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Abstract

Fixing the exchange rate stabilises inflation and reduces monetary seignoriage, a key source of financing under the fiscal dominance hypothesis. However, the link between fixed exchange rate regimes and fiscal discipline in emerging markets has been found to be weak. This paper thoroughly reviews the issue through three venues. First, an alternative measure to gauge fiscal discipline –the so called shadow balance, inclusive of seignoriage revenues– is proposed, since the traditional one, the primary balance, does not convey monetary financing; notwithstanding this modification, no robust relation is found either. Second, we sustain and then prove the hypothesis that fixing the exchange rate may have offsetting effects on fiscal discipline through the relaxation of the fiscal constraint of the government. In particular fixing the exchange rate is expected to reduce the cost and burden of debt and to enhance the ability to obtain revenues through a higher level of activity. The empirical test of this hypothesis follows a two-stage approach. First, we test the impact of the fiscal constraints on discipline: as advocated, a higher fiscal burden induces higher discipline; higher activity does not clearly relax discipline, although expenditures grow and the burden of debt is shown to diminish. The second stage tests the impact of fixed regime on the considered determinants. Again, the relation between fixed regimes and the reduction of the burden is robust, but not so the impact of fixed regimes on the cycle. Third, we explore the dynamics related to the pegging of the exchange rate, uncovering that at its inception exchange rates trigger an expansion and reduce the debt burden. This final outcome does not only strengthen our hypothesis but illustrates how the peg sows the seeds of its own destruction, also at the fiscal level.

1. INTRODUCTION

Traditionally, a strong emphasis on the causes of the traditional high inflation in emerging countries, and in particular in Latin America, has been placed on the fiscal dominance hypothesis. In emerging market economies, the argument goes as follows: the ability to obtain revenues through the fiscal system is weak; as a consequence, traditionally the financing of the deficits has been partially done through money creation by the Central Bank (seignoriage revenues), which in turn leads to higher inflation.

The harmful effects of this practice on price stability and long-term growth contribute to explain that the quest for macroeconomic stability has typically had in the choice of the exchange rate regimes one of its central elements. Many countries based their programs of economic stabilization on regimes of rigid or semi-rigid exchange rates. The rationale for this strategy is clear: fixing credibly the exchange rate allows to tie down inflation expectations; this induces a more disciplined behavior in economic agents, and in particular, on the fiscal sphere, since a fall in inflation should drastically reduce seignoriage revenues, promoting fiscal discipline.

Nevertheless, extensive empirical evidence has challenged this theoretical prior. In figure 1 we observe that fixed exchange rate regimes do not to improve primary balances, which has been the most used proxy for fiscal discipline, even if inflation –and therefore monetary seignoriage– are substantially reduced[1]. It can be argued, as we do, that observed primary balances fail to capture the effect of pegs on fiscal discipline, since they miss the impact of seignoriage. However, when this problem is addressed by defining a shadow balance which account for the effect of seignoriage on the fiscal balance –see Annex 1– the outcome is also unclear as displayed in the last column for each regime.

Why do fixed exchange rates seem to fail in disciplining fiscal policy?. Bits of such theory have been forwarded by several authors, particularly for the case of Latin America. Most relevant is the contribution by Tornell and Velasco (1998), who show that

[1] These data refer to emerging market economies in Latin America and East Europe. Details on the sample are given in the annex.

fixing the exchange rate provides a free lunch in the short run in terms of inflation stabilization and reduces the incentives for fiscal discipline, relative to other stabilization programs based on flexible exchange rates. In other context, Gavin and Perotti (1997) and Gavin *et al.* (1997) have emphasised the relevance of borrowing costs on the behavior of fiscal authorities, which may also be related to the existing exchange rate regime. Finally, an extense literature, recently surveyed by Calvo and Vegh (1998), has analysed the expansionary impact of fixing the exchange rate: exchange-rate-based stabilization schemes usually bring about rapid disinflation (due to the anchoring of external prices), an economic expansion and a fall in real interest rates, which tend to reduce deficits, but these expansions are followed by recessions (boom and bust cycles).

Taking into account these disperse contributions, this paper attempts to articulate a comprehensive hypothesis to explain the failure of fixed exchange rates to reduce fiscal imbalances and to test it empirically. The hypothesis revolves around the idea that even if the pegs impose monetary constraints to finance the deficits, other offsetting effects relax both the revenue-raising and financial constraints for the government. The first of these effects is related to the cycle and, in particular to the 'boom and bust' consequences derived from exchange rate stabilization. The second is through more favorable financing conditions after an exchange rate peg is implemented.

The structure of the paper is as follows. In section two, the links between the fiscal constraint of the government and fiscal discipline are explained, and the concept of shadow balance introduced. In section 3, we setup our hypothesis, which is developed empirically, after some econometric consideration (section 4) in a two-stage approach in section 5. Finally, the hypothesis is made more robust by considering the dynamics triggered by pegging the exchange rate on the economy in section 6. The final section draws some conclusions.

2. FISCAL CONSTRAINTS AND THE DETERMINANTS OF FISCAL DISCIPLINE

The government budget constraint exposes the identity between the fiscal financing needs and sources, expressed in real terms and as a ratio of GDP:

$$-pb + (r - g)d \equiv -fb \equiv \dot{d} \qquad (1)$$

The observed fiscal balance (*fb*) consists of the primary balance (*pb*) minus the interest payments on the stock of debt in the hands of the private sector (*d*), whose magnitude depends on the difference between the real interest rate (*r*) and the rate of growth (*g*). Fiscal balance is financed by increases in the stock of debt. Solving for the primary balance we derive the fiscal constraint of the government:

$$\left[\dot{d} - rd\right] + gd \equiv -pb \qquad (2)$$

Note that seignoriage revenues (denoted by *m*) are not included in this expression, but in fact the observed primary balance already conveys seignoriage revenues, which accrue to the public accounts during the fiscal year, although they are not directly observable. Indeed, with no seignoriage the registered balance would have been lower. Furthermore this consideration is particularly relevant when the focus is to investigate the impact of the exchange rate pegs on fiscal discipline, as they constrain monetary policy and seignoriage. Therefore, we propose a modification to the above expression to take into account 'ex post' the seignoriage revenues, by substracting them from the primary balance. We denote such concept as shadow balance: *sb* = *pb*-*m*. Clearly, this measure has some problems since does not strictly correspond to the fiscal balance that would have been registered if no seignoriage would have been possible, since it can be correctly argued the observed primary balance is to a large extent endogenous to the ability to raise seignoriage. However, this caveat is not possible to circumvent since it is a counterfactual. Modifying identity (1) we obtain an equivalent fiscal constraint with the shadow balance:

$$m + \left[\dot{d} - rd\right] + gd \equiv -sb \qquad (3)$$

In spite of the mentioned problem, the shadow balance is our alternative gauge for fiscal discipline, and written in this manner, expression (3) not only illustrates the sources of

financing fiscal disequilibria but also, when it is read from left to right, the determinants of fiscal discipline: a reduction in the right hand side implies a constraint to the public finances and is due to induce higher fiscal discipline, and vice versa.

The first element is monetary financing through seignoriage revenues (m). Indeed, revenues from seignoriage have typically been considered a special and heterodox form of taxation to finance deficits. Sargent and Wallace (1981) even suggested that inflation is a fiscal, rather than a monetary phenomenon because monetary policy is dominated by the financing needs of the government (the fiscal dominance hypothesis). Here lies the gist of the argument to link fixed exchange rate pegs with fiscal discipline: since pegs limit monetary autonomy they will reduce seignoriage, forcing to larger fiscal discipline.

The impact on fiscal discipline of the financing is captured by the second term ($\dot{d} - rd$). The increase in debt net of interest payments can be interpreted as the ability and scope to attract funds, both in the domestic and external markets, to cover the financing needs of the government. Financing constraints are determined by two intertwined aspects: the increase in indebtedness, ($\dot{d}$), and the cost and burden of debt (rd). An increase in the former reflects, under this view wider access and a relaxation of the financing constraint; on the contrary increases in the cost and burden of debt hardens the constraint.

The third term underscores the impact of growth, (g), and the cycle on fiscal discipline, suggesting that higher growth relaxes fiscal discipline. In expression (2) is at work the fact that higher rates of growth reduce the ratio of debt to GDP facilitating financing of the deficit, but this factor should be interpreted more loosely. Indeed, in expansions revenues are expected to increase and the fiscal constraints for the government would be relaxed[2].

[2] In emerging countries, expenditures are not expected to depend so much on the cycle because the main cyclical item in expenditures in developed countries, unemployment benefits are not generalized in emerging countries. However, other indirect channels as higher support to firms or consumers in cyclical downturns could be possible.

3. THE HYPOTHESIS

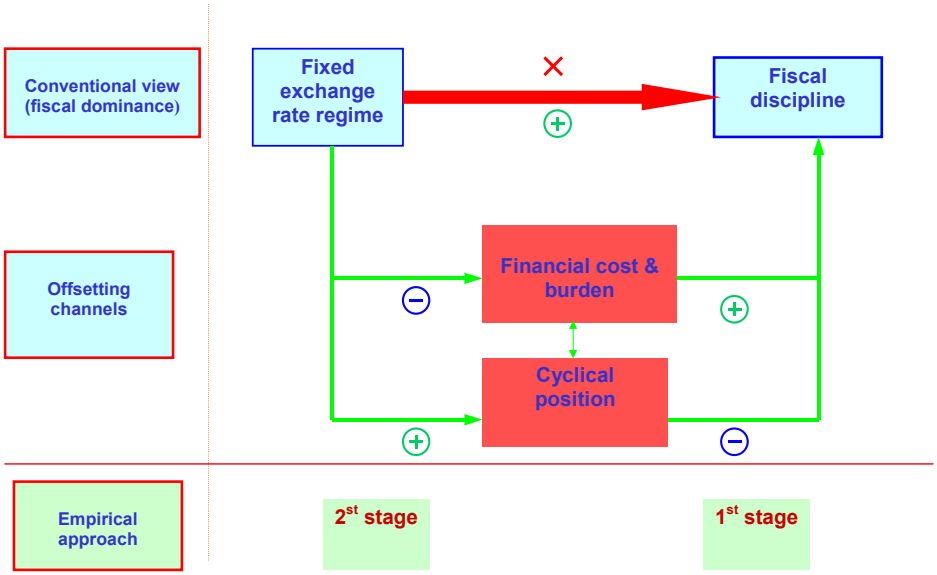
The relevance of seignoriage and of the fiscal dominance hypothesis in the literature explains the emphasis on the first factor in the attempts to explain fiscal discipline in emerging countries. From here, it follows that fixing the exchange rate should guarantee higher fiscal discipline: under a fixed regime the monetary creation process is constrained, and therefore monetary seignoriage is reduced and fiscal discipline enhanced.

However, in a previous paper [Alberola and Molina (2001)] we showed that, although the first hypothesis holds, the second does not[3]; that is, primary deficits are not significantly reduced when monetary seignoriage shrinks. The lack of a disciplining effect coincides with other evidence provided by Gavin and Perotti (1997), Tornell and Velasco (1998) or Calvo and Vegh (1999) which also used the primary deficit as measure of fiscal discipline.

A first possibility for this result is to argue that primary deficits do not properly convey fiscal discipline and in particular the impact of pegs therein, hence our alternative definition of shadow balance.

Yet, provided the alternative gauge of fiscal discipline does not solve the problem, we should be ready to provide a hypothesis to explain the result. We argue in what follows that, fixed exchange rates regimes relax both the revenue-raising and the financing constraint of the authorities and that this more than compensates its potential disciplinary effects through reduction of seignoriage. The following chart outlines our hypothesis, which is developed in a two-stage approach.

[3] In that paper, the proposed explanation was that even under a fixed regime financing the deficit through the central bank is feasible, at least in the short run. Indeed, we showed that fiscal seignoriage (measured as the transfers of money from the central bank to the government) is not constrained by fixing the exchange rate and, more importantly, that the primary deficit is negatively and significantly correlated with fiscal seignoriage, endorsing the idea that fiscal discipline is enhanced when fiscal seignoriage is reduced.



The first stage focuses on the actual effectiveness of the cyclical and financial constraints on fiscal discipline. The propositions to test in this first stage are:

I) A favourable cyclical position, mostly by increasing revenues, relaxes fiscal discipline. A strong version of this hypothesis would imply a negative relationship between the cycle and fiscal discipline, but this is perhaps a too strong assumption. Rather, what it is to be expected is an increase in primary expenditures, induced by higher revenues. Note that this is contrary to conventional wisdom, whereby expenditures should tend to be countercyclical, due to the operation of automatic stabilizers as unemployment benefits. These stabilizers are all but absent in emerging countries.

II) Reduced costs of borrowing and lower burden of debt relax fiscal discipline, as hinted by Gavin *et al.* (1997). Therefore, we would expect to find a negative relation between the fiscal balances and the financing costs. Note that this is a

quite strong hypothesis. Indeed, if causality is admitted to run in the opposite direction –from the fiscal balance to the borrowing cost– it should be expected a positive correlation between these variables.

It is important to note that both expected effects may be closely intertwined. Lower borrowing costs are expected to be expansionary and, viceversa, economic expansions may have an impact on borrowing costs. In a traditional IS-LM framework the impact would be positive, but in emerging markets confidence considerations (high growth reinforcing economic confidence) might play a dominant role. This interconnection is also addressed in the empirical analysis.

The second stage tests the link between the exchange rate regime and the determinants of fiscal discipline. The propositions to test are:

I) Fixed exchange rates increase the level of activity, due to the anchoring of expectations, the reduction of real rates and large capital inflows, which generate an expansionary cycle.

II) Fixed exchange rate regimes reduce the cost and burden of borrowing for the government, due to different factors, such as the disinflationary impact or the credibility of the regime, decreasing the risk premium.

Note that most of these factors are expected to operate primarily at the inception of the exchange rate. The time dimension, underlying the boom and bust literature mentioned in the introduction, is hence bound to play a central role in our analysis.

4. DATA AND ECONOMETRIC CONSIDERATIONS

Before starting the analysis it is important to make several considerations regarding the database and the variables and the econometric techniques used.

The first regards to the choice of the sample, which is explained in more detail in annex 1. We take observations of 32 emerging market economies and transition countries, of which 18 belong to Latin America, 11 are European states in transition, plus Israel, Russia and Turkey. The sample for Latin American countries, Turkey and

Israel runs from 1972 to 2001, and for the European countries it starts, in the majority of cases, in 1990. From this wide sample we have excluded the observations corresponding to inflation and seignoriage outliers, leaving a base sample of 598 observations. However, we use both samples, the one with the outliers and the one without them, to test for the robustness of the hypothesis.

The definition of the variables is as follows:

- Fixed regimes identification is explained with more detail in the annex. The approach adopted is somewhat different from the IMF's, whose strict definition of fixed exchange rate regimes leaves out important stabilization efforts through semi-fixed arrangements, such as crawling pegs. Therefore, an alternative classification is produced, in which by examining more closely the nature of the exchange rate regimes, we expand the proportion of fixed exchange regimes from 49% (which we obtained from IMF's strict definition) to 60%[4]. In doing the estimation regimes are defined by a dummy variable which takes the value of 1 for fixed regimes and 0 for the flexible cases. When there is a shift in regime, we assign a value of 1 for the year in which the change takes place if it is implemented in the first six months, and a value of 1 for the next year if it is implemented from July onwards.

- The choice of the variable which gauges fiscal discipline raises difficult questions. Clearly, fiscal statistics in emerging markets are typically fuzzy, with items off-balance and 'skeletons'[5]. Even more relevant is the variable to define fiscal discipline. For the reasons put forward above we would in principle, prefer the shadow balance, that is, the primary balance

[4] Recently Levi-Leyati and Sturzenegger (2002) and Reinhart and Rogoff (2002) have proposed alternative definitions. We plan to check our results with their database, but they roughly correspond to ours. Nevertheless, the results presented in the paper are robust to a change in the definition of the exchange rate regime (using IMF's one yield very similar outcomes).

[5] Gavin and Perotti (1997) overcome this problem with a revised database, but we keep on national accounts.

net of estimated seignoriage revenues, which are measured, following the traditional definition by Fischer (1982) as the increase in the monetary base relative to nominal GDP. However, this way of computing the shadow balance has some caveats: not only, as observed above, primary balance is to some extent endogenous to the ability to raise seignoriage, but also the definition of monetary seignoriage is an approximation which may not precisely apprehend the actual monetary financing of deficit. For this reasons, it is convenient to present the results for both the shadow and primary balance. This also facilitates comparison with previous contributions since their results have always been presented in terms of primary balances[6]. We also use the components of the fiscal balance, revenues and primary expenditures, to gain further insight on the behavior of the public sector accounts.

- The effect of the cycle is conveyed by the change in output gap relative to GDP. The trend GDP is filtered out through and H-P decomposition. The alternative of using growth rate of GDP and introducing individual effects in the regressions yields very similar results, but given the different marked phases of growth in the region the output gap changes probably captures better the cyclical position.

- Finally, we use two different variables to account for the cost and burden of borrowing which act as proxies of the financing constraints: interest payments of the public debt and the implicit interest rate on this total debt. Higher interest payments –determined by the yield paid and the debt to finance– are expected to be associated with tighter financial constraints, either because rates will tend to increase when financing condition harden or because higher levels of indebtedness make financing increasingly difficult, or both. A second option is to dispense with the level of indebtedness and to use the implicit rate on total public debt,

[6] Overall fiscal balances have also been typically used, but to avoid excessive complexity in the table we do not present the results for this variable.

calculated as total interest payments divided by total public debt, that is, as the average interest rate on outstanding public debt[7].

All the variables, but the regime dummies, are expressed in terms of GDP. The final set of considerations is of econometric nature.

First, the database suggests the use of panel techniques in the analysis. In panel data estimation, individual effects are customarily included, but we consider that in some of our regressions this is inadequate. In particular, when regressing the variables against the regime dummies the results on the regression would be distorted; since introducing individual effects implies to subtract the cross-country averages from the variables in the regression, this would imply that what is regressed is the (cross-country) deviation of the dependent variable on the (deviation of) the regime dummy, therefore distorting the relevant relation to explore which is the level of deficit on the exchange rate regime[8]. In the rest of the cases we include individual effects.

Second, the series show important inertia and the issue of unit roots may become a concern. Therefore, in the regressions on the exchange rates dummies the lagged value of the dependent variable has been included. When we implement the instrumental variables technique, we address this problem using first order autoregressive correction for the residuals.

Third, heteroskedasticity, which leads to an important loss of efficiency in estimation, although the estimates are still unbiased and consistent, is another problem which may arise in the data. Since we are interested in the significance of the parameters rather than in their value, it is important to correct the estimations for heteroskedasticity. This is done by controlling for cross-country variances. Related to this, the wide volatility advises to make use of weighted least square (WLS) estimation

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[7] The increase in public debt, which appear in the budget constraint of section two is an inappropriate proxy because it may signal itself fiscal indiscipline.

[8] Note also that, if individual effects were considered, there would be no difference between countries with only one type of regime in the whole sample, since the resulting dummy value (which would be defined as deviation from the mean value of the regime) would be in both cases equal to zero.

which place proportionally lower weight to more extreme observations. Even so, in a sample with several episodes of hyperinflations and depressions, outliers are large. As we note before, the sample used in estimation filters out the upper ten per cent of the inflation series, although we also have used the whole sample to test for the robustness of our hypothesis.

Finally, the issue of endogeneity and inverse causality is tackled. In the hypothesis presented underlies a causality from left to right in the chart (from the exchange rate regime to the cycle and financing constraint and from these to fiscal discipline). But it could be argued, for instance, that exchange rate regimes and fiscal discipline or borrowing costs are endogenous, that is, that they are determined at the same time, and consequently it is impossible to establish a clear relationship between them; or that the evolution of borrowing costs is a consequence of fiscal discipline, and not vice versa as we suggest. Several venues are used in the equations relating the economics variables, but not on those including the exchange rate regime, since we do not think endogeneity is an issue in that case[9]. In particular, to solve the endogeneity issue we instrument the variables by the lagged value of the regressor and, in some cases, by an 'external' instrument (the current account balance as a percentage of GDP). Then we perform some Granger type causality tests. Also, the sign of the relationship may help to reveal the direction of causality. The focus on the temporal effects of exchange rates in the last section helps to address these problems, too.

[9] The potential issue of endogeneity in the context of the paper raises would raise when the choice of a rigid regime is unfeasible due to a negative fiscal o financial situation, or viceversa, that pegs are only feasible when fiscal situation is right.. But note, on the one hand that the choice of the sample in the work is done taking into account the more or less explicit attempt of using the exchange rate peg as stabilizing device, that is, the expected causation is from left to right. On the other hand, if there remained some cases of regimes determined by the fiscal situation, this would imply that worse fiscal results are expected when the regime is flexible, which is precisely the hypothesis we test and, as we will see, reject, strengthening our results.

5. EMPIRICAL EVIDENCE

Fixed exchange rates and fiscal discipline. The direct channel

Figure 1 in the introduction showed graphically that fixed regimes reduce inflation but they fail to improve fiscal discipline. Table 1 formally confirms the muted effect of fixed exchange rate regimes on fiscal discipline. First, we confirm that seignoriage revenues are reduced under fixed regimes[10]. However, when the two measures of discipline are regressed against the regime, the parameter of the dummy is not significant, and it even takes a negative value for the primary balance. Neither is a significant effect found on the components of the primary balance: revenues and primary expenditures[11]. All in all, fixing the exchange rate does NOT induce discipline on fiscal policy.

First stage: factors determining fiscal discipline

The levers of fiscal discipline under our hypothesis are the cyclical position and the financing constraint. As mentioned above, both factors may be intertwined, so Table 2 displays the joint impact of the cycle, measured as changes in the output gap, and our proxies for the external constraint on fiscal discipline. We combine the cyclical position with both interest payments and the implicit interest rate, so that there are two different regressions, one for each of the fiscal discipline variables. Furthermore, for each regression the results, using both OLS and instrumental variables are displayed. The instruments used are the lagged regressors and the current account balance, and the results are very similar in both specifications.

As shown in the table 2.a, we do not find any relation between the cyclical position of the economy and the primary balance. This is so because the cycle tends to increment fiscal revenues but also, primary expenditures (table 2.b). It seems that

[10] For the sake of completeness, we have also regressed the fiscal discipline variables on seignoriage. Only the shadow balance is largely significant, but this is expected since the shadow balances is constructed using seignoriage revenues.

[11] When maintaining the full sample (with outliers) the impact on revenues is found to be negative and significant. The large reduction in inflation that countries experiences when fixing the exchange rate could lie behind this result.

governments tend to make use the additional revenue they attain when activity grows to increase public expenditure. However, there is a positive and significant relationship between the cycle and the shadow balance, as an increase in activity leads to less seignorage revenues in terms of GDP.

The results for the financing constraint are robust for both the primary and shadow balance: a tighter financing constraint (increase in interest payments or the implicit interest rate) brings about an improvement in the fiscal position. The correction in the fiscal balance is engineered by an increase in revenues and a decrease in expenditures (although for the interest rate the impact on expenditures is non-significant)[12].

In doing these regressions we have to deal with the issue of endogeneity. We tried to address this issue using instrumental variables technique, but we have too some indication that the casuality runs from left to right in the table (from the interest payments to the fiscal variables), which the sign of the coefficient: if the causality were from fiscal discipline to the financing constraint the expected signs would be the opposite (negative, that is, higher discipline leads to a reduction in the financing constraint).

Finally, it is interesting to explore the link between the cycle and the financing constraint, which is displayed in table 3. For the case of the implicit rate the results are non significant, but we find a strong significant negative relation between the cyclical position and interest payments (although not with the implicit interest rate)[13]. As mentioned above, in principle the direction of causality is unclear, and rather it could be thought of a simultaneous occurrence between both facts. To shed a bit more of light on the issue we have perform a Granger causality test, in both directions: the output gap is shown to Granger-cause the interest payments, while the opposite direction of causality is rejected by the test.

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[12] When doing these regressions with the whole sample we loose the significance, but not the sign and the relative value of coefficients.

[13] Note that the variable interest payments is defined as a ratio to nominal GDP, while in the implicit rate variable no trace of GDP is found. This difference might explain to some extent the difference of results, but also note that the GDP is defined in levels and nominal terms.

Second stage: exchange rate regimes and the fiscal constraints

Table 4 summarizes how the exchange rate affects the cycle and the costs of borrowing. Recall that the regime is captured by a dummy which takes value of one when the country has a fixed exchange rate. We find a significant negative effect on interest payments and interest rate on debt, but apparently there is no significant correlation between the fixed regime and the cyclical position. Therefore, fixing the exchange rate contributes to relax the financing constraint but it does not generate by itself an expansionary cycle.

Wrap-up of the results

Our hypothesis sustained that the favorable impact of fixing the exchange rates on fiscal discipline through the reduction of seignoriage revenues is offset by the relaxation of the financing constraint and an expansion of activity, which favors an increase in revenues.

Considering together the evidence found so far the reduction of borrowing costs engineered by the peg plays a significant role in determining fiscal discipline: when a country fixes the exchange rate, it enjoys a softer financial constraint, and a softer financial constraint leads to a relaxation of fiscal discipline. Therefore, the first building block of our hypothesis finds strong empirical support.

However, the results are weaker on the cycle channel. We find that expansions tend to have no effect on the primary balance This lack of effect is explained as we find an increase in revenues and in primary expenditures when activity gains momentum. On the contrary the effect is positive on the shadow balance due to the observed reduction in seignorage revenues as a percentage of GDP. Therefore, the direct evidence of the impact of the cycle on fiscal discipline is at best mixed. Notwithstanding this, an indirect impact of the cyclical position is hinted by its effects on the financing constraints, as we find a strong link between the cycle and interest payments and the causality running from the cycle to the financing constraint. So in economic expansions, financing constraint relaxes and through this indirect way, the cycle would has an effect in relaxing fiscal discipline.

But even if this interpretation was valid, fixed regimes have not been found to have a significant impact on the cycle, and this would undermine our proposition. This lack of significance maybe is due to the well known macroeconomic dynamics generated after the fixing of the exchange rates. Indeed, it is insightful to develop this point in detail.

6. THE DYNAMICS OF THE EXCHANGE RATE PEGS

In this section we focus on the induced dynamics on the relevant economic variables of pegging the exchange rate. There exists a rich literature on the economic implications of exchange rate stabilizations. Exchange-rate-based stabilization schemes (hereafter, ERBS) usually bring about rapid disinflation (due to the anchoring of external prices) and an economic expansion.

From a theoretical perspective, this initial expansion can be explained by inflationary inertia in the service sectors, which, in the aggregate, push down real interest rates [Rodríguez (1982)]; or by the imperfect credibility of the new regime which favors present relative to future consumption, inducing a consumption boom in the initial stages of the peg [Vegh (1992)]. Moreover, as our results (table 4) show, fixing the exchange rate reduce the borrowing costs, reinforcing these effects. Typically, the expansion is coupled with a growing current account deficit and the appreciation of the real exchange rate. In the medium run, demand exhausts its expansionary impulse and leads to recession and, most of times, to the collapse of the fixed regime. This is a brief account of the characteristic "boom-bust cycle" of ERBS. Econometric evidence on all this aspects is quite robust [Kiguel and Leviatan (1992) and references in Calvo and Vegh (1998)].

This sort of dynamics is central to our hypothesis. Since fixing the exchange rate is the trigger for an expansion which is followed by a slowing down of activity or a recession before the regime is abandoned it is to be expected that the overall effect (which conveys the whole boom and bust cycle) is not significant, as we found in our econometric exercise (table 4).

So it is convenient to explore in detail the behavior of the relevant variables around the peg. The graphical analysis in figure 2, whose charts display the mean and one standard deviation of these variables before and after the fixing (denoting by t the year of fixing) is an appropriate starting point, but the high volatility of the series makes hard to draw robust conclusions from this visual inspection, so it is useful to complement it with a more formal analysis.

Using the previous panel, after filtering out the previous sample[14], we now base the econometric analysis on two different approaches comparing the periods before and after the peg: a cumulative time dummy analysis and an equal coefficient test. The results for selected variables are shown in table 5. The first approach applies time dummies which take a value of 1 in the year in which the peg is adopted (t), the year after (t+1) and so on. By sequentially accumulating these dummies and using them as regressors, we can check the effects of the regime shift on the relevant variables. The shaded areas in the graph display the range of periods from the inception of the peg in which the cumulated peg dummy is significant. The second approach defines two dummys representing two periods of time ('before' and 'after' the peg, being 'after' year t, t+1 and so on), and test for the equalization of the coefficients of these dummys. If we find equal coefficients, we can conclude that the behavior of the variable before and after the new exchange rate policy is the same.

The results are as follows:

The disinflationary impact of the peg is evident from the graph (chart a) and it is confirmed by the econometric analysis. For the monetary seignoriage (chart b) visual inspection would suggest a clear reduction, and the parameter associated to the fixed regime is significantly lower. However, the cumulative dummy is only lower for the two first periods (table 5.a).

[14] The sample is reduced relative to that of previous sections. Specifically, we have eliminated fixed regimes that last more than five years, those countries with no change in their regime in the whole sample, and some observations corresponding to fixed regimes derived from Bretton Woods arrangements. So the results are not fully comparable to those of section 3.

On the primary balance (chart c) the impact seems to be positive, up to the third year, with cumulated improvements of one and a half of GDP. Beyond that point the improvements reverse and the variable returns to levels previous to the fixing. The econometric tests (table 5.b) only display a marginally significant value for the cumulative dummy between periods t and t+3. The results are more robust for the shadow balance. Now the cumulative increase is around 2% of GDP; although the improvements subsequently reverse, and despite the results for seignoriage just described, the peg turns to improve significantly the shadow balance one year after the peg and for all the following periods, according to the two econometric tests.

Revenues (chart e) dramatically and continuously increase, around 7 percentage points of GDP at t+5, but primary expenditures (chart f) also increase in parallel. In no case, there is an statistically significant change in the behaviour of the parameters, however (not shown).

The 'boom' phase in the cycle is observable in chart g, lasting until the fourth year after the peg (t+3 in the chart)[15]. After that, there is a return to previous levels afterwards, coinciding with the bust phase of the cycle. The two econometric tests (table 5.c) show a significant increase due to the peg after the third and until the fifth year of the peg.

Finally, the impact on borrowing costs (chart h and chart i) strongly supports the softening of the borrowing constraint, since they are consistently and permanently lower under fixed regimes: interest payments shrink around 1,6 percentage points of GDP, and it is particularly relevant the big reduction in the implicit interest rate (7 percentage points). The econometric test supports these results (table 5.d).

To sum up, in the charts it is observed that the improvement on the fiscal accounts exists but tend to be transitory. On the one hand, revenues substantially increase in terms of GDP and then tend to stabilize, but expenditure increases display

[15] The chart with raw growth figures (not shown) illustrate a much more drastic change. The point here is that even using a more refine definition of cyclical growth the boom-bust hypothesis holds.

higher inertia. The improvement in fiscal accounts is probably related to the expansion of activity after the peg and to the reduction of the fiscal burden. When the boom dissipates, revenues and the burden of debt stabilize but expenditures keep on growing, and this is reflected in the worsening of the primary balance. Therefore, fixing the exchange rate trigger dynamics which have perverse effects on fiscal discipline: the deterioration of the fiscal stance at the end of expansion may even be an important explanatory factor behind the final abandonment of the peg, as Kaminsky *et al.* (1996) show, in their work on exchange rate crises.

7. CONCLUSIONS

This paper has attempted to present and test a comprehensive rationale for the failure of exchange rates to provide fiscal discipline, a result which is statistically robust in our database of emerging countries. Our hypothesis states that fixing the exchange rate has a negative impact on fiscal discipline through the relaxation of the fiscal constraint of the government. This effect offsets the beneficial impact on discipline that fixed exchange rates should have through the reduction in inflationary financing. In particular fixing the exchange rate reduces the cost and burden of debt and enhances the ability to obtain revenues through a higher level of activity.

The empirical test of these hypothesis has followed a two-stage approach in a panel analysis. The hypothesised channel from exchange rate pegs to lower cost of financing and relaxing of discipline has found a strong empirical support. On the contrary, the second channel, through cyclical expansion and relaxing of discipline is less robust: fixed regimes are not shown to have significant impact on the cycle and the link between economic expansion and fiscal disciplined has revealed blurred.

In order to overcome this problem with the second channel we have explored the evolving dynamics that a peg engineers on the relevant variables and in particular on the cyclical position, an issue on which the literature has focused. The results from this analysis is clarifying and strengthens our hypothesis, since it is shown that at its inception the peg generates an economic expansion, and also softens the financing constraint. The ensuing deterioration of the economic indicators reveals how the peg throws the seeds of its own destruction.

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ANNEX 1: DATA SOURCES AND METHODOLOGIES

This annex presents an overview of the data we have used in the empirical tests. We have selected 32 emerging markets economies and transition countries, of which 18 are from Latin America, other 11 are European transition countries, and the last three are Israel, Russia and Turkey[16]. The selection is made on the basis that for all these countries the choice of exchange rate regime has played and continues to play a central position in monetary policy strategies[17].

The bulk of the data are taken from the IMF's 'International Financial Statistics'. They include the official exchange rate, in units of local currency per US dollar (*line ae*), consumer prices (*line 64*), reserve money (line 14), the government deficit or surplus (*line 80*), nominal and real GDP (*lines 99*), public debt (*lines 88 and 89*) and the current account balance (*line 78ald*). Data for interest payments on public debt from the IMF's 'Government Finance Statistics' and from World Bank database are used to construct series of primary deficit. Where it is possible, we have complemented these statistics with national data. In general, we have data from 1972 to 2001 for Latin American countries, Israel and Turkey, and from 1990 to 2001 for European transition countries and Russia.

We define 'seignorage' as the annual change in reserve money scaled by nominal GDP, as in Fischer (1982). It is immediate to see that these calculations are equivalent to the definitions appearing in the text. To compute 'shadow balance' we

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[16] Selected countries are Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, Guatemala, Honduras, Mexico, Panama, Paraguay, Peru, Uruguay, Venezuela, Nicaragua, the Dominican Republic, El Salvador, Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovenia, Romania, the Slovak Republic, Croatia, and Israel, Russia and Turkey.

[17] Therefore, we have not not included any Asian countries in the sample. It could be argued that we could have incurred in a sample selection bias, but we think that the almost similar economic structure of Latin America and European countries (high presence of the public sector in the economy, high and inefficient bureaucracy, import substitution strategy to develop, etc) and the necessity of stabilizing the economy both type of countries have, in contrast with Asian nations, made the sample homogeneous and help us to avoid the bias. Moreover, we have performed the same sort of analysis using only Latin America countries, and the results, except for the primary expenditure, are very similar to those presented in the paper.

simply subtract monetary seignorage from primary balance. Consumer price indices are used to calculate the rate of inflation, and the cyclical position is computed as changes in the output gap –relative to GDP, derived from original real GDP series using a Hodrick-Prescott type filter. The lambda used was 100.

We have constructed a separate sample without inflation outliers since they may distort the results. Inflation outliers are defined as those in the last decile of the sample, leaving observations whose inflation rate is less than 120% a year. This leaves a maximum of 598 observations although for some variables, most notably primary deficits, the availability of data is lower.

A more contentious issue we had to deal with was the definition of the exchange rate regimes. Our main source of information had to be, in principle, IMF's 'Exchange Rate Arrangements And Exchange Restrictions: Annual Report', in which the IMF classified exchange rate arrangements as "Pegged", "Limited flexibility", and "More flexible arrangements". So first of all we construct an 'IMF sample' taking fixed exchange rate regimes as those labeled as "Pegged" according to IMF.

But this definition poses many problems, as it does not include some Exchange Rate Based Stabilizations (ERBS) instrumented via not strictly fixed exchange rates, like crawling pegs or crawling bands, which are labeled as "More flexible arrangements" by the IMF[18]. The IMF itself recognizes this problem in a recent publication [IMF (1999)], and reclassifies many countries' arrangements from year to year. Finally, in 1999 issue of 'Exchange Rate Arrangements…', and in subsequent publications, IMF labels the exchange rate regimes not as fixed or flexible like previously, but as currency boards, crawling pegs, target bands, etc., letting the reader to decide which is a pegged exchange rate an which is not. One of the best examples of the possible inadequacy

[18] Two recent papers, those by Reinhart and Rogoff (2002) and by Levy-Yeati and Sturzenegger (2002) also changes IMF's strict definition. Reinhart and Rogoff distinguish between a "standard" definition of an exchange rate regime, based on IMF's classification, and a "natural" definition, based on the performance of the official exchange rate, declarations from the Government, the behavior of the Central Bank, and so on. More or less, our modified sample coincides with the "natural" classification of Reinhart and Rogoff. Levy-Yeyati and Sturzenegger take five types of exchange rate arrangements, from floating to currency boards, not making any distinction between flexible and fixed regimes.

of IMF's previous definition is the Brazilian *Plano Real,* a "genuine" ERBS dated in July 1994 which was instrumented within a crawling peg system from 1995 to January 1999, and which was labeled as "managed floating" by the IMF.

Having this in mind, we have filtered the IMF sample and constructed an alternative to be used instead of the former. We have added some episodes of semi-fixed exchange rate arrangements that countries implemented with a clear stabilization objective[19]. Finally, when a country changes its system we have changed its definition if the change occurs in the last six months of the year.

In Table A.1 we show the differences between IMF stricter sample and our sample:

Table A.1 Differences between samples

Country	*Date*	*IMF sample*	*Modified sample*
Argentina	1979-1980	Flexible	Fixed (*Tablita*)
Argentina	1985-1986	Flexible	Fixed (*Plan Austral*)
Bolivia	1997-1998	Flexible	Fixed
Brazil	1986	Flexible	Fixed (*Cruzado*)
Brazil	1994-1998	Flexible	Fixed (*Plano Real*)
Chile	1978	Flexible	Fixed
Chile	1985-1999	Flexible	Fixed
Colombia	1992-1999	Flexible	Fixed
Ecuador	1995-1999	Flexible	Fixed

[19] This is the reason why we consider Brazil'1994 as a ERBS, although it was a crawling peg system, and a Money Based Stabilization Bolivia'1986, a country which currency has been depreciating against the US dollar at a much slower pace than the Brazilian's one. However, in IMF (1999) Bolivia is considered again as a fixed exchange rate, as "the deviations of the market exchange rate from the official exchange rate (…) are extremely tight (…), and that the regime is in practice a crawling peg aimed at maintaining the competitiveness of the economy". Finally, in most recent issues of IMF's International Financial Statistics some countries are marked with an asterisk, denoting that "this country has a *de facto* regime which differs from its *de iure* regime". These considerations show that the definition of the regime is not a easy issue. To define theses episodes we have consulted, among others, Kiguel & Liviatan (1992), Tornell & Velasco (1998), Hamann (1999) and IMF (1999).

Honduras	1997-2001	Flexible	Fixed
México	1988-1994	Flexible	Fixed
Uruguay	1978-1982	Flexible	Fixed (*Tablita*)
Uruguay	1992-2001	Flexible	Fixed
Venezuela	1996-2001	Flexible	Fixed
Hungary	1995-2001	Flexible	Fixed
Latvia	1994-1996	Flexible	Fixed
Poland	1991-1999	Flexible	Fixed

Source: IMF (1999) and own elaboration.

Finally, in table A.2. we show the median of the main variables for the different exchange regimes, once we have filtered IMF's definition:

Table A.2 Main features of the samples: median

	Without outliers	*Whole sample*
FLEXIBLE REGIMES (observations)	(225)	(276)
Overall balance	-1,76	-2,22
Primary balance	0,33	0,24
Revenues	16,02	16,37
Primary expenditures	15,19	15,67
Total expenditures	18,28	19,58
Inflation	19,75	26,48
Monetary seignorage	2,04	2,41
Real GDP growth	3,58	3,38
Interest payments	1,85	1,99
Implicit interest rate	6,38	6,28
Public external debt service	4,27	4,19
Output gap change	0,19	0,03
Shadow primary balance	-1,77	-2,23
FIXED REGIMES (observations)	(365)	(420)
Overall balance	-2,10	-2,12
Primary balance	0,03	-0,05
Revenues	17,55	17,55
Primary expenditures	18,43	18,18
Total expenditures	20,71	20,56
Inflation	13,05	13,42

Monetary seignorage	1,58	1,71
Real GDP growth	4,32	4,20
Interest payments	1,56	1,49
Implicit interest rate	5,17	5,16
Public external debt service	3,31	3,11
Output gap change	0,93	0,90
Shadow primary balance	-2,05	-2,06

Source: own calculations.

As for the econometric technique, we have used panel data analysis with fixed effects when required (table 2 and table 3). We made the estimations via weighted least squares (WLS) and the heteroskedasticity is corrected with cross sectional variance.

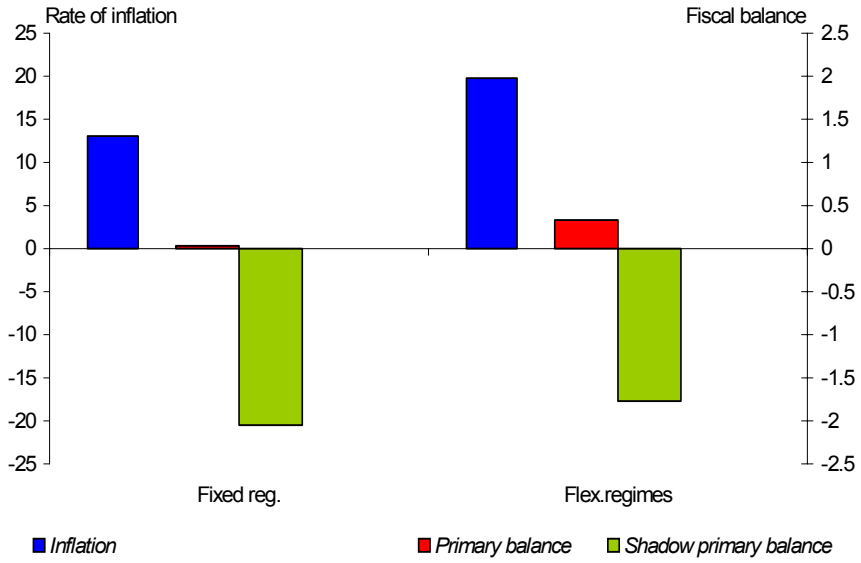
We present the results for the regressions using WLS with a lag of the dependent variable, to take account of persistence in the data (this is equivalent to take a first order autorregresive correction for the residuals).

We also use instrumental variables (IV) to avoid endogeneity problems. The instruments used are first and, in some cases, second lag of the regressor (output gap, implicit interest rate), and lags of the regressor and the current account balance (interest payments). When necessary, estimations are corrected for the presence of first order autocorrelation in the residuals.

Finally, we have filtered the sample eliminating observations of high inflation, specifically the upper ten percent of the inflation series (change in consumer prices higher than 120% a year). The line ‘outliers’ in the tables shows changes in the significance of the coefficients when the wider sample is used.

ANNEX 2: FIGURES AND TABLES CITED IN THE PAPER:

FIGURE 1: EXCHANGE RATE REGIME AND FISCAL DISCIPLINE (a)



Source: own calculations.
(a) Medians of each variable.

Table 1. Exchange rate regime and fiscal variables (a)

	Seignorage	Primary balance	Shadow balance	Accrued revenues	Primary expenditures
Fixed regime	-0,54 (***)	-0,19	0,13	-0,21	-0,03
(t-value)	(-3,93)	(-1,20)	(0,57)	(-1,46)	(-0,20)
Outliers				O (**)	

(a) Estimation via WLS, including first lag of dependent variable in each case.
*, **, *** denote significance at 10%, 5% and 1% respectively.
O in line "outliers" denotes that the estimation usig the whole sample (including outliers) changes the result with the restricted sample to significant
• in line "outliers" denotes that the result shown changes to non significant estimating the relationship with the whole sample (with outliers)

Table 2.a. Combined effects on fiscal variables of cyclical position and financial variables

	Primary balance				Shadow balance			
	WLS (a)	*IV (b)*	*WLS (a)*	*IV (b)*	*WLS (a)*	*IV (b)*	*WLS (a)*	*IV (b)*
Cyclical position	0,02	0,04	0,00	0,04	0,14 (***)	0,19 (***)	0,14 (***)	0,14 (***)
(t-value)	(0,83)	(0,67)	(0,11)	(0,99)	(4,05)	(4,07)	(3,90)	(2,60)
Outliers		O (*)						•
Interest payments	0,27 (***)	0,27 (***)	---	---	0,27 (***)	0,46 (***)	---	---
(t-value)	(5,87)	(3,31)	---	---	(4,02)	(3,80)	---	---
Outliers								
Implicit interest rate	---	---	0,12 (***)	0,12 (**)	---	---	0,13 (***)	0,13 (*)
(t-value)	---	---	(4,54)	(2,12)	---	---	(3,43)	(1,78)
Outliers				•				•

(a) Estimation via WLS, including first lag of dependent variable in each case

(b) Estimation via 2SLS, using first lag of each regressor and the current account balance as instruments.

*, **, *** denote significance at 10%, 5% and 1% respectivley.

O in line "outliers" denotes that the estimation usig the whole sample changes the result to significant

• in line "outliers" denotes that the result shown changes to non significant estimating the relationship with the whole sample

Table 2.b. Combined effects on fiscal variables of cyclical position and financial variables

	Accrued revenues				Primary expenditure			
	WLS (a)	*IV (b)*	*WLS (a)*	*IV (b)*	*WLS (a)*	*IV (b)*	*WLS (a)*	*IV (b)*
Cyclical position	0,06 (***)	0,18 (***)	0,04 (**)	0,18 (**)	0,07 (***)	0,23 (***)	0,07 (**)	0,29 (***)
(t-value)	(2,93)	(2,94)	(2,02)	(2,43)	(2,64)	(3,35)	(2,49)	(3,43)
Outliers	•		•	•	•	•	•	•
Interest payments	0,11 (***)	0,21 (*)	---	---	-0,12 (**)	-0,22 (**)	---	---
(t-value)	(2,68)	(1,92)	---	---	(-2,32)	(-1,99)	---	---
Outliers								
Implicit interest rate	---	---	0,06 (***)	0,14 (*)	---	---	-0,06 (*)	-0,01
(t-value)	---	---	(2,62)	(1,79)	---	---	(-1,93)	(-0,11)
Outliers			•	•				

(a) Estimation via WLS, including first lag of dependent variable in each case

(b) Estimation via 2SLS, using first lag of each regressor and the current account balance as instruments.

*, **, *** denote significance at 10%, 5% and 1% respectivley.

O in line "outliers" denotes that the estimation usig the whole sample changes the result to significant

• in line "outliers" denotes that the result shown changes to non significant estimating the relationship with the whole sample

Table 3. Cyclical position and financial variable

a. Coefficients and significance:

	Interest payments		**Implicit interest rate**	
	WLS (a)	*IV (b)*	*WLS (a)*	*IV (b)*
Cyclical position	-0,03 (***)	-0,46 (**)	0,03	0,27
(t-value)	(-3,61)	(-2,17)	(1,62)	(0,75)
Outliers				

(a) Estimation via WLS, including first lag of dependent variable in each case.
(b) Estimation via 2SLS, using first lag of cyclical position as instrument.
*, **, *** denote significance at 10%, 5% and 1% respectivley.

b. Granger casualty test (c):

Null Hypothesis	Rejected	F-Statistic	Probability
Output gap does not Granger Cause interest payments	Yes	5,34	0,00
Null Hypothesis	Rejected	F-Statistic	Probability
Interest payments does not Granger Cause output gap	No	0,72	0,58

(c) Test using four lags.

Table 4. Exchange rate regime and factors of discipline (a)

	Interest payments	Implicit interest rate	Cyclical position
Fixed regime	-0,12 (**)	-0,46 (***)	0,37
(t-value)	(-2,41)	(-2,66)	(1,38)
Outliers			

(a) Estimation via WLS, including first lag of dependent variable in each case.
*, **, *** denote significance at 10%, 5% and 1% respectivley.

Table 5.a. Test of structural change (a)

	Monetary seignorage	
	Accumulative (1)	*Equal parameters (2)*
Before vs. t	0,21	Yes
t-value / significance level	0,55	0,330
Before vs. t to t+1	-0,40 (*)	**No**
t-value / significance level	-1,60	**0,001**
Before vs. t to t+2	-0,13	**No**
t-value / significance level	-0,61	**0,004**
Before vs. t to t+3	-0,12	**No**
t-value / significance level	-0,61	**0,003**
Before vs. t to t+4	-0,20	**No**
t-value / significance level	-1,17	**0,000**
Before vs. t to t+5	-0,18	**No**
t-value / significance level	-1,09	**0,001**

Table 5.b Test of structural change (a)

	Primary balance		Shadow balance	
	Accumulative (1)	*Equal parameters (2)*	*Accumulative (1)*	*Equal parameters (2)*
Before vs. t	0,25	Yes	0,39	Yes
t-value / significance level	0,58	0,933	0,61	0,343
Before vs. t to t+1	0,28	Yes	1,08 (**)	**No**
t-value / significance level	1,02	0,942	2,58	**0,011**
Before vs. t to t+2	0,34	Yes	0,77 (**)	**No**
t-value / significance level	1,50	0,954	2,19	**0,032**
Before vs. t to t+3	0,34 (*)	Yes	0,80 (**)	**No**
t-value / significance level	1,65	0,991	2,54	**0,024**
Before vs. t to t+4	0,17	Yes	0,74 (**)	**No**
t-value / significance level	0,88	0,579	2,52	**0,030**
Before vs. t to t+5	0,09	Yes	0,56 (**)	**No**
t-value / significance level	0,49	0,419	1,98	**0,069**

Table 5.c. Test of structural change (a)

	Cyclical position: real gdp growth		Cyclical position: output gap change	
	Accumulative (1)	*Equal parameters (2)*	*Accumulative (1)*	*Equal parameters (2)*
Before vs. t	0,58	Yes	0,70	Yes
t-value / significance level	0,73	0,245	1,00	0,212
Before vs. t to t+1	0,14	Yes	0,54	Yes
t-value / significance level	0,26	0,371	1,12	0,176
Before vs. t to t+2	0,29	Yes	0,74 (*)	**No**
t-value / significance level	0,62	0,225	1,81	**0,068**
Before vs. t to t+3	0,53	**No**	0,84 (**)	**No**
t-value / significance level	1,29	**0,098**	2,34	**0,037**
Before vs. t to t+4	0,21	Yes	0,61 (*)	**No**
t-value / significance level	0,56	0,227	1,84	**0,089**
Before vs. t to t+5	0,14	Yes	0,52	Yes
t-value / significance level	0,38	0,271	1,64	0,122

Table 5.d. Test of structural change (a)

	Interest payments		Implicit interest rate	
	Accumulative (1)	*Equal parameters (2)*	*Accumulative (1)*	*Equal parameters (2)*
Before vs. t	0,18	Yes	0,21	Yes
t-value / significance level	1,28	0,754	0,53	0,340
Before vs. t to t+1	-0,12	**No**	-0,10	**No**
t-value / significance level	-1,31	**0,003**	-0,36	**0,044**
Before vs. t to t+2	-0,14 (*)	**No**	-0,02	**No**
t-value / significance level	-1,78	**0,001**	-0,10	**0,043**
Before vs. t to t+3	-0,17 (**)	**No**	-0,18	**No**
t-value / significance level	-2,46	**0,000**	-0,89	**0,008**
Before vs. t to t+4	-0,18 (**)	**No**	-0,17	**No**
t-value / significance level	-2,86	**0,000**	-0,89	**0,009**
Before vs. t to t+5	-0,14 (**)	**No**	-0,12	**No**
t-value / significance level	-2,36	**0,000**	-0,65	**0,013**

COMMON NOTE FOR TABLES 5.a TO 5.d:

(a) Estimation via WLS, including first lag of dependent variable in each case.

*, **, *** denote significance at 10%, 5% and 1% respectivley.

(1) Accumulative effect of fixing the exchange rate (time t=1) and maintain it two years (t+2), three years (t+3), and so on.

(2) Test of equal parameters in a regression of each variable on two dummys, one representing those years before fixing the exchange rate, and the other the years after the peg. We show significance level (p-value) of the test, accepting the hypothesis of equal coefficients when this p-value is higher than 0,10.

FIGURE 2: EVOLUTION OF SOME VARIABLES AROUND THE PEG (a)

Chart a. Inflation rate

Chart b. Monetary seignorage

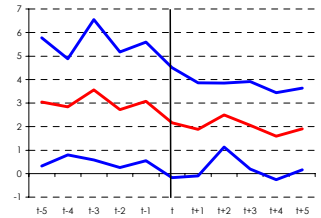


Chart c. Primary balance

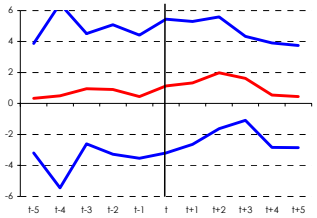


Chart d. Shadow primary balance

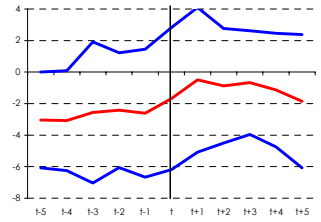


Chart e. Public revenues

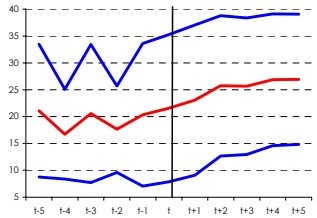


Chart f. Public primary expenditures

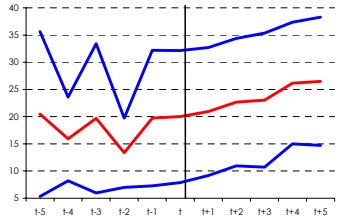


Chart g. Real GDP growth

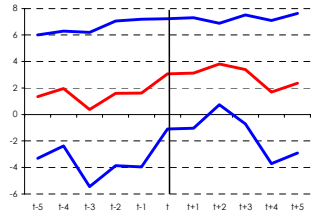


Chart h. Output gap change

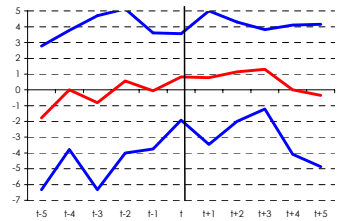


Chart i. Interest payments

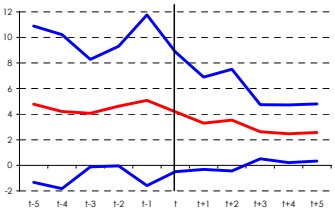


Chart j. Implicit interest rate on public debt

(a) Average value of the variables in the sample, plus and minus one standard deviation