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# Strategic Theory for Central Banking: How to Influence Exchange Rates without Affecting Reserves

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The paper, 'How to Devalue Exchange Rates, without Building Up Reserves: Strategic Theory for Central Banking,' by Kaushik Basu is to be published shortly in the journal, **Economics Letters.** This is a technical paper that uses standard tools from game theory and industrial organization theory to demonstrate how central banks can be vastly more effective in influencing exchange rates by using a strategy of intervention that is different from the ones conventionally used. This is a new theoretical idea and there will have to be a lot of empirical research and small-scale trials before it can be put to use. However, it can potentially have a large effect on the way central bank policy is conducted in managing exchange rates. Since the original paper was written for economic theorists and under the length constraints imposed by **Economics Letters**, it was felt that there is need to spell out the motivation and argument in words. And that is what this short paper tries to do. It may be viewed as a brief for the policymaker. To fully understand the paper it is, however, advisable to read the original paper, available from the author on request.

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## A.

Central banks, wanting to devalue their currency, often intervene in the foreign exchange market by buying up foreign currency by using domestic currency, or conversely, if they want to revalue their currency they intervene by selling off foreign reserves. Such interventions, even if effective, lead to a build-up or running down of foreign exchange reserves, with attendant costs and risks. This paper argues that it is not necessary to have any impact on the reserves when trying to alter exchange rates. By using suitable strategic techniques—called 'schedule intervention' in this paper—it is possible for the central bank to game the private, foreign-exchange dealers to influence the exchange rate without running up costly foreign currency reserves or running the risk of draining limited reserves.

Even as this is being written, there is a lot of concern expressed in the Indian media about the sharp and sudden depreciation of the Indian rupee over the last six months and especially between August and October 2011[1]. The standard way for the central bank to try to correct this (should it wish to) is to release dollars on the market and mop up rupees. Such action is, however, always laced with the concern that there are limits to how much foreign currency the central bank can off-load.

On 6th September, 2011, the Swiss National Bank caused a stir by announcing a ceiling for the Swiss Franc *vis-à-vis* the Euro; and stating that it "was prepared to buy foreign currencies in unlimited quantities" in order to maintain this ceiling[2]. Similar interventions by central banks to depreciate (and occasionally appreciate) currencies have been undertaken around the world. On September 15, 2010, the world felt the tremors when, following a sharp appreciation of the yen, the Bank of Japan sold yen and bought dollars. The immediate impact of this action was to weaken the yen *vis-à-vis* the US dollar. India's Reserve Bank (RBI) has also on occasion used similar action to smoothen exchange rate fluctuations. One consequence of such action to depreciate the domestic currency is that it causes a build-up of foreign exchange reserves, such as happened with

[1] See **Mid-Year Analysis 2011-12**, Ministry of Finance, Government of India, New Delhi.
[2] **Financial Times**, September 7, 2011, p. 1.

the People's Bank of China. This smoking-gun evidence of central bank action has been a source of global criticism. Also, some nations do not want to build up such costly reserves but are reconciled to them as a byproduct of exchange rate intervention.

The aim of this paper (or more correctly the paper that is being elaborated upon here) is to, draw on simple microeconomic theory and show that there is no need to build up reserves or run them down while trying to alter the exchange rate. By appropriately designing *the micro structure of intervention*, the acts of influencing the exchange rate and building up (or running down) foreign exchange reserves can be separated from each other. In particular, it is possible to depreciate your currency and leave no trail of large foreign reserves and equally to revalue your currency without running down your foreign exchange reserves.

**B.**

All central banks keep a watch on the exchange rate of the nation, and when the rate veers too widely 'off course' or away from what is believed to be desirable, the central banks try to intervene directly or indirectly in order to make 'corrections'. It is widely believed that China's PBC tries to keep the renminbi undervalued, thereby making Chinese exports more attractive. On the other hand, the Indian RBI's ostensible aim is to dampen the fluctuations of the exchange rate. To quote from the RBI's most recent **Annual Report** (Reserve Bank of India, 2008, p. 127): "India is classified under the 'managed float' exchange rate regime of the IMF. The Reserve Bank intervenes in the foreign exchange market to contain excessive volatility as and when necessary." Nevertheless, there has been a build-up of reserves. From 1977 to 1990 India's foreign exchange balance hovered around five billion dollars. In the early 1990s the rupee was put on a float and, from then onwards, the way for the RBI to influence the exchange rate was by buying and selling dollars. From 1993-4 the rise in foreign exchange reserves has been sharp, with a slowdown over the last year or so. In recent months RBIs main concern has been to stall sharp depreciations of the rupee, especially *vis-à-vis* the US dollar.

The first proper change in India's exchange rate policy happened because of the financial crisis of 1991. In 1992, a 'dual exchange rate regime' was instituted. There was the **Report of the High Level Committee on Balance of Payments** by C. Rangarajan, which recommended the broad outlines of a market determined exchange rate regime. Current account convertibility was instituted in 1994, and a legal framework to assure such convertibility was put in place in June 2000. India has limited capital account convertibility; such conversions are permitted on a case-by-case basis.

The present paper is not concerned with the rationale behind a central bank's aim, but with the mechanics of how it goes about achieving its objective, whatever that may be. Suppose the RBI wants to devalue the rupee *vis-à-vis* the dollar in order to promote Indian exports. Since India is on a floating exchange rate system, where banks and other foreign exchange dealers are free to announce the exchange rate, the RBI cannot influence the rate by diktat but by buying foreign currency and selling rupees. This typically causes the rupee to depreciate. Usually, the RBI stays behind the scene and the only visible action on the market is that of a public sector bank making a large purchase of dollars. Here is **Mint** newspaper's web edition, **Livemint.com**, August 20, 2008 (2:45 pm), speculating about central bank intervention in India: "State-run Indian banks were seen selling dollars to help the rupee recover from a 17-month low […]. India's central bank uses state-run banks to intervene if it wants to slow a rupee decline or prevent it from rising too quickly, and private bank dealers said Wednesday's dollar selling looked like intervention."

This is not special to the Indian central bank. To quote from a textbook by Auerbach (p. 414)[3]: "This method of influencing exchange rates is not always easy to detect. The central bank may have parties in the private sector intervene for them."

In the U.S., to effect an intervention in the foreign exchange market, the Fed will often contact a dealing bank, such as Citibank and buy currency at Citibank's quoted rate. Moreover, a lot of the Fed's interventions, by some counts nearly half of them, are done secretly. And, often the explicit purpose of the Fed's intervention is to influence the exchange rate.

[3] Auerbach, R. D. (1982), **Money, Banking and Financial Markets**, New York: Macmillan.

This method has its share of practical problems. There is, for instance, the risk that the bank that executes the RBI's order will front-run and buy some dollars for itself first, before executing the RBI's order. The present paper rules out such possibilities and assumes that the central bank's order is carried out by the public sector bank with no effort to make use of insider information. Hence, *in the model*, the RBI and the public sector bank that does its bidding may be treated as the same agent.

## C.

The question that I am interested in is the modality of intervention. If the government's interest is in devaluing the rupee (and not the build-up of dollar reserves), then is placing an order to buy up dollars the best way to achieve this? Are there other ways of intervening in the foreign exchange market which can devalue the rupee without a reserve build-up and vice and versa? The answer is yes and the aim of the paper is to demonstrate this. Let us here call the current mode of intervention by the RBI a 'quantity intervention' whereby the RBI simply states the quantity of dollars that it wants the public sector bank to buy on its behalf. There seems to have been very little research on whether this is the best mode of intervention.

By building a strategic-form game model and studying its Nash equilibria, this paper questions if quantity intervention is the best kind of intervention. It is argued that there are other forms of intervention that may be superior. In particular, the paper develops the idea of what will be called a 'schedule intervention' and argues that central banks interested in influencing the nation's exchange rate, be it the RBI or the PBC or the BOJ should use schedule interventions.

Broadly, a schedule intervention is one where the central bank or its agent bank enters the foreign exchange market not with a fixed quantity demand but with a demand that is conditional on price. By suitably 'sloping' its demand for foreign currency, the central bank can fully immunize exchange rate interventions from a build up or running down of reserves. Basically, what this paper demonstrates is the novel result that exchange rate management and reserve management can be treated as two completely

independent objectives by the central bank. The secret is to choose a suitable schedule of intervention.

If the currency market is fully competitive, there is no advantage from a schedule intervention; but if the market has big, strategic dealers and banks, then schedule interventions can be vastly more effective. There is little work on the microfoundations of central bank intervention, and the present paper may be viewed as a step to correct this.

**D.**

To give the non-technical reader a glimpse of what the new intervention looks like, here is the description of the proposed schedule intervention, *f(p),* when the government's aim is to devalue the exchange rate from the current market equilibrium, $p^0$, to any chosen rate, $\hat{p}$ , given that there are $n$ large private banks that deal in foreign exchange, to whom the value of the foreign currency is given by $u$ per unit, and the demand for and supply of foreign exchange from the price-taking agents are given by linear functions, *d(p)* and *s(p)*, respectively:

$$f(p) = s(p) - d(p) - \left[\frac{s(\hat{p}) - d(\hat{p})}{n(u - \hat{p})}\right]p - \left[\frac{s(\hat{p}) - d(\hat{p})}{n(u - \hat{p})}\right][n(u - \hat{p}) - \hat{p}]$$

This may, at first sight, appear to be nothing but a pretty picture, if that. But it has the potential to be a powerful instrument of central bank intervention for influencing exchange rates.

**E.**

It is true that at this stage this is merely theory. It will take time before it can be put to use. To compute the actual schedule intervention function—meaning, to convert the letters in the equation to numbers—will require empirical work. Also, given that in reality we will never be able to estimate the precise intervention it will be important to work out the consequences of 'small' mistakes in intervention. In other words, there is

still a lot of research to be done before schedule interventions can be used. However, that must not be treated as reason to dismiss theoretical research. We must remember that purely-theoretical research ideas about auction design have transformed the way we conduct auctions and this has yielded huge benefits to governments. There are, of course, theoretical findings that have found no practical use. By its very nature research is a risky venture. But undertaking this risk is an essential step in discovering usable and superior policy instruments.