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COUNTRY RISK AND THE MUNDELL-FLEMING MODEL APPLIED TO THE 1999-2000 ARGENTINE EXPERIENCE

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In this paper we propose a modification of the traditional Mundell-Fleming model. The extended model introduces the implications of including the fiscal deficit and international reserves as determinants of the level of country risk. This slight modification of the traditional paradigm leads to radical changes in the effects that fiscal and monetary policies have in economies with high capital mobility under an extreme version of a fixed exchange rate regime (Currency Board). We use the proposed model to evaluate some of the economic policies implemented between December 1999 and March 2001 by the first economic team under the Presidency of Fernando De la Rúa in Argentina. Additionally, we suggest that some of the main results obtained from the model are applicable to other emerging economies.

JEL classification code: F41
Key words: open economy macroeconomics, country risk for Argentina, reserves, convertibility

I. Introduction

In a series of articles in the early sixties, two brilliant economists, R. Mundell and M. Fleming,[1] developed the basis for what has since become known among economists as the Mundell-Fleming model, that enables analysis

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[1] Although this line of study was published in several books and articles, the most important are Mundell (1963) and Fleming (1962).

of different macroeconomic aspects in economies open to international trade. The model began by recognizing that international markets in the sixties were gradually becoming more integrated because of the new developments in technology that were taking place. In addition, it recognized that a growing number of countries were in the process of dismantling the rigorous exchange controls that had become widespread after the Great Depression. On the basis of the foregoing, these authors assumed that the world was made up of economies producing differentiated goods (that is to say, goods that were not perfect substitutes) but which were subject to a high level of mobility in their capital flows. These authors proceeded to analyze the effects derived from alternative economic policies, under the assumption that the velocity of capital movements between countries was far higher than that of their trade flows for goods. In subsequent years, because of the characteristics mentioned, this model gradually became the profession's preferred tool for the analysis of a wide range of matters related to the macroeconomics of open economies.

This article is intended as a contribution to the extensive literature that followed the acceptance of the Mundell-Fleming model as the central paradigm for the analysis of open economies. It does so by introducing the possibility that one of the components determining domestic interest rates, the factor known as "country risk", is related to both the fiscal situation of the country and its level of international reserves. In this regard, this article represents the combination of two types of models, those in the Mundell-Fleming tradition and those taken from the more modern but equally extensive literature on the topic of "country risk".[2] However, even this simple change to the Mundell-Fleming approach allows us to reach very relevant and novel conclusions on the possible effects of alternative monetary and fiscal policies on small, open economies with fixed exchange rate arrangement while facing a high international capital mobility.

Whereas in the original Mundell-Fleming model monetary policy does not affect domestic interest rate or the level of economic activity, in our model

[2] Eaton, Gersovitz, and Stiglitz (1986) provide a comprehensive summary of such literature.

an expansive monetary policy leads to a contraction in the output level by inducing an increase in country risk and therefore in the domestic interest rate. In addition, in our model the traditionally positive impact on economic activity from an expansive fiscal policy would be weakened by the contractionary effect from the impact of a deteriorated fiscal situation on country risk and consequently on domestic interest rates.

In recent years it has become a habit among a widening circle of economists, participants in the financial sector and even politicians and journalists involved in making or analyzing proposals for the emerging country, to resort mechanically to the transmission mechanism mentioned previously as the only significant mechanism operating in such economies. The transmission mechanism implies that a country faced by a recession (boom) must proceed to implement contractive (expansive) fiscal policies in order to reduce (increase) country risk and thus induce an increase (decline) in the output level.

One notable example of the above proposition was the sharp increase in taxation (the so-called Tax Reform) introduced by the new Argentine economic team in December 1999 with the support of most of Argentina's international creditors (including the IMF and almost all the private credit agencies). The assumption behind these restrictive fiscal policies was that they would lead to a recovery in the level of economic activity, severely affected since mid-1998 by negative external shocks. The only grounds for such a strategy were that a stronger fiscal position would lead to a sharp drop in country risk, which would result in an equivalent reduction in interest rates and therefore a significant increase in domestic spending. However, and in spite of recent prior experience in Argentina, the rise in taxes turned out to be highly recessive and brought the mild economic recovery that had begun in mid-1999 to a complete standstill. The model presented here, by including in the analysis the traditionally contractive effect that higher taxes have on domestic demand, provides a possible explanation for such episode.

In the rest of the paper we will proceed as follows. Section II presents our model. The main implications for economic policy are discussed in the three

following sections. In Section VI we expand on the basic model with the aim of introducing a competitive domestic financial sector, in an attempt to capture the principal mechanisms that come into play when the Central Bank decides to modify the minimum reserve requirements on deposits, the only monetary policy instrument that remains under the monetary system we analyze (Currency Board). We suggest that in cases such as that of Argentina during the last decade, expansive monetary policies very probably ended up by increasing interest rates, further accentuating the decline in levels of activity. Section VII contains our conclusions.

II. The Model

Following the original Mundell-Fleming model, our model assumes the existence of an aggregate demand Y that depends negatively on interest rate i (nominal and real, as an expected zero inflation is assumed) and positively on government deficit D. It is assumed that the so-called IS curve behaves as follows:

$$Y = Y(i, D), \qquad \text{where } Y_i < 0 \text{ and } Y_D > 0 \tag{1}$$

In an economy with a fixed exchange rate, international capital mobility implies that the domestic interest rate should be equal to the international interest rate i^* plus a country-risk premium k (where it is assumed that the expected exchange rate devaluation is zero):

$$i = i^* + k \tag{2}$$

in turn, in line with the extensive literature on "country risk" and the currently accepted fact that it grows as the public sector deficit rises and falls when international reserves rise:

$$k = k(R, D), \qquad \text{where } k_R < 0 \text{ and } k_D > 0 \tag{3}$$

under a Currency Board scheme (such as that adopted by Argentina at the beginning of 1991 with the launch of a monetary reform known as the Convertibility Plan), the monetary base is equal to total international reserves. The base is a fraction *e* of total money supply *M*, because of the existence of a fractionary cash reserve system:[3]

$$R = e\,M \tag{4}$$

in turn, money supply equals demand through the change in the stock of reserves, so that equilibrium in the money market (the LM curve) determines the level of reserves as a function of the arguments in the money demand and the fractional reserve requirements:

$$R = eL(i, Y), \qquad \text{where } L_i < 0 \text{ and } L_Y > 0 \tag{5}$$

therefore, given the values of the three exogenous variables D, i^* and e, the equilibrium values of our three endogenous variables R, Y and i are determined exactly by the following three equations:

$$\text{(IS)} \qquad Y = Y(i, D) \tag{6}$$

$$\text{(FF)} \qquad i = i^* + k(R, D) \tag{7}$$

$$\text{(LM)} \qquad R = eL(i, Y) \tag{8}$$

III. The Effects of Monetary Policies

Under a Convertibility System such as the one we are analyzing, the

[3] For the sake of simplicity we have assumed that throughout the analysis there is a full coincidence between the legal cash reserve requirements and actual amounts, so that at no time do banks maintain technical reserves in excess of those required by the monetary authority. Likewise, there are never any shortfalls in cash reserve requirement compliance.

monetary authority is prohibited by law from issuing domestic credit. Therefore, the only monetary policy possible consists of modifying the cash requirements, which leads to:

$$\partial Y / \partial e = \frac{k_R \; Y_i \; L}{1 - k_R \; e \, (L_i + L_Y \; Y_i)} > 0 \tag{9}$$

$$\partial i / \partial e = \frac{k_R \; L}{1 - k_R \; e \, (L_i + L_Y \; Y_i \,)} < 0$$

$$\partial R / \partial e = \frac{L}{1 - k_R \; e \, (L_i + L_Y \; Y_i \,)} > 0$$

where the notation x_z means $\partial x / \partial z$. Under the assumption that the system is stable (see Appendix), then $1 - k_R \; e(L_i + L_Y Y_i)$ would be positive and consequently expansive monetary policies would lower reserves, increase domestic rates of interest and lower the level of economic activity. Therefore, while in Mundell (1963) an expansive monetary policy under a fixed exchange rate and perfect capital mobility lowers international reserves in the same magnitude, without affecting either the interest rate or the level of income, here the drop in reserves has a contractive effect on the output level since country risk levels rise. The drop in reserves would take place due to:

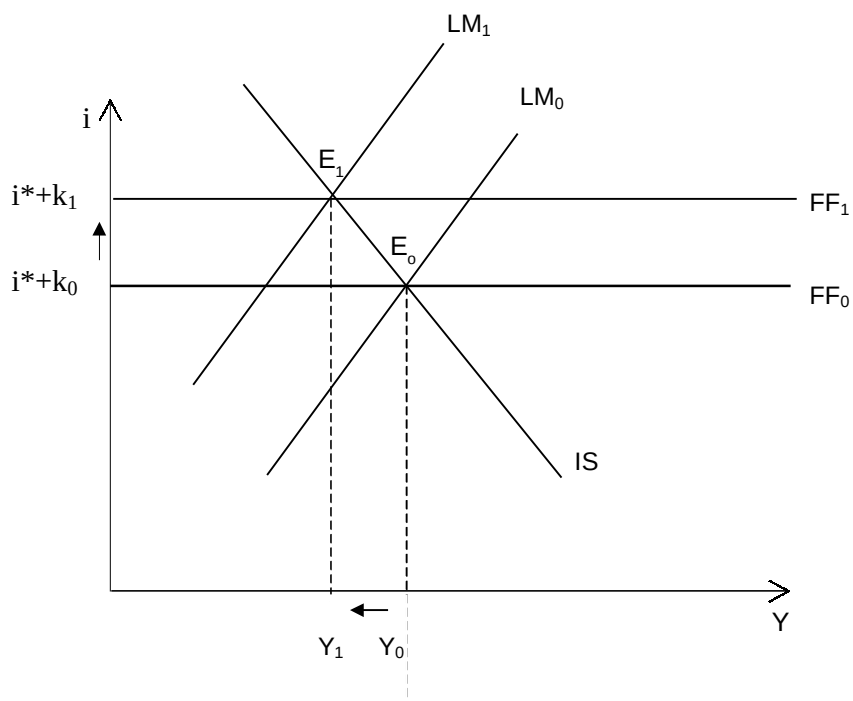
1. A direct effect, which impacts by causing reserves to decline because of equation 8 (the LM curve).
2. Because of equation 7, the reduction in R would increase the country-risk premium raising domestic interest rates (the FF curve). In turn, higher interest rates imply a lower level for Y because of equation 6 (the IS curve).
3. A reduction in the money demand because of the increase induced in i and the reduction in Y. This drop in desired monetary balances would also reduce R because of equation 8.

Therefore, the traditional effect pointed out by Mundell-Fleming (point 1)

has now been strengthened by two other indirect effects, both arising from the higher risk levels induced by the expansionary monetary policy.

Graphically, a reduction in cash reserves shifts the FF and LM curves upward and to the left (see Figure 1),[4] moving the equilibrium from E_0 to E_1. The new equilibrium is characterized by a higher interest rate and consequently a lower level of output.

Figure 1. The Effects of an Expansive Monetary Policy



[4] The slope of the IS curve has a negative sign: $\left.\frac{di}{dY}\right|_{IS} = \frac{1}{Y_i} < 0.$ The LM curve, for its part, has a positive slope: $\left.\frac{di}{dY}\right|_{LM} = -\frac{L_Y}{L_i} > 0.$ In addition, it can be verified that the FF curve has a slope equal to zero.

IV. The Effects of Fiscal Policies

Other main conclusion of the traditional Mundell-Fleming model is that with a fixed exchange rate arrangement and perfect capital mobility, expansive fiscal policies have fully positive impact on economic activity. However, in our model the effect of fiscal policy on the level of economic activity is undetermined. While in the Mundell-Fleming model a worsening of the budget deficit does not alter the interest rate, in our model it would deteriorate country risk, thus increasing domestic interest rates. The final effect on the level of output will depend on the relative magnitude of both effects (i.e. the expansive effect from the increased level of absorption and the contraction induced by a higher interest rate). We would therefore have:

$$\partial Y / \partial D = \frac{Y_D - k_R L_i e Y_D + Y_i k_D}{1 - k_R e (L_i + L_Y Y_i)} \tag{10}$$

$$\partial R / \partial D = \frac{e L_Y Y_i k_D + L_Y e Y_D + L_i k_D e}{1 - k_R e (L_i + L_Y Y_i)}$$

$$\partial i / \partial D = \frac{k_D + k_R e L_Y Y_D}{1 - k_R e (L_i + L_Y Y_i)}$$

Even under the assumption that the expression $1 - k_R e(L_i + L_Y Y_i)$ were to be positive, the three signs remain indeterminate.

These results arise because an increase in D would generate:

1. The shift of the IS to the right, therefore inducing an increase in both Y and i.
2. However, at the same time, an upward shift of the FF curve induces an increase in i and a contraction in Y.[5]

[5] It could be argued that the expansive effects of a fiscal stimulus are immediate, while the effects of a government deficit on the stock of debt and the risk premium take time to

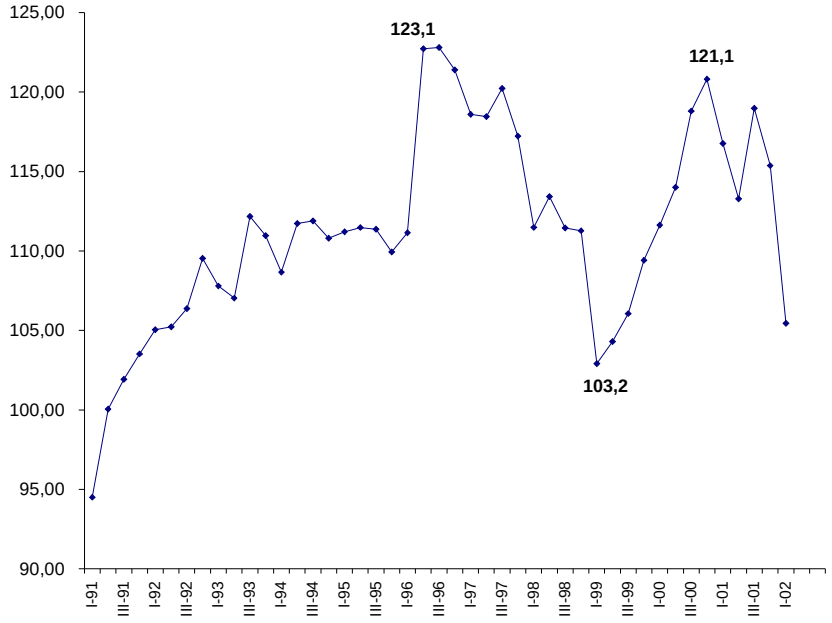
If *i* and *Y* can in principle change in any direction, the same will happen with the money demand and consequently with reserves.

V. The 1999-2000 Argentine Experience

As mentioned above, because of external factors that included a steady deterioration in terms of trade since 1996, and a sharp rise in country risk for emerging nations since 1998 because of the Russian crisis (see Figures 2 and 3), the Argentine economy began to decline. This drop, similar to that observed in many other emerging countries, continued until mid-1999, when a slight recovery began (see Figures 4 and 5).

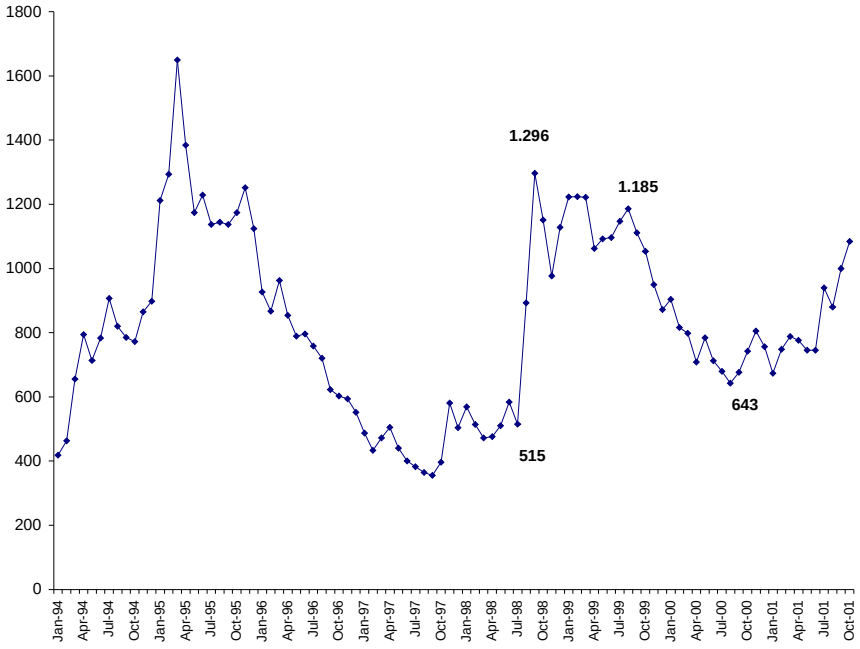
Figure 2. Terms of Trade

(1991 = 100)



Source: Argentine Ministry of Economy (2001)

Figure 3. Emerging Market Risk (EMBI +)
(basis points)

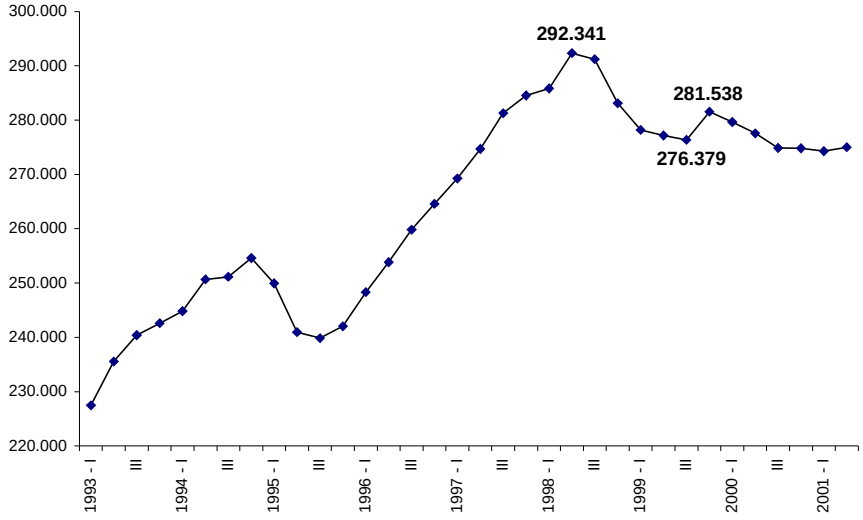


Source: J. P. Morgan (2001)

At the end of 1999 the recently elected government of Argentina, concerned about strengthening the recovery in the real economy, implemented a Tax Reform aimed to improve fiscal solvency, which included greater progression in income tax scales, a rise in excise tax rates and a series of new taxes. This tax increase was decided on the assumption that wide-ranging tax increases,

develop, as they occur only with the accumulation of successive deficits. However, this would be true only in a world of static expectations and not in a world of rational expectations, where investors would perceive an increase in the deficit as a sign that the debt would increase, acting therefore on the basis of such expectations. This case was analyzed in detail by Rodríguez (1979).

Figure 4. Seasonally Adjusted GDP
(in millions of pesos at 1993 prices)

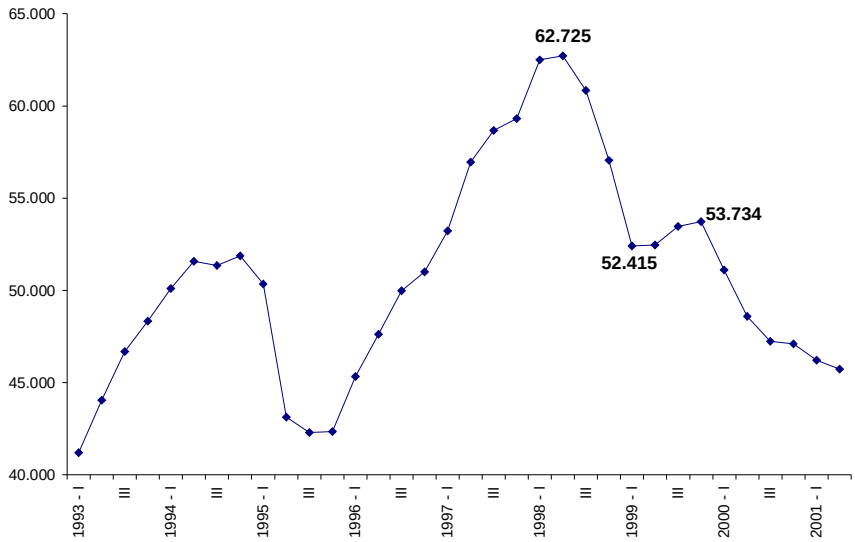


Source: Argentine Ministry of Economy (2001)

by assuring the solvency of the state, would help to strengthen the incipient economic recovery that had begun in August of that year.[6] The Reform, it was argued, would help to speed up economic recovery, since by reducing the fiscal deficit it would cause a drop in the country-risk level, therefore

[6] Two experiences of the recent past weighed particularly heavily on Argentine economic analysts, as in both cases contractive fiscal policies were seen to have strengthened the process of economic recovery. The first of these experiences was the tax increase that was decided on following the so-called "Tequila Effect" at the beginning of 1995. This included a 3-percentage point increase in the value-added tax rate, higher labor taxes and reductions in public sector wages. The second experience took place in mid-1996 when, following the replacement of Economy Minister Cavallo by Roque Fernández, a hike took place in taxes on income, fuels and certain import categories, which helped to overcome without major difficulty the first changes in economic leadership since the launch of the Convertibility Plan.

Figure 5. Seasonally Adjusted Gross Domestic Fixed Investment
(in millions of pesos at 1993 prices)



Source: Argentine Ministry of Economy (2001)

lowering interest rates and encouraging a strong increase in the level of private spending. However, the result was quite the opposite. The country risk rate declined from 610 basis points in the second week of December 1999 to 522 in the same week of March 2000.

Backed by the mentioned reduction in risk, the interest rate declined. However, the economic recovery that was under way came to a halt, in spite of improved external indicators, beginning a lengthy recession. This took place because the tax increase, combined with a government discourse that dramatized the previously existing fiscal situation, led to a sharp reduction in perceived disposable income by consumers. The consequent decline in consumption was aggravated by a significant drop in the marginal efficiency of capital, provoking a strong downward shift in the IS. Clearly, investor pessimism prevailed over the reduction in interest rates, provoking a strong

contraction in investment, which also contributed to wiping out the incipient economic recovery (see Figure 6).

In short, our approach differs significantly in its principal predictions not only from the traditional Mundell-Fleming approach but also from the consensus that currently exists in financial circles. As shown in Table 1, whereas the traditional Mundell-Fleming model predicts that a restrictive fiscal policy would fully impact by lowering the output level, the "consensus view" predicts that it has a reactivating effect on output, because it would generate lower public sector insolvency risks and therefore lower interest rates. The model shown here is of a more general nature, as it allows both results to take place (output can either rise or fall), depending on the relative strength of the shift of the FF and IS curves.

In addition, this new approach reinforces the negative impact of expansive monetary policy, as in addition to generating the familiar effect of reducing *R*

Figure 6. The Effects of a Contractive Fiscal Policy

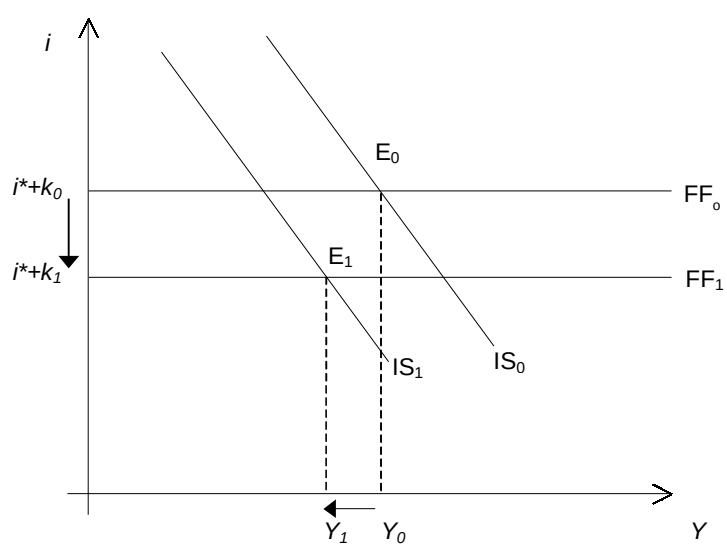


Table 1. Alternative Effects of Monetary and Fiscal Policies under Fixed Exchange Rate Arrangements

Alternative Views	Policies	Results		
		Y	i	R
Mundell-Fleming Model	ΔD	+	0	+
	Δe	0	0	+
"Consensus View"	ΔD	-	+	-
	Δe	?	?	?
Rodríguez & Ortiz	ΔD	+/-	+/-	+/-
	Δe	+	-	+

(which in this new approach is reinforced by two new effects) it increases domestic interest rates and reduces the level of income.

VI. Including a Financial System into the Model

In the middle of 2000 the Argentine economic authorities found themselves trapped in a lengthy recession of their own making. In these circumstances, they argued that if the Central Bank were to implement a cut in reserve requirements on deposits, the consequent reduction in interest rates would stimulate a recovery in economic activity levels. The mechanism for transmission would be the reduction in costs that lower reserves would represent for the banking system, which would in turn lead to a fall in interest rates on bank loans to companies (the lending rate).

With the aim of including in the analysis the principal effects of a change in minimum reserves requirements on deposits, we will proceed to work with a simple extension of the model shown in the previous sections. We will do so following Calvo and Fernández (1983), assuming the existence of a competitive domestic financial system. We will suppose that there are a large number of

identical banks operating on the basis of constant returns to scale, in a competitive environment. Under these conditions, we can expect banks to obtain profits equal to zero. We assume for the sake of simplicity that the operating costs of the banks are also equal to zero. If borrowers (companies) are unable to gain access to the international credit market, then we can write:

$$i_d S = i_l(1 - e)S \tag{11}$$

where i_d is the interest rate paid to depositors and i_l is the lending rate. S in turn represents total deposits. It immediately follows that:

$$\frac{i_d}{(1-e)} = i_l \tag{12}$$

so that, with this modification, our system of equations is:

$$\text{(IS)} \quad Y = Y(i_l, D) \tag{13}$$

$$\text{(FF)} \quad i_d = i^* + k(R, D) \tag{14}$$

$$\text{(LM)} \quad R = eL(i_d, Y) \tag{15}$$

$$i_d = i_l(1 - e) \tag{16}$$

This system determines the equilibrium values of the four endogenous variables: Y, R, i_d, i_l; that is to say, income, reserves and the two interest rates.

Now, we can try to analyze the effects of monetary policies. In this context, a reduction in e, such as that proposed by the Argentine government, would result in:

1. A direct effect (by means of equation 15) on *R*, inducing a lower level of reserves and consequently higher rates of interest paid to depositors (to compensate for the higher risk).
2. This rise in deposit interest rates would lead to a drop in the money demand and therefore in *R*.
3. Higher deposit rates would have an ambiguous effect on *Y*, since even though the lending rate would have to increase to reflect the increase in the deposit rate (in response to the increased risk provoked by lower rates for *R*) this effect is offset by the lower opportunity cost implicit in lower cash reserves. Therefore, lending rates (those charged by banks to their customers) may be higher, equal to or lower than before.[7] And as this is the rate that comes into play in the demand for goods, then *Y* can fall, rise or remain the same. It is because of the latter that it is not possible to predict the direction in which the demand for real balances and thus *R* will move.

Under these scenario therefore, expansive monetary (financial) policies would affect not only *R* but also *Y* and domestic interest rates. In order to identify the relative magnitudes of these effects, it is necessary to estimate the above-indicated group of equations for each of the countries under analysis. However, it is plausible to speculate that in the cases of countries such as Argentina, where country risk responds abruptly to changes of international reserves and the fiscal deficit, the contractionary impacts may predominate over the improved liquidity (or credit availability). If this were the case, expansive monetary policies would have a restrictive effect on the level of economic activity, as a reduction in international reserves would increase both passive and lending interest rates (i.e. that paid to depositors and that collected from bank customers).

This result is of great significance as it means that countries with fixed

[7] It was this latter effect that was invoked by the Argentine economic authorities when they recommended a reduction in cash reserves.

exchange rate arrangements face country-risk levels that are very sensitive to variations in international reserves. And hence they will not be able to increase the level of economic activity by expanding their monetary aggregates. In such cases an expansive monetary policy would be contractionary, as the increase in sovereign risk would predominate over the effect from greater liquidity generated by a reduction in cash reserves. This is a situation we presume could exist in many other developing countries. Given the relevance of its implications, we consider that it merits a highly detailed statistical exploration in the future.

VII. Conclusions

In the case of traditional models based on fixed exchange rates and free capital mobility, the usual conclusion is that monetary policy has no influence on output level, while the opposite is the case of fiscal policy. Monetary policy does not affect interest rates, and therefore it does not generate any "crowding out" of private spending, and therefore fiscal policy is fully effective in modifying output. In this paper we present a variant of the Mundell-Fleming model, which by introducing the commonly accepted effects of reserves and the fiscal situation on the level of sovereign risk, radically alters these conventional results.

Now, expansive monetary policies are contractive, because by encouraging a lower level of reserves they increase country risk, thus stimulating a rise in domestic interest rates. In addition, the conventional results of this type of model, which suggest that expansive monetary policies result in a loss of reserves, are strengthened under our approach by two new transmission channels.

On the other hand, fiscal policies lose part of their effectiveness because higher fiscal deficits now imply higher rates of interest, generating a crowding out of private spending. Thus it becomes perfectly plausible that a relaxation of fiscal policies could have a contractive effect on the level of output.

In this paper we use this new approach to analyze the economic policies adopted between December 1999 and March 2001 by the first economic team appointed under the administration of Fernando de la Rúa, when Argentina still applied a monetary system known as Convertibility (a Currency Board). Based on our model, we offer a new and plausible view of the failure of the monetary and fiscal policies applied during that period.

More significantly, we establish how small changes to the conventional Mundell-Fleming model can lead to important differences in the results to be expected from fiscal and monetary policies. The model we present also differs very considerably in its principal predictions from those derived from the "consensus view" of financial circles and economic analysts.

In addition, we present an extension of the model that includes the existence of a competitive financial system. The inclusion of such a system introduces a new transmission mechanism, which by means of a reduction in the system's reserve requirements, all things being equal, induces a corresponding reduction in lending rates.

We suggest however that in Argentina during the period 1991-2000 expansive monetary policies, even taking into account this last transmission channel, would have lead in any case to lower levels of reserves, higher interest rates and a lower level of output, given the heightened sensitivity of country risk to international reserves and fiscal solvency.

Finally, we suggest that this is the result to be expected in many other developing countries that have adopted a fixed exchange rate system in a context of high international capital mobility such as currently prevails. In all of them, a reduction in reserve requirements, by inducing a loss of reserves, would generate a rise in deposit rates through the perception of increased levels of risk, which would prevail over the reduction of spreads from the lower level of blocked deposits. This implies that expansive monetary policies would continue to raise interest rates (including lending rates) and would cause a fall in activity levels.

Appendix

We will assume that the three endogenous variables *R*, *Y* and *i* move over time as follows:

$$\frac{dY}{dt} = \alpha \left[Y(i, D) - Y\right] \qquad \text{with } \alpha' > 0 \ \wedge \ \alpha(0) = 0$$

$$\frac{di}{dt} = \beta \left[i * + k(R, D) - i\right] \quad \text{with } \beta' > 0 \ \wedge \ \beta(0) = 0$$

$$\frac{dR}{dt} = \gamma \left[e \ L(i, Y) - R\right] \qquad \text{with } \gamma' > 0 \ \wedge \ \gamma(0) = 0$$

where α, β and γ are functions with first positive derivatives and a steady-state value equal to zero. If we take the first-order term in a Taylor expansion, we can linearize these equations close to their equilibrium values, resulting in:

$$\frac{dY}{dt} = -\alpha'(Y - Y_0) + \alpha' Y_i (i - i_o)$$

$$\frac{di}{dt} = -\beta'(i - i_o) + \beta' k_R (R - R_0)$$

$$\frac{dR}{dt} = \gamma' e \ L_Y (Y - Y_o) + \gamma' e \ L_i (i - i_o) - (R - R_o)$$

where the zero sub-indexes indicate initial equilibrium values. At the steady state, we can compute:

$$A = \begin{vmatrix} \frac{\partial \dot{Y}}{\partial Y} & \frac{\partial \dot{Y}}{\partial i} & \frac{\partial \dot{Y}}{\partial R} \\ \frac{\partial \dot{i}}{\partial Y} & \frac{\partial \dot{i}}{\partial i} & \frac{\partial \dot{i}}{\partial R} \\ \frac{\partial \dot{R}}{\partial Y} & \frac{\partial \dot{R}}{\partial i} & \frac{\partial \dot{R}}{\partial R} \end{vmatrix}$$

Therefore, the characteristic equation would be as follows:

$$\begin{vmatrix} -\alpha' - \lambda & \alpha' Y_i & 0 \\ 0 & -\beta' - \lambda & \beta' k_R \\ \gamma' e\ L_Y & \gamma' e\ L_i & -\gamma' - \lambda \end{vmatrix} = \lambda^3 + a\lambda^2 + b\lambda + c = 0$$

where λ are the roots of the system and a, b and c are coefficients. So that this system is stable (with roots with real parts with a negative sign) it is necessary that the trace and the determinant of the above matrix system should have a negative sign.

$$Trace\ A = \quad -\alpha' - \beta' - \gamma' < 0$$

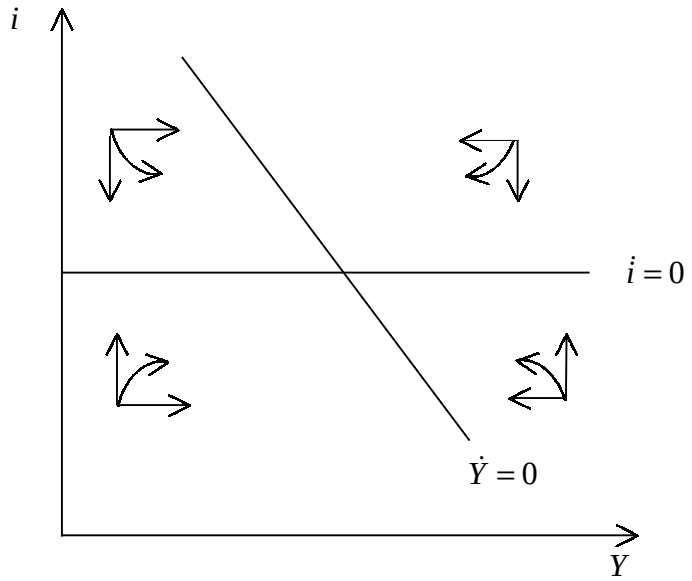
$$Det\ \ A = \begin{vmatrix} -\alpha' & \alpha' Y_i & 0 \\ 0 & -\beta' & \beta' k_R \\ \gamma' e\ L_Y & \gamma' e\ L_i & -\gamma' \end{vmatrix} = \alpha' \beta' \gamma' \left[e\ k_R\ (L_i + L_Y Y_i) - 1 \right] < 0$$

Given that α', β' and γ' are all positive, the necessary and sufficient condition for the local stability of the system is:

$$1 - k_R e\ (L_i + L_Y\ Y_i) > 0$$

Graphically:

Figure 7. Stability of the Ortiz & Rodríguez Model



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