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Reflections on Modeling the Russian Economy⁴¹

Russia is Europe's largest neighbor. How Russia develops is of consequence to the foreign policy of all European countries and the European community as a whole. Economic integration makes Russian development a question of business opportunity and economic growth in border countries and beyond. Russia remains an underinvested market and from a European investment perspective has gained and will continue to gain increased attention.

Politics and business will always be constrained by economics and the latter will always be shaped by the former two. The Russian economy has gone through an unprecedented transition since the fall of the Soviet Union. While other European Comecon countries had a capitalist economic tradition to fall back on, the entirety of modern Russian economic history took shape under the principles of state communism. Since reforms began Russia has been through a painful transition period that more than halved GDP. On the verge of economic stabilization and possible upturn, Russia was hit by a financial crisis founded in the unsustainability of preceding reform policies that wiped out what little wealth had been accumulated among the Russian populace. The detrimental effects of which are felt today. Since the 1998 default Russia witnessed an uninterrupted economic boom until the world was hit by the 2008/2009 global recession.

Global relevance together with significant transitional volatility generates a certain intrigue among macroeconomic researchers. The time span over which Russia has operated in a market economy has only recently become sufficient to allow sound macroeconomic modeling and thus fed into both interest and efforts to model the Russian economy.

Through our involvement in the RussCasp research program Econ Pöyry is committed to the topics of Russian energy and relations between energy and general economic development. Core research topics include energy reform, macroeconomics, scenario foresight and country risk. A major part Econ Pöyry's contribution to the project is the development of a macroeconomic model for the Russian economy geared at analyzing effects of oil price volatility. The first phase of this task has been completed in cooperation with Statistics Norway.

Existing models

To our knowledge not many models of the Russian economy exist today. Among these only a few are available to the international research community. Computable General Equilibrium (CGE) models have been calibrated to the Russian economy by among others Wehrheim (2003). Nonetheless, in existing literature the general equilibrium (GE) approach has been used mostly to analyze trade policy effects on the Russian economy. Jensen et al. (2004) and Rutherford et al. (2005) employ a static comparative CGE model to assess trade liberalization effects of a Russia WTO accession. Alekseev et al. (2003) employ the same methodology to EU enlargement and the proposition of a free trade zone between Russia and the EU. Sulamaa and Widgrén (2005) study the

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same topic using the multiregional general equilibrium model GTAP (Global Trade Analysis Project).

Hauer (2008) analyzes pension reform options within dynamic stochastic general equilibrium framework using the IMF GIMF model calibrated to the Russian economy. Also, related to energy, Kerkelä (2004) uses the GTAP model to assess price reform in Russian energy markets. Although GE modeling has been applied to issues beyond trade liberalization, policy assessment stands out as a common denominator for the studies reviewed above. The applicability of the GE framework in such context can easily be argued due to the non-repeating nature of the respective reform options. When studying possible impacts of principally yet-to-occur phenomena, one has little other option but to build one's argument on economic agents' expected behavior.

It is notable that the GE framework has not (to the extent of our knowledge) found application to research on Russian macro economic response to regular shocks – an issue of equal and perhaps greater relevance to decision makers, be they public or private. From our point of view the single most relevant relation in this regard is the Russian economy's dependence on the oil price. This relevance arises from the commonly accepted significance of the oil price to the Russian economy, but also from its' unpredictable nature.

Leaving the interests of Russian decision makers aside, foreign agents could derive substantial benefit from a comprehensible macroeconomic model of the Russian economy. To provide an example, foreign investors in the Russian banking market could gain important insights into probable development of domestic interest rates as well as consumer and investment demand. In addition disclosing the dependency of key variables on outer factors in a traceable manner would provide strategic support in investment processes. Exporters should benefit from an indication of growth prospects prior to making investments into the Russian market. The national defense strategist could benefit from a scenario-based projection of government spending.

The Institute of Economies in Transition at the Bank of Finland provides regular forecasts of Russian economic performance. The Vector Autoregressive (VAR) model lined out in Rautava (2002) focuses on long run effects of the oil price and the real exchange rate. Significant long run relationships are established between GDP and the oil price and real exchange rate. Also long run relationships between government revenue and the oil price and GDP are established. The oil price is found not to have a direct influence on the real exchange rate, only through the significant effects of GDP and revenue on the former variable. In addition a short run error-correction model (ECM) is constructed. However efforts are constrained to the trial of long-run relations established in the VAR analysis.

Merlevede et al. (2004) develop and estimate a simple ECM for the Russian economy on a sample 1994Q1-2002Q4. Later Merlevede et al. (2009) expand on this model. The sample is extended to 1995Q2-2007Q4. Exports are differentiated between oil and non-oil exports, the nominal exchange rate is endogenized and dummy variables are included in the government revenue equation to account for new oil taxation practices under Putin and in the expenditure equation to account for the introduction of the stabilization fund in 2004. In addition monetary policy is endogenized through a Taylor rule and is found to affect the nominal exchange rate and money supply.

Several reflections appear suitable based on the review above. First, despite the macroeconomic relevance of oil price developments, the topic remains understudied. Second, explicit studies of oil dependency have been concretized outside the GE-framework. As the objective is not to scrutinize effects of a particular reform but rather external volatility, modeling based on economic agents' assumed behavior stands out as unnecessary and a possible source of error due to strictness of imposed assumptions. While GE models are argued to be less prone to Lucas Critique due to their profit and utility maximizing foundation, misspecifications due to invalid assumptions are from our point of view a potential risk when modeling transition

economies. As an example the assumptions in Hauner (2008) of static (and short) planning horizons and credit constraints seem improbable in the Russian setting. The consequences of these assumptions for the outcome of model simulation are however not easily penetrated by the reader putting the benefit of the GE approach as risk. Furthermore the static approach of the CGE framework renders limited added-value to stakeholders interested in the effects of different shocks at various points in time.

Finally, ECM modeling within an IS-LM framework with endogenous fiscal and monetary policy stands out as a favorable approach to building a comprehensible macroeconomic model of the Russian economy that incorporates a sufficient set of interdependencies to be of use for decision makers also beyond academic circles.

A simple econometric ECM for the Russian macro economy

With this starting point Econ Pöyry and Statistics Norway have constructed a macro econometric model of the Russian economy with 14 estimated equations and 5 identities totaling 19 endogenous variables (see Benedictow et al., 2009 - *forthcoming*). Real GDP follows as a sum of domestic demand and net exports. All equations are estimated over the sample 1995Q1-2008Q1 with the exception of the exchange rate which is estimated starting 1999Q1. Oil exports are differentiated from non-oil exports and policy variables are made endogenous. Explicit government revenue and expenditure shifts are not included, but a “Putin dummy” is generally found to be significant. Focus is set on conveying the model’s setup in manner that allows prompt understanding and interested researchers to further develop the model.

The modeling exercise confirms the positive relation between oil prices and Russian economic performance. Government revenue, expenditure and consumption along with oil exports are positively influenced by the oil price leading to higher GDP both directly and through private consumption by means of higher real disposable income. The economy exhibits stabilizing properties as higher oil prices influence inflation directly and through the wage channel bringing about increased counter cyclical pressures through higher interest rates. The interest rate exercises influence on investment and the exchange rate, with the latter (along with higher inflation) putting increased downward pressure on non-oil exports through the real exchange rate. This process is reinforced by a direct negative dependency of the exchange rate on the oil price.

The model exhibits convincing fit and passes standard statistical tests. It should therefore serve as an adequate supplement to existing models for forecasting purposes and policy debate. From a model developer’s point of view it is of significant advantage that the model, despite its accomplishments remains work in progress. Although the model at its current stage deserves confident application to real-life problems, several issues remain to be discussed leading to possible modifications and improvements.

Challenges

A prime challenge in modeling in general and in modeling the Russian economy in particular is of course data. Econometric modeling and analysis prefer long, and well behaved, time series. For Russia, available data are neither. Data credibility no longer poses the same challenges for modelers as for Varshavsky (1999). However market generated data only stretch back to 1992-1994 limiting the scope for modeling operations. Furthermore, the Russia economy itself has been plagued by obvious and not so obvious structural breaks through the course of transition. Short history

complicates econometric diagnostics of these breaks. However their effects are apparent. In our model the exchange rate is estimated using only half the sample and nearly all econometric studies of the Russian economy involve some sort of “Putin” dummy capturing an unknown set of net effects coinciding with presidential succession. These breaks pose particular challenges to modeling policy variables. I return to this below after stopping briefly on the issue of tractability and uncovering a theoretical foundation in econometric models as our own.

When trying to convey the results and the relations behind the results of economic modeling to an audience beyond the modeling team itself, it is often handy to found the uncovered relations in economic theory. However, for certain relations in our model we have found that this often easier said than done. While developing our model we have found that from an econometric point of view, the exchange rate may, and perhaps also should, be omitted from the import equation. It is more complicated however to serve a plausible story of why it should be so. In the course of the 2009 crisis Russia’s current account was rescued by falling imports. Partly this can be attributed to a collapse in past years growth in real disposable income, but can also be attributed to the ruble depreciation from 30 to more than 40 rubles for the dollar/euro basket. Explicit inclusion of the exchange rate in the imports equation could enhance tractability and possibly overall model characteristics. A parallel example refers to the role of oil income in determining imports. In the process of determining the import equation we found that oil income could be omitted from the import equation. Thus one might model imports to be under long-run influence of domestic demand exclusive oil exports and in the short-run under the influence of investment demand and non-oil exports. Oil income would thereby be assumed not to be of influence on imports apart from indirectly through the included constituents of domestic demand. Again omitting oil income does not make immediate theoretical sense. Balancing a coherent theoretical story with deriving sound econometric results is a general challenge, but perhaps more so when working with a sub-optimal dataset.

Both monetary and fiscal policy have undergone substantial change under the time period considered. Integrating known policy shifts into the model represents a challenge, but is still unavoidable for the dedicated researcher. On the fiscal side increased taxation of the oil and gas sector can be assumed to have increased the oil price elasticity of government revenues since Putin succeeded Yeltsin as Russia’s president. Government expenditure on the other hand has become more detached from oil revenues following the introduction of the stabilization fund. While the revenue shift might be adequately handled by Merlevede et al. (2009) by estimating separate oil price elasticities for government revenue prior to and after the year 2000, the expenditure issue is more complex. Russia has not committed itself to a particular rule on how the spend petroleum revenues as say Norway has. The only provision is that excess revenues above the budgeted are to be stuck away in the rainy-day Stabilization fund. The structural deficit of the Russian Federation started to increase in the second half of the 2000s suggesting an increased willingness to spend oil revenues as prices rose (see Anker and Sonnerby, 2008). Separate and static oil price elasticities of government expenditure proposed by Merlevede et al. (2009) might not be the most informative way to go. It might be investigated whether a de-facto policy rule for oil revenue spending would provide additional insights. Possible target variables of such a policy rule could be the oil price and/or size of the stabilization fund relative to GDP along with gap GDP growth.

Monetary policy in our model is assumed to follow a Taylor rule with long and short run effects of unemployment and inflationary considerations. The specification works fine econometrically, but the acceptability of implied assumptions may be questioned. Inflation targeting using the interest rate remains a strategic goal for the Central Bank of Russia (CBR), but has yet to be implemented let alone feasible (see Fjaertøft, 2008). Limited domestic savings and mortgage market can ex-ante be expected to render the interest rate a tool with limited bite. Our modeling reflects this as the interest rate is found to have insignificant effect on private consumption.

Furthermore such a policy rule would imply a free floating exchange rate. The ruble is arguably still on a leash although it might be discussed how much influence the CBR is actually able to exert. Regardless, concerns for the exchange rate have persistently interfered with the CBR's free float and inflation targeting ambitions. Looking forward inflation targeting might become an appropriate assumption, but if one strives for compliance between one's practical and theoretically permissible assumptions other approaches might be considered. In particular one might consider modeling a policy rule with the money base as instrument variable. Significant long and short term effects of inflation along with short term effects of the interest rate can be found for such a specification. However, integrating this approach into the larger model would likely not be as straight forward from a theoretical point of view as the interest rate.

The extensive foreign borrowing by the Russian financial sector witnessed in the years prior to the crisis suggest that foreign interest rates might be integrated into the model as regressors for consumer and investment demand. Such an approach would be inline with the argument above and de-facto assumption of an exogenous domestic interest rate due to the CBR's dirty float policy.

Despite the potential scope for improvements, resource constraints force us to be content with progress made so far and leave further research for a later stage.

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