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Policy Development and Review Department and European II Department

**Ratchet Effects in Currency Substitution: An Application to the Kyrgyz Republic**

Prepared by Joannes Mongardini and Johannes Mueller<sup>1</sup>

Authorized for distribution by Hugh Bredenkamp and Julian Berengaut

July 1999

**IMF WORKING PAPER**



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## IMF Working Paper

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#### **Abstract**

Currency substitution is now a common issue in the design of monetary policy in most transition economies. This paper analyzes the persistence of this phenomenon in the Kyrgyz Republic by including a ratchet variable in the model specification. The main conclusion of the paper is that, while some degree of persistence is present in the allocation of bank deposit, currency substitution in the economy at large has not yet reached a point where reversing it would be difficult. In this regard, there is still room for monetary policy to influence currency allocation in the private sector.

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## I. INTRODUCTION AND SUMMARY OF FINDINGS

1. This paper analyzes the currency substitution (CS) process in the Kyrgyz Republic during the period May 1993-October 1998, covering the timespan between the introduction of the national currency, the som, and the first three months after the Russia crisis hit the Kyrgyz economy in mid-1998. During that period, the ratio of foreign currency deposits to total deposits rose from about 12 percent to 45 percent (Figure 1). The ratio had reached its maximum of about 46 percent already in February 1997 and has since hovered at around 40 percent, with some seasonal variation.

2. It thus appears that the use of foreign currency has become persistent in the Kyrgyz Republic, since the factors that are typically conducive to a decline in the CS ratio—moderate inflation, resumption of growth, stability of the exchange rate, and a relatively calm political situation—have been at work throughout 1997 and most of 1998 (until the onset of the Russia crisis) without yet significantly affecting the ratio. This seems to be consistent with evidence from Latin American and other countries where these factors have led to a reduction in the CS ratio only after long lags. While currency substitution per se, even if it is persistent, may have beneficial effects on an economy and may not need to be discouraged,<sup>2</sup> it is nevertheless important to understand its determinants in order to be able to appropriately design monetary policy.

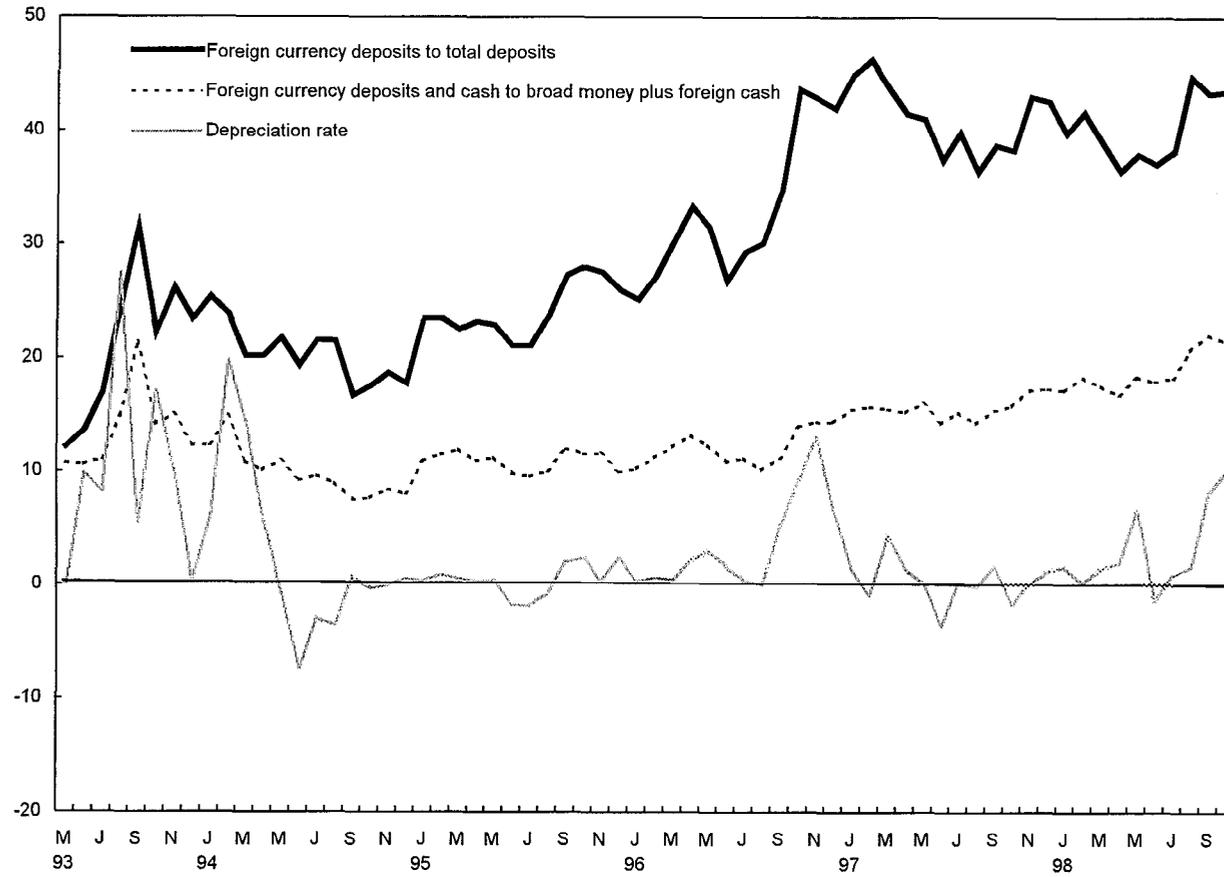
3. Against this background, this paper identifies the determinants that have driven the CS process in the Kyrgyz Republic during the five years leading to the onset of the Russia crisis, including such factors that have traditionally been used in CS studies, i.e., the interest rate differential and the expected depreciation rate. However, based on Mueller (1994), the econometric analysis goes beyond the conventional CS literature by explicitly addressing the persistence in the use of foreign currency. This hysteresis is modeled through the inclusion of a ratchet variable, which implies an asymmetric substitution process between domestic and foreign currency.

4. The existence of an asymmetry in currency substitution is explained by the fixed costs of developing, learning and applying new money management techniques to "beat" inflation. Once these fixed costs are paid for, there are few incentives for households and enterprises to switch back to the domestic currency after the end of the period of instability, thus causing a more prolonged, or a ratchet effect, on the relative demand for foreign and domestic currency even if macroeconomic stabilization is achieved. The credibility of the authorities' stabilization

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<sup>2</sup>See International Monetary Fund (1999). For example, reliance on foreign currency could be a catalyst for financial intermediation in a high-inflation environment. It could also foster a closer integration with international markets, increase exposure to competition from these markets, and make available a more complete range of assets for domestic investors.

Figure 1. Kyrgyz Republic: Measures of Dollarization, 1993-98  
(In percent)



Sources: Kyrgyz authorities; and Fund staff estimates.

efforts may shorten or prolong the duration of the ratchet effect as well as influence its strength.<sup>3</sup>

5. Given the central role of the ratchet effect in the present study, the analysis does not go beyond October 1998 as it is evident that the Russian financial crisis has had a temporary impact on the process of macroeconomic stabilization in the Kyrgyz Republic and induced a renewed phase of currency substitution. The situation is aggravated by the fact that banks have begun to report repayment difficulties by some borrowers for dollar-denominated loans as a result of the sharp depreciation of the som vis-à-vis the U.S. dollar, which, coupled with other factors that go beyond the scope of this paper, led to considerable distress in the Kyrgyz banking system.

6. A second feature of this paper is that it experiments with a second, more comprehensive, definition of currency substitution by including the estimated amount of foreign and domestic cash circulating in the Kyrgyz Republic in the CS definition, based on flow data and a recent survey undertaken by the National Bank of the Kyrgyz Republic (NBKR). By including cash, the CS ratio rises from just above 10 percent in May 1993 to slightly above 20 percent in October 1998, exhibiting a continuous, albeit less pronounced, upward trend and less seasonal variation than the deposit-based CS ratio (Figure 1). The figure implies that the public appears to be more willing to hold a greater share of foreign currency in bank accounts than domestic currency.

7. The econometric results indicate that the interest rate differential and the depreciation of the exchange rate are significant CS determinants in the Kyrgyz economy. Moreover, confirming the anecdotal evidence of Figure 1, while there may be a ratchet effect in the currency allocation of deposits, such an effect cannot be detected in the broader CS definition including foreign currency cash. This implies that the economy *as a whole* has not yet reached a degree of currency substitution that would make the process asymmetric and difficult to reverse, suggesting that policy measures may still have a strong impact on the portfolio decisions of the private sector. However, given the significance of the ratchet variable for the deposit-only CS ratio, particularly strong policies would need to be pursued over an extended period of time so as to convince deposit holders to switch back to som-denominated assets.

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<sup>3</sup>In view of the presence of hysteresis in the data set, this paper follows the distinction between currency substitution and dollarization described in Mueller (1994). Accordingly, "currency substitution" is defined to exist within an economy when the substitution process can be considered symmetrical and reversible, as the driving forces behind the substitution process can *to the same extent* induce an increase or a decrease in the use of foreign currency. On the other hand, an economy is defined as "dollarized", when an asymmetric reaction of the use of foreign currency to changes in the determinants is observed. This implies, for example, that in a dollarized economy, the demand for foreign currency rises when the local currency depreciates, but falls *by a lesser extent* when the local currency appreciates.

8. The paper is structured as follows. Section II describes the two CS definitions used in this paper to describe and measure the CS degree. Section III provides anecdotal evidence of the extent of CS in BRO countries. Section IV highlights the process of macroeconomic stabilization in the Kyrgyz Republic and sets it into perspective with the path of CS during the last five years. Section V is devoted to the ratchet variable itself, providing a brief theoretical background and an overview of its use in other empirical studies. Section VI describes the econometric model and the estimation results, while Section VII provides some general conclusions and policy implications.

## II. MEASURING THE DEGREE OF CURRENCY SUBSTITUTION

9. This paper uses two different definitions to measure the degree of currency substitution in the Kyrgyz economy. The first measure (*CS1*), which is widely used in the empirical CS literature, is defined as the ratio of foreign currency deposits to total deposits in the Kyrgyz banking system and is derived from the monetary survey of the NBKR.

10. Foreign currency denominated bills and coins circulating within an economy are generally omitted in the CS ratios of most studies. This is mainly due to the fact that the stock of foreign cash in circulation within a particular country is difficult to measure and can only be roughly approximated based on generally very restrictive assumptions.<sup>4</sup> While this caveat also applies to this study, the relatively low extent of financial intermediation in transition economies such as the Kyrgyz Republic warrants at least an attempt to capture the cash economy and compare the econometric results of this measure with the more traditional approach found in other CS studies.

11. Against this background, the second measure (*CS2*) of currency substitution used in this paper is defined as the ratio of foreign currency deposits and cash to broad money. The foreign cash component of this measure is inferred from combining the stock of foreign exchange estimated in a recent survey undertaken by the NBKR among foreign exchange bureaus with daily data the NBKR has been collecting since January 1996 on the flows of foreign currency through these bureaus, which are the main source for foreign currency cash in the Kyrgyz economy. Prior to January 1996, the data were extrapolated by assuming that foreign cash holdings moved proportionately to foreign currency deposits.<sup>5</sup> According to the NBKR survey, the stock of foreign cash circulating in the Kyrgyz Republic in July 1998

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<sup>4</sup>As pointed out by Savastano (1992 and 1996), some authors tried to estimate the amount of foreign currency bills in circulation in certain LDCs, e.g. Melvin and Afcha de la Parra (1989) or Kamin and Ericsson (1993). However, according to Savastano, the usefulness of these estimations is doubtful, given the extremely restrictive assumptions on the velocity of circulation of domestic money balances and other variables.

<sup>5</sup>This is equivalent to assuming that the CS ratio only moves on account of foreign currency deposits, thus avoiding any bias from the extrapolation.

amounted to about 4 percent of som-denominated currency in circulation or about 16 percent of foreign-currency denominated deposits. Close to 90 percent of this cash was estimated to be in U.S. dollars, with the remainder being held in Russian ruble (5 percent), deutschmarks (3 percent), and Kazakh tenge (2 percent).

### **III. MACROECONOMIC STABILIZATION AND CURRENCY SUBSTITUTION IN THE KYRGYZ REPUBLIC**

12. After independence in 1991 and the introduction of a domestic currency in May 1993, the Kyrgyz Republic rapidly adopted a reform and adjustment strategy to transform the economy to a market system, thereby becoming one of the earliest and most active reformers within the BRO. Supported under various IMF programs, the government pursued generally tight financial policies, which over time helped reduce the annual inflation rate to single-digit levels by mid-1998.

13. The government also implemented a broad structural reform program to create a market-friendly environment to promote the resumption of growth driven by the private sector: most prices were liberalized, a liberal trade regime was introduced, and most capital controls were eliminated. Significant progress was also achieved in creating a two-tier banking system: several banks were either closed or restructured in 1996, leading to increasing public confidence in the banking system until recently when signs of distress in the banking system emerged.<sup>6</sup>

14. Notwithstanding the overall macroeconomic stabilization up to mid-1998, periods of economic uncertainty and rising inflationary expectations have repeatedly re-emerged during the last five years, extending pressure on the exchange rate and inducing a further increase in the CS-ratio. For example, the relaxation of fiscal and monetary policies in late 1995 in the run-up to the presidential election and the lack of sterilization by the NBKR at end-1996 led to dramatic increases in the inflation rate and a sharp depreciation of the exchange rate, which were ultimately associated with a noticeable rise of the CS ratio (Figure 1).

15. With the exchange rate stabilizing during 1997 and much of 1998 (before the Russia crisis), financial intermediation finally took off. Nevertheless, despite a near doubling of both deposits and credits during the period, the respective ratios of dollar deposits to total deposits and dollar credits to total credits have remained virtually unchanged. Banks' demand for dollar-denominated deposits appears to have also varied in line with changing needs to keep their foreign exchange exposure in check at any given point in time, leading to highly volatile interest rate spreads for som- and dollar-denominated deposits over time. Hence, as banks stirred to attract dollar-denominated deposits, the interest rate differential may at times not have been sufficiently high to compensate som depositors for the expected depreciation of the

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<sup>6</sup>For a description of the components of financial sector reform, see the IMF Staff Country Report No. 98/8.

domestic currency and the risk premium that inevitably is associated with it, thereby containing the decline in the CS-ratio.

#### IV. EVIDENCE OF CURRENCY SUBSTITUTION IN BRO COUNTRIES<sup>7</sup>

16. The process of currency substitution has also been a feature of other transition economies during the last few years.<sup>8</sup> The process began at the time these countries lifted restrictions on foreign currency holdings as part of their efforts to liberalize their economies. In general, the use of foreign currency also reflected a one-time stock adjustment, given the former Soviet Union's central allocation of all international trade through specialized institutions and the strict prohibition on domestic residents to hold foreign currency.

17. Beyond these factors, though, the rising use of foreign currency also appears to mirror the attempts of economic agents to hedge against inflation and/or exchange rate depreciation during periods of large macroeconomic imbalances at the beginning of the respective country's reform and adjustment process. In this context, permitting foreign currency deposits may have also served as a vehicle to foster financial intermediation and financial deepening at a time when banking systems were still considered fragile, thereby laying the foundation for the expansion of commercial banks' operations.

18. Depending on the extent and speed with which restrictions on foreign currency holdings were lifted, the CS ratios in the BRO countries rose rapidly, from virtually nil at independence to an unweighted average of about 35 percent for all BRO countries at end-1995. However, as shown in Figures 2 to 4, by end-1995, there is a substantial variation in the CS ratio across countries: from below 25 percent in Estonia, Moldova, Uzbekistan, and Turkmenistan to 50 percent or above in Armenia, Azerbaijan, Latvia and Georgia. Moreover, while seven countries experienced a further increase in their CS ratio by mid-1998—with substantial increases recorded for Armenia, Azerbaijan, Georgia, and Turkmenistan—the CS ratio declined in six other CIS countries, particularly in Belarus, Kazakhstan, and Ukraine. Overall, the unweighted average CS ratio of the sample countries rose to about 40 percent by mid-1998.

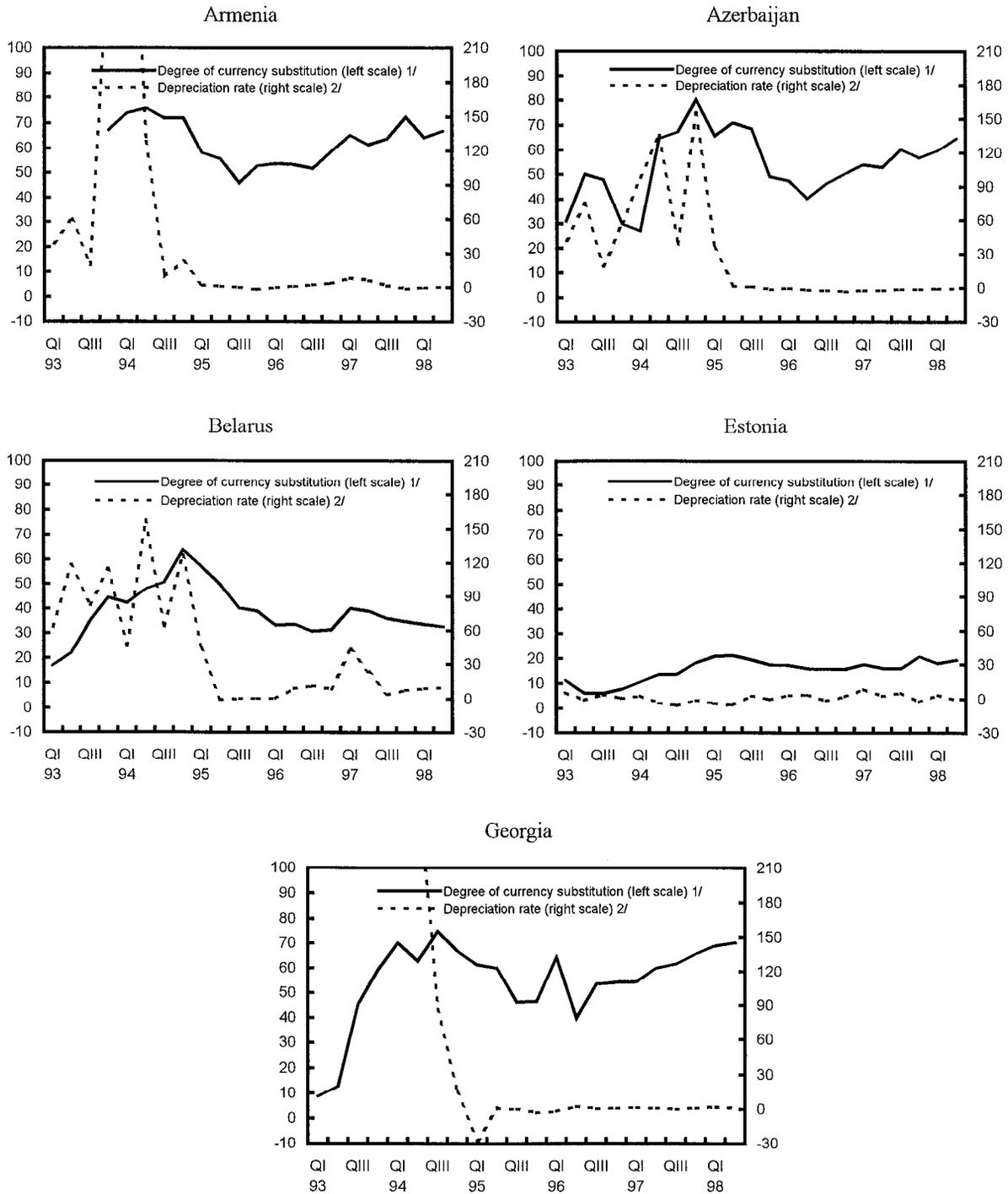
19. The way in which countries induced a reduction in their respective CS ratio varied considerably. Some countries resorted to tighter restrictions on foreign exchange holdings, such as Belarus and Ukraine. The latter, for example, introduced a multiple exchange rate regime and tightened the surrender requirements in 1993. Other countries enjoyed the first outcome of their adjustment efforts, like Kazakhstan and Lithuania. These countries rapidly introduced a currency reform and pursued tight fiscal and monetary policies, in the case of

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<sup>7</sup>Only anecdotal evidence is presented, based on Figures 2 to 4, so as to put the developments in the Kyrgyz Republic into perspective, and the general statements made in this section thus warrant a more detailed, country-specific analysis in a different forum.

<sup>8</sup>For an overview on dollarization in transition economies, see Sahay and Végh (1995).

Figure 2. Armenia, Azerbaijan, Belarus, Estonia, and Georgia:  
Degree of Currency Substitution and Depreciation Rate, 1993-98

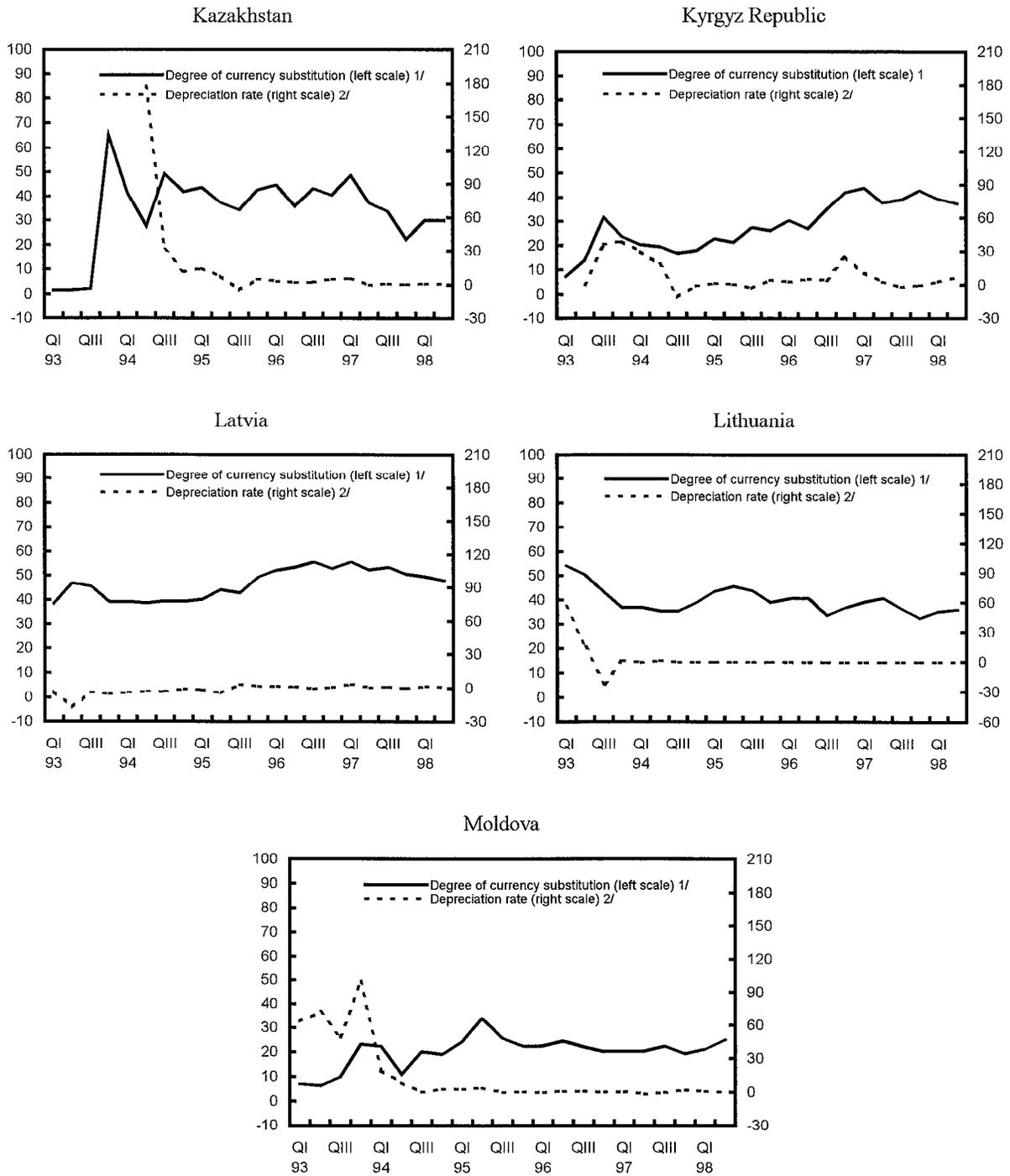


Sources: European II Common Database.

1/ Degree of currency substitution is defined as ratio of foreign exchange deposits to total deposits. For some countries, the available data do not cover the entire observation period.

2/ Depreciation rate of domestic currency vis-à-vis the U.S. dollar.

Figure 3. Kazakhstan, Kyrgyz Republic, Latvia, Lithuania, and Moldova:  
Degree of Currency Substitution and Depreciation Rate, 1993-98

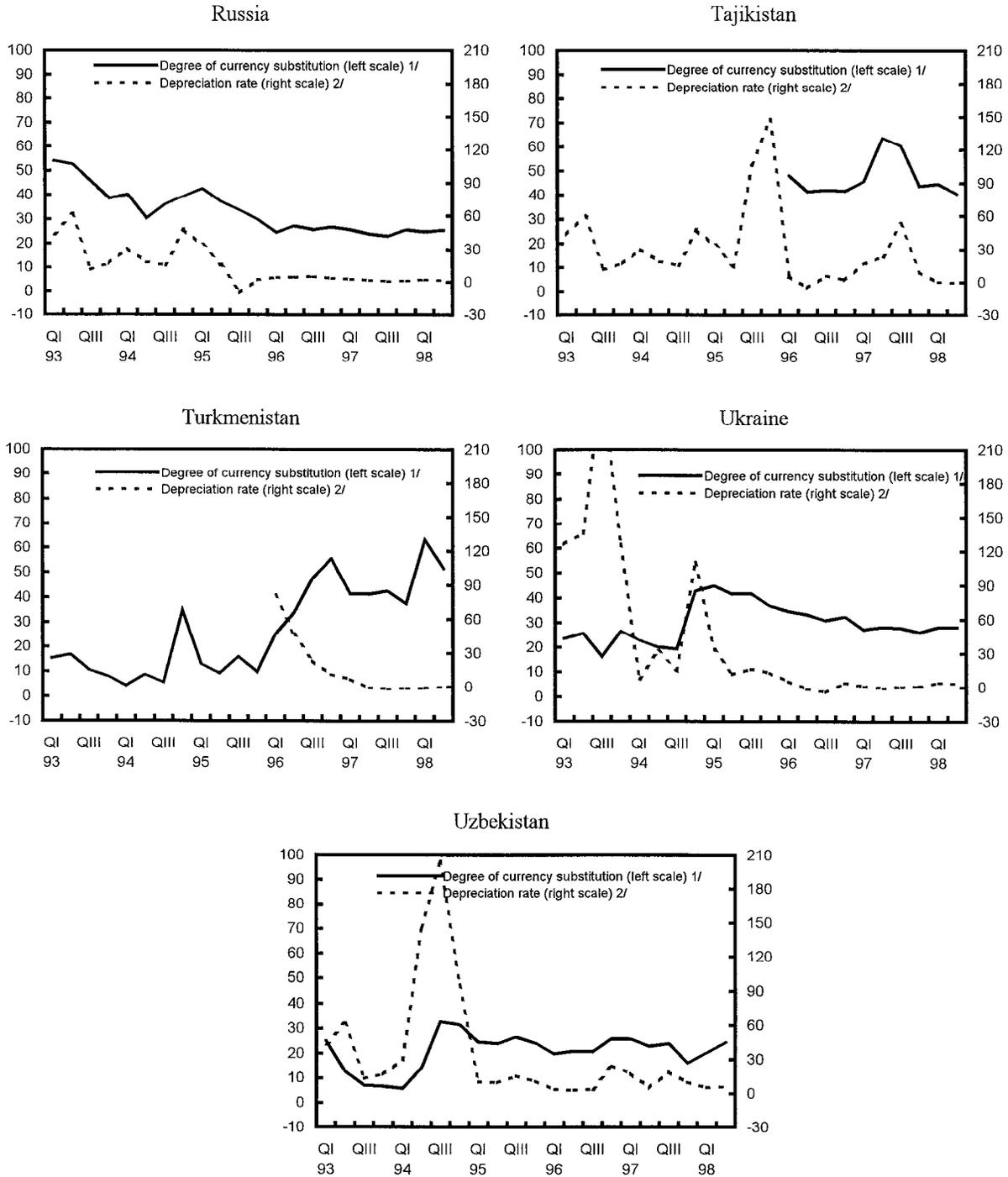


Sources: European II Common Database.

1/ Degree of currency substitution is defined as ratio of foreign exchange deposits to total deposits. For some countries, the available data do not cover the entire observation period.

2/ Depreciation rate of domestic currency vis-à-vis the U.S. dollar.

Figure 4. Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan:  
Degree of Currency Substitution and Depreciation Rate, 1993-98



Sources: European II Common Database.

1/ Degree of currency substitution is defined as ratio of foreign exchange deposits to total deposits. For some countries, the available data do not cover the entire observation period.

2/ Depreciation rate of domestic currency vis-à-vis the U.S. dollar.

Lithuania anchored by a currency board, which led to a rapid deceleration of the inflation rate. While macroeconomic stabilization took hold in almost all of the BRO countries sooner or later, with a decline in inflation and a slowdown in the depreciation of the exchange rate, Figures 2 to 4 suggest that CS ratios, even if they have been declining, have remained at relatively high levels throughout.

20. It thus appears that, in line with the evidence on Latin American and other countries, macroeconomic stabilization in transition economies may have not yet induced a decline in the CS ratio. While these developments suggest that there may be a ratchet effect at work in BRO countries, the process of restoring growth and inducing disinflation in these economies is still ongoing, and the impact of the Russian financial crisis on BRO economies is likely to have further delayed this process.

## V. THE RATCHET EFFECT

21. In economic models that include a ratchet effect, it is assumed that the dependent variable reacts asymmetrically to changes in one of the key explanatory variables, depending on whether the latter is rising or falling. The ratchet effect in these models is usually accounted for through the inclusion of the past peak value of an independent variable, in addition to the current value of that variable, or of the past peak value of the dependent variable. This concept has been applied in different areas of applied economics, such as consumption theory<sup>9</sup> and monetary economics.

22. In the context of monetary economics, the ratchet effect has been included in a variety of empirical studies on the demand for money in several countries, including the United States and some high inflation economies. Although diverse in their specification and estimation method, these studies generally define the ratchet variable as the largest previously achieved value of one of the independent variables over a given period, i.e., the past peak value of the interest rate, the inflation rate, or the depreciation rate. Generally, the ratchet variable is found to be significant, and the respective equations show lower standard errors and a better fit than more traditional empirical formulations.

23. Estimations of money demand functions for the United States in the late-1970s and early-1980s introduced ratchet variables to explain the impact of volatile and high interest rates as a way to improve the econometric fit of traditional money demand models. The

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<sup>9</sup>Duesenberry's relative income hypothesis included the highest previously achieved level of income as a determinant of the current level of consumption, implying asymmetric behavior of the consumption function (Duesenberry (1952)).

money demand functions that explicitly modeled this asymmetry generally added the most recent interest rate peak as one of the exogenous variables.<sup>10</sup>

24. Asymmetry in the money demand function was also assumed in some of the empirical studies on high inflation countries during the 1980s.<sup>11</sup> However, instead of using the past interest rate peak as the ratchet variable, these studies focussed on the effect of inflation on domestic real money balances, thus defining the past maximum of the inflation rate or, alternatively, the peak depreciation rate of the local currency as the ratchet variable in their respective models. Empirical evidence from these studies suggests that hysteresis in the money demand function in high inflation countries exists in a form such that when inflation rises to unprecedented levels, the elasticity of money demand is higher than when inflation is falling.

25. In all of these studies, the asymmetric reaction of money demand to changes in the respective independent variable was attributed to cost considerations of households; once the fixed costs of an investment in new money management techniques are borne, the new product or strategy remains in place and is not discarded even though interest rates, inflation rates, or depreciation rates decline again. In the case of high inflation countries, the ratchet effect was attributed to a costly process of developing, learning and applying strategies to "beat" inflation.<sup>12</sup> Such strategies, commonly labeled as financial innovations, include, inter alia, the rapid switching between demand deposits and savings deposits in domestic currency, the evolution of high yielding or indexed money substitutes, the efficient use of overdrafts, the application of portfolio optimization methods, and, most notably, the flight into foreign currency assets. Over time, an increasing proportion of the public resorts to these forms of financial innovation. The large fixed costs involved in adopting these strategies as well as their wide-spread use and acceptance throughout the economy induce households and enterprises to expand their use of these substitute instruments even in the event of a decline in inflation or an appreciation of the exchange rate; agents become "locked in" the new pattern. Only a significant decline in inflation or a considerable appreciation of the currency can overcome the sunk costs in "inflation-beating" strategies and provide enough incentives for households to eventually revert to traditional domestic money balances.

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<sup>10</sup>See, for example, Enzler, Johnson and Paulus (1976), Quick and Paulus (1979), and Simpson and Porter (1980).

<sup>11</sup>See, for example, Piterman (1988) on Argentina, Chile, Uruguay, and Israel, as well as Melnick (1989), Ahumada (1992) and Kamin and Ericsson (1993) on Argentina.

<sup>12</sup>See Dornbusch and Reynoso (1989), Dornbusch, Sturzenegger and Wolf (1990), Sturzenegger (1992), and Guidotti and Rodriguez (1992).

## VI. ECONOMETRIC ANALYSIS AND RESULTS

### The Empirical Model

26. Most econometric studies aimed at identifying the determinants in the CS process rely on a simple structural model that is based on a standard money demand function and incorporates inflationary or exchange rate expectations and/or interest rate differentials as the main explanatory variables.<sup>13</sup> The underlying assumption of these model specifications is that the demand for foreign currency by residents is driven by the uncovered interest parity condition, i.e. the difference between the real rates of return on domestic and foreign currency. These, in turn, depend on the interest rate level abroad, the domestic interest rate, and expected developments in the inflation rate or the exchange rate. The econometric analysis in this paper relies on a similar model structure,<sup>14</sup> but also includes a variable to capture the ratchet effect.

27. The CS model adopted here can be summarized by the following equation:

$$CSi_t = \alpha + \beta_1 CSi_{t-1-L} + \beta_2 Intdiff_{t-L} + \beta_3 Exch_{t-L} + \beta_4 Ratchet_t + u_t \quad (1)$$

where  $CSi$  is one of the two CS ratios defined above,  $Intdiff$  is the interest differential between equivalent Treasury bills,  $Exch$  is the nominal depreciation of the exchange rate, and  $Ratchet$  is the relevant ratchet variable of the CS ratio. The  $L$  indicates the optimal numbers of lags to be determined empirically through the Aikake criterion.

28. Note that one obvious problem in estimating equation (1) above is that both CS ratios are bound by definition in the interval between 0 and 1. Under a linear specification of the relation between CS and the independent variables, the fitted value of CS may fall outside the 0-1 range in the case of extreme values of the independent variables. A uniform transformation was therefore applied to the CS ratios in the regressions below, defined as follows:

$$LCSi_t = \text{Log}_e \left( \frac{1 - CSi_t}{CSi_t} \right) \quad (2)$$

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<sup>13</sup>See, for example, Ramirez-Rojas (1985), El-Erian (1988), Rojas-Suarez (1992), and Clements and Schwartz (1992).

<sup>14</sup>As there are no reliable monthly inflation data available especially for the first few years of the observation period, it was decided to use the depreciation of the exchange rate as a proxy.

which resolves the problem without affecting the results of the regressions, except for the sign of the coefficients. Moreover, to avoid spurious results due to seasonality, both CS ratios were deseasonalized by using the residuals from a standard OLS regression with 12 seasonal dummy variables.<sup>15</sup>

29. As stated above, two CS measures are analyzed: the first measure (*CS1*) is based on deposits only, while the second measure (*CS2*) incorporates foreign currency cash in the analysis. The other variables used in the regressions are: (a) the average monthly depreciation of the som against the U.S. dollar (*Exch*); (b) the interest differential (*Intdiff*) between the average monthly yield on three-month Kyrgyz GKO (treasury bills) and the average monthly yield on three-month U.S. treasury bills; and (c) a ratchet variable (*Ratcs1* and *Ratcs2*) calculated as the maximum level of the CS1 or CS2 ratios in the history of the sample. The variables *Exch* and *Intdiff* were derived from the International Finance Statistics (IFS) database of the IMF.

30. An additional ratchet variable was also considered, defined as the maximum monthly rate of depreciation of the som against the U.S. dollar; most coefficients using this ratchet variable were nevertheless insignificant. Following Mueller (1994), the use of the CS ratchet can be justified on two grounds: first, it gradually reaches new peaks during the observation period and thus is relatively immune to outliers, thereby more accurately representing the theoretical justification behind the inclusion of the ratchet effect in the model structure (i.e., the building up of a sufficiently strong awareness threshold for the presence of large inflation and currency depreciation and the resulting process of developing, learning, and slowly beginning to apply inflation-beating money management techniques); and second, it represents *all* the factors—not just the role played by the exchange rate—which in the past have influenced the CS process.

### **Econometric Procedure<sup>16</sup>**

31. Table 1 shows the results of the Augmented Dickey-Fuller test for each time series described above. The table indicates that the null hypothesis of a unit-root can be rejected at the 95th percentile significance level for all variables, with the exception of *LCS2*. In other words, *LCS2* is the only variable that is not trend-stationary in the sample.<sup>17</sup>

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<sup>15</sup>All dummy variables in both the regression for the *CS1* and *CS2* ratio were statistically significant.

<sup>16</sup>All econometric results were computed using the Microfit 4.0 software package for Windows, designed by M. H. Pesaran and B. Pesaran (1997).

<sup>17</sup>*LCS2* was also tested against the null hypothesis of a second order integration. The resulting test statistic was -5.738, clearly indicating that *LCS2* is integrated of order 1.

32. In light of these results, it is important for the purpose of this analysis to identify an estimation procedure that can be applied regardless of the stationarity properties of the variables in the sample. The only option in this regard is to estimate equation (1) using an autoregressive distributed lag procedure (ARDL) following the methodology outlined in Pesaran and Shin (1995). The added benefit of such a procedure is that it allows for inferences on long-run estimates, which is not possible under alternative cointegration procedures.

Table 1. Augmented Dickey–Fuller Tests

	Test statistics
Variable	
<i>LCSI</i>	-3.5195**
<i>LCS2</i>	-2.1229
<i>Intdiff</i>	-4.8962**
<i>Exch</i>	-4.9529**

\*\* Indicates a significance level above 95 percent.

33. The first step in the ARDL procedure outlined by Pesaran and Shin is to test for the long-run significance of the dependent variables.<sup>18</sup> In the case of equation (1), it involves the testing of the joint long-run significance of the constant, the *Intdiff*, the *Exch* and the ratchet variables. Table 2 presents the results of such a test for two different specifications of equation (1), namely without a ratchet variable (A) and with the relevant *Ratcs* variable (B). The tests are distributed according to a non-standard F-statistic which has different critical values depending on whether the dependent variable is stationary or non-stationary.<sup>19</sup>

34. In the case of *LCSI*, the long-run significance test indicates that the dependent variables are significant only at the 90th percentile. By contrast, the inclusion in the specification of the *Ratcs1* yields a significance level above the 95th percentile, indicating that the ratchet variable has considerable explanatory power in the determination of the level of the *LCSI* ratio. For the second definition of the CS ratio, *LCS2*, specification (A) without ratchet variables yields a long-run significance test above the 95th percentile significance level. The inclusion of a ratchet variable in specification (B) reduces the significance test, even though the variable *Ratcs2* keeps the significance level still above the 95th percentile. In sum, these

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<sup>18</sup>This test is similar in kind to testing the significance of the ecm variable in an error correction model. For details, see Pesaran and Pesaran (1997).

<sup>19</sup>A table of critical values for this non-standard F-statistic is available in Pesaran and Pesaran (1997).

tests give a preliminary indication that, while for the narrow CS definition (*CSI*) a ratchet effect may be significant, under a broader CS definition (*CS2*) there is no significant ratchet effect. In fact, this preliminary result is also confirmed in the full regressions below.

Table 2. Results of Long-run Significance Tests

	<i>LCS1</i> (Stationary)	<i>LCS2</i> (Non-stationary)
Dependent variables		
(A) <i>Intdiff, Exch, Constant</i>	3.4228*	5.2506**
(B) <i>Intdiff, Exch, Constant, Rats</i>	4.1315**	4.8908**

\*\* Indicates a significance level of 95 percent.

\* Indicates a significance level of 90 percent.

35. The regression results are presented in Table 3. For each specification, the table presents the error-correction (ECM) representation of the short-run estimates and the implied long-run estimates. The optimal lag length for each variable—the coefficient *L* in equation (1)—is determined empirically by maximizing the Aikaike information criterion.

36. Using *LCSI* as the dependent variable, all short-run coefficients under the various specifications are statistically significant at the 90th percentile, with the exception of the contemporaneous coefficient of *dExch*. This poor significance of the coefficient in the first difference of the exchange rate depreciation may be an indication that expectations in the Kyrgyz Republic are indeed adaptive, so that only lagged values of changes in the rate of depreciation have an effect on movements in the currency substitution ratio.<sup>20</sup> The ECM coefficient is highly significant in both regressions, reflecting the joint significance of the long-run coefficients. The F-statistic is also highly significant and, as expected under the ARDL procedure, the Durbin-Watson statistic does not indicate any sign of residual serial correlation.

37. More importantly, all long-run coefficients have the expected sign and are significant at the 99th percentile significance level. In particular, note the significance of the *Rats1* variable in specification (B). This confirms the intuition from viewing Figure 1 and the long-run significance tests above that there may indeed be a significant ratchet effect in the portfolio decision of Kyrgyz deposit holders. Nevertheless, it should be said that the sample covers a relatively short period of time and this result would need to be confirmed over a

<sup>20</sup>This result is also common to the regressions using the *LCS2* ratio as a dependent variable, suggesting that this represents a more generalized phenomenon.

Table 3. Regression Results using the ARDL Procedure  
Sample Period: May 1993 to October 1998

	LCS1		LCS2	
	(A)	(B)	(A)	(B)
<b>Short Run Coefficients: Error Correction Representation</b>				
<i>dINTDIFF</i>	0.143 (3.904)	0.151 (4.137)	0.092 (1.906)	0.128 (2.593)
<i>dINTDIFF(-1)</i>	-- --	-- --	0.027 (0.623)	0.006 (0.145)
<i>dINTDIFF(-2)</i>	-- --	-- --	-0.131 (-3.006)	-0.124 (-2.918)
<i>dEXCH</i>	-0.109 (-0.232)	-0.214 (-0.457)	-0.404 (-1.073)	-0.597 (-1.593)
<i>dEXCH(-1)</i>	1.100 (2.083)	1.230 (2.339)	0.102 (0.247)	0.234 (0.577)
<i>dEXCH(-2)</i>	1.602 (3.850)	1.682 (4.077)	1.009 (2.947)	0.913 (2.737)
<i>dCONST</i>	-0.695 (-2.730)	-0.185 (-2.496)	-0.044 (-2.432)	0.797 (2.036)
<i>dRATCS1</i>	-- --	0.195 (1.656)	-- --	-- --
<i>dRATCS2</i>	-- --	-- --	-- --	-0.645 (-2.151)
<i>ecm(-1)</i>	-0.148 (-3.204)	-0.269 (-3.127)	-0.131 (-2.530)	-0.126 (-2.515)
R-Squared	0.346	0.378	0.459	0.504
Akaike Information Criterion	33.852	34.388	48.397	50.089
DW-statistics	1.923	1.920	1.940	1.899
F-statistic	5.822	5.462	6.304	6.479
<b>Estimated Long Run Coefficients</b>				
<i>INTDIFF</i>	0.969 (3.633)	0.561 (3.155)	0.864 (2.619)	0.904 (2.618)
<i>EXCH</i>	-15.746 (-3.052)	-9.796 (-3.165)	-12.568 (-2.474)	-11.949 (-2.413)
<i>CONST</i>	-0.470 (-2.832)	-0.688 (-5.221)	-0.338 (-1.833)	6.302 (1.545)
<i>RATCS1</i>	-- --	0.725 (2.681)	-- --	-- --
<i>RATCS2</i>	-- --	-- --	-- --	-5.098 (-1.599)

larger sample to ensure its robustness. After all, the fit of the error–correction specification, as measured by the F–statistic, is higher when the *Ratcs1* variable is omitted.

38. The results of the regressions with the *LCS2* ratio as a dependent variable are surprisingly similar, even though the significance tests are somewhat weaker, but with the important difference that the coefficient on the ratchet variable is insignificant and of the wrong sign. The short–run coefficients again are mostly significant, although some coefficients on the lags of the *dExch* and *dIntdiff* variables are below the 90th percentile significance level. The ECM variable is again significant in all specifications at the 95th percentile significance level and the F–statistic confirms the good fit of both specifications.

39. The similarities and differences in the results between the two measures of currency substitution (*LCS1* and *LCS2*) become more apparent when looking at the long–run coefficients. In particular, the coefficients are quite similar between the two sets of regressions, although the *Exch* and *Intdiff* variables have a somewhat lower impact on the broader measure of currency substitution.<sup>21</sup> More importantly, a marked difference from the previous results is the insignificant coefficient on the ratchet variable *Ratcs2*, suggesting that in the broader CS definition there are no ratchet effects that can be detected.

40. To summarize, the econometric results show that the interest rate differential and the depreciation of the exchange rate are significant determinants of the CS process in the Kyrgyz economy. Moreover, while there may be a ratchet effect in the allocation of deposits, such an effect cannot be detected in the broader CS definition, confirming that the economy has not yet reached levels of “dollarization”, as defined above, that would imply a substantial change in the currency used to fulfill the transactional role of money. In this respect, policy measures may still have a strong impact on the portfolio decisions of the private sector.

## VII. POLICY IMPLICATIONS

41. The empirical evidence and econometric results have shown that the CS phenomenon in the Kyrgyz Republic is not yet as advanced as in the classical cases of dollarized economies. In particular, while there may be a ratchet effect in the portfolio allocation of the sophisticated Kyrgyz deposit holders, this effect is not detectable in the economy at large. In this respect, there may, in principle, be room for monetary policy to induce the public to reverse its portfolio allocation in favor of the domestic currency by targeting a greater stability in the exchange rate and fostering a sufficiently large real interest rate differential vis–à–vis the dollar. However, the presence of the ratchet effect in the deposit–only CS definition (CS1) implies that particularly strong policies over an extended period of time would need to be

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<sup>21</sup>The latter is an expected result inasmuch as there are more factors influencing the allocation of cash holdings than just the store of value motive which drives the allocation of deposits between domestic and foreign currency (see Calvo and Vegh (1992)).

pursued to convince deposit holders to switch back to som-denominated assets, while a reduction of the relative importance of dollar cash may be easier and faster to achieve.

42. The econometric results show that the depreciation of the som has been a significant factor in increasing the CS ratio, particularly among deposits. This suggests that the main incentive for the public to switch to dollar deposits has been to hedge against the risk of further depreciation. This flight into the dollar did not change during the period of relative exchange rate stability in 1997 and early 1998, indicating that a more sustained period of exchange rate stability is needed to reduce the role of dollar deposits as a provider for the store-of-value function to sophisticated investors. The hovering of the deposit-based CS ratio at about 40 percent during that period could indicate that the medium of exchange function has not yet become a predominant motive for holding foreign exchange in the Kyrgyz Republic.<sup>22</sup>

43. There are many reasons why the som has been depreciating against the U.S. dollar over the last five years preceding the Russian financial crisis—and it is beyond the scope of this paper to identify all of them—but it can safely be argued that the main source of the depreciation has been the still large, albeit falling, inflationary differential between the Kyrgyz economy and advanced economies. By further stabilizing the Kyrgyz economy, and bringing inflation down again to single digits in particular, monetary policy could therefore bring greater stability to the exchange rate and thus alleviate the incentives behind the process of currency substitution. Moreover, as evidenced in many other economies, a low inflationary regime is usually associated with a lower volatility of inflation, thus reducing the risk associated with the return on domestic currency deposits. This is even more relevant after the sharp depreciation of the som in the aftermath of the Russian financial crisis. While the size of the depreciation may in the short run further boost the hysteresis in the CS process, a convincing monetary policy response by the authorities in the immediate future could be instrumental in decisively stabilizing and subsequently reducing inflation and thus laying the foundation for a reduction of the CS ratio over the medium term.

44. Secondly, interest rate differentials have also been shown to be a significant determinant in the portfolio allocation of the private sector. While the econometric results are based on the differential between three-month treasury bill rates, depositors are likely to be mainly guided by deposit rates. Since interest rates are completely liberalized in the Kyrgyz Republic, the authorities' scope for directly affecting banks' setting of such rates is limited. Nominal interest rates on som deposits have been relatively high over the last few years. Nevertheless, banks have also been eager at times to attract dollar deposits by providing relatively high interest rates on these deposits in order to extend additional dollar credits and profit from the large margin associated with them. Hence, the interest rate differential may not have been sufficiently high to compensate som depositors for the expected depreciation of the domestic currency and the risk premium that inevitably is associated with it.

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<sup>22</sup>This is also supported by the absence of a dollar-based payments and settlement system.

45. Moreover, a comparison between treasury bill rates and deposit rates suggest that there may still be institutional factors in the Kyrgyz banking system that prevent deposit rates from following treasury bill rates more closely. Eliminating these institutional constraints in the banking system could ultimately reduce the stickiness of deposit rates and bring them closer in line with Kyrgyz treasury bill rates, thus increasing the opportunity cost of holding deposits in dollars. Another possibility, though controversial, is the imposition of a tax on foreign currency intermediation, in the form of either higher reserve requirements for dollar-denominated deposits or lower remuneration rates on such requirements. However, given the inconclusive results in other countries and the risk to financial intermediation in the nascent banking system, the merits of such an approach would be doubtful.<sup>23</sup>

46. While, as stated above, reliance on foreign currency in financial intermediation can be beneficial, the relative importance of, and persistence in, the use of foreign currency in financial intermediation in the Kyrgyz Republic raises the question of the potential fragility of the banking system, which is often quoted as one of the major costs of dollarization. The recent problems in the Kyrgyz banking system, which to a large extent are related to repayment difficulties of some borrowers for dollar-denominated loans, clearly illustrate the need to adopt special prudential measures to help commercial banks weather times of significant exchange rate adjustments and swings of capital flows. This is even more important as distress in the banking system lessens the predictability of the monetary transmission process and places an additional burden on the central bank as lender of last resort. In the current environment, it is therefore imperative to enhance banking supervision and enforce an appropriately defined loan risk classification system so as to maintain confidence in the banking system. It also calls for a continuous careful assessment of the appropriateness of the NBKR's monetary policy instruments and liquidity forecasting techniques.

47. Finally, one well-known stylized fact about dollarized economies is that currency substitution is often driven also by the lack or the thinness of markets for medium- and long-term securities denominated in the domestic currency. This lack of medium- and long-term intertemporal markets is usually associated with periods following high inflation, just like in the Kyrgyz Republic.<sup>24</sup> Given the lack of these securities, the natural demand for credits that go beyond the longest horizon in the domestic currency (e.g. mortgages, business credits, etc.) can only be fulfilled by denominating the credits in foreign currency and attracting matching liabilities. In this regard, an additional avenue for reducing the degree of currency substitution is to actively pursue a deepening of financial assets by lengthening the maturity of domestic securities, especially government bonds which could set a benchmark for long-term private securities. However, this should be balanced with the potentially higher fiscal costs of issuing long-term securities.

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<sup>23</sup>International Monetary Fund (1999).

<sup>24</sup>For a discussion of this relation see Heymann and Leijonhufvud (1996).

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