T T Mboweni: Renewed challenges for model builders and forecasters in times of extreme uncertainty

Keynote address by Mr T T Mboweni, Governor of the South African Reserve Bank, at the SAKE24 Economist of the Year Award's Dinner, Johannesburg, 20 May 2009.

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Distinguished guests, ladies and gentlemen

1.　　Introduction

Thank you for the invitation to address you on this important occasion. Since this is a function to recognise the efforts of economic analysts to predict the future, it is fitting to share a few thoughts on the challenges and serious issues that confront both model-builders and forecasters in these most difficult and turbulent times.

The current financial crisis has forced us all to make a major re-assessment of the way in which we have generally perceived the economy to work. Previous fundamental relationships and economic correlations we took for granted have come under question and this has caused intense debate in almost all areas of economic discourse.

The South Africa Reserve Bank and almost all of us here at this venue make use of various tools in the form of structural models that help us analyse and forecast the future of the economy. The fact that forecasts keep changing in such a dramatic way does not necessarily mean that we are bad modellers or forecasters. But we must be aware of the limitations of models, and the major challenges that face forecasters in this ever-changing economic environment.

2.　　The use and challenge for models

At the heart of any economic model is a perception of how the economy works. This leads to the representation of the structural economic relationships in the economy. This can either be a "guesstimate" or gut feel, based on the modeller's knowledge of how the economy functions or, alternatively, a well-articulated mathematical representation of the interrelationships in the economy in the form of an econometric model.

There are significant differences between models, depending on the different views on how the economy is seen to function, and also the use to which the model is being put. Although the various types of models are structured to capture and replicate the economy by providing for the key channels of the transmission mechanism, the emphasis tends to shift between models. For example, the National Treasury will be interested in a model that is geared to accurately assess the overall economic and financial market impact of the spending patterns of government, while the central bank would be more concerned with having a model specifically aimed at achieving its mandated inflation target and monitoring the economic consequences of its monetary policy actions.

There is no unique model or best approach to the forecasting processes and procedures in central banks. This is one reason why the South African Reserve Bank has adopted the so-called suite of models approach. Central banks try to pursue full-information strategies. So, instead of relying on just one model to produce the Monetary Policy Committee (MPC) forecast, we employ a large variety of different models. Also, since the structures of the various models are diverse, each one is capable of telling a different story. The suite-of-models approach has the added advantage of taking some degree of model uncertainty into account by taking all relevant and potentially-important information into consideration.

There are essentially two different types of models. The first is the structural macroeconomic type of model which includes the traditional multi-equation model, and the second is a short-term time series forecast model. Each has its own set of benefits and disadvantages. For example, we have the higher frequency autoregressive integrated moving average (ARIMA) models which are useful for short-term forecasts but are incapable of predicting a turning point since they are essentially based on their own historic trends. The structural multi-equation models such as the South African Reserve Bank's core econometric model is more suited for policy analysis and forecasting since it incorporates behavioural relationships between the key variables of the model.

Other structural models such as the dynamic stochastic general equilibrium models (DSGE) and quarterly projection models (QPM) are more reliable over the medium to longer term but are extremely sensitive to the initial conditions or data starting points of the forecast. This is also a reason why many central banks that have adopted the DSGE approach spend a lot of time and resources on determining exactly where the economy finds itself currently and how far it is from the steady state.

Because of the lags in the response of inflation to changes in the monetary policy stance, any forward-looking monetary policy framework requires a forecast of inflation. However, forecasts should be used with the required degree of caution. Forecasts are, by definition, surrounded by uncertainty, and knowledge about the degree of forecast uncertainty is essential for decision-makers. Basically, we can identify five sources of forecast uncertainty: uncertainty about future shocks to endogenous variables (e.g shocks to consumption and productivity); uncertainty about assumptions concerning exogenous variables (e.g assumptions about oil prices); uncertainty about model parameters (e.g marginal propensity to consume); uncertainty about data (e.g revisions of GDP); and uncertainty about the model structure and specification.

Because of these uncertainties, it becomes extremely difficult to assess the balance of the various influences on the central forecast. Mervyn King, Governor of the Bank of England, has therefore argued that we should not focus too much on the central forecast: "The Monetary Policy Committee has always stressed that a projection is a probability distribution for possible outcomes and not a single path for either growth or inflation".(Mervn King, Bank of England, 2009)

Since their impact depends on the variable in question and the forecast horizon under scrutiny, to actually prioritise or rank the source of forecast uncertainty is a difficult task,. However, in any given model, the degree of uncertainty related to future shocks and the assumed trend in the exogenous variables generally pose the greatest threat to aggregated forecast uncertainty, rather than the uncertainty related to the estimated parameters and data. But challenges also relate to the structural specification of the models used by central banks as it is difficult to incorporate everything that really matters in a simplified econometric framework of the real world.

For example, the traditional models were not able to capture the current crisis. David Blanchflower of the Bank of England recently commented on the use of misspecified models or models that fail to take crucial financial issues into consideration: "The economic models that provided the rationale for the inflation targeting approach do not describe well the features of the global economy that led to the current crisis; the build up of global imbalances, perceptions of risk in the economy and stresses within the financial sector." (David Blanchflower, Bank of England, 2009) As these factors are extremely difficult to incorporate into our models, building models that capture these issues will be a challenge to model builders.

Apart from specification problems, there is the issue of exogenous assumptions that get fed in to the model. A forecast generated by even the most perfect model will only be as good as the assumptions that are used. Very often these exogenous assumptions are notoriously difficult to predict. For example, in 2007 and 2008 when the international oil prices were

increasing, we were continuously surprised on the upside by oil price developments. We were also caught by surprise by the degree to which oil prices declined in the second half of 2008. In the forecasting process our modelling team spends a lot of time analysing the relevant data and forecasts of other institutions to come up with well-informed assumptions. But there is no guarantee that these assumptions will be correct or that they will remain unchanged by the time of the next meeting.

By way of illustration, at the April MPC meeting, the assumptions incorporated into the model included an average contractual oil price of US$50 per barrel in 2009 and US$55 in 2010. (The contractual prices are lower than the spot prices). However in August 2008, the oil price assumptions for the same two years were US$115 per barrel and US$107 per barrel respectively. Other assumptions in the previous meeting included: International commodity prices are expected to decline on average by 15 per cent this year and to remain unchanged next year; international wholesale prices are expected to decline by 3¼ per cent this year before increasing by 2 per cent in 2010; while growth in South Africa's trading partners is expected to contract by 2 per cent in 2009 and expand by 1½ per cent next year. The real effective exchange is expected to depreciate by 4¼ per cent in 2009 and to remain unchanged in 2010. Domestic assumptions include a 4 per cent increase in final consumption expenditure by general government in the next 2 years; administered price inflation of 2 per cent in 2009 and 9¾ per cent in 2010; and an increase in import crude oil volumes of 5 per cent in 2009 and unchanged in 2010.

3.   The monetary policy transmission mechanism

All central bank models strive to replicate the most important channels of the monetary policy transmission mechanism. In particular this includes the interest rate channel and the exchange rate channel in particular. The exchange rate is possibly one the most difficult variables to estimate in the model and usually includes some sort of interest rate parity measure which allows for the domestic exchange rate to appreciate if the interest rate differential moves in its favour. However, does this relationship necessarily hold at times of global financial market uncertainty? We have seen in these circumstances investors and international banks feel the need to limit their risk exposure by repatriating their funds to "safe-haven" instruments such as USA bonds in particular. Our models are unable to predict reliably the exchange rate during such periods where we have extremely volatile and unpredictable capital movements.

The other critical transmission channel is the interest rate channel. Most models generally assume that there is no obstruction to the interest rate pass-through to the rest of the economy. However, at the peak of the financial market crisis towards the latter part of last year, commercial banks started to raise their credit lending standards and criteria. The quarterly Senior Loan Officer survey of the Federal Reserve Board bears testimony to the fact that elevated loan spreads and increased deposit requirements have been self-imposed by the banks to reduce their asset risk in an effort to protect their balance sheets. Although this is probably perfectly rational behaviour by prudent banks struggling to value the extent of their loan exposure, it has the unfortunate effect of reducing the effectiveness of monetary policy initiatives taken by central banks to stimulate the economy. In fact, in most advanced economies, central bank interest rate levels are currently at their lowest levels in decades, but this does not necessarily imply that this intended benefit is passed on directly through to the investor and consumer.

The behaviour of commercial banks is quite understandable, given the nature and origins of the current economic situation. However, it also underlines the procyclical nature of their actions: banks are more keen to offer credit when times are good, but become somewhat reluctant to advance credit facilities during times of uncertainty and economic slowdown. This behaviour of commercial banks is not unique to the USA. The BER/ Ernst & Young Financial Services Index has also found evidence that domestic banks also have raised their lending

standards and criteria. It also appears that domestic banks are charging higher spreads relative to prime than was previously the case.

The above illustrates that we should not rely too heavily on the results of a model to guarantee our policy success, particularly during times of heightened uncertainty. No model can be expected to replicate all these factors in a consistent time-invariant framework, especially since the behavioural patterns of economic agents tend to change so radically from time to time.

4.   Conclusion

Despite all the problems with the use of models and the challenges related to forecasting in an uncertain environment, models, irrespective of how they are structured, remain integral to the policy decision taken and we will therefore continue to use them. The models themselves have become increasingly sophisticated. But this does not guarantee the success of monetary policy formulation and implementation especially, in an uncertain future. The challenges we are faced with have certainly escalated in recent times. However, with the new challenges we also have new opportunities to get a greater understanding of the dynamic and ever-changing economy we need to deal with.

Thank you very much.

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