Integrated Monetary and Exchange Rate Frameworks: Are There Empirical Differences?

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The aim of the paper is to empirically estimate whether the different monetary and exchange rate frameworks observed in the accession countries of Central and Eastern Europe and the Baltic States do yield different outcomes in terms of level and variance of a set of nominal and real variables. The author follows and extends the methodology developed by Kuttner and Posen (2001), who perform a combined analysis of the individual effects of exchange rate regimes, central bank independence and announced targets in nominal variables for a large set of developed and developing countries. They also estimate that a set-up combining a free float, an independent currency board and inflation targeting yields an outcome that mimics the price stabilisation advantages of a hard peg without its drawbacks in terms of extreme volatility. This sample of countries, not covered by the Kuttner and Posen study, supports their conclusions for both nominal and real variables, testing for both the individual and combined effects of the frameworks and indicating that a flexible exchange rate regime, coupled with CBI and DIT, would be Pareto-improving when compared to harder regimes.

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Introduction. Combined Monetary Frameworks

Any specific type of monetary framework can be thought of as providing a commitment technology. In the "first best", a stable equilibrium is achieved in an environment without any kind of distortions or rigidities (ie, prices and quantities adjust freely, costlessly and immediately, there are no market frictions of any kind, etc). Monetary policy "surprises" have no short or long run effects, since inflation expectations always equal their realisations.

Nevertheless, if rigidities do exist (such as multi-period work contracts with rigid nominal wages, "menu costs" or staggered prices adjustments), policy "surprises" would have potential short-run real effects. In such a framework, even if it is optimal for a policy maker to commit *ex ante*, it is not optimal to commit *ex post* (for the classic reference on the so-called "time inconsistency problem", see Barro and Gordon, 1983). Forward-looking agents incorporate such possibility in their expectations, yielding an outcome of higher inflation without even short-run output gains: this is the so-called "inflation bias" of a discretionary policy regime. One of the ways to correct this bias is through a "commitment" or a "rule" technology: the use of a credible monetary policy rule applied by a conservative and independent monetary authority is called a "commitment" equilibrium[2] (see Rogoff, 1985).

The resulting one shot-game eliminates the "inflation bias" and the "stabilisation bias"[3], thus mimicking the "second best" solution on a static context. Nevertheless, on a dynamic setting, both biases re-appear on Rogoff's solution (see Walsh, 1995). However, as Svensson (1997) shows, a monetary authority that acts as a combination of a Rogoff-type independent central bank with a non-negative (ie asymmetric) inflation-targeting rule would successfully eliminate both the inflation and the stabilisation bias, successfully mimicking, therefore, the attainable "second best" equilibrium. Therefore, the introduction of an explicit monetary or inflation target (inflation is generally considered a superior target, due to its timely production, easy understanding by the domestic economic agents and its full incorporation of all available information in a single indicator) in the monetary authority's loss function is one way to achieve the results of a "second-best" commitment-type equilibrium through this "constrained discretion" mechanism (see Mishkin, 2000).

The exchange rate framework, of course, must be set in a consistent fashion with the monetary framework. In a currency board mechanism this consistency is simple and automatic – monetary policy is completely (in a pure currency board) endogenous to the arrangement[4], since the monetary base must equal at least the amount of reserves held by the monetary authority, being therefore a framework completely determined by the exchange

[2]Of course, a currency board arrangement (CBA) is just a commitment mechanism that transfers the solution of the "time inconsistency problem" to the policy makers of the nation that the currency is pegged to.

[3]The theoretical possibility of a monetary authority to care "too little" about output stabilisation (informally known as the "inflation nutter" scenario). The current dispute about setting an explicit non-negative inflation target for the Bank of Japan, which only became institutionally independent from the Japanese Ministry of Finance back in 1998, partially reflects such concerns, and gives them empirical relevance. Due to a continuous deflationary process, Japan is mired in a classic Keynesian "liquidity trap", and it is argued that above zero inflation caused by a deliberate monetary expansion would make monetary policy effective again.

[4]On the other hand, fiscal policy is not automatically endogenised by this arrangement, and can place a serious strain on its sustainability, as the collapse of Argentina's CBA so clearly shows.

rate arrangement. On the other hand, a pure float regime (under the assumption of free movement of capital) is necessary for the effectiveness of an active monetary policy[5].

Working within such an implicit theoretical referential, Kuttner and Posen (2001) perform a combined empirical analysis of central bank independence, announced targets and exchange rate regimes for a large set of developed and developing countries in a post Bretton Woods time sample. They estimate that a set-up combining a free float, an independent monetary authority and inflation targeting yields an outcome that mimics the price stabilisation advantages of a hard peg without its drawbacks in terms of "extreme" nominal[6] events (like very large devaluations), which could imply that a move from one framework to the other would be welfare improving in a Pareto sense. The aim of the current paper is to verify whether such an outcome is also observed in the sub-sample of accession countries (not covered by the Kuttner and Posen study). If so, the policy implications can be non-trivial, as the choice of the exchange rate regime in the pre-accession period is left virtually to the individual countries themselves. Given that possibility, a country should obviously strive to choose the combined arrangement that would increase its aggregate welfare (this being eventually measured by a simple loss function that would encompass a set of nominal and real variables, being the "usual suspects" inflation and GDP).

Therefore, this paper tries to empirically evaluate which, among the combined exchange rate and institutional frameworks available for the accession countries during the period until full euro area membership, would seem to deliver better results in terms of level and variability of such a set of variables, using a simple and transparent framework. In this way, the paper hopes to generate a non-trivial input into the ongoing policy formulation debate that will be relevant not only to a single, specific country, but, potentially at least, to all nations involved in the process of enlargement. Namely, the aim is to verify whether the assumed superiority of more rigid exchange rate regimes in terms of nominal volatility compared to more flexible regimes is observed considering combined frameworks.

The first Chapter of the paper gives a brief description of the current exchange rate arrangements of the accession countries (a fuller description of their combined frameworks is provided in Annex 1). The second Chapter gives a description of the estimation framework and the data used, followed by the estimation results. The paper ends with a conclusion.

[5]This is one of the essential insights of the so-called "Mundell-Fleming" model, which is basically the formalisation of the Keynesian IS/LM framework in an open economy setting.

[6]The explicit assumption in their work is that monetary or exchange rate arrangements have only nominal effects, and that real variables – like growth rates – are determined, on the long run, by the factor endowments and production technology, as well as by the business cycle on the middle to short run.

1. Monetary and Exchange Rate Frameworks of the Accession Countries

Contrary to the usual perception of a smorgasbord of exchange rate regimes among accession countries[7], it could be said that a movement towards a "two-corner" solution, ie either hard-pegs/CBAs or floats (see Table 1 below, a more complete description is to be found in Annex 1), is the current observed outcome amongst these countries, which matches a similar world-wide trend (see Fischer, 2001).

Table 1. Exchange rate arrangements of the accession countries

Countries	Currency	Exchange rate regime	Date of Introduction
Bulgaria	Lev	Currency board (anchor is the Euro).	July 1997
Czech Republic	Koruna	Float with DIT	May 1997
Estonia	Kroon	Currency board (anchor is the Euro).	June 1992
Hungary	Forint	Float with DIT	October 2001
Latvia	Lats	Peg with the IMF's Special Drawing Rights (SDR), with narrow intervention bands (+/- 1%)	February 1994
Lithuania	Litas	Currency board (anchor is the Euro)	February 2002
Poland	Zloty	Float with DIT	April 2000
Romania	Leu	Float	August 1992
Slovakia	Koruna	Float	October 1998
Slovenia	Tolar	Float	October 1991

Sources: Vinhas de Souza and Hölscher, 2001b

The exception was Hungary who, after its decision to expand the fluctuation band of its sliding peg regime to ±15 (the same range in the ERM-2) on 3 May, 2001, announced a float coupled with a DIT framework to be effective by 1 October of the same year, following similar decisions taken by Poland in 2000, and by the Czech Republic already in 1997.

Nevertheless, the path to the current quasi two-corner solution is littered by the ghosts of several kinds of exchange rate and monetary frameworks past (see Annex 1), which enables the construction of a time series dimension of such arrangements.

[7]The paper concentrates only on the Central Eastern European and Baltic accession countries sub-set, namely, Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia.

2. Data and Estimations

The estimation work will "map" the variability of the chosen variable to be analysed to the relevant components of the combined framework as described in Chapter 1 (namely, exchange rate framework, targeting framework and level of independence of the monetary authority).

Any estimation performed on the set of countries that this work addresses faces some obvious difficulties. The time series are notoriously short (in most cases do not make sense, or the series are just not available before 1992, given the recent independence of some of the countries) and are clearly non-stationary. They are buffeted by the initial nominal and real shocks related to the transition process that happened in different countries at different moments, and by what could be classified as "common external shocks", such as the Russian Crisis in the second half of 1998 and the "oil shock" of 1999–2000.

The time dimension problem is minimised by using higher frequency series available for most of the variables of interest to us here. Those series are matched as closely as possible with regime dummies, following whenever possible the classification used by Kuttner and Posen (2001), *ibidem*, from now on indicated as KP.

The Central Bank Independence (CBI) dummies were constructed using national Central Bank laws (available from their web sites) and their changes through time as a reference[8]. As KP indicates, from the usual criteria found in CBI indices, two tend to stick out in terms of their significance: the appointment and dismissal procedures of the head of monetary authority and the prohibition (or otherwise) of monetary financing of government debt. Here, those two are also used to classify the institutions either as partially independent (at least one of them is present) or independent (both are present)[9]. The stylised path of CBI levels in the accession countries can be described as almost monotonically increasing, starting from an already relatively high level (it must be remembered that the independence of monetary authority is actually one of the famous Maastricht Criteria).

The Targeting Regime dummies used here differentiate between narrow money targets (M0/M1), broad money targets (M2/M3), and an explicit inflation target (be it either CPI, as in Poland, or a "net inflation" one, as in the Czech case).

[8]Cukierman *et al* (2001) produces an updated version of their famous index, now in terms of a yearly series for the period 1989–1998 that includes all countries in our sample, adding a time dimension to their analysis. One of their conclusions is that no level of CBI would have been able to have averted the inflationary jumps associated with the on-set of world price levels in the beginning of "transition". See also Loungani and Sheets (1997) and Äimä (1998).

[9]Contrary to earlier versions of this work, this differentiation also applies to currency boards, which would enable us to differentiate the eventual credibility effects linked to high-independence CBAs – like the Estonian case, when compared to partially independent CBAs – like the Lithuanian case. Anyway, as Hallerberg and Vinhas de Souza (1999) point out, the CBI indices for the accession countries tend to show rather high values, which is due to one of the requirements of the so-called Maastricht Criteria.

Finally, the exchange rate regime dummies distinguish between four *de jure*[10] classifications possible: CBA, hard pegs, aggregate that encompasses sliding pegs, target zones and shifting baskets, and floats[11].

The data was taken from the IMF/IFS series, for the period from February 1989 (Hungary was an early reformer) to May 2001. The (heteroscedasticity-consistent) regressions will be done upon an unbalanced panel on "calendar" time[12], given that the individual national series have different time dimensions.

The general form of the equation(s) to be estimated for all series is given below. It corresponds to KP's exchange rate variability equation:

$$V_i^n = \alpha_0 + \alpha_1 Float_i^n + \alpha_2 CBA_i^n + \alpha_3 SPeg_i^n + \alpha_4 HPeg_i^n + \alpha_5 T\arg etMN_i^n + \alpha_6 T\arg etMB_i^n + \alpha_7 T\arg etIT_i^n + \alpha_8 CBIT_i^n + \alpha_9 CBIP_i^n + \mu$$

where *V* is the dependent variable, indexed for country *n* and period *i*, and the ***α's*** are the coefficients of the country and time varying dummies (namely, dummies for floating regime – Float, currency board – CBA, sliding peg – SPeg, hard peg – HPeg, narrow money target – TargetMN, broad money target – TargetMB, inflation target – TargetIR, high level of institutional independence of the monetary authority – CBIT, and a low level of institutional independence of the monetary authority – CBIP). This same equation is estimated for all the series in order to enable a direct comparison of the results.

The set of variables is estimated in terms of their levels, but also on several "variability" measures, namely in terms of their standard deviations, the 90% standard deviations (ie, excluding the extreme 5% realisations on both sides of the distribution) to measure eventual non-linearities of the frameworks in different portions of the distribution, the coefficient of *skewness* (which is a measure of asymmetry of the distribution of a series

[10]Certain studies stress the difference between *de facto* and *de jure* regimes. This distinction is particularly common in the "fear of float" literature (see Calvo and Reinhart (2000), for a recent review). This is usually assessed by comparing the volatility of the exchange rate with the volatility of reserves but, as indicated by KP, just a *de jure* announcement is expected to have effects in terms of the expectations of the private agents.

[11]Eurosation is one policy option that is not analysed it this framework, because no accession country has used it so far. This was discussed separately in the previous versions of this work. Nevertheless, given its potential importance, the author of the paper strongly suggests a specific research effort to be devoted to this subject.

[12]Alternative estimations involving an adjustment for "transition time" were discarded by this author. In Bakanova at al (2001) ibid, this author estimates cross country "growth-regressions" for all the "transition" economies in Europe, both in "calendar" and in "transition" time, and the results do not differ in any significant manner. The reason is obvious: the further away you are from the onset of the transformation process, the less relevant such a distinction becomes. Alternatively, another way to deal with that would be to use a shorter, more recent sample; to adjust for initial shocks related to the onset of "transition" and the "transition time" asymmetry. The author of the present research has done this in earlier versions of the paper. However, it presented problems, as indicated in previous sections, all the economies in our set were being buffeted by a series of common shocks in the 1997–2000 period: the Asian crisis, the Russian crisis and the energy shocks of 1999–2000. Due to that, some of the results were of very counterintuitive interpretation. Besides, one of the regressions (the GDP quarterly regression at the end of this section) just could not be estimated in this shorter sample. Decisively, the longer sample used here should be understood as a better approximation of the true long-run values of the parameters.

around its mean) and the coefficient of *kurtosis*[13] (which measures the "peakness" or "flatness" of a series, when compared to a normal distribution).

An e-mail discussion with Kenneth Kuttner clarified that the process in KP for the calculation of all their "variability" series used a sample that remained constant while all the elements of the framework remained unchanged. The author of the present paper decided to use a centred "sliding sample" of two, three and four observations for the estimation, respectively, of the standard deviation(s), skewness and kurtosis series, for both theoretical and practical reasons. From the theory side, the conceptual underpinnings that could lead one to assume that "variability" should remain constant within any given framework seemed unclear. From the empirical side, the use of such an assumption would lead one to miss the "spikes" observed during episodes like the Asian and Russian crises, that should contain important information about the properties of the arrangements. Additionally, for countries with essentially unchanged frameworks during the sample like, for instance, Estonia the process used by KP would generate series that would be, for all practical purposes, constant terms to be used as the dependent variables in our estimations. Finally and decidedly, using individual observations for each unchanged framework period would yield a sample where the number of observations would be roughly similar to the number of regressors with the associated problems of degrees of freedom for the estimations.

[13]The standard deviation *s* is calculated here as

$$\sqrt{\frac{n\sum x^2-\left(\sum x\right)^2}{n(n-1)}}$$

While *skewness* is calculated here as

$$\left\{\frac{n}{(n-1)(n-2)}\sum\left(\frac{x_j-\bar{x}}{s}\right)^3\right\}$$

where *s* is the standard deviation estimated as above.

And kurtosis is calculated here as

$$\left\{\frac{n(n+1)}{(n-1)(n-2)(n-3)}\sum\left(\frac{x_j-\bar{x}}{s}\right)^4\right\}-\frac{3(n-1)^2}{(n-2)(n-3)}$$

where *s* is, again, the standard deviation estimated as above.

2.1. Nominal variables

2.1.1. Exchange Rates

The monthly series of changes in the average monthly exchange rate of the national currency to USD (with the exception of Lithuania, where DEM was used) were used in the estimations[14]; negative movements indicate appreciation, positive ones depreciation.

As can be seen from the estimation results in Table 2, Annex 2, in terms of changes, floats lead to the highest significant degree of depreciation, while other institutional components (namely, targeting frameworks) seem to be able to almost fully counteract this tendency. On the other hand, central bank independence seems to actually increase it. In terms of their full standard deviations, the highest volatility is indeed observed in a float, while the lowest is associated with a sliding peg, which is partially counteracted by certain types of targeting frameworks, especially by inflation targeting. When using 90% standard deviations, the point estimates are roughly similar for both the float, which still has the highest value, and the CBA, but the lowest value is actually associated with the hard peg, and an inflation-targeting framework would actually increase the variability. Considering the skew, the significant coefficients on float and hard pegs are rather similar, and the institutional framework could offset most of those tendencies. In terms of kurtosis, the only significant coefficient is associated with an inflation-targeting framework: given that it is negative, it may be assumed that it could be used to partially counteract a "peaked" distribution.

In terms of general conclusions, it could be said that any assumed substantial advantage in terms of lower variability associated with more rigid regimes is not observed, when the combined framework is taken into consideration. It is also worth mentioning that most of the gains are associated with targeting frameworks, not with the independence level of the monetary authority.

Of course, the above conclusion comes from the implicit assumption that the effects associated with the individual components of a joint framework would be additive[15]. To test this, individual elements are estimated in an "interactive dummy framework", to estimate the joint effects of the relevant combinations of frameworks. As can be seen from the results of the estimation in Table 3 (see Annex 2), this is indeed the case: the individual elements do show "additive" properties, besides their individual effects. Floats combined with inflation targeting and a high degree of independence would yield similar results in terms of changes in levels of the exchange rate to a high independence CBA: both are among the lowest coefficients of level variability. The same "dampening" effect on the volatility of the float towards the levels of more rigid regimes is observed in terms of standard deviations, both for the full and 90% series.

[14]KP also use nominal rates, due to the same data problem faced in this study: the lack of complete monthly real effective exchange rate series for all the countries in the sample.
[15]The author of the present paper thanks Ülo Kaasik for making this point.

Given the availability of some monthly nominal and real effective exchange rate index series – NEEXR and REEXR for, respectively, 7 and 8 of the countries in the sample (Latvia, Lithuania and Slovenia were the countries excluded from the nominal effective series, and Latvia and Slovenia from the real effective series), provided by the IMF/IFS database and by the national central banks, they were also used for some limited estimations. It must be noted that some of the included series had a somewhat reduced temporal dimension, so those results should be examined with care: they are presented in Tables 4 to 7, in Annex 2.

In terms of level changes for NEEXR in Table 4 (see Annex 2, note that here a stable level would correspond to 100), floats are associated with depreciation, and CBA with a substantially larger appreciation, while inflation target and full central bank independence can counteract this. Considering the standard deviations, floats indeed show the highest deviation, but total CBI would counteract this. However, not to the point where it would surpass a CBA or a sliding peg, the best performers (note also the relative greater improvement of CBA with 90% standard deviations, an indication of the more rigid regime bias to "extreme events"). The additive regressions in Table 5 (see Annex 2) confirm those results (the almost completely stable NEEXR with a float cum CBI and DIT is noteworthy, as is the rather small standard deviation "advantage" of a more rigid regime).

For REEXR level series in Table 6 (see Annex 2), it is worth mentioning that a float, as one could expect, *per se*, is almost all that is necessary for a stable real exchange rate (while CBAs are associated with the highest level of depreciation), and that CBI and DIT partially counteract each other's effects. In terms of standard deviations, the highest value is associated with CBA and the lowest with sliding pegs, the float variation can be almost totally counteracted by full CBI with a targeting framework (again, the use of 95% standard deviations shows the larger relative improvement of stricter regimes, confirming the tendency to "extreme events" of those arrangements). The additivity assumption in Table 7 (see Annex 2) is confirmed as statistically significant, and supports the previous results.

As a general conclusion for the block of tested exchange rate series – nominal, nominal effective or real effective, the assumed advantage of more rigid regimes in terms of variability is not empirically observed.

2.1.2. Inflation[16]

Here, monthly CPI series were used as the dependent nominal variable. As the results of the estimation in Table 8, Annex 2 indicate, in terms of levels, floats lead to a marginally higher inflation level than a CBA, but the lowest inflation is actually associated with pegs, while other institutional components (namely, inflation targeting and CBI) would seem to be able to almost fully counteract it. In terms of their full standard deviations, the highest volatility is indeed observed in a float, but is only marginally greater than the one

[16]KP do their estimations in terms of CPI level and "persistence".

in a CBA, the lowest is associated with a peg, but this can be partially counteracted by the CBI level; when using the 90% standard deviations, the float still has the highest value and the CBA the lowest, and a targeting framework (especially inflation targeting) would decrease the variability. Considering the skew, the significant coefficients of float, CBA and pegs are rather similar: the CBI institutional framework would actually increase those tendencies, but targeting frameworks could contain it. In terms of kurtosis, the picture is rather similar.

The conclusion is that the assumed advantage in terms of lower variability associated with more rigid regimes is not clearly registered, and, again, most of the gains in terms of volatility reduction are associated with targeting frameworks, not necessarily with the independence level of the monetary authority.

As Table 9 indicates (see Annex 2), the "additive" assumption is confirmed once again. Floats combined with inflation targeting and a high degree of independence would yield the lowest average inflation (the large negative significant coefficient for the float with money targeting and a partial degree of independence is difficult to interpret) and the lowest standard deviations, both for the full and 90% series, while the lowest skew and one of the lowest excess kurtosis are associated with the combination that includes monetary targeting.

2.1.3. Interest Rates[17]

Estimating the same equation for the real interest rate[18] we get the results listed in Table 10, Annex 2. In terms of levels floats lead to the highest interest rate levels, and pegs to the lowest, while the other components (namely, inflation targeting and CBI) would seem to be able to substantially reduce it. Considering their full standard deviations, the highest volatility is, by far, observed in a float, but this can be partially counteracted by inflation targeting framework. When using the 90% standard deviations, the float still has the highest value and the CBA the lowest, and inflation targeting would still decrease the variability substantially. Considering the skew, the lowest significant coefficient is on the float, the CBI institutional framework would actually increase those tendencies, but targeting frameworks could contain it. In terms of kurtosis, the picture is rather similar.

As Table 11 shows (see Annex 2), the "additive" assumption is again confirmed. Floats combined with inflation targeting and a high degree of independence would yield the lowest positive real interest rates and the lowest standard deviations and the lowest skew, but the lowest excess kurtosis is associated with CBA, followed by the float *cum* CBI *cum* IT.

So far, the set of nominal variables confirms, with surprisingly robust results, the outcome of KP: considering a combined framework, stricter regimes do not necessarily

[17] KP use the interest rate forward premium in their estimations, the data is not available for most accession countries.
[18] "Real Interest Rate" is defined here as just the lending rate in time *t* minus the consumer price inflation realised also on time *t*. No consistent series of "expected inflation" would be available for all countries throughout the whole sample.

outperform the floating ones, neither in terms of level nor variability (regardless of the exclusion or inclusion of extreme events). Table 2 provides a quick comparison of some results from our previous estimations with similar ones from KP's (which are the coefficients within brackets, below the coefficients estimated from the accession countries' sample). For exchange rate and CPI, most of the observed results have at least the same sign (and most of the results with different signs are not statistically significant), and some point estimates, like the ones for exchange rate and CPI level changes, are strikingly similar. This is truly remarkable, given the differences in size, composition and time dimension of both samples.

Table 2

	Exchange rate: depreciation and			**variance**	**measures**	**CPI**
	change	standard deviation	standard deviation 90%	skewness	kurtosis	level
Float	1.63* (1.24*)	2.33* (5.5*)	1.36* (7.1*)	0.28** (0.36*)	0.43 (0.39*)	3.40* (3.01*)
CBA	-0.20 (-0.22**)	1.35* (-5.2*)	1.26* (-7.0**)	0.11 (-0.15)	-0.07 (-0.25)	3.42* (-2.08)
Inflation target	-1.63* (-0.09)	-0.44* (-0.9)	0.45* (-0.40)	0.09 (-0.10)	-0.70*** (-0.17)	-1.17*** (-1.14***)
Total CB independence	0.48*** (-0.13***)	0.20** (-1.9***)	-0.13 (-0.30)	-0.26*** (-0.19***)	-0.37 (-0.10)	-1.74* (-1.44*)
Partial CB independence	0.77* (-0.06)	0.09 (-2.1*)	0.01 (0.60)	-0.24** (-0.18**)	-0.08 (-0.20)	-2.37* (-0.75***)

* Significant at the 1% level, ** significant at the 5% level; *** significant at the 10% level

2.2. Real variables[19]

One of the underlying assumptions of the previous estimations was that nominal frameworks, as the ones analysed here, would only have effects in terms of nominal variables. Nevertheless, several works do try to assess the effects of exchange rate frameworks on growth rates (for an empirical estimation, see Ghosh *et al*, 1997, for a model-based simulation for the accession countries, see Vinhas de Souza and Ledrut, 2001c). Albeit it is not clear, *a priori*, why and through which channels a nominal mechanism would have persistent effects on real variables' growth paths (indeed the studies above tend to find that the differences in growth performance of different regimes tend to be non-significant), a recent work by Levy-Yeyati and Sturzenegger (2001) found consistent positive growth effects from float regimes, using modified Barro-type "growth equations"[20].

[19]In this section, the IMF/IFS series were complemented with data from the Vienna Institute for Comparative International Studies (WIIW).

[20]Those effects are completely due to the developing countries in their sample (which includes all the accession countries, with the exception of Hungary), and the results are robust to the introduction of, among other tests, regional dummies.

On the other hand, and far less controversially, one of the major assumed advantages associated with floating regimes is indeed their assumed capacity to smooth or cushion shocks, which would indicate that they might affect the variability of real variables[21].

Therefore, as a consistency test, the framework above was extended to real series. Given that we are dealing with monthly and quarterly data, the effects could be understood as the short-run effects of the framework on their level and variability.

2.2.1. Unemployment

As the first of the two real variable series, monthly unemployment series were used. A series of provisos must be made here concerning the data in this section: all the countries in the sample suffered massive productive dislocations with the onset of transition, leading to high and, in some cases, due to skills mismatch, persistent unemployment levels. Also, ethnic and linguistic concerns, especially in the Baltic countries, may contribute to above equilibrium unemployment levels while, on the other hand, the official registered unemployment series may likely suffer from a downward bias (see IMF, 2001 (b)). Finally, this is a shorter sample, starting only in January 1991.

Estimating the same equation as before for the unemployment rate we get the results in Table 12, Annex 2. In terms of levels, floats lead to the highest unemployment levels and CBAs to the lowest (perhaps as an indication that one of the assumed mechanisms to underpin the sustainability of a currency board, namely, flexible labour markets, is indeed present in those countries), while inflation targeting frameworks would be able to reduce it, and CBI would actually increase it. The significant standard deviations are rather small and similar across regimes, with some targeting frameworks increasing it, and CBI decreasing it. Considering the skew and the kurtosis, the picture is similar. As Table 13 indicates (see Annex 2), the "additive" assumption is once again confirmed, and here, the assumed variability advantages of more flexible regimes are more strongly observed.

Nevertheless, in terms of a general conclusion, the prior of a worst employment variability performance of more rigid regimes as compared to floats is, perhaps surprisingly, not clearly confirmed.

[21]The "shock-isolation" capabilities of a float regime can be intuitively demonstrated in a simple IS–LM analytical framework (see Visser & Smits (1995)). Both foreign demand and foreign price shocks are cushioned by a floating exchange rate. Nevertheless, a foreign interest rate shock is cushioned neither by a float nor by a peg, but the shock works in opposite directions (in a float, a fall in the "world" interest rates cause a capital inflow and an appreciation of the exchange rate, leading the IS curve to shift to the left, and conversely, in a hard peg regime). However, in case of the float, an active monetary policy can be used as an effective instrument by the domestic policy maker (those conclusions are derived under the assumption of full capital mobility).

2.2.2. GDP

As the second of our two real variable series, quarterly GDP series were used. A proviso that not all countries produce quarterly GDP data applies here as well, so for half of our sample (Hungary, Poland, Romania, Slovakia and Slovenia) industrial production series were used instead. As is known, industrial production can be a rather unreliable proxy for GDP. Those nominal series are turned into real series (using the CPI as a deflator) which are turned into indices' series; their natural logs are used as the dependent variable on our regressions.

Estimating the same equation for the "GDP" series, we get the results in Table 14, Annex 2: in terms of levels, CBAs slightly outperform all other regimes, but the use of inflation targeting would more than fully compensate this difference. Standard deviations, on the other hand, are substantially smaller under a float, with inflation targeting increasing it somewhat, but this is counteracted by the institutional framework. Considering the skew, the float is the highest, but some targeting frameworks and CBI can control this. In terms of the kurtosis, inflation targeting could help a float approach a normal distribution. The "dummy interaction" estimations mostly support those results (see Table 15 in Annex 2).

As a conclusion, the variability and level of our "GDP" series does seem to be, respectively, smaller and greater under more flexible regimes. Therefore, here the usual priors about the regimes do seem to have been confirmed[22].

[22]A question not addressed here is that smaller, less diversified, more open economies could have a greater GDP variability than larger, more closed ones, regardless of the type of combined framework used. This question arises due to the fact that, in our sample, after the initial widespread use of external anchors, only the smaller economies consistently used harder regimes. Such a "endogenous" hypothesis could be tested with a larger set of countries.

Conclusions

The aim of this work was to assess whether a combined framework that included the exchange rate arrangement, the institutional set-up of the monetary authority and the existence of different types of targeting frameworks would yield differences in terms of level and variability of a set of nominal and real variables in a sample made of the accession countries, following the methodology developed by Kuttner and Posen (2001).

The results of the present analysis confirm most of the results obtained by KP. Considering a combined framework with the three elements above, the assumed advantages of more rigid exchange rate regimes in terms of, if not the level, then at least the variability of the series like exchange rate changes, inflation and interest rates, when compared with floating regimes, is no longer observed.

In addition to the work carried out by KP, one of the fundamental underlying assumption in their conclusions is the "additivity" of the significant effects estimated for the individual component of a combined framework (which they do not test). This was assessed via the use of "interactive dummy models", which assumed that the additive nature of individual effects is indeed found to be statistically significant in those estimations (which can be due to the average high level of CBI amongst the countries in our sample).

Most of the gains in the reduction of the variability can be linked to the use of targeting frameworks, especially inflation targeting. The level of independence of a monetary authority is also a significant element in terms of the effects of the arrangement. However, given that the credibility effects associated with it can also be achieved within the institutional set-up of more rigid regimes, the additional gains registered by the more flexible regimes must come from the targeting mechanism.

In another addition to KP's work, this paper also estimated the effects of the combined frameworks in the level and variance of a set of real variables. The results here are less strong than the ones for the nominal set, mostly due to data problems, but at least partially the traditional assumption of a smaller real volatility associated with more flexible regimes seems to be confirmed.

Taken together, the conclusion from the estimations with both sets of nominal and real variables is that it would be Pareto-improving for an economy to switch from a stricter regime to a more flexible one – if that change were coupled with CBI and DIT, given that no losses would be incurred in terms of nominal variability, and gains would be observed in terms of real variability.

Nevertheless, to derive hard policy conclusions from this set of estimations is a more problematic proposition. To start with general questions, the data is rather limited in terms of time and has several shortcomings, as indicated previously. Also, the sample uses a very specific set of countries in a very particular moment in their histories. Of course, the broader conclusions are strikingly similar to the KP conclusions, derived from

a much larger set of countries with a much longer time sample, so their overall robustness can be assumed. It is also assumed that countries can actually choose their exchange rate framework, ie this is not endogenously determined by structural factors such as size, productive structure, etc (for a recent work that supports this "endogenous" view, see Poirson (2001)). On the other hand, another "endogenous" view, and one that actually underpins the current EU integration efforts, would see the structure as endogenous to the policy choice, so an arrangement that may not be optimal *ex ante* becomes optimal *ex post* (see Frankel and Rose (1997)). Also, some of the observed outcomes may be due to non-considered factors (like labour market institutions, the size and openness of the economy and a worldwide environment of low inflation during most of the 1990s). Perhaps more fundamentally, the conclusion about the net Pareto-improving nature of a switch of frameworks does not assume any kind of eventual costs associated with the changeover. It is very easy to conceive that credibility losses could be, under certain circumstances, incurred during the regime change, preventing the country in question from achieving the expected gains. Of course, any credibility losses leading to eventual speculative attacks would arise not from the regime switch per se, but from wrong policy mixes or fundamentals perceived as unsustainable by market agents, which would have negative effects under any type of combined frameworks.

Also, on sheer operational terms, the effectiveness of a DIT framework hangs on the stability of the transmission mechanism of monetary policy, ie on functioning financial markets, and on the availability of an effective model to forecast inflation in an economy[23], as well as on the openness and transparency of the whole procedure to economic agents, so that they can understand and anticipate monetary policy actions[24]. Therefore, no economy during the early stages of the transition process would have been able to successfully implement a DIT framework[25]. However, "transition" started a full decade ago[26], and the conditions are plainly there in a growing subset of the accession countries for its effective introduction.

The conclusion must be that, at least as a policy option, a float coupled with an inflation-targeting framework administered by a credible and independent monetary authority should not be dismissed *a priori*.

[23]Given that monetary policy actions feed into the wider economy with a lag that can be as long as 18–24 months, in practical terms, inflation targeting means inflation forecast targeting.
[24]This, of course, also implies that the private agents must "know the model" which a monetary authority uses.
[25]For some works on DIT in the accession countries, see Christoffersen and Wescott (1999) and Orlowski (2001) and (2000).
[26]And, for some authors, has effectively ended, at least for the accession countries: see Gros and Suhrcke (2000) and Weder (2001). This author actually agrees with this notion, which explains his reluctance to use the term "transition".

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Annex 1: Combined Frameworks

Country	Exchange Rate Regime	Domestic Target	CBI (with the indices by Lougani & Sheets (1998), and by Äima (1997))
Bulgaria	From May 1990, Bulgaria introduced a brief peg to a basket of certain types of import prices and two "market rates". Already in February 1991 it was transformed into a free float unified exchange system. Currently, Bulgaria uses a currency board regime, which linked the Lev to the Deutsch Mark (DEM) until the end of 1999, with a rate of 1.000 Lev to DEM. It was introduced as part of a one-year "stand-by" IMF programme in 1 July 1997 (preparations started with the "stand by" in April), after a bank run, where a third of all banks closed. Exchange rate crisis started already in 1996, which aimed to bring macroeconomic stabilisation into the country (one of its results was to almost immediately bring hyperinflation down from over 1,000% a year to around 5%). Starting from January 1999, the anchor currency of the arrangement became the Euro.	An implicit reserve (base) money intermediate target was used from 1992. Multibank system existed from 1990 onwards (with the conversion of the BNB monobank branches and new entrants), but open market operations were only introduced in 1993.	0.875 (1997) Inconsistent accommodating instance of the National Bank of Bulgaria before CBA, extensive debt monetisation of the government and banking sector deficits (with a more restrictive after episodes like the exchange rate crisis of 1994). Inconsistency of fiscal and monetary policies, limited liberalisation (reforms started in February 1991). Original CBA law from 10 June 1997, last amended in 1999. Article 12(1): Governor elected by the Parliament; Article 14: dismissal only by reasons of crime, impropriety, incapacity. Article 45: Lending to government prohibited (the exceptions are the SDR from multilateral loans, which are part of the Bank's liabilities). IMF entry: 25/9/90
Czech Republic	The Czech Koruna (CZK) followed a peg to DEM/USD basket until May 27, 1997. After a speculative attack against Koruna, the system was forced to abandon (the initial choice of a "nominal anchor" foreign exchange regime was set by the stabilisation programme jointly designed with the IMF in 1990, with the peg being introduced with a substantial cumulative "entry" devaluation of 95%). Among the Eastern European countries endowed with a CB, the Czech Republic can be singled out for its ability to hold on to a fixed exchange rate regime for a record period of time. CZK held its basket peg in a very narrow +/-0.5 band from December 1990 until	The monetary policy intermediate target evolved from the domestic credit volume target (1990) to net domestic assets in the banking system target (1991/92). Finally, an M2 (money and quasi money) "corridor" and, with the introduction of a direct inflation targeting (DIT) framework, from January 1998, a "net inflation" concept (CPI on non-controlled sectors) as the target (3% +/-1% is the target, while a "price stability range" is set at 2% +/-1%). Starting from 2001, the "net inflation" will be set parallel to a CPI target, as a prelude to a full CPI target.	0.875 (1997) Original law from 17 December 1992, last amended in January 2001. Article 6(2): Governor appointed by the President and recalled by him 6(12); 30(2): Debt financing prohibited. IMF entry: 20/9/90 (as the Czech and Slovak Federal Republic, and, since January 1 1993, as separate states).

	February 1996 (when the bands were extended to +/7.5%). The system even survived the Czechoslovakia partition in early 1993 without disturbances. The CNB (*Ceska Narodni Banka* or Czech National Bank) follows a float regime since the mid-1997, coupled with direct inflation targeting (DIT).		
Estonia	Estonia has a currency board system administered by Eesti Pank (Bank of Estonia, BoE) which linked the Estonian Kroon (EEK) to the Deutsch Mark by a rate of EEK 8 to DEM 1, since June 20, 1992. Starting from 1 January 1999 the Estonian Kroon was fixed against the Euro, at the same conversion rate of DEM in the common currency.		1.0 (1998), 0.74 (1997) Original law from 18 May 1993, last amended in 2001. Article 6(1): Governor appointed by the President, confirmed by the Parliament. Article 12: dismissal only by the usual reasons, Article 16: Prohibition of lending to the Government. IMF entry: May 25, 1992
Hungary	From 1990, Hungary used an 11-country basket peg (for non-CMEA transactions), with periodic adjustments for inflation differentials. Starting from December 1, 1991 a new adjustable peg to a DEM/USD basket (with a 50%/50% composition) was introduced. When fiscal deficit reached 9% of the GDP in 1995, the Forint was devalued by 8.3% in March 13, 1995. A crawling peg with a variable pre-announced devaluation rate was introduced (of 0.4% a month now; 1.9% March 13-June 30 1995; 1.3% during 1996 1.2, in April 1 1997 1.1, August 15 1997 1.0, January 1 1998 0.9) towards a DEM/USD basket (with weights of 70% and 30%, respectively), within a +/-2.25% intervention band. Since January 1, 1999 this basket was converted into an Euro/USD one, with the same relative shares. The MNB (*Magyar Nemzeti Bank* or National Bank of Hungary) switched to a full (100%) Euro crawling peg by January 1, 2000, with a pre-announced monthly devaluation rate of 0.3%. The fluctuation band was extended to ±15 (the same range in the ERM-2) on 3 May 2001. A switch to a DIT framework was announced on 13 June, and a full float introduced on 1 October 2001.	The original legal framework for the national bank of Hungary was introduced in 1991. It defined the MNB's aims as safeguarding the internal and external purchasing power of the Hungarian currency. This implied the problem – clear between 1991 and 1994 – of too many targets for monetary policy, inflation control and external balance. In practical terms, policy emphasis shifted from one to the other. This problem was compounded by a postponement of fiscal adjustment. The 1995 fiscal crisis caused the clear selection of price stability as the ultimate target of monetary policy (with the nominal exchange rate being used as an intermediate target). From mid-2001 onwards the system was replaced by inflation targeting.	0.312 (1997) Original law from 1991, with several modifications ever since. Article 19(4): limited budget financing permitted; Article 58: Governor appointed by the President, and can be replaced by him: 58(8)b. IMF entry: 05/06/1982.
Latvia	Latvia uses a peg regime through which the Lats, the currency which replaced the temporary Latvian Ruoble or	The Bank of Latvia uses the exchange rate peg to the SDR as an intermediate target and net domestic assets	0.85 (1998)

	"Rublis" (which, as a dirty float, was the country's first step of monetary independence from the "Ruoble Zone", and lasted from July 20, 1992 to March 1993), is linked to the IMF's fiduciary account unit – the Special Drawing Rights (SDR, which is a basket of currencies of IMF member countries) since February 1994. The SDR's weights roughly reflected Latvian external trade composition (only a third of its foreign trade was with the euro area on the introduction of the arrangement, but in 1999 it reached around 60%). Another reason for this choice is that the creation of the Latvian currency was one of the results of the IMF-backed stabilisation programme in 1992. Peculiarly, *Latvijas Banka* (the Bank of Latvia), in spite of deviating on the surface from its Baltic neighbours on the use of CBA strategy, has consistently emulated at least one of its features – it aims to keep near 100% of its domestic liabilities covered by foreign reserves	as an operational target. As a full-fledged central bank, it has the standard set of indirect monetary policy tools: repurchase agreements ("repos"), a treasury bill market, reserve requirements, and also LLR facilities.	Original law from 19 May 1992, last amended on 1 June 2000 Article 22: Appointment of the Governor by the Parliament (1997 amendment); Article 36: Prohibition of lending (1998). IMF entry: May 19 1992.
Lithuania	Lithuania uses a modified currency board arrangement, introduced in 1994, which pegs the Lithuanian Litas to USD. The Rouble was initially replaced, as in Latvia, by an interim floating coupon currency, the Talonas, in May 1992, issued by the newly re-created Bank of Lithuania (BoL). From May to October 1992 the Talonas co-existed with the Rouble. The talonas was replaced by the Litas in June 1993. The Talonas, in a float regime, lost over 50% of its value between its introduction and April 1993. Some exchange rate stability was regained with the introduction of the Litas. Nevertheless, the government, with the support of the IMF, decided to press for the constitution of an Estonian-type CBA already in October 1993, and the CBA was finally introduced on April 1, 1994 (4/1 USD). It is a modified CBA, since some of the central bank instruments (like reserve requirements and short-term credit facilities, including the LLR) were preserved. Lithuania re-pegged the Litas directly to the Euro on 2 February 2002.		0.125 (1997), 0.82 (1998) Current law from 1994 (1992 Law: Budgetary financing allowed), last amended on 13 March, 2001. Article 27: No lending allowed to the Government; no articles related to board appointment. IMF entry: April 29, 1992.
Poland	The initial choice of a peg regime in Poland was linked to the need to fight hyperinflation in the country in 1989/90. An initial peg with USD was set in 1990, with a substantial undershooting of the "entry level" exchange rate (it was preceded by a basket peg for non-CMEA transactions; CMEA use of "Transferable Rouble" ended in 1 January	Poland switched to a DIT (Direct Inflation Targeting) framework between late 1998 and early 1999. The official announcement of the new policy came as early as September 1998, but the forecast targeting was only applied by the NBP starting from January 1999, and only more precisely formulated as of March 1999. No	0.50 (1997) Original Law from 31 January 1989 (last amended on 1 January 1998). Article 9 (1), Governor appointed by the

	1991). Another devaluation in May 1991 (of 17%) was followed by the introduction of a crawling peg of the Polish Zloty (PLZ) to a currency basket (USD/DEM/GBP/FRF/CHF) by October 1991. Other devaluations followed in February 1992 (10.7%) and in August 1993, when a monthly crawl rate of 1.6% was established. The pace of the progressive flexibility of the foreign exchange regime increased with the introduction of a crawling band regime with ±7% intervention bands in May 1995 (the new regime witnessed the first Zloty *revaluation*, of 6%, in December of the same year), increased to ±10% in February 1998. Then to ±12.5 in October of the same year, in the aftermath of the Russian devaluation, and finally to the current ±15% in March 1999. In a comparable trajectory, the monthly crawl rate was set at 1.5%, in September 1994, 1.4% in November of the same year, 1.2% in February 1995, 1% in January 1996, 0.8 % in February 1998, 0.65% in July 1998, 0.5% in September 1998 and, finally, 0.3% in March 1999. A float was finally introduced in April 2000.	explicit targeting before.	Parliament. Even in the current law, no apparent provisions concerning debt financing. IMF entry: 06/12/1986.
Romania	From 1990 Romania used a basket peg of 6 currencies, in a non-unified forex regime. On February 18 1991, a parallel free exchange rate is introduced, with the official peg rate used for imports and exports. On April 1 1991, a depreciation to the USD (71%) precede the November 11 1991 unification of the forex rates under a float, since May 4, 1992 full float. Romania uses a dirty float regime since then, with the National Bank of Romania (NBR) – the Romanian Central Bank – intervening in the market to support the Leu in a discretionary fashion.	Intermediary target: 1991/1994, M2; 1995 to the present, base money. An inflation target was introduced in 2001: 25% (aims to bring it down to single digits by 2004, with plans for full DIT by 2003). Infrequent open-market operations, from 1997 onwards. Clear lack of consistency between fiscal and monetary policies. Limited liberalisation: most prices were regulated until 1999.	0.50 (1997) Original law from 3 April 1991 independent CB with price stability as its main objective, formally in charge of exchange rate policy, independence strengthened in 1998 (last amendment in October 1999). Article 28(3): temporary loans to the government still allowed, Article 34 (4,6): board appointed and dismissed by the Parliament. State Owned banking sector with quasi-fiscal deficits (20% of GDP 91/92, compared to the central government's 1.8%) financed by "direct credits" during 1992–96, effectively counteracting monetary policy actions. Episodes of IMF backed tightening circumvented by increase in money velocity (double from

			4 to almost 8, from 1991–1994) and widespread arrears (later monetised by law). Open accommodating instance thereafter. IMF entry: 15/12/1972.
Slovakia	Slovakia used a peg regime with intervention bands, through which the National Bank of Slovakia (*Národná Banka Slovenska*, NBS) pegged its Koruna to a basket made of DEM and USD (with weights of 60% and 40%, respectively). The intervention bands had to be progressively widened since the introduction of the regime in 1996, from +/-1.5% to +/-3%, to +/-5%, and then to +/7.0% on January 1 1997. After a series of speculative attacks, the NBS was finally forced to abandon the peg and float the Koruna on October 1 1998.	Domestic M2 intermediate target.	Original law from 18 November 1992 (last amendment in 2001). Article 7(1): the President of the Republic appoints and dismisses bank Governor; Article (26): direct financing seems prohibited by 25(1) and (2). IMF entry: January 1 1993.
Slovenia	Slovenia uses a float system for its Tolar (created on October 8, 1991), administered by the Bank of Slovenia (*Banka Slovenije*, BoSe). During 1996/97, the Tolar experienced a nominal depreciation of 6.9% per cent to the DEM.	Domestic monetary aggregate (M3: money, quasi-money, time and foreign currency deposits) as its intermediate target.	Original law from 25 June 1991. Article 61: short-term loans to the government allowed, no apparent provisions for the dismissal of the Governor. IMF entry: 14/12/1992

Annex 2. Regressions

Table 2

Sample:	**Exchange Rate: depreciation and variability**				
1989:01–2001:05	depreciation	standard deviation	standard deviation 90%	skewness	kurtosis
float	1.63*	2.33*	1.36*	0.28**	0.43
CBA	-0.20	1.35*	1.26*	0.11	-0.07
sliding peg	1.04*	1.26*	1.00*	0.14	0.04
hard peg	1.05*	1.45*	0.95*	0.31*	0.02
narrow money target	3.67	1.66	0.18	0.08	-0.13
broad money target	-1.41*	-0.31*	-0.02	-0.07	-0.14
inflation target	-1.63*	-0.44*	0.45*	0.09	-0.70***
total CB independence	0.48***	0.20**	-0.13	-0.26***	-0.37
partial CB independence	0.77*	0.09	0.01	-0.24**	-0.08
R2	0.008	0.12	0.03	0.02	0.01

* Significant at the 1% level; ** significant at the 5% level; ***significant at the 10% level

Table 3

Sample:	**Exchange rate: depreciation and variability**				
1989:01–2001:05	depreciation	standard deviation	standard deviation 90%	skewness	kurtosis
CBA with total CB independence	0.38*	1.65*	1.46*	-0.23**	-0.57*
CBA with partial CB independence	0.21*	1.09*	0.98*	-0.01	0.06
sliding peg with a broad money target	7.00	9.91***	0.95**	0.45	2.58*
sliding peg with partial CB independence	1.31*	1.49*	1.36*	0.09	0.13
sliding peg with a broad money target and partial CB independence	-7.91	-10.28***	-1.37*	-0.69	-3.08*
hard peg with a broad money target	-12.02*	-3.86*	0.11	-0.37	0.32
hard peg with partial CB independence	11.85*	5.05*	1.03**	0.03	-0.24
hard peg with a broad money target and total CB independence	12.13*	4.61*	0.59	0.41	-0.93
float with a narrow money target	5.26***	3.96	1.53*	0.36*	0.28
float with a broad money target	12.34**	12.44**	2.32*	0.48**	0.34
float with a broad money target and partial CB independence	-11.09***	-10.30***	-0.87***	-0.61**	-0.28
float with a broad money target and total CB independence	-12.58**	-10.00***	-1.37*	-0.15	0.35
float with an inflation target and total CB independence	0.49*	2.07*	1.59*	0.13	0.30
float with an inflation target and partial CB independence	-0.09	1.94*	1.59*	-0.14	-1.58**
R2	0.02	0.04	0.01	0.03	0.03

* Significant at the 1% level; ** significant at the 5% level; *** significant at the 10% level

Table 4

Sample:	**Nominal Effective Exchange Rate Index: depreciation and variability**				
1989:02–2001:03	depreciation	standard deviation	standard deviation 90%	skewness	kurtosis
float	131.09*	3.21*	2.92*	0.01	-0.47
CBA	50.82*	2.01*	1.66*	0.15	-1.02***
sliding peg	120.66*	1.79*	1.90*	-0.05	-0.50**
hard peg	164.01*	2.74*	2.02*	-0.09	-0.34
narrow money target	-25.16**	0.24	0.28	0.14	0.66
broad money target	-52.66	-19.13*	-8.81*	-0.01	0.28
inflation target	-56.52*	-0.93	-0.84	0.13	-0.49
total CB independence	23.74*	-1.52*	-1.22*	-0.04	0.85
partial CB independence	29.34	17.31*	7.27*	0.12	0.03
R2	0.31	0.11	0.08	0.004	0.01

* Significant at the 1% level; ** significant at the 5% level; *** significant at the 10% level

Table 5

Sample:	**Nominal Effective Exchange Rate Index: depreciation and variability**				
1989:01–2001:05	depreciation	standard deviation	standard deviation 90%	skewness	kurtosis
CBA with total CB independence	83.60*	0.82*	0.83*	0.11	-0.19
CBA with partial CB independence					
sliding peg with a broad money target	3638.93*	168.07	168.07	0.35	1.07
sliding peg with partial CB independence	110.78*	1.27*	1.29*	0.06	-0.48*
sliding peg with a broad money target and partial CB independence	-3647.23*	-168.76	-168.78	-0.38	-0.83
hard peg with a broad money target					
hard peg with partial CB independence	1006.01*	93.68*	49.51*	0.26	-0.31
hard peg with a broad money target and partial CB independence	-906.63**	-93.44*	-49.28*	-0.33	0.03
float with a narrow money target	105.55*	3.44*	3.20*	0.15	0.20
float with a broad money target	399.15*	57.29	57.29	0.06	-0.47
float with a broad money target and partial CB independence	-305.69*	-56.43	-56.37	0.04	0.64
float with a broad money target and total CB independence					
float with an inflation target and total CB independence	99.16*	0.89*	0.89*	0.10	-0.03
float with an inflation target and partial CB independence	78.14*	1.04*	1.03*	0.20	-1.42**
R2	0.99	0.10	0.07	0.006	0.01

* Significant at the 1% level; ** significant at the 5% level; *** significant at the 10% level

Table 6

Sample:	**Real Effective Exchange Rate Index: depreciation and variability**				
1989:02–2001:03	depreciation	standard deviation	standard deviation 90%	skewness	kurtosis
float	100.77*	1.59*	1.54*	-0.33**	-0.32
CBA	124.93*	1.61*	1.14*	-0.00	0.04
sliding peg	102.03*	0.92*	0.80*	-0.03	-0.36
hard peg	92.05*	1.10*	0.94*	-0.04	-0.15
narrow money target	-1.86	1.13**	1.20**	0.36***	0.20
broad money target	6.25*	-0.45*	-0.64*	0.19	0.02
inflation target	23.64*	0.10	-0.44*	0.31	0.50
total CB independence	-10.76*	-0.56**	-0.11	-0.02	-0.36
partial CB independence	-4.87*	0.05	0.38**	0.04	0.06
R2	0.95	0.01	0.01	0.006	0.003

* Significant at the 1% level; ** significant at the 5% level; *** significant at the 10% level

Table 7

Sample:	**Real Effective Exchange Rate Index: depreciation and variability**				
1989:01-2001:05	depreciation	standard deviation	standard deviation 90%	skewness	kurtosis
CBA with total CB independence	114.27*	1.10*	1.08*	0.00	-0.43***
CBA with partial CB independence	129.86*	1.33*	1.31*	0.02	0.26
sliding peg with a broad money target	121.89*	7.68**	7.68**	0.23	-0.47
sliding peg with partial CB independence	102.34*	1.11*	1.09*	0.06	-0.25
sliding peg with a broad money target and partial CB independence	122.55*	-8.18**	-8.14**	-0.14	0.54
hard peg with a broad money target					
hard peg with partial CB independence	62.40*	2.85*	2.75*	-0.01	-0.02
hard peg with a broad money target and partial CB independence	34.41*	-2.45*	-2.34*	0.28	-0.16
float with a narrow money target	97.86*	2.71*	2.74*	0.02	-0.12
float with a broad money target	88.42*	4.97	4.72	-0.12	-0.22
float with a broad money target and partial CB independence	15.53*	-3.86	-3.41	0.01	-0.22
float with a broad money target and total CB independence					
float with an inflation target and total CB independence	113.79	1.11*	0.94*	-0.11	0.13
float with an inflation target and partial CB independence	125.12*	1.60*	1.56*	0.24	-0.74
R2	0.98	0.02	0.005	0.005	0.004

* Significant at the 1% level; ** significant at the 5% level; *** significant at the 10% level

Table 8

Sample:	**CPI: level and variability**				
1989:01–2001:05	level	standard deviation	standard deviation 90%	skewness	kurtosis
float	3.40*	1.39*	0.70*	2.22*	11.68*
CBA	3.42*	1.32*	0.49*	2.10*	10.83*
sliding peg	2.55*	1.04*	0.58*	2.08*	9.85*
hard peg	2.69*	1.15*	0.63*	1.72*	6.47*
narrow money target	1.07	0.24	0.59*	0.04	-2.97*
broad money target	0.43	0.00	-0.35*	-1.47*	-9.26*
inflation target	-1.17***	-0.44	-0.63*	-1.26*	-7.58*
total CB independence	-1.74*	-0.45	0.20	2.68*	16.87*
partial CB independence	-2.37*	-0.80*	0.03	1.20*	6.80*
R2	0.02	0.002	0.05	0.43	0.30

* Significant at the 1% level; ** significant at the 5% level; *** significant at the 10% level

Table 9

Sample:	**CPI: level and variability**				
1989:01–2001:05	level	standard deviation	standard deviation 90%	skewness	kurtosis
CBA with total CB independence	1.24*	14.91*	0.64*	5.45*	39.53*
CBA with partial CB independence	0.98*	7.90*	0.56*	1.92*	5.92*
sliding peg with a broad money target	10.04*	7.66*	2.71*	0.67*	2.15*
sliding peg with partial CB independence	1.73*	11.95*	0.68*	4.21*	23.16*
sliding peg with a broad money target and partial CB independence	-11.12	-19.16*	-3.12*	-3.71*	-20.48*
hard peg with a broad money target	-11.68	-15.30*	-1.05*	-0.65*	-1.94*
hard peg with partial CB independence	12.45*	15.72*	1.33*	1.48*	4.96*
hard peg with a broad money target and total CB independence	12.45*	23.81*	1.49*	3.98*	17.96*
float with a narrow money target	4.39*	10.56*	1.26*	2.33*	9.24*
float with a broad money target	8.89*	6.36*	1.74*	1.07*	3.98*
float with a broad money target and partial CB independence	-7.78*	-3.91*	-1.41*	1.59*	8.43*
float with a broad money target and total CB independence	-2.19	6.73*	-0.02	0.26*	0.14
float with an inflation target and total CB independence	0.49*	0.67*	0.25*	2.46*	11.37*
float with an inflation target and partial CB independence	0.53*	9.21*	0.25*	5.55*	38.01*
R2	0.01	0.81	0.18	0.82	0.83

* Significant at the 1% level, ** significant at the 5% level; *** significant at the 10% level

Table 10

Sample:	**Real Interest Rate: level and variability**				
1989:01–2001:05	level	standard deviation	standard deviation 90%	skewness	kurtosis
float	50.20*	7.18*	2.34*	0.81*	6.96*
CBA	31.43*	3.61	0.60*	-3.17*	-16.76*
sliding peg	24.48*	1.44*	0.71*	0.05	3.05*
hard peg	28.69*	2.31*	1.26*	-0.15*	1.90*
narrow money target	9.92*	0.50***	1.39**	-1.45*	6.12*
broad money target	4.76	1.16	-0.91*	-3.23*	-20.13*
inflation target	-26.90*	-4.66**	-2.41*	-2.10**	2.72
total CB independence	-13.84*	-1.93	0.65	3.86*	20.58*
partial CB independence	-17.02*	-2.40	0.52	4.62*	25.22*
R2	0.37	0.06	0.02	0.30	0.16

* Significant at the 1% level; ** significant at the 5% level; *** significant at the 10% level

Table 11

Sample:	**Real Interest Rate: level and variability**				
1991:01–2001:05	level	standard deviation	standard deviation 90%	skewness	kurtosis
CBA with total CB independence	14.62*	15.02*	1.15*	0.79*	3.43*
CBA with partial CB independence	19.63*			0.85*	3.00*
sliding peg with partial CB independence	27.43*	530.84*	0.93*	8.54*	77.95*
sliding peg with a broad money target and partial CB independence	-14.81*	-530.09*	-0.51*	-8.17*	-74.28*
hard peg with a broad money target	203.45	-680.67*	-4.32*	-2.88*	-12.04*
hard peg with partial CB independence	215.96	681.31*	4.72*	2.78*	14.15*
hard peg with a broad money target and total CB independence	225.75	698.31*	5.94*	3.55*	14.59*
float with a narrow money target	59.27*	23.88*	3.73*	-0.57	10.54*
float with a broad money target	70.23*	14.50*	2.80*	2.01*	6.53*
float with a broad money target and partial CB independence	-51.52*	74.73*	-1.09*		
float with a broad money target and total CB independence	-2.26	-8.29*	-0.36*		
float with an inflation target and total CB independence	9.43*	1.46*	0.53*	-0.41*	4.11*
float with an inflation target and partial CB independence	19.71*	388.34*	0.40*	11.37*	132.65*
R2	0.62	0.67	0.04	0.72	0.56

* Significant at the 1% level; ** significant at the 5% level; *** significant at the 10% level

Table 12

Sample:	**Unemployment: level and variability**				
1989:01–2001:05	level	standard deviation	standard deviation 90%	skewness	kurtosis
float	11.56*	0.03	0.23*	-0.39*	1.88*
CBA	7.08*	0.05	0.27*	-0.30*	2.29*
sliding peg	9.44*	0.20*	0.24*	-0.11*	3.40*
hard peg	7.20*	0.40*	0.19*	-0.32*	2.23*
narrow money target	-1.43**	0.22*	0.01	-0.44*	1.21*
broad money target	-2.50*	0.17*	-0.02	-0.30*	1.34*
inflation target	-3.69*	0.03	0.02	1.12*	0.70*
total CB independence	2.89*	0.29*	-0.08*	-0.39*	0.88*
partial CB independence	4.39*	-0.05*	-0.07*	0.02	-0.07
R2	0.82	0.25	0.01	0.45	0.27

* Significant at the 1% level; ** significant at the 5% level; *** significant at the 10% level

Table 13

Sample:	**Unemployment: level and variability**				
1991:01–2001:05	level	standard deviation	standard deviation 90%	skewness	kurtosis
CBA with total CB independence	11.39*	2.40*	0.18*		3.30*
CBA with partial CB independence	7.41*	1.42*	0.20*	0.03	2.32*
sliding peg with partial CB independence	13.36*	2.56*	0.17*	-0.72*	
sliding peg with a broad money target and partial CB independence	-1.12*	0.02	-0.02	-0.66*	4.95*
hard peg with a broad money target	-5.30*	0.02	-0.31*	-0.77*	1.81*
hard peg with partial CB independence	8.39*	0.68*	0.39*	0.38*	1.77*
hard peg with a broad money target and total CB independence	12.88*	1.17*	0.40*	-0.21**	2.60*
float with a narrow money target	10.29*	2.61*	0.24*	-0.86*	3.23*
float with a broad money target	8.63*	1.89*	0.22*	-0.39*	2.02*
float with a broad money target and partial CB independence	5.32*	-0.53*	-0.08*	-0.65*	1.86*
float with a broad money target and total CB independence	-3.76*	-1.05*	-0.08*	0.04	-0.19*
float with an inflation target and total CB independence	7.52*	1.55*	0.16*	0.90*	3.71*
float with an inflation target and partial CB independence	14.53*	2.42*	0.16*	-0.46*	2.56*
R2	0.86	0.85	0.00	0.52	0.81

* Significant at the 1% level; ** significant at the 5% level; *** significant at the 10% level

Table 14

Sample:	**GDP: level and variability**				
1989:1–2001:2	level	standard deviation	standard deviation 90%	skewness	kurtosis
float	1.98*	0.01*	0.013*	0.78*	-0.68***
CBA	2.01*	0.04*	0.040*	0.44***	0.12
sliding peg	1.99*	0.02*	0.020*	0.31***	-0.27
hard peg	1.97*	0.03*	0.022*	0.61*	-0.18
narrow money target	-0.03	0.01	0.001	-0.99*	0.23
broad money target	-0.03	0.00	0.000	-0.50**	0.55
inflation target	0.03**	0.01*	-0.013*	0.06	2.02*
total CB independence	-0.01	-0.00*	-0.011*	-0.65**	-0.41
partial CB independence	0.00	-0.00*	-0.008	-0.43**	-0.20
R2	0.99	0.23	0.20	0.10	0.05

* Significant at the 1% level; ** significant at the 5% level; *** significant at the 10% level

Table 15

Sample:	**GDP: level and variability**				
1989:1–2001:2	level	standard deviation	standard deviation 90%	skewness	kurtosis
CBA with total CB independence	1.89*	0.026*	0.026*	-0.20	-0.90**
CBA with partial CB independence	1.89*	0.036*	0.035*	-0.01	0.34
sliding peg with a broad money target	0.47*	0.007*	0.009*	-0.52*	0.56
sliding peg with partial CB independence	1.54*	0.010*	0.009*	-0.19	-0.20
hard peg with total CB independence	2.05*	0.009*	0.009*	-0.58**	0.14
hard peg with a broad money target and partial CB independence	1.96*	0.017*	0.016*	0.4	0.20
float with a narrow money target	1.91*	0.017*	0.016*	-0.22	-0.50
float with a broad money target	1.95*	0.020*	0.016*	0.03	0.36
float with a broad money target and partial CB independence	0.05*	-0.015*	-0.011	-0.15	-0.86
float with a broad money target and total CB independence	0.05*				
float with an inflation target and total CB independence	1.98*	0.017*	0.017*	0.23	1.23*
float with an inflation target and partial CB independence	2.02*	0.008*	0.008	0.41	-1.49
R2	0.99	0.45	0.38	0.09	0.10

* Significant at the 1% level; ** significant at the 5% level; *** significant at the 10% level