

# **Middle way exchange rate regimes – the case of Singapore**

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## 0.1 Abstract

Since 1981, Singapore has pursued a middle way regime – a managed float – for its exchange rate. During currency crises in the 1990s, countries such as the UK, Mexico or Thailand had to abandon their mid-spectrum exchange rate regimes. In this thesis, the question of why a middle way exchange rate regime works in Singapore is addressed. Building on the theoretical literature on currency regime choice, the institutional and economic aspects which allow Singapore to successfully maintain their managed float are reviewed. By developing, estimating and simulating a small-scale open economy macro model, implications for the credibility of the central bank as an inflation targeting institution and the role of the exchange rate as an intermediate policy target are evaluated. A strong inflation focus of the central bank is verified in terms of an exchange rate policy reaction function. A simulation of the estimated macro model gives strong evidence for the effectiveness, stability and hence sustainability of the middle way exchange rate regime pursued in Singapore. Stability features of the model are enhanced when the theory led identity of uncovered interest rate parity is relaxed to levels which are found empirically.

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## 1 Introduction

Recent financial crises, starting from the break-up of the EMS in 1992 and the Asian Crisis 1997, followed by events in Brazil (1998/9), Russia (1998) and most recently Turkey (2001) involved the break down of a middle way exchange rate regime, namely a soft peg against the US dollar for the latter countries. Whether the economic downturns which followed the abandonment of the peg was caused by the respective exchange rate regimes or merely aggravated it, is subject to debate.<sup>1</sup> Among international policy makers the view emerged that a currency arrangement within the spectrum of totally fixed exchange rate regimes such as a monetary union or a currency board on the one side and a complete free-float on the other would not be sustainable.

The aim of this thesis is to critically evaluate this claim by analysing the evidence of Singapore. Since the late 1970s, the Singaporean central bank, the Monetary Authority of Singapore, has pursued an intra-spectrum exchange rate regime. The authorities manage the exchange rate, targeting a non-disclosed trade-weighted basket of nominal exchange rates, thereby providing exchange rate stability to the economy in the short-term but allowing for flexibility in policy responses more long-term.

This thesis draws on areas of currently active research: exchange rate regime choice and open economy macro modelling. From developing and estimating a three equation open economy model, methodologically formalised and quantitatively verifiable results are obtained in order to draw conclusions for the sustainability of the Singaporean exchange rate regime. The contribution of this thesis is twofold. First, the question of *why* a middle way exchange rate could be sustainable is analysed. Much of the literature on currency regimes weighs the respective advantages of different exchange rate systems or searches for factors which can

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<sup>1</sup> After abandoning the pegs, the currencies devalued substantially. As there were substantial borrowings denominated in US-dollar by the private sector in the Asian countries, debt levels ballooned in terms of local currency leading to bankruptcy in the corporate sector and feeding through to a credit crunch and banking crisis. Had the currencies been allowed to float freely, many corporate borrowers would have hedged their currency exposure. Frankel (1999) takes a different view: Had the currencies hit by the crisis been allowed to float freely, the baht, won and rupia would have appreciated up to 1996, thereby increasing the trade deficit and causing bigger build ups of debt that would have resulted in an even worse insolvency situation.

explain a country's regime choice. While building on the existing literature, the research question of *why* a middle way could work relates to the literature from a new angle. Second, a small-scale open economy macro model is estimated and simulated for one of the most open economies in the world – the sum of Singaporean imports and exports amounts to almost 300% of GDP – in order to evaluate whether the exchange rate can be modelled in terms of a reaction function and whether it can be used as a stabilising tool in a simulated system.

Singapore could not serve as an unqualified model for other countries. The country is geographically very confined, virtually all the population of 4.1 million live in an urban environment, infrastructure and education systems are very highly developed, per capita GDP in 1996 equalled 90% of US income per head. Still, by exposing key determinants of the success of their exchange rate regime, it would be possible to obtain the cornerstones for policy evaluation in other countries.

The chapters are organised as follows. Chapter 2 reviews the literature on exchange rate regimes. The focus will be on the advantages and disadvantages of particular currency regimes, the actual choices made by countries and what factors determine these choices. Referring to the 'hollowing out view' the case for a middle way exchange rate regime is developed. Also, ways of managing an exchange rate are presented. Chapter 3 describes Singapore, provides an overview of the economic development of the country and explains the institutional structure of the exchange rate management and the objectives of the central bank. In chapter 4, the small-scale open economy macro model is developed. Drawing on the recently active research area of open economy macro modelling and optimal monetary policy rules, the implications with regard to the exchange rate transmission channel of monetary policy are exposed. This chapter also presents the data. The model developed in chapter 4 is estimated and simulated in chapter 5.

Two aspects of the success of the Singaporean exchange rate system are to an extent qualitative. There are, first, the non-internationalisation policy which curbs downward pressure from speculation as shorting the Singapore-dollar is not permitted and, second, the solid budget

position in the past paired with high levels of central bank foreign reserves which allow for forceful intervention in the currency markets. Chapter 5 aims to quantitatively analyse the credibility of the Singaporean central bank and the fundamental sustainability of the exchange rate target by means of estimating and simulating a small-scale macro model. Possible extension of the thesis are indicated.

Chapter 6 summarises the analysis for Singapore and weighs the applicability of the Singaporean results to a wider community of potential candidates for a managed float.

## 2 Exchange rate regime choice

The traditional literature on exchange rate regime choice has weighted the relative advantages and disadvantages of fixed and floating exchange rates. This literature is briefly reviewed initially. Following from the lessons learnt from recent currency crises, the literature on regime choice has been a very active one in the last few years. This chapter of the thesis will focus on two aspects of the recent work.

First, there is the hypothesis of a ‘hollowing out’ of the middle ground of exchange rate regimes, i.e. that no exchange rate regime which is not completely fixed nor completely floating is viable in the long-term. This ‘bipolar’ view does not go unchallenged and authors such as Williamson have argued strongly for middle way exchange rate regimes which compose aspects of currency baskets, exchange rate bands and continuous adjustment (crawls). Williamson also argues for transparency of the policy objectives and measures taken by the monetary authorities.

The second active branch of recent research examines the factors which make countries opt for particular exchange rate regimes, where special emphasis is put on the difference between *de facto* and *de jure* exchange rate regimes. Having discussed the theoretical aspects of exchange rate regime choice, the subsections on policy aspects and empirical aspects will give answers to the questions: What do countries actually do? And secondly, why do countries do what they do?

Singapore with its *de jure* and *de facto* middle way exchange rate system has been following a basket, band and crawl approach successfully for the last 20 years and it has thereby proved the strict bipolar view wrong. Still, the idea of transparency in policy making has not been followed either in the past, though greater transparency has been gradually introduced since last year. The ideas raised in this chapter are summarised by the question as to what extent Singapore compromises on the three aspects which form the ‘impossible trinity’. Chapter 3 will discuss these questions with a strict Singapore focus.

## 2.1 Theoretical aspects

The spectrum of exchange rate regimes is bounded at the one end by a perfectly free floating exchange rate and on the other end by a completely fixed exchange rate. Frankel (1999) summarised the current state of knowledge in this field of economics with ‘no single currency is right for all countries or at all times’. Starting from this basis, what determines the ‘best’ exchange rate regime for an economy are the cost and benefit trade-offs associated with the chosen location on the spectrum.

### 2.1.1 Fixed versus floating

The prime advantage of completely fixed (nominal) exchange rates is the elimination of exchange rate risks. Elimination of this risk is beneficial to international investors and trade and thereby it has been argued promotes economic growth. Krugman (1989) argues that exchange rate risk, which he regards as an add on to transportation cost, not so much increases the cost of trade but causes firms to adopt a wait-and-see strategy with regards to (non-reversible) investment<sup>2</sup> and thus delays investment decisions. In the debate about the effects of the European Monetary Union, researchers have suggested that additional GDP growth of up to one percent per annum could be freed by eliminating risk avoidance behaviour and transactions cost. Particularly for developing nations, prospects of increased growth stemming from investment would be valuable. Also, the cost of accessing international capital markets is decreased, as the foreign exchange risk premium becomes obsolete.<sup>3</sup> For countries with a less than solid history of inflation and economic discipline, fixing the exchange rate to a currency with a desirable track record of inflation and growth facilitates the ‘import’ of favourable foreign monetary policy. The commitment required to sustain an exchange rate peg imposes the ‘much needed’

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<sup>2</sup> Investment as a real option, as in Dixit and Pindyck (1994)

<sup>3</sup> Whether a completely fixed exchange rate in fact increases the default risk of a sovereign borrower is open to question. Currently, Argentina is facing severe difficulty in refinancing its quasi dollar denominated debt. If the country had not been on the currency board system, it would have been possible to liquefy the debt either by ‘intended’ inflation or the printing press.

discipline.<sup>4</sup> The peg gives a nominal anchor to policy, it makes policy objectives transparent and success easily measurable.

There is no such thing as a free lunch, and the benefits of a fixed exchange rate regime come at a cost. Today, all developed countries (as defined by the MSCI developed economy index) have lifted restriction for transactions involving both the current and the capital account. Equally, freely convertible currencies have been understood to be an important aspect in attracting investments into developing countries. Capital mobility is a cornerstone in the current international financial system.

Assuming capital mobility, the two versions of the hard currency peg, namely monetary union and the currency board ('dollarisation'), require a country to surrender independent monetary policy. In a monetary union, which is a bilateral<sup>5</sup> or multilateral symmetric agreement to replace independent central banks by a common one, the resulting policy making institution is responsible for the entire area of the union – an 'optimal' one size fits all policy results. National monetary policy cannot be used to off-set national idiosyncratic shocks, such as earth quakes or oil price shocks.

A currency board system is generally based on a unilateral and asymmetric decision to peg a currency to another country's money. The domestic authorities must comply with the policy 'imposed' by the foreign country. The usual 'tool of compliance' is the interest rate. Under the premise of capital mobility, exchange rates respond to interest rate differentials, as investors try to exploit arbitrage opportunities out of interest rate differentials and the exchange rate. In order to prevent such arbitrage opportunities, the domestic interest rates need to be set in a way that

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<sup>4</sup> Corden (1993) states that in developing nations the initial reason behind prolonged inflation is often monetisation of debt. As the inflation tax is regarded as an inefficient form of taxation, 'discipline' benefits an economy. In order to make the nominal anchor approach successful, Corden lists four conditions: 1) A peg must lead to discipline in credit creation of the public sector, otherwise foreign reserves will fall. 2) The peg must be credible with the exchange markets. 3) Commitment must be credible in the labour market. 4) Rigidities in the labour market must not prevent real adjustment. Corden views points 1) and 4) as the most important ones.

<sup>5</sup> for example Belgium/Luxemburg in the pre-EMU era and Switzerland/Lichtenstein

prevents capital flows from inserting pressure on the exchange rate.<sup>6</sup> Idiosyncratic shocks cannot be countered by independent monetary policy.<sup>7</sup> Also, if domestic inflation is relatively higher than in the country of the pegged-to currency, the domestic currency becomes overvalued, thereby reducing international competitiveness in trade. To summarise the disadvantages of a fixed exchange rate system, monetary policy cannot react to domestic shocks and shocks in the foreign country are fed through to the domestic economy without being buffered by an exchange rate adjustment.

The advantages and disadvantages of floating exchange rate regimes are mirror images of the fixed exchange rate discussion. A flexible currency regime can dampen the effects of external shocks. On the downside, overly volatile exchange rates reduce trade and financial transactions. Fundamental overvaluation (undervaluation) of a currency can have severe negative (positive, in the short-run at least) effects on the international competitiveness of a country. Also, a depreciating currency could import inflation. Table 2.1 summarises the discussion.

	<b>Advantage</b>	<b>Disadvantage</b>
<b>Floating</b>	<ul style="list-style-type: none"> <li>• Flexibility: Monetary independence (offset internal and external shocks)</li> </ul>	<ul style="list-style-type: none"> <li>• No Stability: short and long-term exchange rate volatility</li> <li>• No economic discipline required for exchange rate regime, no nominal anchor</li> </ul>
<b>Fixed</b>	<ul style="list-style-type: none"> <li>• Stability: No exchange rate volatility, no misalignments (short-term at least)</li> <li>• Potential for nominal anchor to economy if needed</li> <li>• Requires economic discipline</li> </ul>	<ul style="list-style-type: none"> <li>• No Flexibility: no independent monetary policy</li> <li>• No absorption of shocks</li> </ul>

**Table 2.1: Regime pay-offs**

Restating the above in Corden's (1999) words adds a view from a slightly more abstract angle with regard to a float. Corden states that a country could have three possible objectives for the choice of the exchange rate policy: Exchange rate stability and the nominal anchor approach favour fixed rates, while the real targets approach leads to flexible exchange rates as the exchange rate is used as a policy instrument.

<sup>6</sup> Technically, under a currency board system, the domestic monetary base would be eroded as investors demand conversion of domestic money into the pegged to currency. The reduction on the money base would drive up the interest rate until equilibrium is re-established.

<sup>7</sup> It is here where the analysis for Mundell and Kenen's optimum currency area starts. As this theory is not of direct interest in the context of a Singapore focused analysis, only the condensed results are stated: Two countries should form a single currency if they have a) highly integrated trade patterns, b) high capital mobility, c) high labour mobility and d) are hit by economic shocks in a symmetric fashion.

Is either end of the bipolar spectrum more desirable? Frankel (1999) notes that during the late Bretton Woods period, economists argued for flexible exchange rates in order to smooth out the interruptions caused by devaluations in the system. However, floating rates have proved to be more volatile than could be explained by fundamentals and policy makers started to refer preferably to the stability during the Bretton Woods era. The grass always seems greener on other side of the street. Edwards and Savano (2000) compare the performance of fixed and floating regimes and find that a) fixed regimes have higher output volatility, b) fixed and floating regimes lead to equal output growth and c) floaters experience higher inflation. In any case, capital is more flexible today than in 1970 and thereby limits an easy implementation of fixed rates on a broad scale.

### **2.1.2 The bipolar view and its challenges**

In between the two extremes there is a spectrum of intermediate regimes, which at least theoretically trade off the advantages and disadvantages of the two polar systems in degree.<sup>8</sup> Following the experience of currency crises in the 1990s, the view emerged that such middle way exchange rate regimes are unsustainable, and policy advice argued for a ‘hollowing out’ of the middle ground. Fischer (2001) summarises the bipolar discussion in a balanced way. Based on the experience of exchange rate crises in the 1990s which all involved the abolition of a (soft) pegged exchange rate regime, only completely fixed or floating exchange rate regimes were deemed viable. Fischer carefully corrects this view and explains that rather than deleting the whole spectrum between strongly fixed and floating, only a small stretch in the spectrum has to be excluded, i.e. soft pegs and narrow bands, as only pegs which are not backed up by institutional arrangements like currency boards pose a problem under the premise of open international capital flows. All other regimes, the polar ones as well as middle way regimes, including managed floats and bands are not necessarily non-viable. The ‘broader’ bipolar view encompasses these systems in principle.

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<sup>8</sup> See table 2.2 in the next subsection for a list of the spectrum varieties

The argument for the strict bipolar view is grounded in the empirical fact that over the last decade a movement from the middle ground (i.e. soft, adjustable pegs) to the poles has set in. Many of the European fixed-but-adjustable pegs have been merged into EMU, while other soft pegged regimes have moved at least *de jure* to a free float (Britain to a degree after 1992, Mexico, Thailand, Russia, Indonesia, Korea, and Turkey are examples of countries moving to a free float. Very recently even the hard peg via a currency board has suffered a blow in Argentina). Apart from the EMU economies, those countries which have moved towards hard pegs are small.<sup>9</sup> Larger countries have tended to adopt floating regimes, a view Obstfeld and Rogoff (1995) support, too.<sup>10</sup> Since an inflation targeting framework for monetary policy can offer equally good results as an exchange rate peg in order to obtain a nominal anchor for the economy, soft pegs have been replaced by free floats.<sup>11</sup>

Critics of the (strict) bipolar view such as Williamson stress that border solutions cannot constitute an optimum trade-off of flexibility versus stability for many countries.<sup>12</sup> Williamson proposes a ‘BBC’ approach, he advocates regimes that incorporate one or more elements of the following: basket, band and crawl.

Williamson’s ‘BBC rules’ are based on three pillars.<sup>13</sup> First, countries with a diversified trade pattern should peg to a basket of currencies rather than a single currency. Working with a basket provides a ‘portfolio balancing effect’,<sup>14</sup> and effects on competitiveness of swings between major third party exchange rates are buffered.<sup>15</sup> Williamson argues that a basket peg could serve equally well as a nominal anchor, but without the swings in international competitiveness. The second pillar is bands. Bands serve a threefold purpose: no-one can determine the true parity

<sup>9</sup> For example, Ecuador have dollarised their economy.

<sup>10</sup> Frankel (1999) points to a ‘sample selection’ problem. With many countries following intermediate regimes in the early 1990s, there was a higher chance of seeing some of them encountering difficulties. In fact, it is difficult to analyse whether the initial regime cum crisis still performed better than a crisis-avoidance regime could have done. The polar situations could cause difficulties as well. However, the discrete shock of an exchange rate realignment is highly visible news. Obstfeld and Rogoff (1995) note that (soft) pegged regimes do not have a long life expectancy.

<sup>11</sup> One example is post-crisis Thailand. Australia and New Zealand provide further evidence.

<sup>12</sup> Frankel (1999) endorses this view, too.

<sup>13</sup> As explained in Williamson (2001). He notes that whenever the criteria for an optimal currency area plus the willingness to operate on a common monetary policy stance are not satisfied, the BBC approach could provide an appropriate solution.

<sup>14</sup> The effect of bilateral exchange rate volatilities is greatly reduced when targeting a weighted exchange rate basket, as the third party bilateral exchange rates are less than perfectly correlated. See own analysis in section 5.

<sup>15</sup> Kwan (1998) found that the yen/dollar exchange rate had statistically significant effects on growth in Asian countries. When the yen appreciated, the US-dollar pegged currencies effectively depreciated, thus fuelling further growth.

level, a wide band allows for mismeasurement. Wide bands allow for non-discrete exchange rate movements when the central parities of the band are realigned. Wide bands also allow for individual policy initiatives.<sup>16</sup> Thirdly, the crawl element allows for inflation differentials to be adjusted for. Also, emerging economies can offset appreciating pressures on their exchange rate stemming from the Ballassa-Samuelson effect by a crawl.<sup>17</sup> Singapore follows the BBC approach.

Williamson's idea addresses the problem that no single currency regime is right for all countries *and* at all times. Across countries, varying strictness on the band and the crawl parameters allow a country to choose the 'optimal' location along the regime spectrum. A trade-weighted basket could give an 'objectively optimal' currency target, unless the major basket components are linked to unstable economies whose monetary shocks should be avoided. The danger of building up substantial parity misalignments can be overcome. The BBC view also has particular appeal for solving the 'at all times' dimension. If gradual adjustment via a crawl is not allowed for, a country could find itself in a position that does not provide an elegant exit option. It is this missing exit option that led to overly long support for fundamentally overvalued currencies. The discrete adjustments which followed in Britain 1992 and South East Asia 1997/8 led to currency crises. Supposing that a basket provides a fundamentally sound exchange rate target, authorities can more forcefully prevent speculative attacks as they could not be forced into expensive one way bets (Fischer (2001)). Stabilising rather than destabilising speculation should prevail.

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<sup>16</sup> Williamson (1999) differentiates a variety of different kinds of bands. Besides hard bands that require commitment to defend the band at the margin, he also develops the notion of monitoring bands within which the authorities would commit *not* to intervene. In what he calls a modified BBC proposal, Williamson argues the case that even reference rates with no bands or soft bands can provide useful information to the market and can help steer expectations. An interesting feature of target zones is Krugman's (1991) 'honeymoon' effect. Since the market expects central banks to intervene at the margin (and not intra-marginally), there is an S-shaped rather than a linear relationship between 'fundamentals' and the exchange rate.

<sup>17</sup> The Balassa-Samuelson effect arises out of the fact that the productivity in capital-intensive sectors is higher in developed countries, while in the labour intensive sector productivity is similar. Prices of the capital intensive (tradable) goods must be equal on the world market. In order to sustain equilibrium in prices across countries and labour allocation within countries, less developed countries have a lower overall price level, i.e. absolute purchasing power parity (PPP) does not hold. If an emerging country grows faster than a developed economy, its productivity of the manufactured goods sector rises and so does the relative price level, the real exchange rate appreciates for the emerging country.

Kenen (1988) notes that in order to manage an exchange rate within a band – and thus follow aspects of a BBC approach – a country needs to decide on four aspects: a) how are central rates chosen and changed, b) how firm and narrow are the bands, c) what is the policy instrument used to keep rates within the bands and d) how much does the market know about the first three aspects? Krugman (1991) has shown theoretically that for a credible target zone there is a ‘honeymoon effect’ which stabilises the exchange rate within the band as speculators know that towards the edges of the (credible) band their profit opportunities are reduced. Williamson (2001) views the empirical analysis of the honeymoon effect as one of the most important untouched issues in exchange rate economics.

To what extent is transparency a crucial feature for successful management of a BBC regime? Williamson argues that if the exchange rate regime should be subject to public scrutiny, transparency is key. Also, transparency can help to increase confidence in market participants as policy objectives can be verified. Especially for the honeymoon effect to work, a transparent band and central parity need to be public knowledge.<sup>18</sup> More generally, across the regime spectrum, transparency of policy follows a U-shaped curve. Only the polar cases provide easily understandable and verifiable signals to the currency market. A non-disclosed basket with a wide band and a large crawling effect will be hardly comprehensible and testable. If the policy maker does not have a reputation for discipline, market expectations could easily wrack havoc of the regime. During the Asian crisis, in-transparent middle way exchange rate regimes got replaced by highly transparent polar regimes.<sup>19</sup> Singapore is the most successful counter example for the need for transparency. The next chapter readdresses this issue.

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<sup>18</sup> In the next chapter, we will see that Singapore only gives vague indications to market participants about central rates and bands. Still, the country manages its exchange rate very successfully.

<sup>19</sup> Indonesia and Thailand moved to a free float, Malaysia introduced capital restrictions and fixed the exchange rate. The extreme cases are immune to speculative attacks. For Singapore, despite the officially undisclosed basket, traders in the foreign exchange market believe to have a reasonably good idea of how the trade-weighted basket moves. All major fx dealers in Singapore construct their own basket estimates, which gives a picture good enough to foresee bilateral exchange rates against the Singapore dollar that could trigger an intervention from the central bank.

## 2.2 Policy aspects – what do countries actually do?

No medium sized country views their exchange rate with benign neglect. Nominal rigidities in prices and wages cause nominal exchange rate movements to become real exchange rate movements in the short to medium term. Therefore, misalignments in the exchange rate can have adverse effects on a country's competitiveness. For example, a strong pound at the beginning of the 1980s is credited with damaging parts of the UK's manufacturing and export good sector. Similarly, swings in the US-dollar in the mid 1980s caused pressure on some industries and regions in the US.<sup>20</sup>

			1990	2001	Sample countries in 2001
1	Currency union			39	EMU (12), small countries without own legal tender
2	Currency board			8	Argentina, Hong Kong, China
3	'truly fixed' exchange rate		44	44	Countries in francophone West and Central Africa, fixed against EURO
4	Adjustable peg 'fixed but adjustable'				As under the Bretton Woods system
5a	Crawling peg		8	4	Bolivia, Costa Rica, Nicaragua, Zimbabwe
5b	Crawling band			5	Israel, Uruguay
6	Basket peg		41		ERM, also with aspects of 7a
7a	Target zone or band	Central parity defined in nominal terms		6	Denmark
7b	Target zone or band	Central parity adjusted according to real objectives			
8	Managed float 'dirty float'	Mainly leaning against the wind	26	33	Russia, Norway, IMF classifies Singapore in this category (but it also combines 5,6,7), India
9	Free float		25	47	Japan, US, Switzerland
<b>Total number of Countries:</b>			154	186	

**Table 2.2**<sup>21</sup>: The regime spectrum

Volatility and misalignments are the two hazards of floating exchange rates. Intervention in the market can aim to curb either phenomenon. Meese and Rogoff (1981) concluded that for horizons of *more* than two years, forecasting models based on 'fundamentals' could outperform a random walk or chartists' forecasts. In the short-run, the exchange rate is not determined by economic fundamentals arising out of the current account balance and purchasing power parity considerations (Williamson 1993).<sup>22</sup> Although market participants viewed the USD as

<sup>20</sup> The strong USD helped Japanese car and semi-conductor manufacturers to successfully conquer the American market. The Louvre Accord which aimed at depreciating the USD is understood to be an intervention for competitiveness.

<sup>21</sup> These broad classifications are taken from Frankel (1999), Edward and Savatano (1999) and the IMF, the allocation of countries to categories is taken from the IMF's International Financial Statistics.

<sup>22</sup> Williamson regards the fundamental equilibrium exchange rate (FEER) as depending not so much on absolute purchasing power parity (PPP), which has been shown not to hold, but on the relative PPP and a sustainable current account position that reflect average cyclical demand and supply conditions as well as 'normal' capital flows.

overvalued as early as February 1985, the greenback kept rising for another 15 months (Koromzay et al (1987)). Looking at the microstructure of the foreign exchange market, Lyons (1998) showed that market makers and traders pursue short-term investment strategies. As long as a currency is believed to appreciate, traders will hold long positions, however overvalued the long-term prospects look. Also, Williamson (1993) conjectures that ‘the market’ does not have targets for fundamental equilibrium rates in mind.

Do countries follow the (strict) bipolar view or the Williamson approach? Is there really a hollowing out of the middle ground? Obstfeld and Rogoff (1995) argue for ‘the mirage of fixed exchange rate regimes’, i.e. in accordance with the predictions of the (soft) bipolar view, fixed exchange rate regimes, and particularly soft pegs are being replaced by floating exchange rate regimes. Their finding is, according to IMF classifications, correct *de jure*. After the bad experiences with fixed but adjustable exchange rates, countries increasingly claimed to follow a free float. But, subsequent research has shown that countries don’t do what they say they do, i.e. the announced free floats behave *de facto* like dirty floats or even soft pegs.

As the exchange rate determines the competitiveness of an economy in the short-run at least, it is understandable that national authorities feel uneasy to leave this variable to ‘non-fundamental’ market forces. Against this background Calvo and Reinhard (2000) find and explain a ‘fear of floating’ in developing countries.<sup>23</sup> Analysing the actual variability of bilateral exchange rates against the USD, foreign currency reserves, interest rates, money supply, and commodity prices of about 40 countries, they conclude that many emerging market economies do not let their currencies float, even if they say they do. Calvo and Reinhard identify three ‘true’ free floaters over the period of 1973-1999: The US, Japan and Germany. Despite occasional interventions, these three countries provide the benchmark variability of the key variables. Calvo and Reinhard examine the frequency distribution of changes in their four key variables and they report the probabilities that a variable moves by more than 1% or 2.5%

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<sup>23</sup> See also Reinhart (2000) for a summary. She calls her paper ‘the mirage of floating exchange rates’.

during one month. They find that most emerging markets have a lower variability in the exchange rate, but much higher volatility in their interest rates, foreign reserves, and money supplies, which leads to the conclusion that emerging countries deliberately suppress exchange rate volatility<sup>24</sup> and follow *de facto* dirty floats or soft pegs. Also, interest rates tend to be procyclical, i.e. they are low at a peak of the cycle in order to keep the exchange rate stable. Commodity prices in local currency, which usually account for a big portion in the terms of trade of emerging markets, are more volatile than they would be under ‘appropriately’ changing exchange rates. Table 3.3 in section 3.2.7 gives an overview of the Calvo and Reinhart results for a selected number of countries.

A number of issues give rise to the fear of floating. The foremost reason is the significant liability dollarisation in many emerging countries, a stark depreciation would therefore be associated with a recession rather than an improvement in the terms of trade, as borrowers, public and private, would struggle to meet their debt obligations. Additional reasons include the high pass through of exchange rate movements into inflation for emerging markets and the negative trade effects of volatile exchange rates since goods are usually traded in USD.

To conclude, from a practical point of view, there is evidence for a ‘crowding in’ rather than a ‘hollowing out’ in the middle ground of the exchange rate regime spectrum. With regards to Singapore, the Calvo and Reinhart results confirm that Singapore has followed a consistent regime over the last twenty years. Also, the country combines low exchange rate volatility with low reserve and interest rate variability. Indeed, regarding this data, Singapore on the face of the reserve and interest rate volatility looks almost like a free floater.<sup>25</sup>

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<sup>24</sup> Calvo and Reinhart note that the emerging countries are subject to external shocks which are at least as big as those impacting on the G3-benchmark.

<sup>25</sup> Calvo and Reinhart note that it is difficult to draw a clear line between a soft peg and a managed float, exchange rate regimes are in fact left for discretionary decisions to this respects. Interest rates can be observed well and are meaningful. Changes in reported levels of reserves however do not necessarily reveal the true extend of interventions as central banks can intervene in the forward markets. For example, Thailand engaged heavily in forward intervention. These transactions were off-balance sheet and were not reported in the published central bank accounts in early 1997. Still, over a longer period of time, the volatility in the reported reserve levels should mirror the propensity to intervene in the foreign exchange market.

### 2.3 Empirical aspects – why do countries do what they do?

The recent theoretical and empirical literature on the factors influencing the exchange rate regime choice has mainly followed three branches. Two branches focus on political economy considerations and the fear of floating school of thought, respectively, while an additional branch originates from the traditional theory of optimal currency areas (i.e. correlations of economic shocks, openness to trade). Poirson (2001) examines all three approaches and empirically tests for the significance of variables associated with these branches.

Collins (1996) and Edwards (1996) discuss the political economy aspects. Discrete adjustments of the exchange rate as happens under a soft peg are politically more costly than a smoother depreciation which could be ‘disguised’ under a managed float. The main point is that discrete devaluations make headline news, and a government ‘looks bad’ when devaluation occurs. Countries which are likely to run into misalignments of a fixed exchange rate (due to price shocks to commodities or higher propensities to inflate for example) should not fix. Collins also elaborates on the importance of the state of academic discussion for the regime choice in developing countries. In the 1970s, the prevailing view was that developing countries without well functioning financial markets and thin and hence potentially very volatile foreign exchange markets should peg their currency to their main trading partner. In the 1980s, the view emerged that developing countries could do well under a floating exchange rate regime, particularly in the light of free capital movements under increased financial integration. Since the late 1980s, fixed exchange rate regimes became fashionable as a means to stabilise economies suffering from high inflation. Although there appears to be anecdotal evidence for the influence of ‘academic fashion’, it is difficult to measure and prove its significance.

Using a probit model with two classifications of exchange rates (fixed, floating) on a sample of 24 Latin American countries for the period of 1978-1992, Collins (1996) finds that small, less open economies tend to fix the exchange rate, as do countries with hyperinflation (>500% p.a.). In accordance with the political cost of adjusting a (softly) pegged exchange rate, countries with

medium to high inflation (but not hyperinflations) tend to float. Edwards (1996) incorporates measures of political stability, the likelihood of abandoning pegged rates and real economic targets of the government into a similar probit regression model on a sample of 63 (developed and developing) countries for the period from 1980-1992.

Defining political stability by the frequency of change in government and by the percentage of seats a ruling party has in parliament, Edwards finds that politically less stable countries are more likely to have their currency float. Not surprisingly, countries with (varying degrees of) capital controls are more likely to adopt fixed exchange rates. Also, richer countries in terms of GDP per capita tend to follow more flexible exchange rate regimes. Edwards interprets this finding the way that richer countries can afford the more sophisticated institutional arrangements which are needed for floats.<sup>26</sup>

The ‘fear of floating’ school following Calvo and Reinhart (2001) has found that liability dollarisation and limited availability of effective financial hedges induces a (*de facto*) fixed exchange rate. The Collins and Edwards papers acknowledge the difficulty of categorising exchange rate regimes into two groups only without showing a more refined picture on middle way exchange rate regimes. Also, as the papers date from 1996, the issue of *de facto* versus *de jure* exchange rate behaviour is not addressed. These issues Poirson (2001) tries to capture in a careful analysis. Not only does she include variables relating to political economy, fear of floating and optimal currency area (OCA), Poirson also uses a variety of alternative measures of exchange rate variability, thereby capturing the *de facto* and *de jure* differences.

Poirson main results are this.<sup>27</sup>: Economic size (GDP), vulnerability to external shocks, product diversification, capital mobility, and temptation to inflate on the side of the government all have significant positive impact on the likelihood that a country adopts a floating exchange rate regime. Factors like liability dollarisation, high levels of reserves, and political stability make a

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<sup>26</sup> Authors such as Collins note that with respect to GDP-related measures, the potential for estimation problems arising out of endogeneity issues is important. For example, a related literature has asked whether fixed or floating regimes lead to higher growth.

<sup>27</sup> Regressions are based on 93 developing countries for the period from 1990 to 1998.

country more likely to follow an exchange rate peg. Hence, political economy, OCA and fear of floating factors are all relevant for the decision regarding the exchange rate regime. Interestingly, Poirson finds that ‘traditional’ OCA items such as openness to trade and the existence of dominant trading partners as well as the overall level of development do not feature significantly in her regressions.<sup>28</sup> By using a specific empirical measure of exchange rate flexibility, her results show that the aforementioned factors do not only explain a binary fixed/floating decision but can explain more gradual differences between regimes. Poirson conjectures that there will be a trend to more flexible exchange rate regimes, as (developing) countries become financially integrated and sophisticated (ability to hedge foreign exchange exposure) and more economically stable (lower inflation volatility). Her conclusions do not contradict the bipolar view, but run counter to the fear of floating proposition. In the next chapter, the situation in Singapore will be considered together with explanations as to what extent Singapore’s actual regime choice is in line with the general predictions of the literature.

## 2.4 A technical note - exchange rate management

Exchange rate management can focus on different aspects: the provision of a nominal anchor, the prevention of misalignments in international competitiveness, or the reduction of exchange rate volatility. The effectiveness of official intervention in the foreign exchange market has been debated. Research in the 1990s has found evidence that both sterilised *and* unsterilised intervention influence the exchange rate. During unsterilised intervention, the domestic monetary base is reduced (enlarged) when the foreign currency is bought (sold). The change in the domestic money base will enhance the effectiveness of open market operations in the currency market. The usual reaction chain feeds from money supply to interest rates and then to the foreign exchange market.

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<sup>28</sup> This contradicts the Edwards result mentioned above. However, the countries and periods included in the regressions are different, and so are the classifications of the dependent variable.

In a sterilising strategy, the domestic authorities try to off-set the changes in the money base by buying or selling domestic government bonds. If foreign and domestic securities were perfect substitutes, sterilised intervention would not be effective. The finding of Dominguez and Frankel (1993) that sterilised intervention is effective in the short-run at least provides evidence that perfect substitutability is too strong an assumption. Sarno and Taylor (2001) expose two channels of making sterilised exchange rate intervention effective: the portfolio balance channel and the expectations or signalling channel. The former one rests on the assumption of imperfectly substitutable international financial assets. When a central bank intervenes in the currency market, the relative availability of currencies is changed and subsequently investors are required to rebalance their portfolios, thereby adjusting prices of currencies. Although very plausible, this channel is difficult to verify due to unavailable data.<sup>29</sup> Even if the first channel is not effective, the second one could be. By intervening in the markets, a central bank releases information as it regards the previously prevailing exchange rate to be wrong. If market participants believe the central bank to act credibly, they will revise their exchange rate expectation. If the authorities enjoy credibility with the market, a mere announcement of views on the exchange rate could change the rates. Mussa (1981) first exposed this channel. In Singapore, announcements of the central bank carry great weight.

Although the signalling channel is seen as an effective tool for exchange rate management, central banks in general are reluctant to announce interventions even after the event. Only the G3<sup>30</sup> central banks decided in the early 1990s to make available daily data on currency market interventions. The Singaporean central bank does not make announcement *ex post* either, and trying to construct monthly volumes of intervention from changes in reserves is rather imprecise due to data definitions. The reluctance of central banks to openly communicate interventions and thereby increase their effectiveness has been termed the 'secrecy puzzle'. Three explanations have been brought forward: intervention announcements could contribute to increased volatility; central banks do not want to trigger portfolio rebalancing activities; and

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<sup>29</sup> In fact, Sarno and Taylor cite studies which showed that the effect of sterilised intervention is statistically insignificant for portfolio rebalancing movements.

<sup>30</sup> US, Japan, Germany

finally central banks could at times be forced to act not in accordance with long-term fundamentals. It is this last point that carries the strongest weight in the light of second generation currency crisis models.<sup>31</sup> Williamson (1999) considers intervention as a short-term response in exchange rate management only. An exchange rate target must be based on supporting macroeconomic policy. Only then can intervention be credible and hence effective.

## **2.5 The impossible trinity and uncovered interest parity**

The institutional arrangements in Singapore are going to be discussed in the next chapter, which will also consider how Singapore fits with the literature on the bi-polar view, the Williamson BBC doctrine and the empirical regime choice literature. Before the analysis moves on to that, the following subsection will summarise the important points from this chapter and will focus on the aspects which are central for the chapters to come. Especially the ‘impossible trinity’ and the concept of uncovered interest rate parity need to be considered.

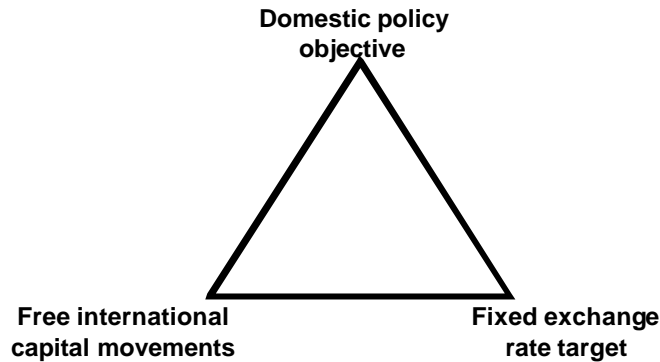
### **2.5.1 The impossible trinity**

The fact that the joint benefits of (perfect) exchange rate stability and independent domestic monetary policy cannot be realised under perfect capital mobility is also known as the ‘trilemma’ of exchange rate economics. One of the three aspects – exchange rate target, independent domestic policy objective and absence of capital restrictions – has to be compromised on at least.<sup>32</sup> The impossibility of having all three features of the trinity at the same time is due to the arbitrage between international money/bond markets via the foreign exchange market. There is the potential for conflicting effects of the exchange rate and interest rate. Due to these conflicts, middle way exchange rate regime commitments (e.g. Britain 1992 and Thailand 1998) can become incredible.

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<sup>31</sup> In these models, if intervention is made from a less than solid position, intervention makes a currency collapse more probable as the central bank is likely to lose money in the intervention. In other words, only stabilising speculation in the Friedman sense is a viable option long-term.

<sup>32</sup> One of the crucial assumptions here is that domestic and foreign assets are perfect substitutes. Isard (1995), p. 197, elaborates on this. Arguably, domestic and foreign bonds are not perfect substitutes, thereby loosening the impossible trinity condition.



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**Figure 1.1: The impossible trinity**

Why does a managed float work in Singapore? Could it be that Singapore has found a successful combination of compromises on the three aspects of the trinity? A managed float, in particular one targeting an undisclosed currency basket is a less rigid exchange rate objective than a fixed exchange rate. Hence, there is a first ‘compromise’. Also, Singapore does restrict capital movements to the extent that speculative shortening of the currency is prohibited, foreign and domestic assets are not perfect substitutes. Finally, does Singapore compromise on real domestic policy objectives such as output or unemployment in order to meet their exchange rate target? The question about the policy objectives of the Singaporean policy setter will be addressed in chapter 5 where a small-scale macro model with a reaction function of the authorities is estimated. The most important finding arising out of the small model estimation will be the virtual collapse of the trinity-triangle. Singapore is an economy so open that the exchange rate is more important for long-run stability than the interest rate. Hence, when the exchange rate as an intermediate policy target acts to achieve domestic policy targets, there is reduced potential for a trilemma conflict to arise. Real and exchange rate targets are aligned, and credibility is best supported by keeping the exchange rate at a ‘fundamentally correct’ level.

## 2.5.2 UIP

The nexus between exchange rates and interest rates is known as the uncovered interest parity condition. International investors would seek to equalise returns on financial asset across

countries taking exchange rate movements into account. Uncovered interest rate parity (UIP) is a standard building block of exchange rate economics. Despite its theoretical appeal, UIP does not seem to hold when tested empirically. The literature analysing UIP and the potential reasons for its failure is abundant.<sup>33</sup> In the open economy model to be simulated later in this thesis, the assumption about UIP will be important.

$$1.1) \quad E_t [De_{t+4}] = E_t [e_{t+4}] - e_t = \text{const}^{UIP} + \mathbf{b}^{UIP}(i_t - i_t^*)$$

Equation 1.1) formalises the idea, where  $E_t [De_{t+4}]$  is the *expected* change in the exchange rate over the next four quarters.  $(i_t - i_t^*)$  is the interest rate differential between domestic and foreign interest rates respectively. Under the rational expectation hypothesis,  $\mathbf{b}^{UIP}$  is assumed to equal unity, while  $\text{const}^{UIP} = 0$  is also assumed. Since expected exchange rates are difficult to measure, realised exchange rates are often used on the basis that with unbiased expectations, realised future spot rates should not systematically differ from expected rates. Given rational expectations of international investors, the *ex ante* returns on domestic and foreign bill holdings should be equal, i.e. a difference in the domestic and foreign money market must be compensated by changes in the exchange rate.

Both assumptions regarding the intercept term and the slope coefficient have been proved wrong empirically. A significant constant can be interpreted as a risk premium, i.e. domestic and foreign bills are not perfect substitutes (in terms of default risk and liquidity; capital account restrictions could matter, too). The slope coefficient has often been estimated as minus 0.8, rather than plus 1.0. de Brouwer (1999, p. 79-82) outlines some of the suggested explanations in the literature. Following Fama (1984), the exchange rate risk premium could be time-varying, and more importantly, it could have a negative covariance with an expected depreciation of the exchange rate. In other words, a depreciation in the currency would lead to a higher interest rate normally. However, the argument goes, the interest rate falls as the risk premium embodied in the interest rate falls by *more* than the required interest rate increase to make UIP hold.

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<sup>33</sup> See for example: Isard (1995) as a text book guide to the literature, McCallum (1994), and de Brouwer (1999) for an analysis aimed particularly at the evidence from East Asia.

Explanations brought forward for this phenomenon include interest rate smoothing of central banks. For example, if the economic condition of a country gives rise to an expected exchange rate depreciation, this should lead to an increased interest rate differential. If the central bank now smoothes interest rates, the money market rate does not rise by as much as the expected exchange rate change predicts. Hence, there would be a reduction in the ‘implied risk premium’.

In a recent IMF research paper by Basurto and Ghosh (2000) it is argued that the exchange rate/interest rate link is weak, and that it has been particularly loose during the Asian crisis for many of the countries involved (Thailand, Korea and Indonesia). Basurto and Ghosh point out that due to the risk premia, inflation and/or exchange rate expectations included in the interest rate, it is difficult to use UIP econometrically.

The UIP relationship remains one of the important puzzles of macroeconomics. When UIP is made a building block of the small-scale macro model developed in chapter 4, thereby imposing a strict, endogenous (because foreign interest rates are assumed to be exogenously given and fixed) causality between the exchange rate and the interest rate. Since, theoretically, interest rates and exchange rates should work in opposite directions (a ‘stimulating’ currency depreciation would cause a ‘depressing’ rise in interest rates, hence the potential for conflict in the impossible trinity) according to UIP, the factors that really *cause* the interest rate (given the exchange rate as for the Singapore case) will be important for the stability properties of the simulation. de Brouwer (1999) has attempted to identify to what degree interest rates are caused by exchange rate movements, foreign interest rates and domestic influences. His important results for Singapore will be considered in the next chapter.

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