Institution: University of Surrey

Unit of Assessment: UOA 18 Economics and Econometrics

Title of case study:

Improving the robustness of monetary policy under uncertainty in emerging economies

1. Summary of the impact (indicative maximum 100 words)

Research by Surrey's Centre for International Macroeconomic Studies (CIMS) has had significant impact on monetary policy in several emerging economies.

This case study highlights impact in Nigeria and Pakistan. Both are important emerging economies: Nigeria is the second largest economy in Africa and ranks 30th by world GDP (adjusted for purchasing power parity), while Pakistan ranks 27th; yet GDP per capita is relatively low in both.

Since 2008, Surrey research has: (1) led to the establishment of a new Centre for Survey Research at the State Bank of Pakistan, collecting data that have directly influenced the Bank's monetary policy; (2) steered reform of the macroeconomic models used by the State Bank and the Central Bank of Nigeria; and (3) helped develop a new approach to monetary policy Nigeria.

2. Underpinning research (indicative maximum 500 words)

Whilst macroeconomic policy rules for developed economies are reasonably well established, emerging economies create several challenges for standard models. This becomes increasingly important as Asia, Africa and South America gain economic prominence. Examples of the unique features of these economies include the potential use of outside currencies in parallel with the domestic one ('dollarization'), significant household liquidity constraints, numerous other financial frictions and large-scale informal sectors. Macroeconomics research at Surrey (currently within its Centre for International Macroeconomic Studies, CIMS, of which all authors named in Section 3 below are members) has been at the forefront of key developments in models to take account of these issues and a number of the results have influenced macroeconomic policy and policymakers in several such economies.

The key features of Surrey's research revolve around significantly amended dynamic stochastic general equilibrium (DSGE) models of the economy in which agents and policymakers base their actions over time on the current state of the economy, their understanding of how it functions and perceived present and future policy. In this context, policy rules are designed to minimise consumers and producers vulnerability to 'shocks' particularly those arising from international openness. Policy needs to be `robust' in the sense of performing well against such shocks, and uncertainty about the true model of the economy. We note several results arising from our work.

First, over a number of years, CIMS has produced leading research in the design of robust monetary policy. Papers (1), (2) and (3) provide new results and clear policy guidance about the nature of the probability models necessary here and (in paper (4)) the need for commitment from policy makers. In 2009, Levine gave the State Bank of Pakistan's annual Zahid Hussain memorial lecture, and an invited keynote Conference lecture for the Central Bank of Nigeria, both on the application of these results to research in emerging economies. This told policy makers to recognise serious microstructural differences between emerging and developed economies when building and applying macro-models, and the role of measurement error in creating uncertainty which could be ameliorated by better data collection.

Second, by amending DSGE models to take account of the openness of emerging economies and

key financial frictions, we have identified robust policies for such settings. Paper (5) demonstrates that this involves the "twin pillars" of flexible exchange rates and inflation targeting. This is a new result with the clear policy recommendation: economies exhibiting emerging market frictions should consider adopting these twin policies, as opposed to their more traditional use of active exchange rate management, to accommodate fluctuations in capital inflows and anchor the inflation rate.

Third, recognising informal (i.e. 'black market') activity in emerging economies leads to key modelling changes and new results. Paper (6) examines a DSGE model where an 'informal' sector avoids the attention of the tax and regulatory authorities. Here, the use of standard inflation measures weakens the link between monetary policy and economic activity and effective policy must recognise this; in particular, it needs better measurement of price formation in the informal sector.

Fourth, another strand of CIMS' research has examined forward-looking inflation targeting. Paper (3) highlights the implications of such policy, but cautions against incorporating especially 'long' sighted expectations, which can render policy 'un-robust' (in the sense above).

3. References to the research (indicative maximum of six references)

1. Levine, McAdam & Pearlman (2012): "Probability models and robust policy rules", *European Economic Review*, vol 56, pp. 246-262.
2. Levine & Pearlman (2010): "Robust monetary under unstructured model uncertainty", *Journal of Economic Dynamics and Control*, vol 34(4), pp. 456-471.
3. Batini, Justiniano, Levine & Pearlman (2006): "Robust inflation-forecast-based rules to shield against indeterminacy", *Journal of Economic Dynamics and Control*, vol 30(9-10), pp. 1491-1526.
4. Levine, McAdam & Pearlman (2008): "Quantifying and sustaining welfare gains from monetary commitment," *Journal of Monetary Economics*, vol 55(7), pp 1253-1276.
5. Batini, Levine and Pearlman (2010): "Monetary rules in emerging economies with financial market imperfections", in Gali & Gertler (eds) *International Dimensions of Monetary Policy*, University of Chicago Press. (Originally NBER Discussion Paper 2007).
6. Gabriel, Levine, Pearlman & Yang (2012): "An estimated DSGE model of the Indian economy", in Ghate C (ed.) *Oxford Handbook of the Indian Economy,* Oxford University Press.

4. Details of the impact (indicative maximum 750 words)

The foregoing research has influenced monetary policy in several emerging economies; indicating significant impact and reach. Since 2008, CIMS researchers have worked with the subjects of this case study (in Nigeria and Pakistan), as well as the IMF in Peru, and the National Institute of Public Finance and Policy in Delhi. The case study arose from the State Bank of Pakistan recruiting a member of CIMS to be Research Director in 2008, and the Central Bank of Nigeria's recruitment of one of our PhD students; both led to Levine's lecture invitations. The Nigerians have subsequently participated in our DSGE Training Courses, generating a strong relationship and channel for impact between us. Several examples illustrate our impact:

(a) Impact on the foundation of a new survey centre in the State Bank of Pakistan, specifically for collection of micro-founded data.

(b) Impact on the design of macro models at the Central Bank of Nigeria and the State Bank of Pakistan.

(c) Impact on monetary policy in Nigeria and Pakistan.

(a) Impact on the foundation of a new survey centre in the State Bank of Pakistan (SBP)

Our research identifies accurate data on forward-looking inflationary expectations and measures of the informal sector as key to building models of emerging economies. Neither was available in Pakistan until the SBP established a new Centre for Survey Research in 2011. Employing 11 full-time equivalent staff, this collects such data in support monetary policy making. [C1] confirms our role: "influenced by CIMS researchers, [SBP] taken much more seriously the need for good data in order to implement such models, and conduct robustness analysis, in the presence of an informal sector. As a result, we have invested in a designated Centre for Survey Research." Our support with the "theoretical background, development and implementation" of the Centre is publicly acknowledged in [C2]; in particular we provided conceptual underpinnings, and Vasco Gabriel advised on sample and questionnaire design. Notably, the Centre's planning and implementation has happened "under the guidance" [C1] of a former full-time member of CIMS (see above), who "brought a number of ideas from CIMS", and excellent lines of communication between ourselves and the Bank.

The Centre collects bi-monthly data on inflation expectations from 2,000 households and organizes national data collection on prices and wages from 1,000 firms. Crucially, approaching individual firms rather than observing purchases captures the informal sector's role in price formation [C3].

(b) Impact on the design of macro models at the Central Bank of Nigeria (CBN) and the State Bank of Pakistan (SBP)

At the CBN, [C4] reports that Levine's 2009 lecture to them and a subsequent presentation to research staff and top management, "brought a completely new foresight to our modelling framework and policy analysis." Through an ongoing "collaborative initiative" (including attendance at our DSGE Training Courses), the CBN has "learnt to avoid the previous constraints of using single – large macro models and [is] now trying to develop micro DSGE models that are designed around interest rate rules that are robust across rival models." (See papers (1)-(3).) "Based on CIMS research" the models include distinctive features of Nigeria: "oil, dollarization, financial frictions and a large informal economy". [C4] recognises our research "has had a considerable influence on the way we are now modelling the Nigerian economy" and believes this has "improved … our monetary policy through its country-specific structure and ability to deal with uncertainty."

At the SBP, [C1] describes a new "research program that uses the probability models recommended in Prof Levine's lecture and in CIMS' publications" and mentions papers (1), (5) and (6)). "Because of this, the [SBP] is developing a series of … DSGE models for Pakistan". [C1] continues: "We have developed our models to incorporate the informal sector, as recommended by Levine's invited lecture." The first model was publicised in [C5] in 2012. [C6] describes a "macroeconomic model incorporating the microeconomic features of the informal sector of the Pakistan economy" (as collected above). As anticipated, the model performs "better" than available alternatives according to [C5] – see also [C6]. The authors of the model [C5] cite papers (5) and (6) as demonstrating the "significance" of, and "providing important evidence" for, their modelling approach.

(c) Impact on monetary policy in Nigeria and Pakistan

In Nigeria, [C4] notes that "CIMS research has significantly improved the output of the Research and Monetary Policy Departments, which generally guide the Monetary Policy Committee members." The CBN has "drawn extensively from the research by CIMS … to review Nigerian exchange rate policy and recently announced [an] inflation targeting framework.", moving the Bank from monetary targeting and a guided exchange rate. It has "benefitted from CIMS research on

comparisons between inflation and exchange rate targeting and … in its recent Board Retreat, announced the plan to implement an inflation targeting monetary policy framework for Nigeria." – exactly as in paper 5.

In Pakistan, the data collected in (a) now feature prominently in monetary policy. For instance, the SBP's Monetary Policy Committee used the data explicitly in its June 2013 Monetary Policy Decision on interest rates – see [C7], and paper (3). The Centre's data have become "vital in conducting forward-looking monetary policy and … a vital rudder in our decisions and overall analysis of the economy." ([C8], p. 60).

5. Sources to corroborate the impact (indicative maximum of 10 references)

Sources selected in line with REF Guidelines:

"Independent documentary evidence of links between research and claimed impacts."

[C1] Chief Economic Advisor, State Bank of Pakistan. (provided statement)

[C2] State Bank of Pakistan Annual Report 2012-2013 (State of the Economy, Volume 1), Chapter 4, forthcoming.

[C3] Choudhary, Naeem, Faheem, Hanif & Pasha (2011): "Formal sector price discoveries: Preliminary results from a developing country, SBP Working Paper no. 42.

[C4] Director, Research Department, Central Bank of Nigeria. (provided statement)

[C5] Ahmad, Ahmed, Pasha, Khan & Rehman (2012): "Pakistan economy DSGE model with informality", SBP Working Paper no. 47.

[C6] State Bank of Pakistan Annual Report 2011-2012, Volume 2, Chapter 1.

[C7] State Bank of Pakistan, Monetary Policy Committee, Monetary Policy Decision, 21 June, 2013.

[C8] State Bank of Pakistan Annual Report 2011-2012 (State of the Economy, Volume 1), Chapter 5, Pages 59-60.

State Bank of Pakistan Annual Reports available from; http://www.sbp.org.pk/reports/annual/