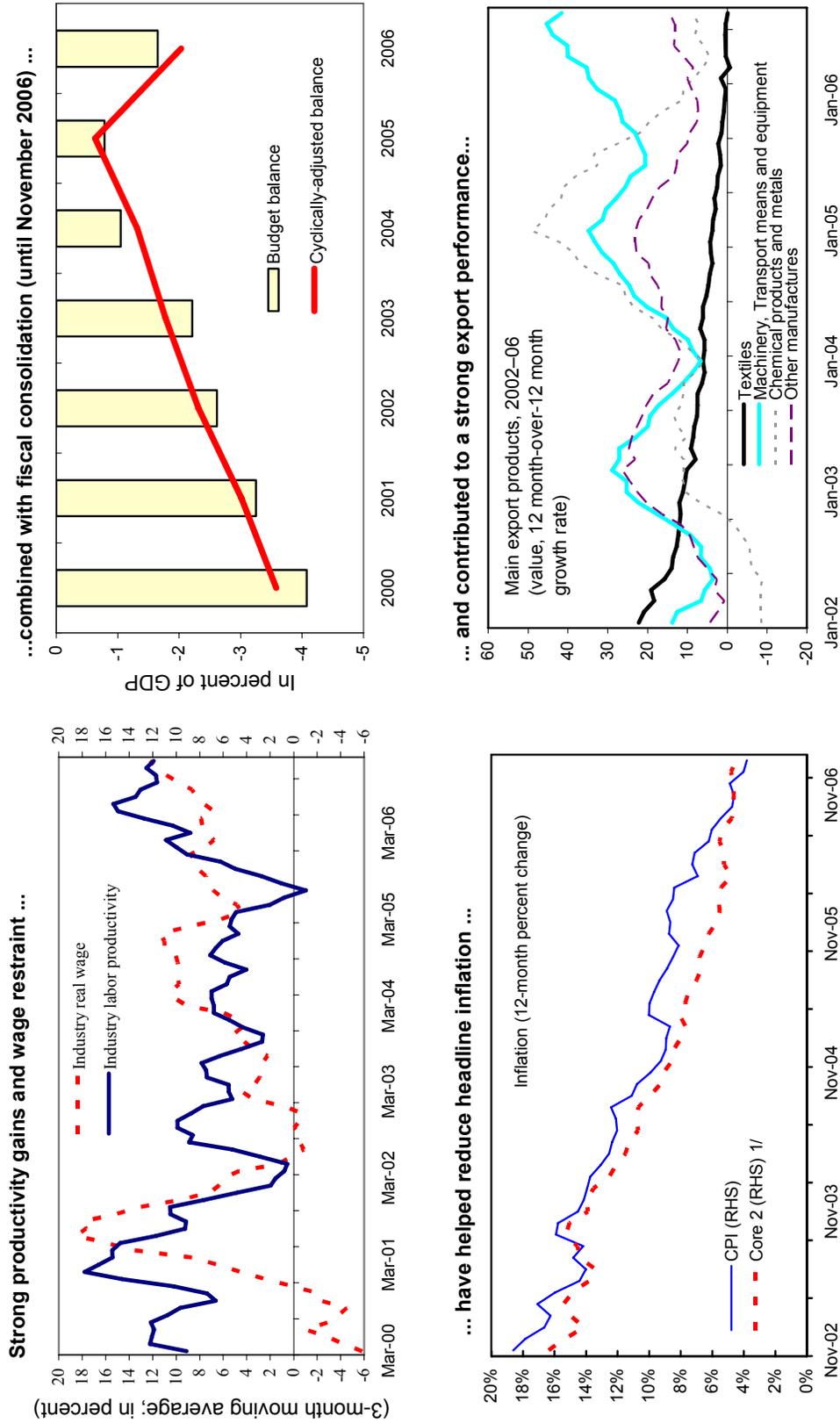
58. **Wage restraint has been an important element of Romania's stabilization process (Figure 1).** By keeping a lid on public-sector wage increases—through prudent wage increases in the general government and strict control of the wage bill of the state-owned enterprises (SOEs)—and approving modest increases in the minimum wage, the growth in the economy-wide real wage has been moderate. This has contributed to modest increases in unit labor costs which have been below productivity gains for most of Romania's recent history. As a result, Romania has achieved substantial competitiveness gains and export performance has been strong, despite a sharp appreciation of the exchange rate. In a related vein, a prudent incomes policy—in association with tight fiscal (until late-2006) and monetary policies—has contributed to a sharp decline of inflation.

59. **However, the recent loosening of public-sector wage policy has raised concerns about Romania's ability to achieve sustainable strong growth in a low-inflation environment.** Since end-2004, wage increases in the government sector have considerably outpaced ones in the private sector. At the same time, public-sector employment has been expanding (partly on account of the need for EU-accession related hirings), in a labor market characterized by low unemployment, participation, and employment rates. Moreover, the monitoring of the SOEs' wage policy eased this year. These developments raise concerns about whether private-sector wages—which have so far increased only modestly—will follow these trends and exhibit significant increases. These concerns are exacerbated as the Romanian economy has shown persistent signs of overheating.

60. **A number of other institutional factors of the wage-determination process are also cause for concern.** Although Romania has achieved low single-digit inflation, multiple increases in government wages continue to take place every year. Moreover, due to the timing of government-wage agreements, most wage increases are not included in the budget approved by parliament, thus creating the need for additional budget allocations and budget revisions during the course of the year. As a result, in many instances, additional wage allocations displace other government spending, including, most importantly, capital. Finally, although government employment has been expanding steadily, there is no well-specified medium-term plan for the reform of public administration.

²⁶ Prepared by Costas Christou.

Figure 1. Romania: Wage and Fiscal Developments, and Macroeconomic Performance, 2000-06



1/ Core 2 CPI excludes administered prices, volatile food items, and fuel.

Source: Romanian authorities and staff estimates.

61. **Evidence from other countries points to a generally strong impact of public-sector wage policy on private-sector settlements.** Demekas and Kontolemis (1999) develop a two-sector labor market model and by applying it to Greece—a country with a relatively large public sector—show that increases in government wages lead through worker-flow dynamics to increases in private-sector wages and, therefore, directly to higher unemployment. Mizala and Romaguera (1995) find that in the case of Chile, private-sector wages have followed those of the public sector in a time path, and that the leadership role of public wages has gradually become weaker as state intervention in the labor market declined. In a system of joint wage determination of private, public, and local sector wages in Sweden, Jacobson and Ohlsson (1994) found that private sector wages lead public-sector settlements. Finally, Bemmels and Zaidi (1990) looked into the wage leadership hypothesis in the Canadian industry and were able to identify that certain institutional forces (e.g., unionization or efficiency wages) of some sectors contributed to those sectors being leaders of the wage determination process.

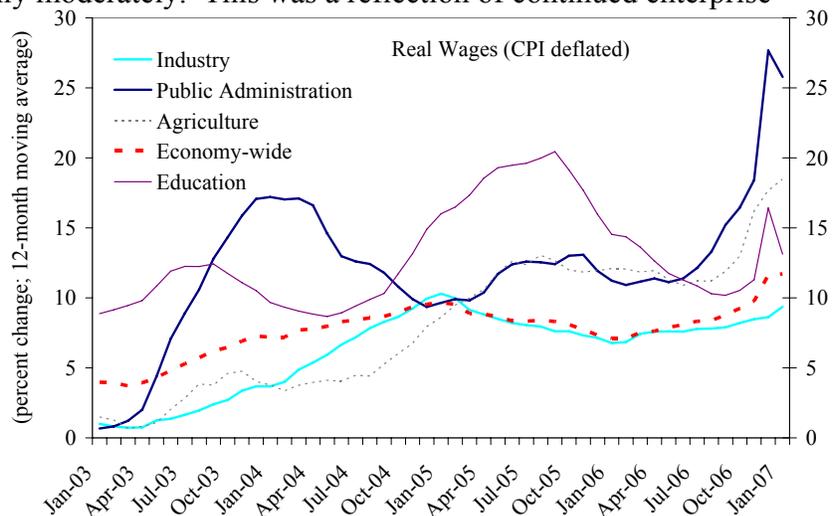
62. The objective of this paper is to examine recent wage developments in Romania, and to test the links between the wage determination process of the public and private sectors. Section B presents a number of stylized facts regarding recent wage and employment developments, and the wage-setting process. Section C presents the results of econometric analysis aimed at testing the links between wages in various sectors of the economy; and Section D summarizes the results and provides policy recommendations.

B. Stylized Facts

Wage and employment developments

63. **Wage moderation has been an important element of Romania's stabilization process, but recent developments raise concerns.** Up until mid-2006, the gross economy-wide real wage increased only moderately. This was a reflection of continued enterprise

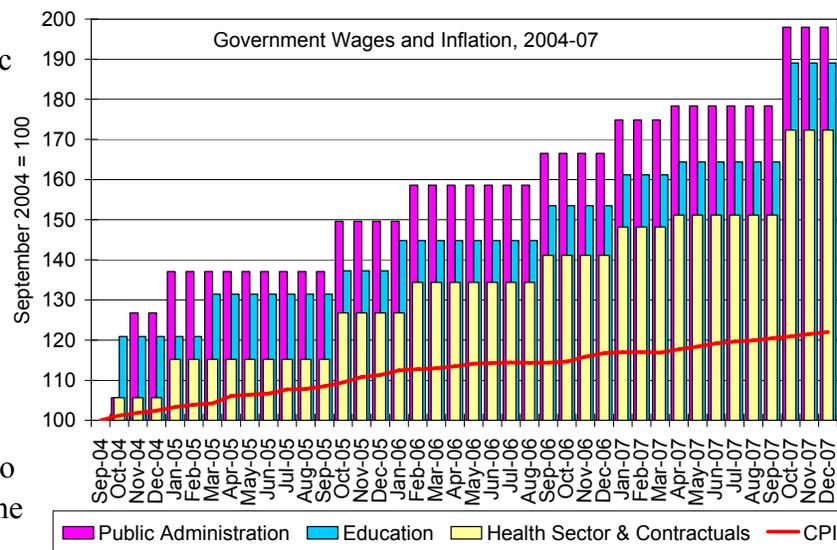
restructuring and took place despite relatively tight labor market conditions, high migration to western Europe, and expanding public-sector employment. Romanian (net) incomes benefited from the cut in the personal income tax to a flat rate of 16 percent on January 1, 2005, while the currency appreciation led to higher purchasing power and wealth effects. However, since mid-2006, the economy-wide



real wage has been increasing fast, reflecting continued tightening of labor market conditions and a pronounced lack of educated and skilled workers, but also driven by sharp increases in government wages. This development is taking place at a time when the economy is overheating—as evidenced by the widening external imbalance—while inflationary pressures are building. Non-government credit growth is very strong; and fiscal policy is contributing to demand pressures following the loosening that started at end-2006 and in light of the envisaged relaxation this year. At the same time, the gap between real wage increases and productivity gains has been closing fast, thus raising concerns about enterprise profitability and Romania’s competitiveness edge.

64. **Substantial increases have been provided to the government sector.** Following a trend that started in late-2004, the government has been giving substantial wage increases in

all sectors of the general government, namely, public administration, education, health, contractuels, the police, and the army (Table 1). Government officials have justified the magnitude of such increases as necessary to attract high-quality staff in the public sector in line with Romania’s objective to improve the efficiency in the provision of government



services. They also cite the high competition for jobs with the private sector, which has been expanding rapidly. At the same time though, the loose government-wage policy has been greatly influenced by strong labor unions (particularly in the education sector), in the context of a tense political environment.

Table 1. Romania: Wage Policy of the General Government in 2004-07
(In percent)

	Public Administration			Contractual-Civil Administration			Army		
	Salary Increase	Cumulative Increase		Salary Increase	Cumulative Increase		Salary Increase	Cumulative Increase	
		(In each year)	(In 2004-07)		(In each year)	(In 2004-07)		(In each year)	(In 2004-07)
2004									
January	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
May									
October	5.7	12.0	12.0	5.7	12.0	12.0	5.7	12.0	12.0
November	20.0	34.4	34.4						
2005									
January	8.1	8.1	45.3	9.0	9.0	22.1	3.6	3.6	16.0
March									
October	9.2	18.0	58.6	10.1	20.0	34.4	4.2	8.0	21.0
2006									
February	6.0	6.0	68.1	6.0	6.0	42.5	4.5	4.5	26.4
September	5.0	11.3	76.5	5.0	11.3	49.6	5.0	9.7	32.7
2007									
January	5.0	5.0		5.0	5.0		14.5	14.5	52.0
April	2.0	7.1	80.0	2.0	7.1	52.6			
October	11.0	18.9	99.8	11.0	18.9	69.4			
	Police			Health			Education		
	Salary Increase	Cumulative Increase		Salary Increase	Cumulative Increase		Salary Increase	Cumulative Increase	
		(In each year)	(In 2004-07)		(In each year)	(In 2004-07)		(In each year)	(In 2004-07)
2004									
January	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
May							5.0	11.3	11.3
October	5.7	12.0	12.0	5.7	12.0	12.0	20.9	34.6	34.6
2005									
January	20.0	20.0	34.4	9.0	9.0	22.1			
March							8.7	8.7	46.3
October	8.0	29.6	45.2	10.1	20.0	34.4	4.4	13.5	52.8
2006									
January							5.5	5.5	61.2
February	4.5	4.5	51.7	6.0	6.0	42.5			
September	5.0	9.7	59.3	5.0	11.3	49.6	6.0	11.8	70.8
2007									
January	14.5	14.5	82.4	5.0	5.0		5.0	5.0	
April				2.0	7.1	52.6	2.0	7.1	74.3
October				14.0	22.1	73.9	15.0	23.2	100.4

Sources: Romanian authorities and staff calculations.

65. **As a result, the government's wage bill has increased substantially.** From 4.8 percent of GDP in 2004, the general government payroll increased to 5.4 percent and 6.1 percent in 2005 and 2006, respectively. Generous wages increases, increases in employment, and various bonuses contributed to such outcomes. In 2006, average statutory wages increased by 9-15 percent and employment expanded by 3 $\frac{1}{3}$ percent; however, on account of increases in bonuses and payment of retroactive wages for teachers and judges due to legal settlements, the wage bill increased by 36 percent in nominal terms.

65 **Government wages are on average higher than private-sector ones (Table 2).** Having benefited from multiple sharp increases, the average wages in public administration and education are now 72 and 16 percent higher than the economy-wide average wage. Regarding public administration, in many countries it is the case that wages are higher than

the rest of the economy, due in part to the fact that many public administration employees have usually completed tertiary education. However, the rate of wage increases is not at all usual.

Table 2. Romania: Gross Wage by Sector
(In percent of the economy-wide average wage)

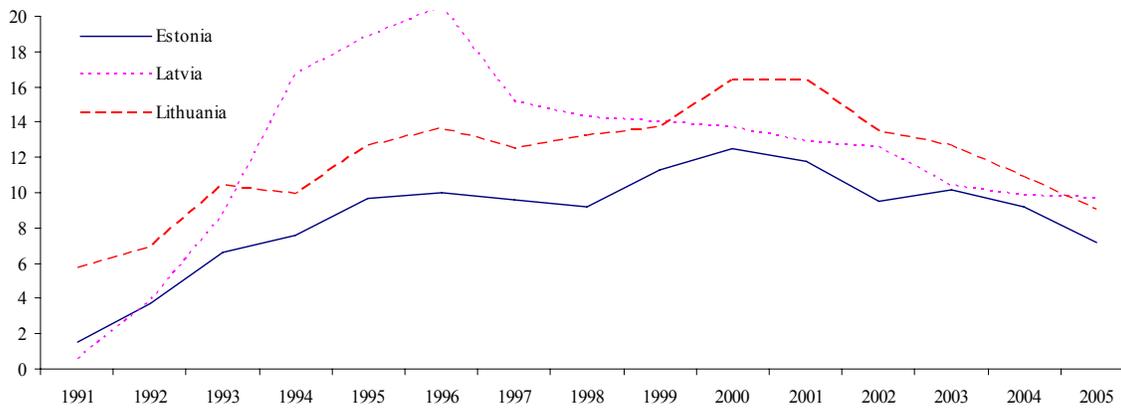
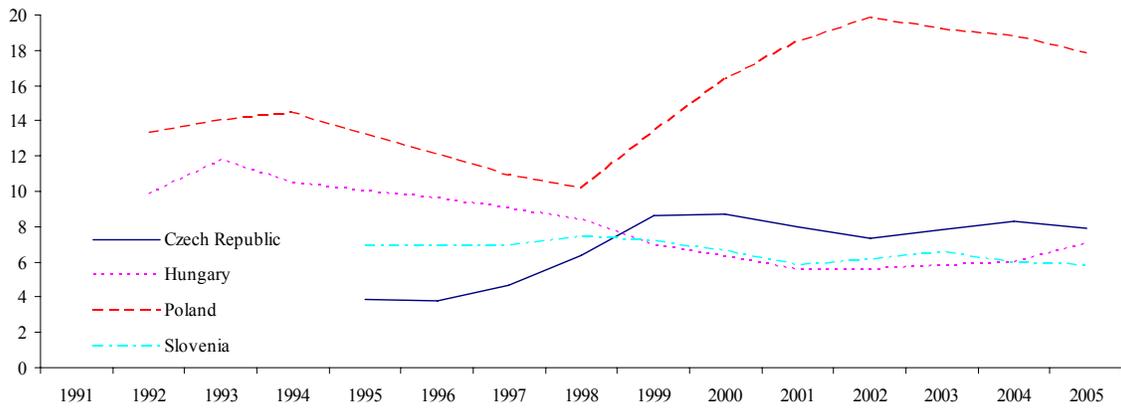
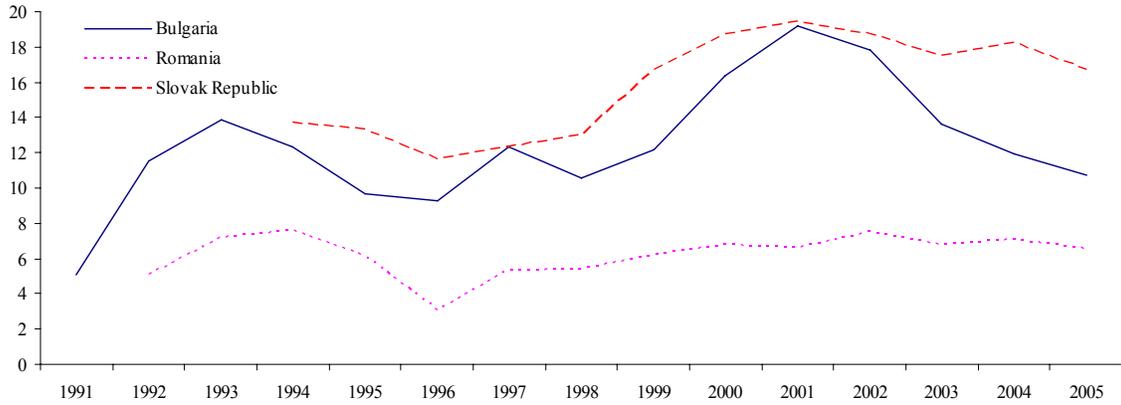
	Agriculture	Industry	Construction	Trade	Financial Intermediation	Public Administration	Education	Health
1997	97	109	97	79	523	90	83	72
1998	68	105	96	77	312	120	94	79
1999	68	105	94	79	299	123	92	91
2000	69	101	86	75	314	135	95	86
2001	68	103	83	82	287	133	92	86
2002	67	100	88	80	304	132	95	82
2003	65	96	88	79	297	144	98	83
2004	64	97	82	85	300	144	103	83
2005	66	96	83	80	332	150	111	90
2006	70	94	82	77	309	172	116	93

Sources: Romanian authorities and staff calculations.

66. These wage developments have been taking place in a tight labor market.

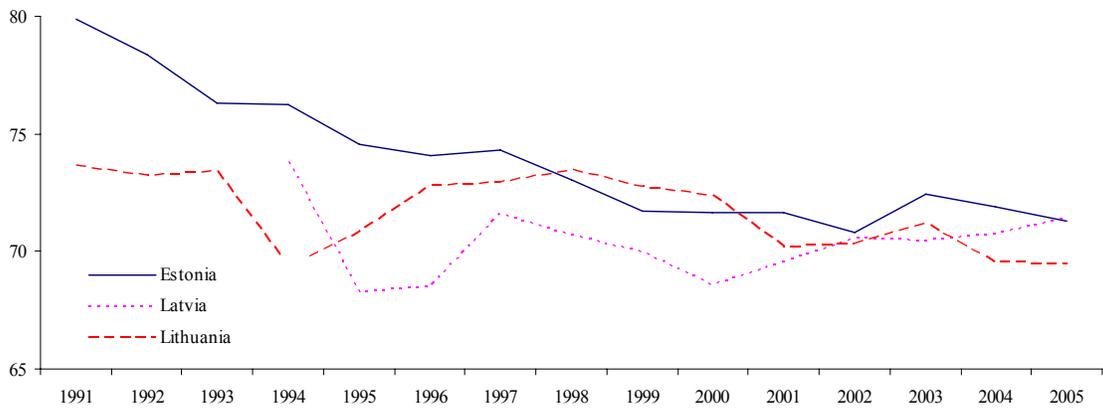
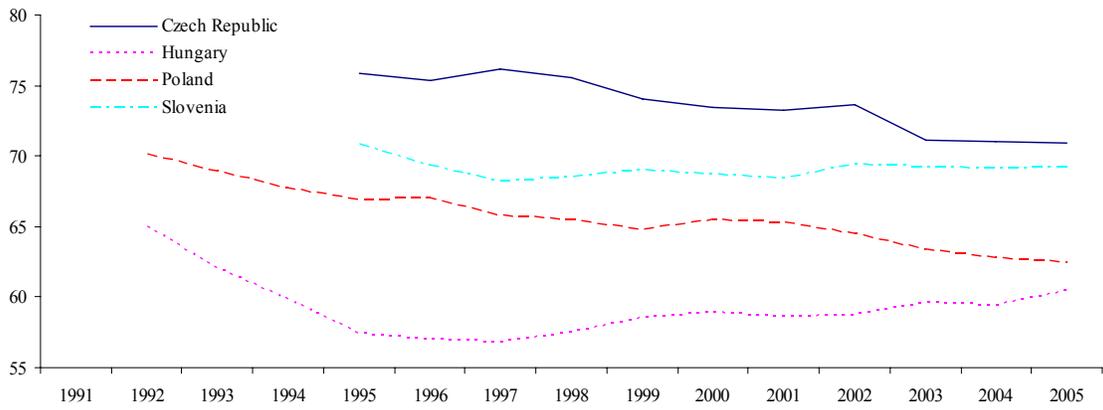
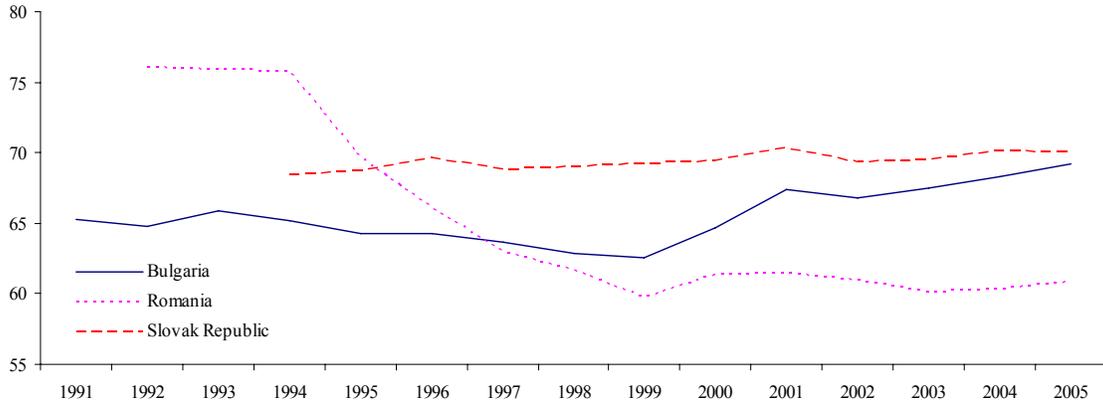
Romania's unemployment rate is among the lowest in the European Union (Figure 2), while the labor market is particularly tight for skilled and educated workers. Labor market tensions are also exacerbated due to the very low labor-market participation and employment rates. Despite some increase in recent years, both rates (61 and 56 percent, respectively in 2005) are among the lowest in the European Union (Figures 3 and 4). A recent study by the Ministry of Labor (2006) looked into the dynamics of the labor market and noted the tensions stemming from the widening gap between labor demand and supply in particular segments of the labor market.

Figure 2. Romania: Unemployment Rates in Selected EU New Member States, 1991-2005
(In percent)



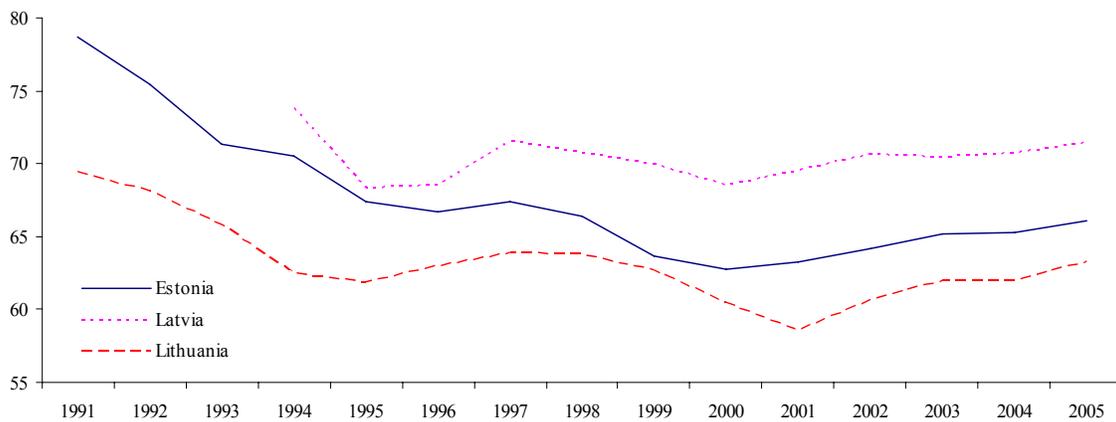
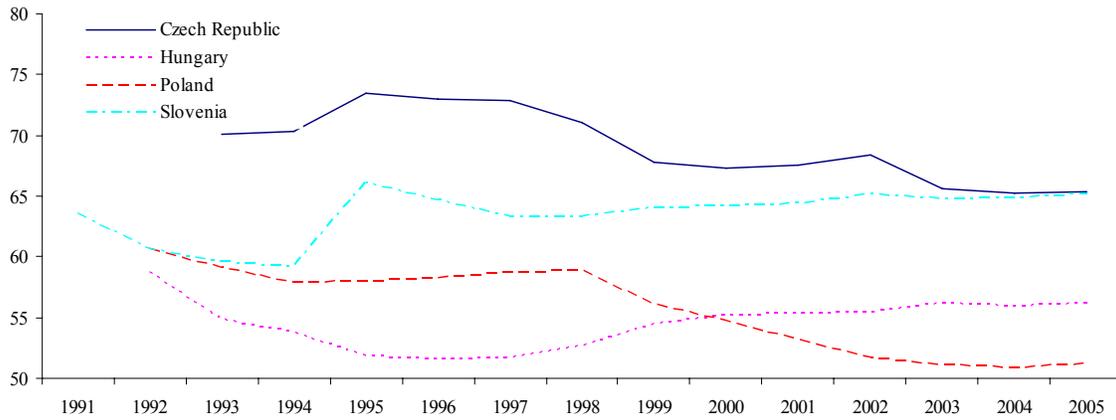
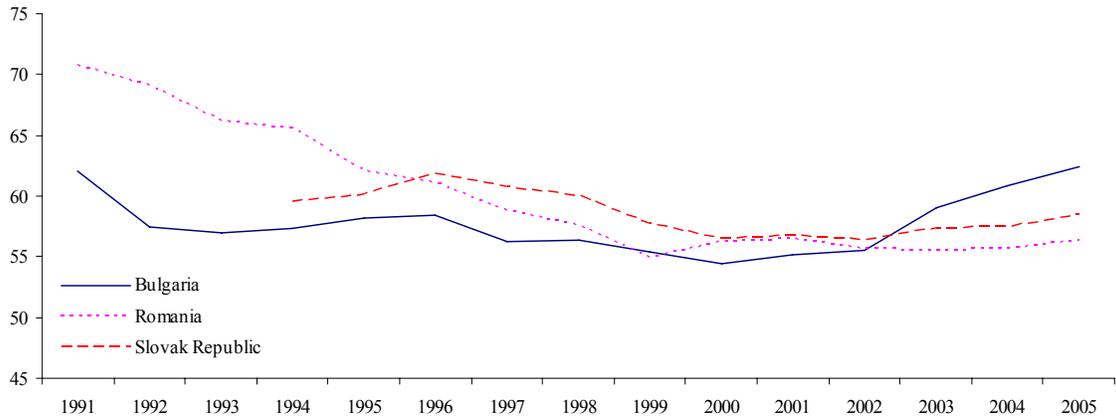
Source: AMECO.

Figure 3. Romania: Labor Force Participation in Selected EU New Member States, 1991-2005
(in percent of working-age population)



Source: AMECO.

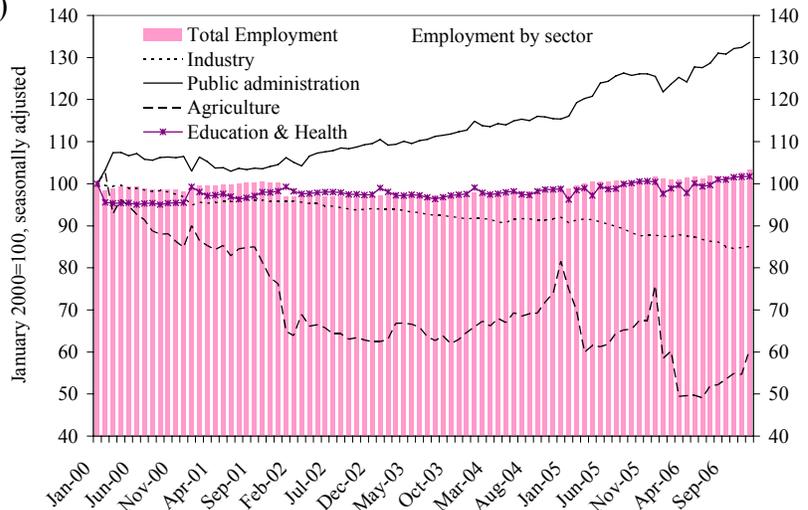
Figure 4. Romania: Employment in Selected EU New Member States, 1991-2005
(in percent of working-age population)



Source: AMECO.

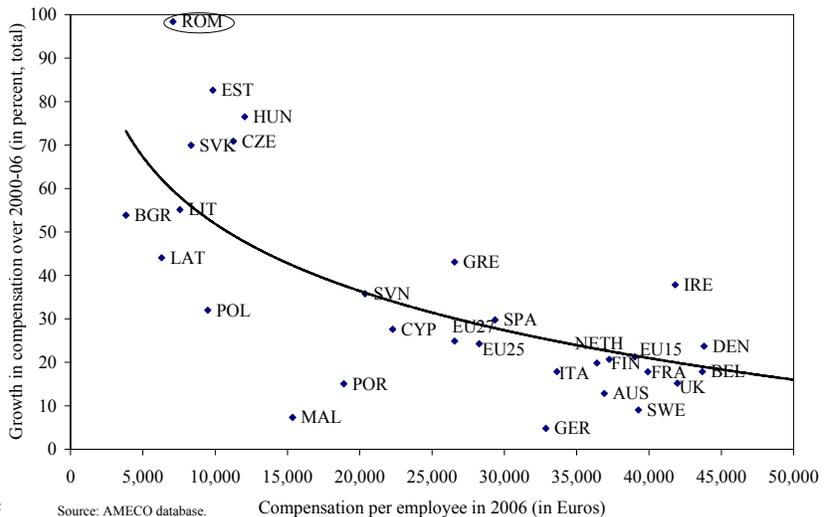
67. **Public-administration employment policy has been crowding out private sector employment.** While total economy-wide employment has been increasing at a slow pace (and industry employment has been declining in line with the ongoing enterprise restructuring), employment in the government sector has been growing at a much-faster rate. This outcome is driven by the very fast increase in employment in public administration. For example, in 2006, although the authorities had committed to freezing vacant positions

(except for EU-related hirings) to provide resources for wage bill overruns, government employment increased by almost 30,000 (3⅓ percent). Although many of those positions may reflect hirings associated with commitments to the EU (e.g., to improve border protection and the capacity for absorbing EU funds), such an expansion of government employment is taking place without a well-specified plan for the reform of public administration. Thus, considerable concerns exist about the efficiency in the provision of services by public administration.



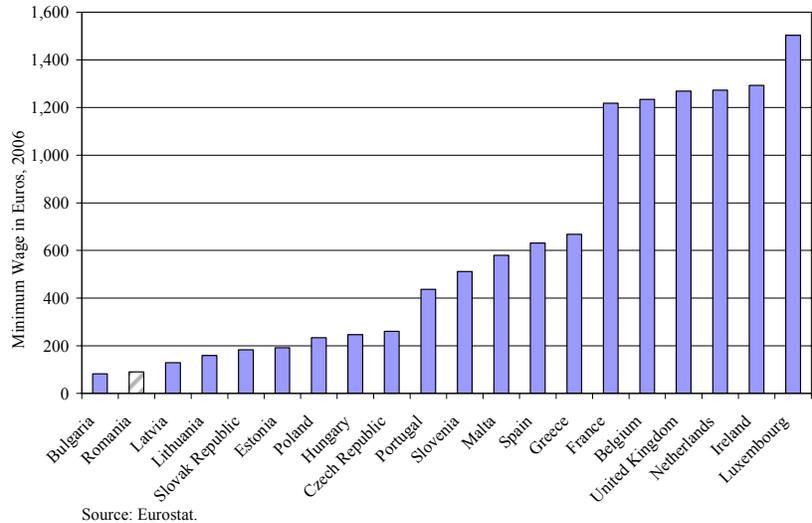
68. **The gap between Romanian and average EU wages has narrowed recently. Wage**

increases of recent years (which exceeded average EU wage increases) coupled with significant nominal appreciation of the leu have led to a narrowing of the gap of Romanian wages (measured in euros) from the EU-average wage. During 2000-06, the average compensation of Romanian employees exhibited the largest increase among EU countries and almost doubled. Although it is among the lowest, it is now comparable with a number of recent new member states of the European Union.



Source: AMECO database.

69. **The minimum wage remains low.** Owing mainly to prudent increases in the minimum wage during 2004-06 (nominal increases of 12, 11, and 6 percent, respectively), the minimum wage had little impact on the behavior of the economy-wide wage. This is the case notwithstanding the fact that a relatively high (12 percent in 2004; and among the highest in the EU) share of full-time employees have earnings on the minimum wage (Eurostat (2006)). However, the recently-approved significant increase in the 2007 minimum wage of 18 percent is going to increase the minimum wage relatively to the average economy-wide significantly, thus possibly providing a signal for high private-sector wage increases.



The government wage-setting process

70. **There is no unified pay system in the Romanian public administration, as the legal framework differentiates between several employment categories.** As World Bank (2006) indicates, in addition to the general principles stipulated by the Labor Code and other normative acts, various regulations (both general and specific) influence substantially pay structures and employment policy. This structure complicates and segments the wage bargaining process and salary setting, resulting in large discrepancies across and within public sector categories.

71. **The timing and duration of wage negotiations presents challenges for the budget process and fiscal management.** Negotiations for the wage increases to be effected the following year usually begin toward the end of the year and often get protracted and last well within the new year. As a result, the budget that is approved by Parliament does not include fully the impact of agreed wage increases. Despite attempts by the Ministry of Finance to create some space in the wage bill for wage increases, it is usually the case that budget rectifications during the year have to provide additional resources for payroll. For example, in 2006 the original budget approved by parliament in December 2005 included an allocation of 5.5 percent of GDP for wages. This allocation was successively increased to 5.6, 5.8, 5.9, and 6.0 percent of GDP during each of the four budget rectifications, while the outturn for the year reached 6.1 percent. Another remnant feature of Romania's long tradition of high

inflation is the existence of multiple wage increases. Perhaps as a way to deal with high inflation and preserve purchasing power, the government has traditionally offered more than one wage increase during the year to its employees. However, this “tradition” continues even now, although Romania has achieved low single-digit inflation.

72. **The base salary—which varies widely across public institutions—is only one component of the total compensation package.** Due to the complicated legislation and various regulations, the pay structure of the government varies considerably across government institutions (Table 3). The most important element is the limited role and the significant variation of the base salary (ranging from 52 to 67 percent of total compensation). The rest of the compensation is accounted for by various bonuses, which are provided on the basis of both objective and subjective criteria. This compensation structure and the magnitude of bonuses in the total compensation package raise questions about the effective budgeting, and the transparency and monitoring of the wage bill, as well as the objectivity in providing such rewards.

Table 3. Romania: Pay Structures for Civil Servants (by type of public institution)
(In percent of total compensation)

Pay Element	Type 1	Type 2	Type 3	Type 4
Base Salary	60	52	52	67
Managerial bonus	4	3	2	2
Performance salary	2	2	2	2
Seniority allowance	13	11	10	13
"Dispozitiv" allowance	0	2	0	0
Loyalty allowance	8	0	0	0
Overtime	5	4	1	7
Incentive	0	21	29	0
Various other bonuses	8	5	4	9

Note: Type 1 represents public institutions subordinated to the central Government; type 2 covers ministries; type 3 covers public institutions subordinated to ministries; type 4 covers local public institutions.

Source: World Bank (2006) on the basis of the Hay Group report.

Wage linkages

73. **The incomes policy of the public sector could affect economy-wide wage settlements in a number of ways.** First, since agreements on increases in the government wage, the minimum wage, and the wages of SOEs usually take place before similar settlements take place for the private sector, sharp increases in public-sector wages could provide a strong signal (demonstration effect) to the private sector. Second, in countries where the government employs a large and growing number of staff, significant increases in government wages, lead through worker-flow dynamics to increases in private-sector wages. This mechanism is particularly strong in countries with very low unemployment. In a related

vein, competition by the government for the hiring of educated and skilled employees could create tensions for particular segments of the labor market. Finally, since Romania has had a long history of high inflation, wage indexation mechanisms have been quite prevalent, were based on historical inflation, and, as noted earlier, came in multiple rounds.

C. Econometric Analysis

74. **A bivariate vector autoregressive (VAR) system is estimated in order to model sectoral wage behavior.** Such a system is a popular framework for estimating and evaluating economy-wide models, since, among other things, it provides a flexible forecasting model, forms the basis of Granger (1969) causality testing, and can be extended to incorporate various restrictions in the form of structural VARs. The key characteristic of the model is that it expresses the wage of a sector of the economy as a function of: (i) its own lags and (ii) lags of wages in other sectors. Thus, in the case of private and government wages, the bivariate VAR takes the form:

$$\begin{aligned} WPRIV_t &= \alpha_1 + \sum_{j=1}^r \beta_j WPRIV_{t-j} + \sum_{i=1}^s \gamma_i WGOV_{t-i} + u_{1t} \\ WGOV_t &= \alpha_2 + \sum_{j=1}^r \delta_j WPRIV_{t-j} + \sum_{i=1}^s \varepsilon_i WGOV_{t-i} + u_{2t} \end{aligned} \quad (1)$$

where: $WPRIV_t$ and $WGOV_t$ are the monthly rate of growth in the real private- and the government-sector wage, respectively; the explanatory variables are lags of the two wages, and u_{1t} and u_{2t} are the disturbance terms. A VAR can be estimated by applying ordinary-least squares to each equation, which produces efficient parameter estimates. Although economic theory could provide some a priori judgment about the number of lags, the optimal number of lags (r and s) in the VAR could also be chosen by employing three information criteria: Akaike, Schwarz, and Hannan-Quinn.²⁷

75. **Having estimated a VAR for wages, Granger-causality testing could provide information about the relationship between movements in wages of different sectors.** In the Granger sense, a time series X_t is said to cause another series Y_t if the future values of

²⁷ The Akaike (1969) criterion in general chooses long lag structures, whereas the Schwarz one tends to choose very short lag structures. In cases of different suggested optimal lags, researchers usually use the Hannan-Quinn criterion as an in-between measure. In the models estimated in this paper, we follow the same approach, but also report results using all criteria in case of differences in the derived results.

Y_t can be better predicted when the information contained in the series X_t is included rather than excluded. Granger-causality tests are based on testing the joint significance of the lags of each variable in the system, apart from its own lags. Thus, a test that an increase in the government wage $WGOV$ Granger-causes an increase in the private-sector wage $WPRIV$ is given by testing the hypotheses:

$H_0 : \gamma_1 = \gamma_2 = \dots = \gamma_s = 0$ (No Granger causality)

H_1 : at least one of the restrictions fails,

where the parameters $\gamma_1, \gamma_2, \dots, \gamma_s$ are defined in the first equation of the VAR (1). The reverse test that an increase in the private-sector wage $WPRIV$ Granger-causes an increase in the government wage $WGOV$ is given by testing the hypotheses:

$H_0 : \delta_1 = \delta_2 = \dots = \delta_r = 0$ (No Granger causality)

H_1 : at least one of the restrictions fails,

where the parameters $\delta_1, \delta_2, \dots, \delta_r$ are defined in the second equation of the VAR (1).

76. We employ this methodology to test whether wage increases in one sector of the economy lead others. By estimating bivariate VARs we examine whether a Granger-causality relationship exists among wages in government, state-owned enterprises, and the private sector. Specifically, we examine two hypothesis: (i) whether government wage developments affect private-sector settlements and visa versa; and (ii) whether developments in state-owned enterprises wages affect private-sector and government wage settlements and visa versa. We use monthly data on gross wages (deflated by consumer prices) compiled by the Romanian Statistical Office for various sectors of the economy. We proxy the government wage as a weighted average of wages in public administration, education, and health by using employment as weights. Data span the 1993-2007 period, with the exception of wages in the SOEs, which begin in 1997. Since wage dynamics have evolved over time as part of Romania's transition to a market economy, we test the developed hypotheses for various time periods. Seasonal dummies were included in models where they were found to be significant (e.g., a December dummy was important in explaining end-year bonuses provided by the government sector and SOEs).

77. The results of causality tests indicate strong links between the wage-setting behavior of the government and the private sector (Table 4). By employing the entire sample (which starts from the beginning of Romania's transition) we find that private sector wages lead wages in the government sector. Specifically, the null hypothesis that the coefficients of the real wage increase in the private sector are zero is rejected in almost all model specifications. However, in the reverse case, for samples beginning until 1997, we were not able to reject the null hypothesis that the coefficients of the real increase in the government wage are zero. This result points to the conclusion that government wage

increases do not cause (in the Granger sense) private-sector wage increases. However, for all samples covering the 1998-2006 period, bi-directional causality is obtained. In other words, in recent years and as Romania has been moving along its transition to a market economy, and labor market conditions have become tighter, the wage policy in the government sector appears to influence wage settlements in the private sector.

Table 4. Romania: Granger-causality Tests for Private Sector and General Government

Causality direction	Chi-square test	Number of lags	Probability
1993:01-2006:11			
Private Sector→Government	4.39	1	0.036
Government→Private Sector	0.01	1	0.916
Private Sector→Government	6.21	2	0.045
Government→Private Sector	0.59	2	0.743
1997:01-2006:11			
Private Sector→Government	7.44	2	0.024
Government→Private Sector	0.93	2	0.630
Private Sector→Government	10.94	5	0.050
Government→Private Sector	3.02	5	0.670
1998:01-2006:11			
Private Sector→Government	19.12	12	0.086
Government→Private Sector	18.59	12	0.099
2000:1-2006:11			
Private Sector→Government	23.62	14	0.051
Government→Private Sector	61.30	14	0.000
2001:01-2006:11			
Private Sector→Government	1.07	2	0.586
Government→Private Sector	7.47	2	0.024
Private Sector→Government	32.05	14	0.004
Government→Private Sector	45.45	14	0.000
Private Sector→Government	29.16	15	0.015
Government→Private Sector	45.58	15	0.000

78. **Wage policy in the state-owned enterprise sector does affect private-sector wage developments (Table 5).** Granger tests indicate causality from SOEs' wage increases to wage increases of the private sector. Specifically, the null hypothesis that the coefficients of the real SOEs wage increases is zero is rejected for all model specifications; these coefficients are statistically different from zero at a significance level of less than 8 percent. However, that is not case when reversing the equation with the coefficients of the lags of the growth rate of private-sector wages, thus implying that private-sector settlements had no influence on wage settlements in the SOEs sector. Finally, a test of the causality between government and SOEs' wages points to a strong leadership role of government wage policy

on wage developments in the SOEs, but not visa versa. One interpretation has to do with the timing of the wage increases, since government wage policy is usually determined before the one of the SOEs.

Table 5. Romania: Granger-causality tests for Private Sector, Public Enterprises, and Government

Causality direction	Chi-square test	Number of lags	Probability
Private Sector→Public Enterprises	5.36	3	0.147
Public Enterprises→Private Sector	22.64	3	0.000
Private Sector→Public Enterprises	5.79	12	0.926
Public Enterprises→Private Sector	20.28	12	0.062
Private Sector→Public Enterprises	23.52	18	0.171
Public Enterprises→Private Sector	27.24	18	0.075
Government→Public Enterprises	16.39	3	0.001
Public Enterprises→Government	3.71	3	0.294

D. Conclusions

79. **This paper examined the dynamics of wage determination in Romania, with particular focus on the influence of government-wage policies on private-sector settlements.** The analysis showed that private- and public-wage settlements are closely linked, in the sense that private sector wage increases affect public wage increases and visa versa. This implies that although prima facie, the private and public sector determination processes are separate, they are effectively linked. Wage agreements in the government provide a signal to private-sector wages, on account of their timing, and the fact that the government competes with the private sector for educated and skilled staff. It is the interaction in the competition for jobs, particularly in an environment of low unemployment, labor participation and employment rates, that provides additional impetus to the interaction between government- and private-sector wages. The paper also showed a strong leadership role of the SOEs' wage policy on private-sector wage agreements.

80. **The results of the paper are particularly relevant for Romania's current position on the business cycle.** In the context of an economy that is overheating—as evidenced by a widening current account deficit, very strong demand pressures, and building of inflationary pressures—the government's wage policy has an important role to play. This role becomes even more crucial as public-sector employment has been rising under very tight labor market conditions. Thus, a prudent wage policy in the broad public sector (general government and SOEs) could provide an appropriate signal to wage settlements in the private sector and weigh heavily on the wage determination process.

81. **These results are also important as Romania improves its institutional setting of macroeconomic policy.** With the transition to a low-inflation environment, it is important

that the wage-setting process changes in various ways. For example, public sector wages should increase only once a year, and the agreed wage increase should be moderate and take into account expected inflation. Moreover, government wage increases need to be approved before the budget is approved by parliament, and, if possible, be integrated into a credible medium-term fiscal plan.

82. **As part of convergence, Romanian wages will rise, but policymakers need to watch carefully the speed of convergence.** Although consecutive sharp wage increases coupled with leu appreciation have led to a narrowing of the wage gap from EU average wages, Romanian wages (in euro terms) are still low. There is no doubt that, as part of income convergence, economy-wide wages will move toward the EU average. The speed of convergence, though, could have important macroeconomic implications (including supporting sustainable strong growth in a low-inflation environment). Thus, due attention is needed to ensure that rapid wage increases do not outpace productivity gains, and in turn hurt Romania's competitiveness position.

83. **Finally, a well-specified reform plan is needed to strengthen the quality and efficiency of public administration.** Maximizing the benefits of membership in the European Union requires establishing a modern public administration that responds to the country's priorities, including the need for high absorption of EU funds. Better alignment of functions within public administration, an upgrade of skills of public-sector employees, and efficient and monitorable rules for the hiring, promotion and dismissal of staff are essential elements of a reform plan. Moreover, wages need to better reflect skill needs, otherwise a ballooning wage bill will only undermine the aim of establishing a modern public administration and improving the efficiency in the provision of public services.

References

- Akaike, H. (1969) "Fitting autoregressive models for prediction," *Annals of the Institute of Statistical Mathematics*, 21, 243-247.
- Bemmels, Brian and Mahmood Zaidi (1990). "Wage leadership in Canadian Industry," *Applied Economics*, 22: 553-567.
- Demekas, Dimitri and Zenon Kontolemis (1999). "Government employment and wages and labor market performance," Working Paper 99/55, *International Monetary Fund*, Washington, DC, USA.
- Eurostat (2006), "Minimum Wages 2006," *Statistics in Focus*, 9: 2006.
- Granger, Clive (1969). "Investigating causal relations by econometric models and cross-spectral methods," *Econometrica*, 37(3), 424-438.
- Jacobson, Tor and Henry Ohlsson (1994). "Long-run relations between private and public sector wages in Sweden," *Empirical Economics*, 19: 343-360.
- Ministry of Labor of Romania (2006). *Evolutia Ocupatiilor pe Piata Fortei de Munca din Romania in Perspectiva Anului 2010*.
- Mizala, Alejandra and Pilar Romaguera (1995). "Testing for wage leadership processes in the Chilean economy," *Applied Economics*, 27: 303-310.
- Statistical Office of Romania, *Monthly Statistical Bulletin*, various issues.
- World Bank (2006). "Wages and wage policy in the public sector," in *Romania: Public Expenditure and Institutional Review*, vol. 2.

III. THE IMPACT OF AGING ON THE PUBLIC SECTOR IN ROMANIA²⁸

A. Introduction

84. **This paper addresses the expected impact of aging on Romania's public sector and, especially, its pension system.** Unlike some previous work on this topic in Romania, this paper takes a more macroeconomic perspective, considering not only the effects on the pension system, but also on some other expenditures. Among the possible reforms, the paper considers, in addition to direct pension reform, some more general economic reforms that could support the sustainability of the pension system.

85. **The paper finds that the impact of aging on the public finances will be large, and that reforms already under way, while helpful, are insufficient to ensure sustainability.** Combining them with further increases in the retirement age and improvements in the employment rate could, however, achieve sustainability, provided revenue gains are not immediately used for pension increases. More generally, the paper argues in favor of a more predictable pension increases, following an agreed formula rather than yearly ad hoc decisions. The paper begins, in section B, by providing an overview of the demographic developments and projections in Romania and compares them to other economies. Section C describes the existing pension system, including its main features and the challenges it faces. This is followed, in section D, by a discussion of possible reforms, including direct pension and more general economic reforms. Section E briefly concludes.

B. Demographic Developments

86. **The Romanian population is aging and shrinking, as a result of rising life expectancy and low fertility.** At a level of 1.3 births per woman, the total fertility rate is far below the rate necessary for replacement of about 2.1. With life expectancy at birth of just 71.3 years, there is much scope for further improvement.

	Population	Median Age
2000	22.12	34.7
2001	22.03	
2002	21.94	
2003	21.87	
2004	21.79	
2005	21.71	36.7
2006	21.53	

87. **Compared to its immediate neighbors, the Romanian demographic position is not unusual** (Table 1).

Dependency ratios and life expectancies are very similar across all neighbors. Fertility rates are higher in Serbia and Montenegro, but similar elsewhere, while emigration is almost twice as high in Serbia and Montenegro and in Ukraine. Interestingly, Hungary was a net immigration country, showing that not all transition economies lose population due to

Source: UN (2007)

²⁸ Prepared by Alexander Klemm.

emigration. Employment rates vary more across countries, with the Moldavian rate almost 10 percentage points lower and the Ukrainian rate about 8 percentage points higher than the Romanian one.

Table 1: Demographic statistics for Romania and selected other countries 1/

	Dependency ratio (population under 15 and over 65 per working age adult)	Total fertility rate (live births per woman)	Life expectancy (years at birth)	Net migration rate (net migration in percent of total population)	Employment rate (in percent of working-age population)
Romania	0.43	1.29	71.3	-0.69	55.5
Bulgaria	0.44	1.30	72.4	-0.65	55.4
Hungary	0.45	1.28	72.6	0.50	56.0
Moldova	0.40	1.35	68.3	-0.95	46.1
Serbia & Montenegro 2/	0.48	1.70	73.2	-1.22	n.a.
Ukraine	0.45	1.19	68.2	-1.49	63.0
<i>Average (neighbors)</i>	<i>0.44</i>	<i>1.36</i>	<i>70.9</i>	<i>-0.76</i>	<i>55.1</i>
Germany	0.49	1.37	78.5	1.33	70.3
France	0.53	1.90	80.2	0.49	63.2
UK	0.51	1.74	78.5	1.14	72.2
USA	0.49	2.04	77.4	1.96	71.4
<i>Average (large EU economies and USA)</i>	<i>0.51</i>	<i>1.76</i>	<i>78.6</i>	<i>1.23</i>	<i>69.3</i>

1/ Fertility rate and life expectancy data: 2004, all other data: 2005.

2/ No separate data yet available for Serbia.

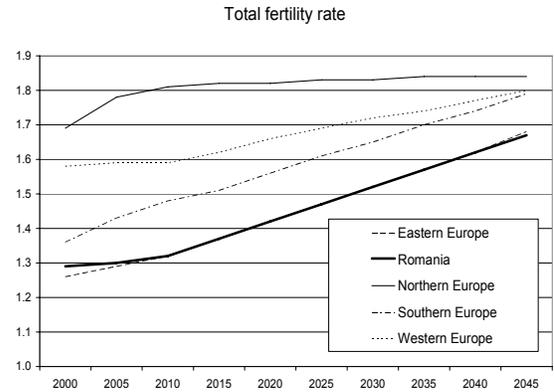
Sources: World Development Indicators (WDI) and World Economic Outlook (WEO).

88. **Compared to the largest Western European economies and the U.S., however, there are important differences.** Romania's dependency ratios are about 5 percentage points lower, as a result of lower life expectancy of on average 7.3 years and lower fertility. Net migration is negative, thus exacerbating rather than counteracting (even if to a limited extent) the low fertility rate. The most striking difference is however that employment rates are much lower, by on average 13.7 percentage points. These comparisons can be summarized by noting that stock variables appear to be of a lesser concern in Romania, while flow variables suggest that changes are occurring at a faster pace.

89. **The exceptionally low fertility rate is assumed to increase gradually over the medium-term, but without reaching replacement rates.**²⁹ According to the UN central

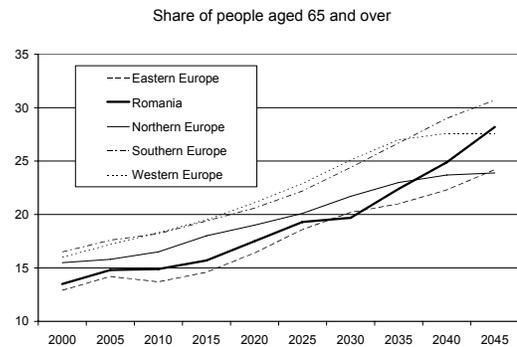
²⁹ The most common fertility measure is the total fertility rate. This is calculated by first obtaining the fertility rates (births per woman) for population groups defined by five-year intervals, which are then aggregated. Another measure is the cohort fertility rate, which is calculated as the total number of children born by women of the same cohort. As this measure can only be calculated for cohorts past child-bearing age, it is often approximated by the total fertility rate. This will, however, provide a downward-biased projection if the average mother's age at birth is increasing and vice versa (for details see inter alia Kohler et al. (2002), for attempts to adjust for this see, e.g., Kohler and Ortega (2002)).

population projection, the total fertility rate is expected to be almost the same as the Eastern European average, but below the average of any other European region. Projections by the US Census Bureau equally assume a slow increase in fertility rates, reaching 1.7 by 2050. Clearly these projections are crucial for the predicted population size, but because of the uncertainties of future fertility, they are also prone to large forecast errors. It is thus inevitable that population projections and all simulations based on them will be subject to a large margin of error and therefore more than one scenario will be considered.



90. **While the share of old-aged people is still relatively low in Romania, it is expected to exceed Northern, Eastern and, marginally, Western European averages by 2050.**

Compared to Southern Europe, however, the share will still be much lower. The dependency rate will increase slightly less, because the share of young dependents will fall as a result of low fertility.



91. **While population projections by various institutions differ substantially, all predict a significant shrinking of the Romanian population over the medium to long-term** (Table 2). This already started 1991, although initially at a very slow pace. The rate of decrease will reach $\frac{1}{2}$ percent of the population per year by around 2011 (UN central projection) or 2038 (US Bureau of the Census projection).

Table 2: Population data and projections
(in millions)

	National Statistical Institute / Institute for Demographics	US Bureau of the Census, International Programs Center	UN World Population Prospects			
			low	medium	high	constant
2000	22.4	22.5			22.1	
2001	22.4	22.4			22.0	
2002	21.8	22.4			21.9	
2003	21.7	22.4			21.9	
2004	21.7	22.4			21.8	
2005	21.6	22.3			21.7	
2010	21.3	22.2	20.9	21.1	21.3	21.1
2020	20.5	21.6	19.3	20.1	20.9	20.0
2030	19.9	20.8	17.5	18.9	20.2	18.6
2040	19.1	19.9	15.5	17.5	19.6	16.9
2050	18.5	18.7	13.3	15.9	19.0	14.9

Sources: Romanian Authorities, National Institute of Statistics (2005), United Nations (2007) and US Bureau of the Census (2006).

C. The Pension System

Description

92. **Romania has an unfunded (or “pay as you go”) pension system, in which the currently working generation finances the pensions of the retired generation.** A voluntary and a compulsory funded system are soon to be phased in, but will remain small in comparison to the unfunded component. The main features of the current system and imminent reforms are summarized in Box 1.

93. **Contributions rates and pensions have periodically been adjusted by ad hoc political decisions rather than a pre-determined formula.** An advantage of this is that it allows the government to weigh pension contribution increases and their benefits (higher pensions) directly against other tax and spending decisions, thus potentially improving efficiency. There are, however, also political economy risks, given that the legislative period is very short compared to the horizon of the pension system, so that unsustainable choices may appear attractive to legislators (and their myopic voters). In an aging society this may be a particularly risky, as the vote of the elderly will be increasingly important.³⁰

³⁰ Cross-country empirical evidence suggests that countries with large shares of elderly in the population tend to have more generous pension system (Profeta, 2002).

Box 1: Main features of the Romanian Public Pensions System

Pillar I: unfunded system

Retirement age and required years of contributions:

	Male	Female
Retirement age	63 rising to 65 by 2013	58 rising to 60 by 2013
Years for full pension	31 rising to 35	26 rising to 30
Minimum years	11 rising to 15 by 2013	

Contributions:

Earnings of at least RON 318 per month and up to 5 times the gross average wage (RON 6350) are liable for pension contributions. The employee contributes 9.5 percent and the employer pays the balance to achieve the following overall rates:

Ordinary working conditions:	29 percent
Difficult working conditions:	34 percent
Most difficult working conditions:	39 percent

The average pension is worth about 1/3 of the average wage.

Pillar II: mandatory funded system

Operational from January 1, 2008.

Compulsory for employees up to 35 years of age and optional for employees aged between 35 and 45.

Contributions: 2 percentage points out of the total contribution in 2008, rising by 0.5 percentage points per year until 6 percentage points are reached in 2016.

Pillar III: voluntary funded system

Expected to become operational during 2007. Contributions are made out of gross earnings.

94. **The planned introduction of funded pillars in addition to the existing unfunded system does not directly address the problems created by aging, but may be beneficial for other reasons.** The advantages include that contributions may be less distortionary, because they would be considered (forced) savings rather than taxes by individuals. Moreover, under most circumstances the rate of return on funded systems is higher than on

unfunded ones. A related advantage is that national savings may increase, which would help strengthen the current account. There will however also be costs, notably the cost of transition, during which retiring individuals will still qualify for full state pensions, but contributions will partially go towards the funded system. As the reform has not yet been implemented, the calculations below will consider both the implications of aging on the current system if it were to remain static, and on a system that is reformed according to the planned schedule.

95. **As long as an unfunded element remains, there will be fiscal pressures as a result of aging.** A higher funded element would increase the fiscal costs in the medium term, because of the need to finance the transition, but would reduce them in the longer term. According to current reform plans the unfunded part of the pension system will remain the most important of the three pillars. However, even if the unfunded element were fully abolished, some fiscal pressures would remain, as some individuals would not be able to build up sufficiently large pension funds and hence require welfare payments after retirement.

Sustainability of the pension system

96. **A crucial analytical choice in the assessment of the sustainability of a pension system is which feature to keep constant.** On one hand, one could assume a fixed contribution rate, and forecast the implied replacement rate based on assumptions about the developments of the population and the economy. On the other hand, one could assume a fixed replacement rate, and calculate the necessary contribution rate. In both cases one would then look at the calculated rate to see whether it could be an acceptable outcome. If not, then clearly the system is not sustainable and deeper reforms than simple adjustments of one of the rates are necessary. The choice between both approaches is normally given by the pension system, which often implies one of the two approaches in the absence of a major reform. In Romania, however, as both rates are subject to ad hoc political decisions the choice is less obvious. Politicians facing a deteriorating dependency ratio are most likely to make adjustments on both sides, to dampen negative effects on both working and retired generations.

97. **To illustrate the implications of aging, this paper assumes that the government will keep the relative living standard of pensioners constant.** This assumption reflects the low level of current pensions compared to earnings, which means that it would be politically difficult to allow pensions to fall back even further in relative terms. Specifically, the government is assumed to keep the ratio of pensions per old-aged person constant as a share

of per capita income rather than fixing the contribution or replacement rate.³¹ An implication of this assumption is that, if employment rates rise, the additional contributions do not increase pensions of the average old-aged person. Further assumptions are detailed in Box 2. These assumptions aim to focus on the effect of demographic change and abstract from other changes. Hence education expenditure is assumed to grow with GDP, but to fall with the number of young people. While there could well be a case for increasing per-student expenditure in excess of GDP growth, this is a separate question, not addressed here, and would need to be financed by other expenditure cuts or tax increases. Table 3 presents the results, both under the assumption of the current system remaining static, and under the assumption that reforms are implemented as announced.

³¹ In case of stable employment ratios and wage shares in GDP, this would be equivalent to fixing the replacement rate.

Box 2: Assumptions underlying the baseline scenario of the simulation

Revenues:

- Pension contributions: constant as a share of GDP in no reform scenario. In the reform scenario, it is assumed that half of all individuals for whom the second pillar is optional will decide to enroll.
- Other revenues: constant as a share of GDP.³²

Expenditures:³³

- Pensions: increasing at the rate of increase of the number of old-aged people and per capita GDP. In the reform scenario, it is assumed that the real interest rate exceeds the real rate of economic growth by 50 percent. Hence, first pillar expenditure can be cut by more than the reduction in contributions, without leaving pensioners worse off.
- Education: falling at the rate of decrease of young people and increasing with GDP.
- Other non-interest: constant as a share of GDP.³⁴

Other assumptions:

- Growth of GDP per working adult: as in macroeconomic framework until 2012, 5.5 percent in 2013, falling to 3 percent by 2050.
- Population growth: UN WPP central forecast, unless otherwise noted.
- Employment rate: constant (relaxed later).

³² Goudswaard and van de Kar (2001) argue that aging may have a positive effect on tax revenues, as wages and hence tax payments of older employees are higher because of career progression. In Romania, however, such an effect should be small, because of the low progressivity of the flat income tax.

³³ For empirical underpinnings of these assumptions, see Luski and Weinblatt (1998). Using cross-sectional data they find that expenditure shares in GNI of education and welfare spending do not change with per-capita GDP (except in poor countries). They also estimate a proportional relation of both with the share of young and old people in the population. They cannot confirm any scale effects in the provision of education.

³⁴ Some expenditures, notably health, may increase with the share of old people, while others will decrease.

Table 3: Simulation based on current pension system and planned reforms
(percent of GDP)

	Revenue			Expenditure (non-interest)				Primary balance	
	Pension		Other	Pension		Education	Other	static system	reformed system
	static system	reformed system		static system	reformed system				
2006	5.4	5.4	25.8	5.3	5.3	4.3	22.6	-0.9	-0.9
2007	5.4	5.4	28.7	5.3	5.3	4.8	24.0	0.0	0.0
2008	5.4	5.2	28.7	5.3	5.3	4.7	24.0	0.0	-0.2
2009	5.4	5.1	28.7	5.3	5.3	4.7	24.0	0.1	-0.2
2010	5.4	5.1	28.7	5.3	5.3	4.6	24.0	0.1	-0.2
2020	5.4	4.5	28.7	6.4	6.4	4.1	24.0	-0.4	-1.3
2030	5.4	4.4	28.7	7.3	7.2	3.5	24.0	-0.7	-1.6
2040	5.4	4.3	28.7	9.9	9.5	3.1	24.0	-3.0	-3.7
2050	5.4	4.3	28.7	13.2	11.8	2.9	24.0	-6.0	-5.7

Source: Staff calculations, using data from the Romanian authorities, United Nations (2007), and WEO.

98. **The results of the simulation are dramatic and reveal the necessity of an enormous fiscal effort if relative living standards of pensioners are to be kept.** Initially, the worsening of the primary balance is modest, but after 2030 it accelerates in line with the much faster increase in ratio of old-aged people per working adult (Figure 1). The planned reforms would at first increase the strain on the public pensions system, but by 2050 a saving of 0.3 percent of GDP could be achieved, which would rise further over time until the transition is complete.³⁵ As shown in Table 4, the cost will also depend on fertility, with a difference between the low and high fertility scenarios of about 1½ percent of GDP. Despite the long horizon over which this deterioration is expected to occur, the size of the effect warrants early reforms.

³⁵ This will occur when the last pensioner who has not contributed to the second pillar is deceased.

Table 4: Primary balances under different fertility scenarios
(percent of GDP)

	Static system			Reformed system		
	low	medium	high	low	medium	high
2006	-0.9	-0.9	-0.9	-0.9	-0.9	-0.9
2007	0.0	0.0	0.0	0.0	0.0	0.0
2008	0.1	0.0	0.0	-0.1	-0.2	-0.2
2009	0.2	0.1	0.0	-0.1	-0.2	-0.3
2010	0.3	0.1	0.0	0.0	-0.2	-0.4
2020	0.6	-0.4	-1.5	-0.2	-1.3	-2.3
2030	0.2	-0.7	-1.6	-0.8	-1.6	-2.6
2040	-2.9	-3.0	-3.6	-3.6	-3.7	-4.3
2050	-7.5	-6.0	-5.9	-6.9	-5.7	-5.8

Source: Staff calculations, using data from the Romanian authorities, United Nations (2007), and WEO.

D. Options for Further Reform

99. **Ultimately, within an unfunded pension system, no reform can prevent that aging will lead to a reduction in pension benefits relative to contributions paid.** A reform therefore cannot solve the fundamental problem, it can merely determine who will bear most of the burden (pensioners or contributors, current or future generations) and how the burden will be borne (higher contributions or longer working lives). These choices are very important, as they may have very different effects on economic efficiency.

Reform of the current unfunded pension system

100. **Increasing retirement ages has proved to be the most effective parametric reform in improving the sustainability of unfunded pension systems.**³⁶ Such a reform works by both reducing the time of benefit entitlement and increasing the time of compulsory contributions. However, for this to work, it must be the case that the longer working years do not lead to actuarially larger entitlements. The current retirement ages are already scheduled to increase to 60 for women and 65 for men by 2013. The retirement age for women then reached will still be low by international standards, and differentiation of retirement age by sex is becoming increasingly rare. The retirement age for men will be typical, although other countries strongly affected by aging have legislated increases in retirement ages to 67 (e.g., Denmark, Germany, Norway, United States). The estimated improvement in the primary

³⁶ See for example simulations in Chand and Jaeger (1996).

balance as a result of increasing retirement ages by one year are shown in Table 5. The savings in 2050 range from ½ percent of GDP if fertility turns out to be high and the introduction of the second pillar is implemented as planned to 1 percent of GDP if fertility is low and no second pillar is introduced.

Table 5: Savings from increasing the retirement age by 1 year
(percent of GDP)

	Static system			Reformed system		
	low	medium	high	low	medium	high
2020	0.5	0.5	0.5	0.5	0.5	0.5
2030	0.5	0.5	0.4	0.5	0.4	0.4
2040	0.8	0.7	0.7	0.8	0.7	0.6
2050	1.0	0.8	0.7	0.9	0.7	0.6

Source: Staff calculations, using data from the Romanian authorities, United Nations (2007), and WEO.

101. **Another useful reform would be to introduce a more predictable mechanism for contribution and benefit rates.** This would improve the transparency of the existing system, allowing individuals to better gauge the value of pension benefits they will receive relative to their contributions. To ensure a stable mechanism that would not be in need of adjustment, such a formula would have to take demographic statistics into account. In the extreme case, each individual could have a notional account, in which case contributions would be perceived as investments rather than tax payments.³⁷ However, even if the system remained actuarially unfair, e.g., by maintaining elements of redistribution, the benefits of contributions would still be more obvious to individuals than currently.

Further move towards a fully funded pension system

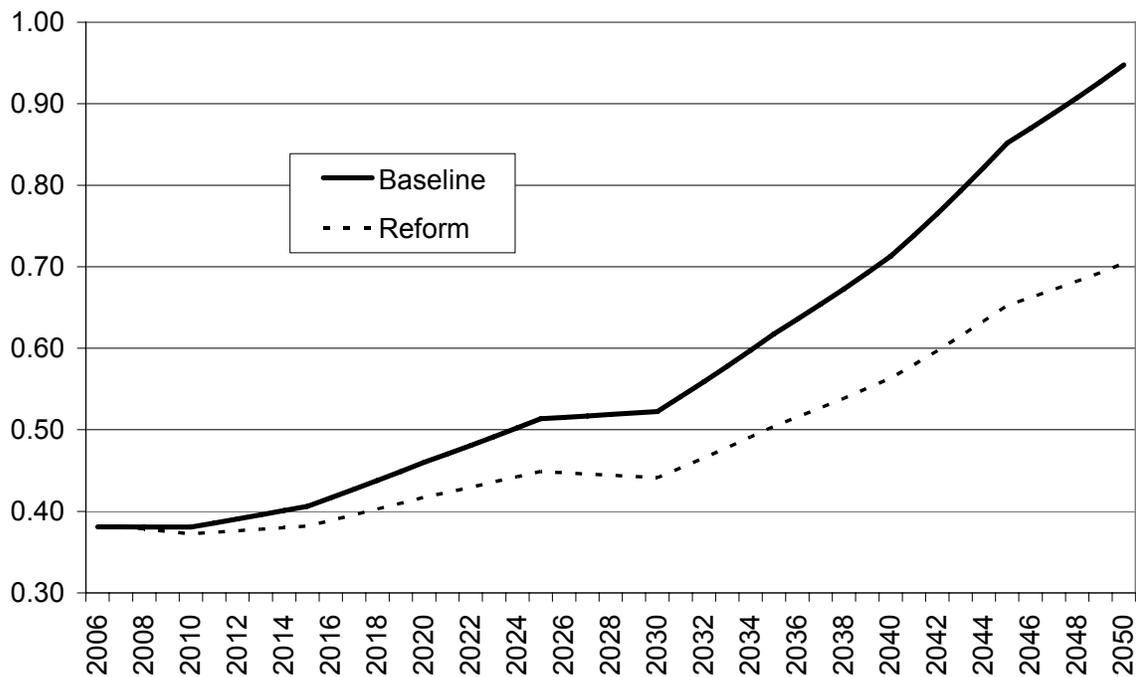
102. **Despite the predicted benefits of the introduction of funded pillars, a complete abolition of the unfunded pillar would be risky.** The negative effects of aging on pensions would remain under a funded system, as increasing longevity will reduce annuity revenues on retirement. Moreover, the much smaller younger cohorts will need to supply the relatively large group of old-aged people with non-tradable goods and services. This can be expected to put upward pressure on their prices and thus reduce the real value of pensions. Another disadvantage of a fully funded system would be that individuals would bear all investment risks.

³⁷ An incentive to underreport income may continue to exist, as the rate of return on this investment may not be very high and not reflect an individual's preferred use of resources, but it would be reduced.

Other economic reforms which affect the pension system

103. **Increasing Romania's very low employment rate would be a powerful way of increasing pension contributions of the current system.** The current low employment rate of just 56 percent means that each working adult is supporting 0.38 old-aged people.³⁸ Increasing the employment rate can counteract the increase in old-aged people due to aging. Norway, Europe's best performer has an employment rate of just over 75 percent. If the Romanian rate is steadily increased to such a level by 2050, then the ratio of old aged-persons per working adult will increase only modestly until around 2032. Thereafter, a steep increase is unavoidable, and every working adult would have to support 0.7 old-aged people by 2050. Without an increase in employment rates, however, there would be almost one (0.95) old-aged person per working adult by 2050.

Figure 1: Old-aged persons per working adult



³⁸ This is thus an adjusted dependency ratio, as only employed people are counted in the denominator. The logic could be taken further, by including only those old-aged persons who are entitled to a pension in the numerator, as for example done in Hagemann and Nicoletti (1989). Including all old-aged persons however, has the advantage that it shows the future burden in very general terms, as even those people without pension benefits will have to be supported somehow by public funds, except those who have sufficient private wealth, which are unlikely to form a significant share.

104. An increase in the employment rate would greatly reduce the fiscal cost of aging, provided pension entitlements are not increased following the increased participation.

If the employment rate were increased to 75 percent, the primary balance would improve by between about 2½ and 4 percent (Table 6). The benefit would be particularly large in case of the low fertility scenario, in which case it would also be particularly necessary. Examples of such policies include: improved education, including retraining for employees with obsolete skills; encouragement of female labor participation by subsidized child care provision; welfare reform to ensure strong work incentives; and promotion of general labor market flexibility.

Table 6: Savings from increasing the employment rate to EU best performance
(percent of GDP)

	Employment rate	Static system			Reformed system		
		low	medium	high	low	medium	high
2006	55.7	0.0	0.0	0.0	0.0	0.0	0.0
2010	57.0	0.0	0.0	0.0	0.0	0.0	0.0
2020	61.5	0.5	0.5	0.4	0.5	0.5	0.4
2030	66.0	1.1	1.0	1.0	1.1	1.0	1.0
2040	70.5	2.3	2.0	1.8	2.2	1.9	1.7
2050	75.0	4.1	3.3	2.7	3.9	3.1	2.6

Source: Staff calculations, using data from the Romanian authorities, United Nations (2007), and WEO.

105. Policies aimed at increasing fertility rates could also support the sustainability of the pension system, although the gains would be modest over the medium term.

As shown in Table 4, the effects of increasing fertility rates to the UN's optimistic scenario would be small, and in the case of the reformed scenario almost negligible. This is because expenditure on education would rise immediately, while stronger contributions can only be expected when individuals reach working age. Nevertheless, a number of policies aimed at increasing fertility rates were recently introduced, including generous maternity leave, increased child benefit, allowances for large and one-parent families, and even payments for first marriages and newborns. Empirical evidence from other countries (Gauthier and Hatzius, 1997) suggests that such policies can be expected to have a statistically significant—though modest—effect on fertility.

E. Conclusion

106. **The aging of the Romanian population poses a challenge for the public pensions system and fiscal sustainability.** This is not insurmountable, particularly if reforms are tackled soon.

107. **Reforms under way are helpful, but insufficient for fiscal sustainability over the long term.** In addition to direct changes to the pension system, such as further increase in retirement ages, especially for women, other structural reforms, particularly aimed at increasing the employment rate, appear most promising.

108. **A requirement for successful fiscal consolidation is that improvements in the revenue side are not immediately spent.** If for example the increased pension fund revenues that would result from higher employment rates were immediately spent on current pensioners, fiscal sustainability would not improve. And even if savings were achieved inside the pension system, they would not improve overall fiscal sustainability, if they led to higher current spending in other budgetary areas, as would occur if government tried to achieve a fixed overall fiscal balance.

References

- Chand, Sheetal K. and Albert Jaeger (1996) "Aging Populations and Public Pension Schemes" Occasional Paper 147, International Monetary Fund.
- Gauthier, Anne H. and Jan Hatzius (1997), "Family Benefits and Fertility: An Econometric Analysis", *Population Studies* 51(3), pp. 295-306.
- Goudswaard, Kees and Hans van de Kar (2001) "The Impact of Demographic Change on Tax Revenue" *Atlantic Economic Journal* 22(3), pp. 52-60.
- Hagemann, Robert P. and Giuseppe Nicoletti (1989) "Population Ageing: Economic Effects and Some Policy Implications for Financing Public Pensions" *OECD Economic Studies* 12, pp. 51-96.
- Kohler, Hans-Peter, Francesco C. Billari, and Jose Antonio Ortega (2002) "The Emergence of Lowest-Low Fertility in Europe during the 1990s" *Population and Development Review* 28(4), pp. 641-680.
- _____, and Jose Antonio Ortega (2002) "Tempo-adjusted period parity progression measures, fertility postponement and completed cohort fertility" *Demographic Research* 6(6), pp.91-144.
- Luski, I. and J. Weinblatt (1998) "A Dynamic Analysis of Fiscal Pressure and Demographic Transition" *Applied Economics* 30, pp. 1431-1442.
- National Institute of Statistics (2005), *National Statistical Yearbook 2004*, Bucharest.
- Profeta, Paola (2002), "Aging and Retirement: Evidence Across Countries" *International Tax and Public Finance* 9, pp. 651-672.
- United Nations, Department of Economic and Social Affairs, Population Division, (2007), *World Population Prospects: The 2006 Revision*.
- US Bureau of the Census, International Programs Center (2006), *International Database*.