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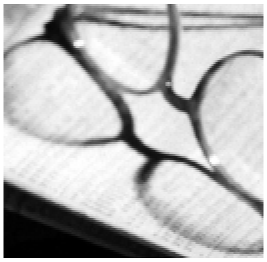


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Macroeconomic Coordination and Monetary Unions in an N-Country World: Do all Roads Lead to Rome? *

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Abstract

In Europe, twelve countries have joined a currency union but four have stayed out. The EU enlargement process implies a large set of potential EMU entrants. In Latin America, two countries have recently dollarized and regional currencies have also been a recurring theme. We develop a theoretical model in which countries are exposed to real and monetary shocks of both a systemic and individual nature. The model suggests when countries should float, form a CU or fix to an anchor as a function of their sensitivity to systemic shocks and the size of individual shocks. In an empirical analysis we consider a set of countries in Latin America. We find that what is beneficial for a given country depends on the actions of others. Integration may then be path dependent, and all roads may not lead to Rome.

1 Introduction

Mundell (1961), Mckinnon (1963) and Poole (1970) provided path-breaking theoretical models to consider when countries should consider adopting a common currency. These papers gave rise to what are now referred to as the Optimal Currency Area (OCA) conditions. OCA theory has hence become an essential element of the toolkit of international economists and these earlier papers have now spawned a wide literature[1]. However, most OCA models are essentially two-country,

*We are grateful for comments from Guillermo Calvo, Ernestto Stein, Alan Taylor, Andrés Velasco and participants at the brainstorming session in Cambridge, USA and the, "FTAA and Beyond: Prospects for Integration in the Americas" conference in Punta del Este, Uruguay.

[1]See for example Bayoumi (1994) for a formal model of OCAs, Bayoumi and Eichengreen (1994) on OCA and Nafta, Bean (1992) on OCA and Europe, Buiter (1999) on OCA and the UK, and Masson and Taylor (1993) and Willett (1999) for more recent reviews.

suggesting when a country should "fix" to the other - which is often thought of as the rest of the world. Such models are then restrictive in analyzing a set of important issues, such as what is the effect on a third country when two other trading partners form a monetary union and how two current members of a monetary union are affected if a third, fourth and fifth country joins in and (hence) what the optimal membership of a monetary union might be for a particular country. These are not simply interesting theoretical issues but they are also of significant practical importance. In the context of EMU, 12 countries have now adopted the single currency, while 4 EU members have stayed out. The EU enlargement process implies a very large number of potential new eligible members. In Latin America, 2 countries have recently dollarized (Ecuador and El Salvador) while the majority have adopted more flexible regimes with floating exchange rates. A recurring theme is a common regional currency, for example, among countries in Mercosur[2]. The decision of El Salvador to dollarize has effects on other countries in Central America and if another country in the region dollarized that would also affect El Salvador. If the Southern Cone adopted a single currency, that would be a very significant development for the whole of South America and beyond. To date, there does not appear to be a simple theoretical framework capabale of analyzing the externalities of one country's decisions on others in a multi-country setting that might be made applicable to these real world examples.

A second issue is the interplay with trade and free trade areas (FTAs). Economists have a strong belief in the benefits of trade integration. Yet this unusual consensus within the profession has not been matched by advances at the implementation stage when protectionist forces have tended to delay the process of trade integration. The link between trade and monetary integration is a subtle one. The common view might be that trade integration is a necessary condition for monetary integration. However, others might argue that monetary integration might provide the impulse for trade liberalization and counter the protectionist forces.

The interplay between these two reforms is then highly significant. Again, Europe and the Americas provide interesting contrasts. In the former, a single currency came about only after a significant deepening of trade integration whereas in the case of the Americas there is a dollarization debate in Latin America which at times appears quite independent of the debate regarding FTAA. Nafta is deepening trade integration in the north but there is less talk of a single currency between the current three partners. Mercosur attempted to deepen trade integration in the South and although as mentioned, a common currency has been a re-

[2] See for Carrera y Sturzenegger (2000).

curring theme, Argentina in particular has also flirted with the idea of dollarization.

This paper constitutes a first attempt at developing a simple framework potentially capable of considering these various different interaction effects. We develop what might be considered a "reduced form" version of a OCA model and extend it to the case of n countries. More specifically, our model might be described as the factor approach (or more loosely CAPM) meets OCA.

We assume countries are affected by four types of shocks; idiosyncratic and systemic shocks, both real and monetary in nature. We then develop equations for GDP volatility as a function of simple underlying characteristics of countries and, in particular, their dependence on systemic shocks (a type of beta coefficient), the size (volatility) of the idiosyncratic shocks, and the choice of exchange rate regime. While we label shocks as real or monetary, they can be interpreted more widely as shocks to which it would be desirable for the exchange rate to respond, and shocks that might shift the nominal exchange rate away from some desired path (in terms of GDP stabilization), respectively. This relatively simple framework allows us to consider the effect of a monetary union in a subset of countries on the members of the union and on other countries. We can also compare the case of a monetary union, where monetary policy and hence exchange rates respond to the shocks to the members of the union, with "dollarization" where monetary policy and exchange rates are assumed to be governed by US (or the anchor country) characteristics. We illustrate these and other points in a set of simulations.

We introduce trade integration and free trade areas as we posit that countries that are more integrated will have a more similar dependence on the systemic factors. Hence if an FTA increases integration, we then have a link between trade and monetary integration. Broadly speaking the greater the degree of trade integration in a CU, then the lower is the cost of a single currency between members. We illustrate that the establishment of an FTA may then increase the argument for a currency union (CU). At the same time, however, if a subset of countries forms an FTA increasing the incentives for those countries to form a CU, then this may have a deleterious effect on other countries that are left out.

We also provide a first empirical application of the model - to Latin America. We conduct a principal component analysis to obtain the systemic factors and the dependence of countries to those factors - the "factor loadings". We then estimate, using a Vector Autoregression (VAR) technology, the volatility of the idiosyncratic real and nominal shocks. This analysis yields some interesting if preliminary results.

The paper is organized as follows. In the next section, we provide the basic theoretical model. In section 3 we then consider a set of initial simulations regarding CU's and dollarization. In section 4 we present the empirical application to Latin America and section 5 concludes.

2 The Model

2.1 A reduced form OCA

Our model is a reduced form version of the OCA conditions inspired by the early work of Mundell and Poole but that we think nests many views regarding the costs and benefits of currency unions. We start with an initial output equation for a single country i of the form:

$$\Delta GDP_i = \Delta R_i - \alpha \Delta S_{i.} \tag{1}$$

In this specification, real shocks ΔR_i, which affect output directly, can be smoothed by exchange rate adjustments ΔS_i . Here, α is the smoothing effect of the exchange rate movement. In this specification, the exchange rate refers to the nominal exchange rate. The exchange rate in turn, is determined by a "monetary approach to the exchange rate" equation as follows,

$$\Delta S_i = \Delta GDP_i - \Delta M_i, \tag{2}$$

where, as expected a positive monetary shock results in an exchange rate depreciation. Combining (1) and (2) we get that

$$\Delta GDP_i = \frac{1}{1+\alpha}\Delta R_i + \frac{\alpha}{1+\alpha}\Delta M_i,$$

which applies to countries under float. Under a fix regime $\Delta S_i = 0$, so that very simply:

$$\Delta GDP_i = \Delta R_i.$$

The benefit to choosing a float is then that the exchange rate can act as a shock absorber in the case of real shocks but also introduces the possibility of monetary shocks that tend to move the exchange rate away from this smoothing motion. In this specification, real shocks can be terms of trade, productivity or capital flow disturbances (sudden stops). Monetary shocks can relate to money supply disturbances or changes in money demand not related to the real side of the economy. The important aspect of our monetary shocks is that they are shocks that drive the exchange rate away from desired changes given the confluence of real shocks.[3]. Relating the model to the early work of Mundell and

[3]We note that this set up abstracts from the ever-growing list of "new considerations" that various authors have suggested should be included within OCA theory.

others, a country that suffers large "monetary" shocks may then find it should fix whereas a country that has low monetary shocks but suffers large "real" shocks should float and use the exchange rate to smooth those real disturbances.

A potential criticism of this set-up is that there appears to be no room for independent monetary policy. However, for those that believe that independent monetary policy can be employed to respond perfectly to real shocks without suffering from any monetary shocks at all, then this view can be translated simply into our model with the assumption that the monetary shocks have a variance of zero and the alpha parameter is very large. Then, GDP volatility is close to zero under a float even in the presence of real shocks. However, a more general view might be that there are certain limitations to using monetary policy in this way and that monetary variables may not be totally within the control of the monetary authorities[4].

Another view, stressed by Calvo - see for example Calvo (2002) - focuses on the severity and importance of "sudden stops". In our model, a sudden stop might be thought of as a systemic real shock. As such, shocks impact the real economy through a decline in available funds for investment and in general require a significant current account adjustment. These are then shocks where it would in general be advantageous to respond with exchange rate flexibility[5]. To the extent that a group of countries suffer from such a shock simultaneously implies that the cost of a monetary union between those countries would be low, although if an individual country was more prone to such a "sudden stop" then individual exchange rate flexibility would clearly be an advantage.

2.2 A factor approach to OCA

In the previous section we referred to one country in isolation. The extension to many countries entails tracking the exchange rates between countries. Suppose there are $n+1$ countries (i.e: n + country i). Our

Willett (1999) includes as (new) considerations, "optimal public finance, the degree of international currency substitution, the new classical view of policy effectiveness, the informativeness of price and quantity signals, the controllability of the money supply, time inconsistency problems and credibility issues".

[4] As Buiter (1999) puts it, perhaps too strongly, "... objections to UK (EMU membership) are based on the misapprehension that independent monetary policy, and the associated nominal exchange rate flexibility, can be used effectively to offset or even neutralise asymmetric shocks. This 'fine-tuning delusion' is compounded by a failure to understand that, under a high degree of international financial integration, market determined exchange rates are primarily a source of shocks and instability" (quoted from the abstract of the paper).

[5] We note however that this assumes that the shock is exogenous to the exchange rate regime in place, we come back to these endogeneity issues below.

equation for GDP is

$$\Delta GDP_i = \Delta R_i - \alpha \sum_{j=1} \frac{1}{n} \Delta S_{ij}, \tag{3}$$

where ΔR_i is a "real shock" that hits country i and where the real shock has both a systemic and an individual component:

$$\Delta R_i = \beta_i^R \epsilon_w^R + \epsilon_i^R. \tag{4}$$

Each country is affected directly by individual shocks ϵ_i^R or in response to world shocks ϵ_w^R with adjustment coefficient β_i^R . Exchange rate changes are governed by the monetary approach to the exchange rate such that the nominal exchange rate is affected by changes in relative outputs and relative monetary supply. Thus

$$\Delta S_{ij} = (\Delta GDP_i - \Delta GDP_j) - (\Delta M_i - \Delta M_j). \tag{5}$$

Where the relative money shock has, in similar vein to the real shocks, systemic and independent components:

$$\Delta M_i = \beta_i^M \epsilon_w^M + \epsilon_i^M. \tag{6}$$

Equations (5) and (6) imply that exchange rate movements are driven

by real and monetary shocks. In order to express the exchange rate movement only in terms of these shocks, we first compute the difference in GDP movements of countries i and j. From equation (3):

$$\Delta GDP_i - \Delta GDP_j = \Delta R_i - \Delta R_j - \frac{\alpha}{n} \sum_{k=1} (\Delta S_{ik} - \Delta S_{jk}). \tag{7}$$

However, from our setup it follows that $\Delta S_{ij} = \Delta S_{ik} - \Delta S_{jk}$ and hence this simplfies to:

$$\Delta GDP_i - \Delta GDP_j = \Delta R_i - \Delta R_j - \alpha \Delta S_{ij}. \tag{8}$$

We can then substitute this expression into equation (5) to obtain:

$$\Delta S_{ij} = \frac{1}{1+\alpha} [(R_i - R_j) - (\Delta M_i - \Delta M_j)]. \tag{9}$$

And from the equation governing the changes in GDP we now have:

$$\Delta GDP_i = \Delta R_i - \frac{\alpha}{1+\alpha}\frac{1}{n}\sum_{j=1}[(\Delta R_i - \Delta R_j) - (\Delta M_i - \Delta M_j)]. \quad (10)$$

Which makes clear that for a country that has asymmetric real shocks (ie: where its real shocks are different to the other n countries), a floating exchange rate has a dampening role. On the other hand a country that has asymmetric monetary shocks (e.g.: where individual monetary shocks are large), a floating exchange rate may imply greater shocks to GDP relative to a fix. Subsituting in for the specification of the real and monetary shocks, we can write that:

$$\Delta GDP_i = \frac{1}{1+\alpha}(\beta_i^R + \frac{\alpha}{n}\sum_{j=1}\beta_j^R)\epsilon_w^R + \frac{\alpha}{1+\alpha}\frac{1}{n}\sum_{j=1}\epsilon_j^R + \frac{1}{1+\alpha}\epsilon_i^R + \frac{\alpha}{1+\alpha}\sum_{j=1}\frac{1}{n}(\beta_i^M - \beta_j^M)\epsilon_w^M - \frac{\alpha}{1+\alpha}\sum_{j=1}\frac{1}{n}\epsilon_j^M + \frac{\alpha}{1+\alpha}\epsilon_i^M \quad (11)$$

We will idendity welfare with the inverse of GDP volatility. Given that the systemic shocks and the individual shocks are all independent, GDP volatility is now relatively straightforward in this world of $n+1$ floating currencies. This turns out to be:

$$\sigma^2_{GDP_i^{Float}} = (\frac{1}{1+\alpha})^2\sigma^2_{\epsilon_i^R} + (\frac{1}{1+\alpha})^2\left[\beta_i^R + \frac{\alpha}{n}\sum_{j=1}(\beta_j^R)\right]^2\sigma^2_{\epsilon_w^R} + (\frac{\alpha}{1+\alpha}\frac{1}{n})^2\sum_{j=1}\sigma^2_{\epsilon_j^R} + \left(\frac{\alpha}{1+\alpha}\right)^2\sigma^2_{\epsilon_i^M} + \left(\frac{\alpha}{1+\alpha}\frac{1}{n}\right)^2\left[\sum_{j=1}(\beta_i^M - \beta_j^M)\right]^2\sigma^2_{\epsilon_w^M} + (\frac{\alpha}{1+\alpha}\frac{1}{n})^2\sum_{j=1}\sigma^2_{\epsilon_j^M}. \quad (12)$$

On the other hand, if there is one world currency then we have that:

$$\Delta GDP_i^{Fix} = \Delta R_i = \beta_i^R\epsilon_w^R + \epsilon_i^R. \quad (13)$$

And the volatility under a one world currency is given by:

$$\sigma^2_{GDP_i^{Fix}} = \beta_i^{R^2} \sigma^2_{\epsilon_w^R} + \sigma^2_{\epsilon_w^R}. \tag{14}$$

Comparing this to the equation for GDP volatility under floating, we can see that floating reduces GDP volatility derived from own asymetric real shocks (idiosyncratic or systemic but where betas are different), to the extent that α is positive, but floating also introduces greater GDP volatility stemming from the monetary shocks in other countries (that affect exchange rates domestically) and own asymmetric monetary shocks.

2.3 Partial Monetary Unions

This simple set-up is useful in that it also allows us to consider what happens when two or more countries form a currency union. If two countries decide to adopt the same currency, then the basic equation for GDP movements remains the same except for the fact that now one currency dissapears.

$$\Delta GDP_{i(k)} = \Delta R_i - \alpha \sum_{j \neq k}^{n-1} \frac{1}{n} \Delta S_{i(k)j}, \tag{15}$$

where we assume that i merges with k indicated by the subscript $i(k)$.

We assume symmetry, in that all countries are of equal size and hence have equal weight regarding how the common exchange rate of a monetary union is determined. Denoting $\Delta M_{i(k)} = \Delta M_{k(i)}$ as the monetary shock of the monetary union between countries i and k, the common exchange rate movement is then given by:

$$\Delta S_{i(k)j} = \begin{cases} 0 \text{ if } j = k \\ \frac{\Delta GDP_{i(k)} + \Delta GDP_{k(i)}}{2} - \Delta GDP_j - (\Delta M_{i(k)} - \Delta M_j) \text{ if } j \neq k. \end{cases} \tag{16}$$

We will assume that the movement of the joint exchange rate follows the same rules as before with a systemic and an individual component for the real shocks and monetary shocks. Following standard theories of finance, the "beta" of the currency union is then simply the average of the two individual country "betas" and the individual shock of the currency union is just the average individual country shocks. Let us define:

$$R_{i(k)} = \frac{1}{2}(\beta_i^R + \beta_k^R)\epsilon_w^R + \frac{1}{2}(\epsilon_i^R + \epsilon_k^R) \tag{17}$$

and

$$M_{i(k)} = \frac{1}{2}(\beta_i^M + \beta_k^M)\epsilon_w^M + \frac{1}{2}(\epsilon_i^M + \epsilon_k^M). \tag{18}$$

With this notation, for the case $j \neq k$, we can write:

$$\Delta S_{i(k)j} = \frac{1}{1+\alpha}[(\Delta R_{i(k)} - \Delta R_j) - (\Delta M_{i(k)} - \Delta M_j)],$$

where we use the fact that $\Delta S_{i(k)l} = \Delta S_{k(i)l}$ and $\Delta S_{i(k)l} - \Delta S_{jl} = \Delta S_{i(k)j}$. We can then write the change in GDP, if i and k fix, as a function of the real and monetary shocks as follows:

$$\Delta GDP_{i(k)} = \{(\beta_i^R - \frac{\alpha}{1+\alpha}\frac{1}{n}\sum_{j\neq k}^{n-1}[\frac{1}{2}(\beta_i^R+\beta_k^R)-\beta_j^R]\}\epsilon_w^R - \frac{\alpha}{1+\alpha}\frac{1}{n}\sum_{j\neq k}^{n-1}\epsilon_j^R + (1-\frac{1}{2}\frac{n-1}{n}\frac{\alpha}{1+\alpha})\epsilon_i^R$$

$$+\frac{1}{2}\frac{n-1}{n}\frac{\alpha}{1+\alpha}\epsilon_k^R + \{\frac{\alpha}{1+\alpha}\frac{1}{n}\sum_{j\neq k}^{n-1}[\frac{1}{2}(\beta_i^M+\beta_k^M)-\beta_j^M]\}\epsilon_w^M - \frac{\alpha}{1+\alpha}\frac{n-1}{n}\frac{1}{2}\epsilon_i^M$$

$$-\frac{\alpha}{1+\alpha}\frac{n-1}{n}\frac{1}{2}\epsilon_k^M + \frac{\alpha}{1+\alpha}\sum_{j\neq k}^{n-1}\frac{1}{n}\epsilon_j^M. \tag{19}$$

The variance of GDP is then given by:

$$\sigma^2_{GDP_{i(k)}} = \{(\beta_i^R - \frac{\alpha}{1+\alpha}\frac{1}{n}\sum_{j\neq k}^{n-1}[\frac{1}{2}(\beta_i^R+\beta_k^R)-\beta_j^R]\}^2\sigma^2_{\epsilon_w^R} + (\frac{\alpha}{1+\alpha}\frac{1}{n})^2\sum_{j\neq k}^{n-1}\sigma^2_{\epsilon_j^R} + (1-\frac{1}{2}\frac{n-1}{n}\frac{\alpha}{1+\alpha})^2\sigma^2_{\epsilon_i^R}$$

$$+(\frac{1}{2}\frac{n-1}{n}\frac{\alpha}{1+\alpha})^2\sigma^2_{\epsilon_k^R} + \{\frac{\alpha}{1+\alpha}\frac{1}{n}\sum_{j\neq k}^{n-1}[\frac{1}{2}(\beta_i^M+\beta_k^M)-\beta_j^M]\}^2\sigma^2_{\epsilon_w^M} + (\frac{\alpha}{1+\alpha}\frac{n-1}{n}\frac{1}{2})^2\sigma^2_{\epsilon_i^M}$$

$$+(\frac{\alpha}{1+\alpha}\frac{n-1}{n}\frac{1}{2})^2\sigma^2_{\epsilon^M_k}+(\frac{\alpha}{1+\alpha}\frac{1}{n})^2\,{}^{n}\!\sum_{j\neq k}^{1}\sigma^2_{\epsilon^M_j} \tag{20}$$

This equation can be extended to the case in which more than two countries decide to conform a monetary union. If the monetary union is between three countries, say i, k and l, then the exchange rate equation is calculated including real and monetary shocks with the "betas" defined as follows:

$$\beta_{i(k,l)}=\frac{1}{3}\beta_i+\frac{1}{3}\beta_k+\frac{1}{3}\beta_l,$$

and individual shocks as follows:

$$\epsilon_{i(k,l)}=\frac{1}{3}\epsilon_i+\frac{1}{3}\epsilon_k+\frac{1}{3}\epsilon_l.$$

In this way, we can use this approach to consider partial monetary unions including $x+1$ of the $n+1$ countries. The general equation for the GDP volatility for this case is:

$$\sigma^2_{GDP_{i(k,..x)}}=\{(\beta^R_i-\frac{\alpha}{1+\alpha}\frac{1}{n}\,{}^{n}\!\sum_{j\neq k,..x}^{x}[\frac{1}{x+1}(\beta^R_i+\beta^R_k+...\beta^R_x)-\beta^R_j]\}^2\sigma^2_{\epsilon^R_w}+(\frac{\alpha}{1+\alpha}\frac{1}{n})^2\,{}^{n}\!\sum_{j\neq k,..x}^{x}\sigma^2_{\epsilon^R_j}+(1-\frac{1}{x+1}$$

$$+(\frac{1}{x+1}\frac{n-x}{n}\frac{\alpha}{1+\alpha})^2(\sigma^2_{\epsilon^R_k}+\sigma^2_{\epsilon^R_l}+..\sigma^2_{\epsilon^R_x})+\{\frac{\alpha}{1+\alpha}\frac{1}{n}\,{}^{n}\!\sum_{j\neq k}^{1}[\frac{1}{x+1}(\beta^M_i+\beta^M_k+...\beta^M_x)-\beta^M_j]\}^2\sigma^2_{\epsilon^M_w}+(\frac{\alpha}{1+\alpha}$$

$$+(\frac{\alpha}{1+\alpha}\frac{n-1}{n}\frac{1}{x+1})^2(\sigma^2_{\epsilon^M_k}+\sigma^2_{\epsilon^M_l}+...\sigma^2_{\epsilon^M_x})+(\frac{\alpha}{1+\alpha}\frac{1}{x+1})^2\,{}^{n}\!\sum_{j\neq k,..x}^{x}\sigma^2_{\epsilon^M_j}. \tag{21}$$

Although this formula is long it is fairly simple to interpret. It says that as the number of countries forming a monetary union increases, if the betas are very different, then the exchange rate will not reflect well the systemic real shocks that hits country i (first term). This makes intuitive sense, as the exchange rate in a very large monetary union of diverse members will do little to smooth the systemic shocks of individual members. On the other hand, the effect of the individual real shocks of countries not in the union become less important (second term) as they affect less and less the exchange rate of the union, which is increasingly driven by its members. Also, the exchange rate of the union is going to reflect less the individual real shocks of country i (third term) and hence smooths output less efficiently. There is a posistive effect as the exchange rate will also reflect less the individual monetary shocks of the countries of the union (the fifth term). The fourth term reflects the asymetric monetary shocks and the best case for monetary union is where the effect of the union is to generate an "average beta" close to the average beta of the $n+1$ countries. The final term indicates that when the number of countries in the union increase then the individual monetary shocks of countries not in the union become less important as they affect less the exchange rate of the union. Note that as x tends to n, then this equation collapses to the equation for output volatility for the one world currency case.

2.4 Fixing to an anchor currency

Alternatively countries may choose to coordinate by fixing to a country that can provide some credibility enhancement. We will refer to this country as the US. The purpose of this section is to provide the sequence of volatilities as more and more countries peg to the same currency. As always we start with our canonical output equation

$$\Delta GDP_{i(US)} = \Delta R_i - \alpha \sum_j \frac{1}{n}\Delta S_{USj}, \tag{22}$$

In this case, we can write that:

$$\Delta GDP_{i(US)} = \Delta R_i - \sum_j^{n-1} \frac{1}{n}\frac{1}{1+\alpha}\{(\Delta R_{US} - \Delta R_j) - (\Delta M_{US} - \Delta M_j)\} \tag{23}$$

and going through the same procedure as above, we find the variance of output fixing to the US$:

$$\sigma^2_{GDP_{i(US)}} = \{\beta_i^R - \frac{\alpha}{1+\alpha}\frac{1}{n}\sum_{j\neq k}^{n-1}(\beta_{US}^R - \beta_j^R)\}^2\sigma^2_{\epsilon_w^R} + (\frac{\alpha}{1+\alpha}\frac{1}{n})^2\sum_{j\neq k}^{n-1}\sigma^2_{\epsilon_j^R} + \sigma^2_{\epsilon_i^R}$$

$$+(\frac{\alpha}{1+\alpha})^2\sigma^2_{\epsilon_{US}^R} + \{\frac{\alpha}{1+\alpha}\frac{1}{n}\sum_{j\neq k}^{n-1}(\beta_{US}^M - \beta_j^M)\}^2\sigma^2_{\epsilon_w^M}$$

$$+(\frac{\alpha}{1+\alpha})^2\sigma^2_{\epsilon^M_{US}} + (\frac{\alpha}{1+\alpha}\frac{1}{n})^2\sum_{j\neq k}^{n-1}\sigma^2_{\epsilon^M_j} \tag{24}$$

If now a second country dollarizes, then the extension is reasonably straightforward and if x countries plus country i dollarize then we obtain the following equation for output volatility:

$$\sigma^2_{GDP(US)} = \{\beta^R_i - \frac{\alpha}{1+\alpha}\frac{1}{n}\sum_{j\neq k,..x}^{n-x}(\beta^R_{US}-\beta^R_j)\}^2\sigma^2_{\epsilon^R_w} + (\frac{\alpha}{1+\alpha}\frac{1}{n})^2\sum_{j\neq k}^{n-x}\sigma^2_{\epsilon^R_j} + \sigma^2_{\epsilon^R_i}$$

$$+(\frac{\alpha}{1+\alpha}\frac{n-x}{n})^2\sigma^2_{\epsilon^R_{US}} + \{\frac{\alpha}{1+\alpha}\frac{1}{n}\sum_{j\neq k,..x}^{n-x}(\beta^M_{US}-\beta^M_j)\}^2\sigma^2_{\epsilon^M_w}$$

$$+(\frac{\alpha}{1+\alpha}\frac{n-x}{n})^2\sigma^2_{\epsilon^M_{US}} + (\frac{\alpha}{1+\alpha}\frac{1}{n})^2\sum_{j\neq k,..x}^{n-1}\sigma^2_{\epsilon^M_j} \tag{25}$$

Dollarization then eliminates the dependence of output volatility on the local monetary shock, replacing it with US monetary shocks, but will import volatility to the extent that real and monetary shocks are asymmetric. As the number of countries that dollarize increase, the importance of the asymmetric real shocks increases (there are more terms in the first sumation) but the importance of US monetary shocks diminish. As x tends to n, this equation collapses onto that for the one world currency (fixed) case.

3 A Set of Simulations

3.1 The model in action to illustrate different possibilities

In this section, we report the results of a set of simulations of the model. Our aim is to understand the implications for GDP volatility under different exchange rate regimes of different constellations of parameter values. The model is simple but extremely general in that by varying a parsimonious set of variables, we obtain very different results. The different parametrizations we adopt below are detailed in Table 1. The simulations are labelled somewhat suggestively according to the flavour of the reults obtained.

Table 1 Here

3.2 G-3

In the first simulation, the size of the individual real shocks are the same as the size of the individual nominal shocks (all equal to 1). The α parameter is set to 0.5 implying that a floating rate can substantially smooth the real shocks. In this simulation all the β's for all the countries are set equal to one and the volatility of the shocks are also the same across countries. Figure 1 graphs one country's GDP volatility a) when that country forms a monetary union with an increasing number of partners (the number of partners is the X axis), b) versus pegging to one of the other countries (let us call it the US although in this simulation the US is just another country - the number of countries pegged to the US is the X axis) c) versus floating. Remember that fixing to the US anchor and forming a monetary union both converge to the case of one world currency as the number of countries that fix increases. As can be seen, floating is the best in terms of the lowest GDP volatility followed by a partial monetary union, followed by a one world currency, and finally fixing to the "US". A monetary union is preferred to fixing to the US currency, as in a monetary union with two members, the monetary policy more closely reflects the real shocks of those two members. However, in this case, where floating is optimal, the cost of a monetary union (that one country's monetary policy does not relfect that country's real shocks), outweighs the benefit in terms of the diversification of "harmful" monetary shocks. Hence as the number of members of the monetary union rises, the cost of the monetary union increases. In this G3 inspired simulation, where harmful nominal shocks are no higher than the real shocks, the best policy is to float.

Figure 1 Here

3.3 EMU

In this second simulation, we make various changes. We assume that the anchor country has relatively smaller nominal shocks and the other countries higher nominal shocks[6]. We also assume that the anchor country has a dependence on the systemic real factor that is higher than the other countries (0.75 versus 0.25). We assume that the other countries all have the same, lower, dependence on the systemic real factor. The idea here is that the anchor is a more "systemic" country than the other countries and also has smaller individual monetary shocks. We tentatively suggest that these stylized facts might be thought of as modelling Europe. Here we find, as illustrated in Figure 2, that the best policy is a monetary union. Monetary union is now superior to floating as the benefit of diversifying the nominal shocks outweighs the cost of adopting a monetary policy that does not fit one's own characteristics - as given by the real shocks. In common with results on diversfication of financial assets, it is noticable how quickly the standard deviation of output drops as a few more countries join the monetary union. After some 7 or 8 countries join, virtually all the benefits of monetary union are dissipated. In this simulation, pegging to the anchor is however better than floating as the anchor has considerably lower monetary shocks. Again, as more and more countries "fix", both monetary union and fixing to the anchor converge and they converge on the standard deviation of the one world currency. We then label this simulation EMU, as the model with this set of assumptions yields the result that a monetary union is indeed optimal.

Figure 2 Here

3.4 Dollarization

In the third simulation, we increase the nominal (monetary) volatility substantially higher thus increasing the relative attrativeness of the anchor's (US's) currency . In this case, as illustrated in Figure 3, dollarization is now the preferred option. Floating, of course, yields the highest GDP volatility and while a currency union, (CU) diversifies some of the individual monetary shocks, fixing to the low nominal volatility country (the US) is clearly preferred. We note that this relative attraction of dollarization decreases as more countries "fix". As more and more countries "fix", "dollarization", and a monetary union converge again on the output volatility of a one world currrency.

[6] The anchor country is labelled the US in the graph but we could equally think of it as Germany. In other words fixing to the anchor would be adopting German monetary policy whereas monetary union would be where the montary policy reflected the shocks of the whole monetary area.

Figure 3 Here

3.5 CU or dollarization: size matters

In Figure 4, we fine-tune the costs and benefits of a CU relative to dollarization to illustrate an interesting case. Here the individual nominal volatility is lower than in Figure 3 and the two curves cross. This implies that if we consider a country dollarizing or forming a monetary union with a single partner, then dollarization is preferred. This result is obviously driven by the lower individual nominal volatility assumed for the US. However, as the number of countries entering into the monetary union rises, after a critical number of countries have entered, the CU is then preferred! In this case output volatility of a monetary union with 5 countries (country i plus 4 partners) is lower than that if those five countries (country i plus 4 partners) dollarize. Now the diversification effect of the CU has reduced substantially the problem of the high individual nominal volatility, and in the CU, the monetary policy more closely reflects the real shocks of the CU's members - whereas with dollarization, monetary policy reflects the real shocks of the US.

This result may give rise to a coordination problem. Suppose there are say 6 countries in a world of 50 that might either dollarize or eventually form a CU but that the technology of CU formation is such that only two countries can first form a CU and only subsequently can that CU be extended. The problem is that each two or three countries would prefer to dollarize over the alternative of a small CU. Hence if the decision of each country is to dollarize today versus form a CU with one or two partners in the hope of convincing others to join later, then the decision today might be dollarize. A CU with 6 members may then never get off the ground even though it is the preferred solution for the whole group.

Figure 4 Here

3.6 On endogenizing the effect of trade integration

As suggested in the introduction, we might posit that the "real betas" of two countries that are more integrated, will be more similar than those of two countries that do not trade very much. This idea may provide a link between trade agreements and monetary agreements. Also, for a group of countries that join a CU, we might posit that the "monetary betas" could also converge. This would be a way of making operational, Mundell's idea that the traditional OCA criteria are to a large extent, endogenous[7].

To illustrate this possibility, we consider monetary union between a country that has a real beta of 0.75 and a group of countries that have dispersed real and monetary betas. The distribution of real betas for these other countries is uniform between 0.1 and 0.9. We then shrink the dispersion of that distribution towards 0.75. The result is illustrated in Figure 5 and more detail on the parameterization is given in the Appendix in Table A1. In the Figure, the variable S summarises the disperson of the distribution with a S=1 implying total uniformity (all betas equal to 0.75) and S=0 represents a uniform distribution in the interval 0.1 to 0.9. As the real betas converge, the GDP volatility falls. We might posit that forming a CU might speed this convergence process. This means that as a CU is formed between a divergent group, the relevant curve may not be the curve with those divergent betas but rather the betas may converge and output volatility may fall to one of the lower curves depicted in Figure 5. This graph then illustrates the potential importance of endogenous convergence between members of a CU.

Figure 5 Here

4 An Application to Latin America

In this section we report the results of an empirical exercise using the model and applying it to Latin America. We identify the systemic shocks and the factor loadings for countries to those systemic shocks by conducting a principal component analysis based on the first difference of GDP and then on exchange rate movements in 6 countries across Latin America and the US over the period 1980-1999[8]. In this exercise, we consider just the first principal factor and in both cases this explains close to 40% of the variation. The dependencies to the first principal factor across the different countries are then used as the beta coefficients in our simulations and the first principal factors from this analysis are then the systemic real and monetary shocks respectively. The theoretical model and the empirical exercise could of course be extended to

[7] Of course a similar argument could be made for dollarization ie: the betas of a country adopting the US currency might converge to US values.

[8] The six countries are Brazil, Chile, Colombia, Mexico, Uruguay and Venezuela. We do not include Argentina due to the fixed exchange rate during the period of analysis.

multiple factors - ie: more orthogonal systemic shocks and hence other corresponding sets of beta coefficients. We leave this for future work.

We then conduct a Vector Autoregression (VAR) for each country where we have one equation for the log change in GDP and a second equation for the log change in the nominal exchange rate - against the US dollar. In the VAR we introduce the principal components as exogenous variables. We then interpret the residuals from these regressions as the individual real and monetary shocks respectively. Table 2 provides a summary of the variables and their values for the different countries employed in this exercise. Finally we set the α parameter equal to 0.5 as in the simulations above. In fact we find that the spirit of the results are not very sensitive to different values of the α parameter, in terms of the effects on output volatility of the relative exchange rate arrangements. Given the number of assupmtions, the results should of course be taken as suggestive rather than definitive.

Table 2 Here

4.1 Mexico

We first consider the case of Mexico. Mexico, as can be seen from Table 1, has higher individual monetary shocks relative to the average, relatively low individual real shocks and the lowest "real beta" (dependence on the real systemic shock principal component). It is therefore not too surprising that floating is the worst exchange rate regime choice for Mexico. Figure 6 illustrates that forming a monetary union lowers GDP volatility and we find that a CU with Colombia, Chile and Uruguay is the best on offer. While Colombia has a higher "real beta", its individual monetary shocks are low. Gains are also had in extending the CU to Chile and Uruguay that also have low individual monetary shocks. However, incorporating Venezuela and especially Brazil, with their higher individual monetary shocks, worsens the output volatility of the CU for Mexico. Dollarizing also lowers GDP volatility for Mexico and indeed is slightly better than a CU with Colombia. However, the optimal policy for Mexico is a CU with Colombia, Chile and Uruguay.

Figure 6 Here

4.2 Brazil

Turning to the case of Brazil, Table 2 shows that Brazil has average levels of the beta parameters, a low value for the individual real shock but a high value for the individual monetary shock. Here, due to the higher individual monetary shocks, the benefit of dollarizing or a CU are substantially increased relative to floating. Figure 7 shows that for the case of Brazil, extending the CU to all 5 other countries provides benefits - the full extension of the CU working to diversify Brazil's individual monetary shocks. However, the optimal policy, according to this strictly economic criteria, is dollarization, which is preferred even compared to the CU including all countries.

Figure 7 Here

4.3 Chile

A simulation for the case of Chile is illustrated in Figure 8. Chile has a relatively high value for the "real beta", a low value of the "monetary beta" and low real and monetary individual shocks. Dollarization is worse than floating for Chile. However, a monetary union with Colombia is the preferred option and output volatility is only slightly increased if Uruguay is also admitted. However, if Brazil is added to the CU, then this becomes worse for Chile than floating or even dollarizing! If we change the order such that we have Colombia, Uruguay, Mexico, Venezuela, Brazil then as before a CU with Colombia or Colombia and Uruguay is preferred. Adding Mexico and Venezuela serves to increase GDP volatility, although it remains just below the GDP volatility of floating. Adding Brazil makes GDP volatility for much Chile higher than floating.

Figure 8 Here

4.4 Exchange rate disagreements

This empirical exercise illustrates some of the potential conflicts regarding exchange rate arrangements in Latin America. For example, according to this strictly economic exercise, Brazil should prefer to dollarize, Mexico would like to have a CU with Colombia and Chile, but Chile would prefer to have Colombia and Uruguay in a CU and not include Mexico. If we are considering just CU's, while Brazil would prefer a CU with all 7 members, neither Chile nor Mexico would wish to have Brazil in a CU. Of course, these results should only be considered highly tentative and by no means definitive, but they give some flavor to the types of conflicts that might be present. It is perhaps not so surprising that despite the repeated debates about CUs in the region, little has actually happened!

4.5 Endogenous betas and reducing individual monetary shocks

As discussed above, these results assume that the beta coefficients and especially the individual monetary shocks remain constant despite the changes in monetary regimes discussed. We might for example expect the "monetary betas" and the "real betas" to converge with greater integration. Moreover, it might also be argued that with a multi-national central bank in charge of the monetary policy of a CU, this would boost central bank independence and credibility and that would then reduce the size of the individual monetary shocks[9]. We can also use the model to attempt to gauge how important these effects are. In Figure 9-11 we consider the convergence of the real betas, the monetary betas and the reduction in size of the individual monetary shocks for Mexico, Brazil and Chile respectively. Specifically, we put the real betas and then subsequently the monetary betas all equal to their average values and then we reduce the individual monetary shock size of Brazil, Mexico and Venezuela half the way towards that of Chile as a result of a monetary union[10]. The Figures tell a similar story.

The convergence of the betas appears insignificant in terms of reducing the GDP volatility, but reducing the size of the individual monetary shocks has a sizeable impact. Of course, if such a change could be effected under another regime, then the attractiveness of that regime would also rise. For example, if the recent adoption of inflation targetting in Mexico and Brazil led to a reduction in individual monetary shocks along Chilean lines, then floating would become more attractive. In fact we suggest that this result supports the view that greater emphasis should be placed on the governance structure of central banks. If a multi-national central bank provides a way to enhance the independence and credibility of monetary policy, then the results here suggest that that would provide a significant boost to the attractiveness of a regional currency.

[9]In contrast to other countries that have adopted inflation targeting, the Central Banks of Brazil and Mexico lack formal independence and specific legislation setting out their policy objectives. With a currency union, we might expect some institutional advances for the common Central Bank and less political interference in policy making.

[10]While this is arbitrary it seems reasonable as a way of capturing the potential credibility gain.

Figures 9-11 Here

5 Conclusions

In this paper, we have developed a simple theoretical framework that might be thought of as a reduced form of the OCA conditions capable of being extended to an n-country world. The model combines a CAPM or factor approach with systemic and individual shocks, with the idea that for some sorts of shocks it is valuable to have exchange rate flexibility (the real shocks) whereas for other (monetary) shocks flexiblity may represent a cost.

A set of simulations shows the model in action. We illustrate how, by varying the parameters of the model, different cases can be analysed and, perhaps most importantly, how one country's decisions may impact on others' GDP volatility. Depending on parameter values floating, a monetary union, or dollarization might be the best option for a particular country. Interestingly, as more countries join a CU, there is a tradeoff between the diversification effect (diversifying individual monetary shocks) against a cost of including more countries with different sensitivities to the systemic real shock - the "real betas". One possibility is that dollarization might be preferred to a small CU but that a larger CU with a greater diversification of the individual monetary shocks is dominant. Depending on the technology of CU formation, this might imply a coordination problem among countries.

We have also explored how, if trade and monetary integration impacts the betas coefficients, then this may imply that a CU is more attractive. For example, if trade integration implies a convergence of the "real betas" and monetary integration implies a convergence of the "monetary betas", the cost of a CU is reduced. The advent of FTAA might then be thought of as sparking greater trade integration and hence a convergence of the real betas in the context of our model.

Finally, we have conducted a first empirical exercise considering 6 countries in Latin America. Specifically, for Mexico, Brazil and Chile we have compared dollarization to different combinations of CUs between the 6 countries to floating. The results, based strictly on these economic criteria suggest that Brazil should prefer to dollarize, Mexico would like to have a CU with Colombia and Chile, but Chile would prefer to have Colombia and Uruguay in a CU and not include Mexico. If we are considering just CU's, Brazil would prefer a CU with all 6 countries but neither Chile nor Mexico would wish to have Brazil in the CU. For Chile, the gains of entering the preferred CU over floating are small whereas the gains for Mexico and especially Brazil from their preferred CUs, (or dollarizing) are quite significant. The results then indicate the potential for significant conflict when it comes to exchange rate arrangements in the region. This may be part of the reason why little has happened regarding exchange rate coordination. Finally, we have investigated how these results might change if the beta coefficients converge to their average values for these countries as, say, an FTAA is formed and a regional CU is put in place. We also compute what would happen, perhaps as a result of the formation of a multi-national central bank, if the individual monetary shocks in Brazil, Mexico and Venezuela (the high individual monetary shock countries of the group) are reduced. We find that the convergence of the betas leads to virtually no change in our results - it is just not quantitatively important. However, we find a very significant gain from the reduction in individual monetary shocks. We conclude therefore that when it comes to analyzing the potential costs and benefits of a regional CU, the emphasis should be placed on the potential benefits of enhancing the governance structure of a multi-national central bank that might increase monetary policy credibility and reduce the size of individual monetary shocks and less emphasis on the costs of a lack of trade integration.

We consider this as very much a first attempt at applying this general theoretical framework to a practical example. We offer the results as suggestive rather than definitive. We hope that the theoretical ideas of how to model OCA conditions in a very simple way may provoke further interest in trying to pin down what the real and the monetary individual and systemic shocks are and how they might be best estimated in practice. We believe the theoretical framework could be substantially further developed and used to analyze a set of interesting questions in multi-country versions of optimal currency area theory and in many practical applications.

6 References

Bayoumi, T. (1994) "A formal theory of Optimum Currency Areas" IMF Staff Papers, 42(4): 537-54.

Bayoumi, and Eichengreen, B. (1994) "Monetary and exchange rate arrangements for NAFTA" Journal of Development Economics, 43: 125-165.

Bean, C. R. (1992) "Economic and monetary union in Europe" Journal of Economic Perspectives, Fall: 31-52.

Buiter, W (1999) "Optimal currency areas: why does the exchange rate matter?" Sixth Royal Bank of Scotland/Scottish Economic Society Annual Lecture, mimeo University of Cambridge.

Carrera, J. y F. Sturzenegger (2000) "Coordinación de políticas macroeconómicos en el mercosur" Fundación Gobierno y Sociedad, Buenos Aires.

Calvo, G. (2002) "Explaining sudden stop, growth collapse and BOP crisis: the case of distortionary output taxes" Paper prepared for Anual IMF Research Conference, Mundell Fleming Lecture, Nov 7 2002 and mimeo Inter American Development Bank, Washington DC.

Mckinnon, R.I. (1963) "Optimum currency areas" American Economic Review, 53, pp 717-25.

Masson, P and M Taylor (1994) "Optimal currency areas: a fresh look at the traditional criteria" in Pierre Siklos ed. Varieties of Monetary Reform, pp 23-44, Kluwer, Boston, Mass. USA.

Mundell, R. A. (1961) "A theory of optimum currency areas" American Economic Review, 51, pp 657-75.

Poole, W (1970) "Optimal choice of monetary policy instruments in a simple stochastic macromodel" Quarterly Journal of Economics, 84, pp. 197-216.

Willett, T. W. (1999) "The OCA approach to exchange rate regimes: a perspective on recent developments",

paper prepared for conference on "Should Canada and the US adopt a common currency" Western Washington University, April 30, 1999 and mimeo, Claremont Graduate School, CA.

7 Appendix

Tables A1 and A2 Here

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