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1. Introduction

Macroeconomic policy making is, more than other branches of economics, given to fads and fashions. For instance, money supply targets have been given a quiet burial, inflation targeting has taken over the commanding heights of policy-making without any soul-searching that should accompany such a major shift in thinking—almost a shift in paradigm.

Two ideas have been in fashion in the recent past: Exchange rate regimes had to have “corner solutions” and macroeconomic policy-making should be fully transparent. A corner solution refers to policy-makers choosing either a “hard peg”—that is a fixed exchange rate system with no discretionary recourse on part of the central bank to monetizing the government budget deficit—or a freely floating exchange rate regime. Thus if a country wants fixed rates, it must opt for a currency board where its central bank surrenders possible tax from seignorage to those who issue internationally acceptable reserves. It rules out a soft peg, where domestic assets, in addition to foreign

assets, also constitute backing for the monetary base. The argument being that an irresponsible central bank would monetize deficits and precipitate an attack on the currency a la Krugman's (first generation) balance of payments crisis models.

The second idea of transparency requires that a minimalist rule-based macroeconomic policy should be communicated to the private sector. Crudely put, this says: Why should the central bank with nothing to hide introduce noise into the system? This thinking forms the core of the call for an independent central bank.

We shall see in this chapter that Singapore monetary policy (since 1981) cocks a snook at both these bits of received conventional wisdom. And since no one can argue that Singapore's macroeconomic policy has been anything but a spectacular success story, we have to ask ourselves how does this unique macroeconomic (primarily monetary) policy work? Can we use macroeconomic theory to understand the functioning of these policies? Or is it the case that Singapore got its bouquet of policies right but we cannot say if it could have done better?

There is quite a substantial literature on Singapore's monetary policy. I shall review this literature and, without apology, borrow from it. In my overall evaluation, I will have a little more to say than these previous studies.

This chapter is organized as follows: In the next section (section 2) the exchange rate-based monetary policy followed by the Monetary Authority of Singapore (MAS) is outlined. Section 3 discusses possible theoretical frameworks, including a reaction function. In section 4, I discuss briefly the way the MAS has dealt with recessions. Section 5 presents the view that the regulatory framework is the important distinguishing feature of policy in Singapore and monetary policy is only a part of it. In the concluding section I discuss the issue of transparency.

2. Singapore's Monetary Framework: An Overview

Since 1981, Singapore's monetary policy has been based on controlling the exchange rate as the intermediate or operational target. The objective of monetary policy generally stated, as is almost common to all Central Banks, is to promote price stability to support sustainable economic growth. The MAS encourages the exchange rate to appreciate if the

expected inflationary pressures are strong. Recognizing the lags in monetary policy, the MAS acts in a forward-looking manner by taking into account anticipated developments in the domestic economy and those in the rest of the world.

Targeting of the exchange rate path implies that the MAS cedes control over the interest rate and the money supply. In any case, the interest rate is beyond the MAS' control since for a small open economy like Singapore, uncovered interest parity holds.¹ But as the central bank presiding over an orderly banking system, the MAS also has to ensure sufficient liquidity in the banking system so as to enable the banks to meet their normal demand (for reserves and settlements).² The magnitude of this liquidity requirement can vary significantly from day to day.^{3,4}

The MAS' exchange rate targeting framework has three elements: basket, band and crawl ("BBC" popularized by Williamson (1998, 1999)).

I will now elaborate on these components.

(1) The basket: The Singapore Dollar (S\$) is managed against a basket of currencies of its major trading partners and competitors—the S\$ trade-weighted index (S\$TWI). The

¹ Ex post, uncovered interest differentials generally lie within the two standard error bounds (with a range of $\pm 2\%$ points), except during the volatile period of the Asian financial crisis.

² The money market tools available include foreign exchange swaps, interbank lending/borrowing, and sales/purchases or repurchase agreements in government securities. The MAS introduced a Standing Facility (a borrowing / lending facility provided to its appointed Primary Dealers) in June 2006 to counter the increased volatility in rates and to complement its money market operations.

³ The MAS is also, like most central banks, the government's banker. In Singapore this involves dealing with the Accountant General's Department (AGD) and the Central Provident Fund (CPF) Board. Both of these wings of the government have been running surpluses—the budget is in surplus and payments into the provident fund exceed payments out of it (because of the age composition of the Fund members).

⁴ Since the AGD and CPF run surpluses, the management of Singapore government securities (SGS) differs from those countries where the government is a net borrower. This provides a liquid asset for the banks' minimum asset requirements while providing a risk-free bench-mark for the pricing of other assets. In any case, for money market operations (outright sales and repo sales) require SGSs. Finally, a well-developed bond market is crucial for a well-defined term structure of interest rates and information about the markets' inflation expectations that can be inferred from a yield curve. (See MAS (2007) for details).

weights depend on the extent of Singapore's trade with the concerned country and also Singapore's competitors. The MAS does not reveal the weights used in constructing the index.

(2) The band: The MAS operates a managed the trade-weighted value of the S\$. Thus the exchange rate is allowed to float within a band, the level and slope of which are announced periodically (semi-annually) to the market. The band enables flexibility while allowing the authorities to tackle excess volatility.

If the S\$TWI approaches or crosses the policy band on either side, or if the MAS perceives that there is excess volatility or speculation, it will intervene (using spot or forward foreign exchange transactions). The timing of intervention is at the discretion of the MAS. Usually the exchange rate is set by the market within the band but on occasions the MAS may intervene before the band is breached (if it believes there is excess volatility or manipulation by speculators). On other occasions, it may allow the S\$TWI to breach the band before intervening.

Thus "(i)ntervention operations may take the form of a purchase of S\$ against the US\$ to stem the depreciation of the S\$, or alternatively a sale of S\$ against the US\$ to moderate its appreciation. The frequency of these FX intervention operations is indeterminate, but the MAS will refrain from intervention as far as possible and allow market forces to determine the level of the S\$ exchange rate within the S\$TWI policy band." (MAS (2007) p.13).

The crawl: The MAS periodically reviews the policy band and may allow the band to "crawl" if the exogenous factors (at home and abroad) so warrant. This ensures that the S\$TWI is consistent with market conditions over the medium term.

In implementing this policy the MAS decides on the band using its own econometric model of the Singapore economy (this model is also not publicly available) with different paths for the relevant exogenous variables (e.g., import prices, exports, tourism etc.) (see Wilson (2008), pp 66-67). Note that this procedure is forward-looking and involves a

judgment about the most likely path of the world economy with an emphasis on those variables directly impinging on the future time path of the Singapore economy.

The policy is then communicated to the public.⁵ Only a forecast path is communicated with neither the weights used in the construction of the S\$TWI, nor the width of the band—see e.g. the latest forecast in its Macroeconomic Review of October 2009, where the average path of depreciation has a zero slope. The MAS retains, as the above discussion suggests, a lot of discretion in the pursuit of its policy. The public can only guess the model behind the announced time path of the currency.

The intervention by the MAS to limit the S\$TWI within the band (unless it opts to let the band be breached) limits its control over the money supply or the interest rate. However, since the exchange rate is not immutably fixed, the MAS can react in a limited way to money market conditions by meeting the liquidity needs of the banks and the general public. It can conduct open market operations by buying or selling Singapore Government Securities (SGS) in return for cash.⁶ This is constrained by the MAS' preferred intermediate target, the S\$TWI, and the fact that with an open capital account short term interest rates cannot move out of line with those prevailing in the rest of the world. In other words, some sterilization of the money supply is possible but not “too much”.

Flexibility about the exchange rate target (whether inside the band, or a crawl in the band itself) means that the MAS is seeking a trade-off between the value of the exchange-rate and sterilizing the money supply, as dictated by the “impossible trinity”. The readers will recall that the expression “impossible trinity” refers to a world where a central bank tries to figure out whether it is possible control the money supply having fixed the exchange rate in a world of perfect asset substitutability (i.e. an open capital account). Of the three

⁵ The MAS started communicating its policy to the public only in 2000. This is primarily done via the Monetary Policy Statement issued every six months.

⁶ Over time, the fact that the Singapore Government has consistently run budget surpluses, or the Central Provident Fund (CPF), because of the demographic profile, also runs a surplus (contributions are in excess of withdrawals), implies that the MAS must take offsetting actions to ensure that liquidity is not withdrawn from the system.

ingredients of this, “the impossible trinity” asserts that the central bank must choose two and let the third be determined residually. In the case of the MAS, it is not looking to defend a single value of the exchange rate, so it has some control over the money supply. But if the liquidity situation of the domestic banking system warrants it can perform an open market operation (and take the exchange rate consequences of that intervention).⁷

3. A Possible Theoretical Apparatus?

How can one understand the exchange rate based monetary policy in operation in Singapore from a theoretical perspective. The strength of the Singapore model is its flexibility. A fixed exchange rate regime would imply that over a long run, the inflation rate of the economy in question has to converge to that prevailing in the economies that it trades with. In the adjustment process, since the exchange rate cannot be changed, the entire burden of adjustment must then fall on the goods and the labor markets. While Singapore has more flexibility in these markets than most other countries, a fixed exchange rate regime is not a good idea especially when there are large shocks emanating from the rest of the world. Some Latin American economies tried to circumvent these problems by announcing a depreciation path for the exchange rate (the so-called tablita scheme). This does provide some flexibility but it shares with a pegged rate the other problem: any fixed rate scheme is vulnerable to an attack because it is a one-way bet against the central bank. A one way bet is if the agents (i.e. the private sector) believe that the peg is going to collapse, they can attack it by buying foreign exchange. If the peg collapses they make capital gains on their holding of foreign currency. If it survives, they lose very little. Fully flexible exchange rates on the other hand introduce volatility into the system, especially in a developing economy. Pure noise related volatility could affect real activity—intervention to counteract this would be desirable.⁸

⁷ In times of an attack on a currency, a central bank may step in to buy the local currency and not sterilize the effect of this on the money supply i.e. it may drain liquidity from the system, raising short term interest rates. Such an attack occurred in Singapore in September 1985. The MAS sold foreign exchange but left the effect on the money supply unsterilized. As a consequence the overnight interest rate touched 100 percent. (MAS (2007), p. 24)

⁸ The standard deviation of the S\$ NEER was 1.47% between 1981Q1 and 2004Q2, compared to 3.44% and 4.62% for the US\$ and yen respectively (MAS 2007).

Can we use macroeconomic theory to understand and evaluate the policies of the MAS over and above the discussion in the preceding paragraphs? I propose three candidate models. But we shall see below that the lack of information on the authorities thinking do not allow a formal test of these models except for what has been done—namely fitting a reaction function for the MAS' behavior.

The first and the crudest model is the so-called S-s model. This model is usually applied to monitoring the quantity of a good (say for inventory purposes) or holding of money balances. There is an upper bound of, say, money balances at which the agent goes and deposits money in the bank, and a lower bound at which the agent sells interest-bearing assets to acquire money. In between these bounds the stochastic economic activity determines the level of money balances. Remedial action is taken only when the level of money balances hits either a lower or upper barrier.

While this model is used for the threshold monitoring of the quantity of a variable, it can be applied to monitoring of the price of a variable. A menu cost argument can make it possible for an agent to be indifferent to changing the price but if the price barriers were breached then some corrective action would take place.⁹ Note there has to be some information about the price limits (i.e. the upper and lower bounds) for the private agents to use this model for predictive purposes—something that is not available in Singapore.

The second candidate is more promising but also requires more information on the behavior of the MAS than is publicly known. This is the so-called target zone model. The literature developed to study the European Monetary System (before the advent of the Euro), where the member currencies were allowed to float within a band. The prediction of the model was—not quite borne out by facts, unfortunately—that as the exchange rate approached either one of the boundaries, expectations of intervention would make the approach smooth. This was the smooth-pasting condition. The problem with the SSTWI is that the MAS does not announce the band, nor, for that matter, is there a promise that it will intervene to keep the index within a band.

The third class is the “exchange market pressure” model first proposed by Girton and Roper (1977), and subsequently applied to a number of countries. This is general enough to encompass the exchange rate policy in place in Singapore. This model applies to any

⁹ See Blanchard and Fischer (1989) Chapter 8 for a macroeconomic example.

economy which does not choose either a rigidly fixed exchange rate¹⁰ (with attendant change in foreign exchange reserves) or a fully floating exchange rate (with the exchange rate doing the adjustment and not foreign exchange reserves) to resolve “exchange market pressure”.

3.1 The monetary policy reaction function of the MAS

So the question then is: Having chosen a managed float how does the MAS decide on when to intervene and when not? A reaction function of the monetary authority has been estimated. The Singapore economy is a small open economy. It is price taker in both the market for its exports and imports. It uses S\$TWI to control inflation—given the foreign currency price of imports, an appreciation reduces the S\$ price. But a nominal appreciation if it results in a real appreciation, could harm its exports unless there is (as is true for the Singapore economy) productivity growth in the export sector.

$$(\Delta e_t - \bar{\Delta e}) = (1 - \rho)[\beta(\pi_{t+n} - \pi^*) + \gamma x_{t+m}] + \rho(e_{t-1} - \bar{\Delta e}) + \varepsilon_t$$

where e is the exchange rate, x is the deviation of output from trend, $\bar{\Delta e}$ is the long run change in the exchange rate and ρ is the degree of smoothing.

Khor et al. (2007) summarize the estimated reaction function for the MAS as having two ingredients: First the policy is countercyclical—the S\$TWI is appreciated when output is high (see their Figure 6, which is a scatter plot of the year-on-year changes in the S\$ NEER against the output gap over the period 1980Q1-2004Q3).

Second, “the relative size of the CPI inflation and output coefficients suggest that monetary policy has placed a relatively higher degree of importance on maintaining low and stable inflation”.

There is an attempt to then generalize the estimated reaction function as being ‘universal’ (my expression). It is sought to be established that this reaction function is similar to the one for the Greenspan period in the Fed. For this quantitative estimates of the Singapore reaction function are compared with those of the Fed under Greenspan. Thus (and I quote

¹⁰ The real appreciation has not hurt Singapore’s exports because of the productivity growth in the tradables sector.

at length)“Singapore’s exchange rate policy are broadly similar to recent comments by Janet Yellen (Feldstein *et al.*, 2004), which identified several key elements of the US Federal Reserve’s monetary policy under the chairmanship of Alan Greenspan. First, she notes the commitment of the Greenspan-era Fed to price stability as a fundamental goal of monetary policy, which has helped to anchor inflationary expectations. Reflecting this, the coefficient on core inflation in Yellen’s econometric estimate of the Greenspan Fed’s reaction function is greater than unity (1.68). This is similarly borne out in Parrado’s analysis using Singapore data, in which the coefficient on inflation (β) is also well in excess of unity (1.89). Second, the relatively high coefficient in the “unemployment gap” (1.71) in; Yellen’s estimated reaction function suggests that, since movements in unemployment commonly lead inflation, the Fed has typically acted preemptively to curb inflation, by working actively to stabilize the real economy. This compares with a coefficient of 0.42 on Singapore’s output gap (γ), which although lower, is positive and significant. In addition, this coefficient estimate indicates that monetary policy in Singapore is also influenced by deviations of output from its estimated potential levels. Third, Yellen notes that the generally predictable and systematic behavior of the Fed’s strategy is reflected by the good fit (above 0.8) of her estimated reaction function. The coefficient of determination (R^2) of 0.86 in Parrado’s estimates also compares well in this regard.”

There are several comments that I wish to make on this. First, with hindsight the paper (Feldstein et al.) is unwarrantedly hubristic (when is it warranted?). The Greenspan era has spawned the biggest economic downturn in the OECD countries since the Second World War. But in 2004, when Janet Yellen is describing the reaction function, it seems to think of the Greenspan years as the golden years of central banking. Second, the US is a continental shelf and Singapore is a small very open economy. Third, the right hand coefficients may be similar but if the left hand target variable is different, these are elasticities that are different across regressions. The MAS monetary policy surely does not necessarily require a certificate from the Fed!

4. EXCHANGE RATE POLICY IN THE RECENT DOWNTURN

The MAS has allowed a secular appreciation in the trade-weighted S\$ since 1981, in both nominal and real terms. The appreciation of the S\$TWI has helped to keep inflation lower than its trading partners. Since 1981, domestic inflation has on average been 1.8 percent while the inflation of a trade-weighted average of foreign composite CPI was 4.0 percent. It has however allowed a real depreciation when it perceives that export competitiveness was hurt. Since it takes “exchange market pressure” as given (equivalent to maintaining an open capital account for Singapore), its ability to generate a depreciation may be limited by the “pressure”.

Singapore experienced its first recession in 1985, caused largely by the deterioration in export competitiveness, a cyclical downturn in electronics, and the collapse of the construction boom. A real depreciation was achieved via a reduction in business costs from a cut in employer pension contributions, and a depreciation of the S\$TWI. The latter depreciated by about 16 percent during 1985-1988. Following the recovery of the economy fear of renewed inflation prompted the MAS to allow the appreciation of S\$TWI for the next ten years. In the 1990s real GDP growth averaged almost 8 percent each year.

In 1997 with the onset of the Asian crisis, the Singapore dollar strengthened in effective terms, because of the sharp depreciation of the other Asian currencies. As inflation fell and real GDP growth slowed down, the MAS ended its decade-long policy of appreciation of the S\$TWI and allowed the exchange rate to fluctuate within a zero-appreciation exchange rate band. The MAS also allowed interest rates to fall via money market operations.

In the recessions of the early part of this century the MAS reacted by setting the trend rate of depreciation to zero--in the 11th September 2001 attacks in New York, it allowed a widening of the boundaries of the band around this trend.

The collapse of Singapore’s exports, in tandem with the other countries in Asia, in the Q4 of 2008 and Q1 2009 did not see any major attempt at moving either the S\$TWI or the REER offset the effect of the crisis. The IMF’s series on NEER shows the value in April 2009 at 109.02 against 109.85 a year earlier—the corresponding values for the REER are

108.36 against 110.51. This would seem to be a very conservative stance, given very little inflationary pressures. But the “exchange market pressure” was absorbed by purchase of foreign exchange by the MAS—its holding of foreign exchange went up from S\$ 239.8 billion to S\$ 252.4 billion between April 2008 and April 2009 (reserve money went up from S\$ 29.5 billion to S\$ 34.1 billion. Thus capital inflows thwarted a more expansionary stance on the part of the MAS.¹¹

5 MONETARY POLICY OR SOMETHING ELSE?

Khor et al. (2007) point out some reasons outside the conduct of monetary policy (narrowly defined) which make the exchange rate based monetary policy so successful. In particular, the strength of the “real” economy with the budget surpluses, flexibility in the labour market, productivity growth etc takes a lot of the pressure normally facing a central bank off monetary policy. They note, inter alia, that “the public sector in Singapore has no foreign debt, while banks and corporation have generally not borrowed from abroad in foreign currencies given the relatively low domestic interest rates. The lack of balance sheet vulnerabilities has been an important factor in preventing the economy from being pushed into the “zone of vulnerabilities”, and facing the risks of intense speculative attacks on the currency in times of regional turmoil, market contagion or terms of trade shocks.”

Over time the financial markets have been developed and better regulatory and supervisory practices have been put in place. The financial markets now have considerable depth and are able to withstand external shocks with relative ease. The MAS “undertook a strategic review of its financial sector policies in 1997 in order to keep pace with the rapid changes in global financial markets. This resulted in measures to develop the bond market, asset management industry and the insurance industry, as well as to open up the domestic banking industry to greater competition. The MAS also liberalized its policy on the restriction of credit to non-residents in order to allow foreign investors to issue S\$ bonds, and to finance their S\$ investments with domestic funds.” (Khor et al. (2007) p. 22).

¹¹ The volume of the “exchange market pressure” is something missing from the estimated reaction function. The more the inflows the more difficult it is for the MAS to achieve an exchange rate target.

Thus with the whole macroeconomic policy framework supporting a well-oiled economy, the role of monetary policy is a supporting one (though not to be minimized). Eichengreen (2002) argues that "Singapore has been able to commit credibly to adjusting its monetary policy instruments to limit exchange rate fluctuations because it has had an impeccably strong banking and financial system. It has not had a large stock of non-performing short-term debts in the corporate sector. It has run large fiscal and current account surpluses every year since 1989. It holds large reserves ... Its combination of strong growth and flexible labor markets ... means that monetary policy adjustments designed to stabilize the exchange rate have not put undue strain on the real economy. Its political stability means that its commitment to hit those exchange rate targets has political support and therefore credibility." (quoted in Khor et al. (2007), pp22-23).

6. CONCLUSIONS

Monetary policy in Singapore has been very successful by any yard-stick. It has kept inflation low with hardly any loss in real GDP growth. In the previous section, the quote from Barry Eichengreen seems to take the credit away from monetary policy and place the crown on some other head. But it is an incontrovertible fact that the MAS has done a good job of keeping its two ultimate objectives in good shape while the economy has had to cope with shocks of all kinds and erratic capital flows. Thus exchange rate targeting, unfashionable though it may be, has worked well in practice.

As the economy matures, it may be time to give up the cloak of secrecy surrounding the formulation and implementation of policy. It is ironic that in Khor et al (2007) while they are comparing the success of Singapore's monetary policy with those of the UK and the US (rather mechanically done, I argued above), they have nothing to say on transparency that is a large part of the policy debate. The time has surely come when the MAS could share with the public the values of the boundaries of the policy band, and indeed where those values were obtained from. It could retain the right to suspend the sharing of information, or indeed, some class of transactions in abnormal times.

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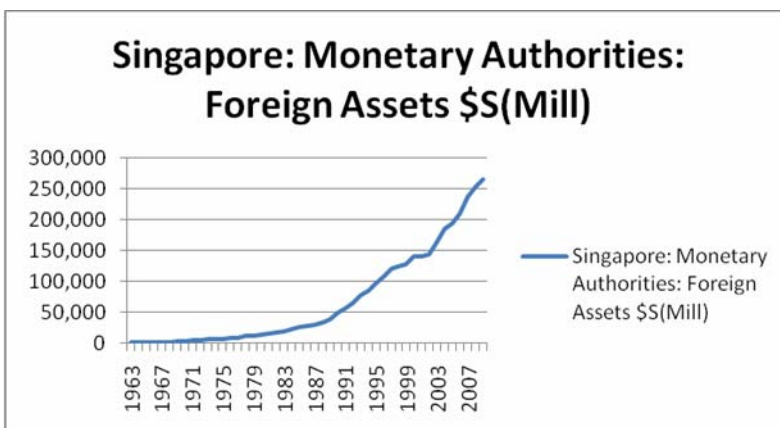
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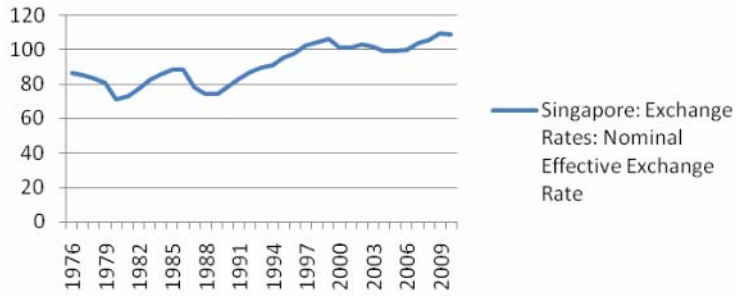
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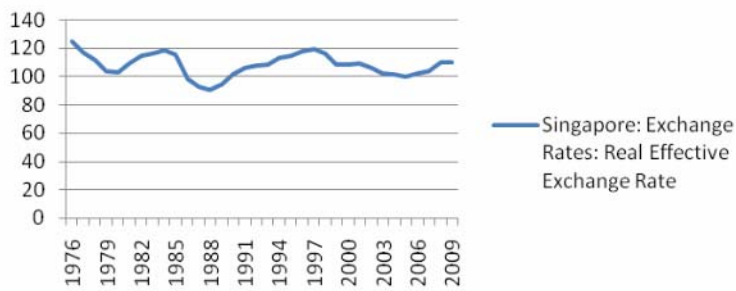
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Singapore: Exchange Rates: Nominal Effective Exchange Rate



Singapore: Exchange Rates: Real Effective Exchange Rate



Year	Singapore: Unemployment Rate % Annual Average 1999-2008
1999	4.9
2000	4.4
2001	3.8
2002	5.6
2003	5.9
2004	5.8
2005	3.1
2006	3.6
2007	3
2008	3.2

Source:- International Financial Statistics