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<u>Dollarization in Lebanon</u>

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Abstract

Lebanon has experienced large-scale dollarization during and after its 15-year long civil war. This paper analyzes the driving forces behind the dollarization of the Lebanese economy, using two econometric models that, apart from determinants commonly included in empirical studies on the dollarization phenomenon, also specifically take into account the limited reversibility of the dollarization process. The latter is modeled through the inclusion of a ratchet variable, which implies an asymmetric substitution process between domestic and foreign currency. The ratchet effect, in the different definitions applied, is found to be significant. In addition, the expected depreciation, a stock adjustment variable and, when cross-border deposits of Lebanese residents are included in the analysis, also the interest rate differential are other statistically significant determinants of the dollarization process in Lebanon.

<u>JEL Classification Numbers:</u>

E41;E50;F41;O53

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Summary

Lebanon's 15-year long civil war had a devastating effect on the economy. Over time, because of large-scale inflation and currency depreciation, Lebanese households and enterprises increasingly resorted to using foreign currency for transaction, store-of-value and unit-of-account purposes. This reliance on foreign currency persisted even after the end of the civil war, a normalization of the political and economic situation, and a significant reflow of funds from abroad.

This paper analyzes the determinants of the use of foreign currency in the Lebanese economy during the last two decades and--going beyond the conventional literature on the dollarization phenomenon--explicitly addresses the persistence in its use. The two econometric models developed in the paper model the persistence through the inclusion of a ratchet variable, thus implying an asymmetric substitution process between domestic and foreign currency. The paper experiments with two different definitions of the dollarization ratio and of the ratchet variable, and also estimates the likely length of the ratchet effect in Lebanon.

The existence of the ratchet effect is attributed to prolonged periods of financial innovation and the related fixed costs of developing, learning and applying these new money management techniques to "beat" inflation. Once these fixed costs are overcome, households and enterprises have little incentive to switch back to domestic currency after the period of instability ends. As a result, the effect on the relative demand for foreign and domestic currency money is more long-lasting. In addition to the costs, the extent of credibility of the authorities' stabilization efforts as well as the design of and changes to the institutional and regulatory framework may influence the duration and strength of the ratchet effect.

The estimation results suggest that the ratchet variable is significant in the case of Lebanon. The ratchet effect is particularly pronounced and unambiguous when defined as the past-peak dollarization ratio and is likely to last for at least 4 1/2 to 4 3/4 years. Moreover, and in line with the conventional literature on currency substitution and dollarization, the expected depreciation does have an impact on households' holding of foreign currency deposits. The interest rate differential is insignificant if only domestically held foreign currency deposits are considered in the dollarization ratio but is likely to be significant when cross-border deposits are included. Most of the adjustment in households' portfolios takes place after a certain lag, as indicated by the high significance of an included stock adjustment variable. Taken together, these findings suggest that there is only limited scope for the Lebanese authorities to actively promote a fast de-dollarization of the economy.

I. Introduction

Lebanon's 15-year long civil war had a devastating effect on the economy. Real per capita GNP in 1990 was only one third of its 1975 level. Rapidly increasing fiscal deficits, financed with money creation,-- particularly during the mid-1980s as the war intensified--entailed spiralling domestic demand pressures and inflation together with a rapid and sustained depreciation of the currency, the Lebanese pound (LL). Over time, these developments contributed to an increased reliance on foreign currency for transaction, store-of-value and unit-of-account purposes, which persisted even after the end of the civil war, the establishment of a stable government, the stabilization of macroeconomic conditions, including inflation, and a significant reflow of funds from abroad.

Similar patterns have been observed in a variety of other countries around the world. Such large-scale currency substitution and dollarization are usually assumed to be triggered by a country's deteriorating economic, financial, and political situation, which is reflected, inter alia, in high and accelerating inflation rates and a large depreciation of the local currency. During the last decade and a half, a number of empirical studies have focused on this phenomenon, which has been particularly widespread and persistent in Latin America, but has, in a much milder form, also occurred in other developing and industrial countries around the world, among them also some Middle Eastern countries, such as Egypt and Yemen. [1]

However, most of the conventional currency substitution models imply that once macroeconomic and political stability is regained, the use of foreign currency declines again. This, however, did not occur in reality in many of the country cases. But only very few empirical studies on currency substitution have specifically dealt with hysteresis in the substitution process.

This paper analyzes the determinants of the use of foreign currency in the Lebanese economy during the last two decades and explicitly addresses the persistence in its use. While regular models of currency substitution assume a symmetric and reversible substitution process that allows for an unrestricted change in the currency substitution ratio in both directions when the underlying determinants change, the approach used in this paper specifically takes into account the limited reversibility of the dollarization of the Lebanese economy even after a relative normalization of the political and economic situation, thus implying an asymmetric substitution process. This is achieved by including a ratchet variable in the two econometric models developed in this paper to capture the driving forces behind Lebanon's dollarization.

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[1] An overview on other country studies on currency substitution and dollarization is given at the beginning of Section 6. For a summarizing discussion of these studies, see Calvo and Végh (1992).

The existence of the ratchet effect is attributed to prolonged periods of financial innovation and the related fixed costs of developing, learning and applying these new money management techniques to "beat" inflation. Once these fixed costs are overcome, there is little incentives for households and enterprises to switch back to domestic currency after the end of the period of instability, thus causing a more long-lasting effect on the relative demand for foreign and domestic currency money. In addition to costs, the extent of credibility of the authorities' stabilization efforts may shorten or prolong the duration of the ratchet effect as well as influence its strength. Furthermore, the ratchet effect is often reinforced by the design of and changes to the institutional and regulatory framework within a given country. In the case of Lebanon, for example, the introduction of a clearing system for dollar denominated checks at the Bank of Lebanon (BoL) in 1990 as well as the maintenance of a reserve requirement system that discriminates against domestic currency deposits have further promoted the use of dollars in the economy.

The ratchet variable is included in the model structure in two different definitions, which are derived in the course of the paper. It will be shown that the ratchet variable defined as the past-peak dollarization ratio provides superior estimation results compared to the ratchet variable in the form of the past-peak depreciation rate, which was used in the very few other empirical studies on dollarized countries containing the ratchet variable. However, it will also be shown that, irrespective of the exact definition of the ratchet variable, its inclusion in the model specification generally provides a better fit of the estimation. Dropping the ratchet variable from the model specification also causes ambiguous and biased estimation results, affecting the sign and magnitude of the coefficient estimates as well as the significance of the remaining regressors, particularly of the interest rate differential. In addition, omission of the ratchet variable generally considerably impairs the stability of the coefficient estimates over time.

The existence of the ratchet effect may have implications on the use of the terms "currency substitution" and "dollarization". In general, currency substitution is defined as the substitution of foreign money for domestic money by residents as a medium of exchange, store of value, and unit of account, with the implicit underlying assumption that the substitution process is symmetrical and responds to changes in the determinants equally in both directions. Very often in these studies, the terms currency substitution and dollarization are used synonymously, given the U.S. dollar's leading role among the replacing currencies. On the other hand, some authors regard currency substitution as the last stage of the dollarization process. They argue that as long as "dollars" are used only as store of value and unit of account, but not as medium of exchange, the economy is dollarized; currency substitution occurs when foreign currency is also used as the major medium of exchange. 1/

1/ See Calvo and Végh (1992).

The evidence provided in this paper, however, may suggest a different distinction between currency substitution and dollarization, one that refers to the extent of reversibility in the substitution process. According to this definition, currency substitution exists within an economy when the substitution process can be considered as being symmetrical and reversible. Consequently, the substitution can go in both directions, that is from local to foreign currency and vice versa, and the driving forces behind the substitution process can <u>to the same extent</u> induce an increase and a decrease in the use of foreign currency. 1/ On the other hand, an economy is 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 <u>by a lesser extent</u> when the local currency appreciates.

The paper is structured as follows. Section II derives the two definitions used in this paper to describe and measure the degree of dollarization. Section III illustrates the path of the dollarization of the Lebanese economy during the last 23 years. Section IV highlights the experiences of other countries confronted with currency substitution and dollarization, providing casual evidence for the extent of currency substitution and of the ratchet effect in these countries. Section V is devoted to the ratchet variable itself, providing a brief theoretical background, an overview of the use of the variable in other empirical studies, and some possible explanations for the existence of the ratchet effect in the dollarization of a country's economy. Section VI focuses on the econometric analysis of the degree of dollarization in Lebanon. It uses two econometric models that differ from one another only as regards the definition of the dollarization ratio. Both models view the degree of dollarization as a function of the expected depreciation, the interest rate differential, a stock adjustment variable, and the afore-mentioned ratchet variable in its different definitions. The paper ends with conclusions in Section VII.

II. <u>Measuring the Degree of Dollarization</u>

This paper uses two different definitions to measure the degree of dollarization in the Lebanese economy. Both definitions relate foreign currency deposits to total deposits, the latter consisting of the sum of domestic and foreign currency deposits. However, both definitions differ from one another as to how foreign currency deposits are defined. The definitions read as follows:

<u>Definition 1</u>:   foreign currency deposits of residents within the domestic banking system as a percentage of total

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1/ This concept is also behind much of the work on currency substitution in industrial countries. See, for example, Lane and Poloz (1992).

deposits of residents within the domestic banking system;

Definition 2:   foreign currency deposits within the domestic banking system plus foreign currency deposits of residents held abroad as a percentage of total deposits within the domestic banking system plus foreign currency deposits of residents held abroad.

While Definition 1 can be considered as a strictly domestic measure for the degree of dollarization and relies exclusively on domestic banking data, Definition 2 is broader and extends to foreign currency deposits held by Lebanese residents at 33 international financial centers around the world, as captured by the International Financial Statistics (IFS) of the International Monetary Fund (IMF) on a quarterly basis.

Definition 1 relies on data provided by the Bank of Lebanon on a monthly basis for the period from 1971 to 1993. It exclusively reflects the accounts of residents, as non-residents' deposits have been relatively small over time--between 5 and 13 percent of all deposits-- and largely held in foreign currency. 1/

Definition 2 combines data on foreign currency deposits of residents held abroad, as provided by the IFS series, with the domestic banking data set; it represents the broadest and most comprehensive definition of the degree of currency substitution possible, given the restricted availability of data, which will be further elaborated upon below. 2/

Most of the other empirical country studies use a measure of currency substitution similar to Definition 1, except that they very often also include domestic currency cash in the denominator of the ratio, thus relating foreign currency deposits to broad money. However, foreign currency denominated bills and coins circulating within the respective economy are generally omitted in the dollarization ratios of most studies, including this one. This is mainly due to the fact that the stock of foreign cash in circulation within a particular country is impossible to be

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1/ The econometric analysis of this paper was also extended to a definition of the degree of currency substitution that included both residents' and non-residents' accounts. However, the results were largely identical to the ones of Definition 1.

2/ Definition 2 can only be calculated for the period from 1982 to 1993, owing to the fact that the IFS series came out in 1982.

captured by any reliable statistics or estimation. 1/ On the other hand, these balances may become sizable and fluctuate considerably over time, particularly in cases where the dollar also serves as the major transaction medium and banking habits are underdeveloped or, as in the case of Lebanon, disturbed by civil-war activities. 2/ Consequently, the dollarization ratios in most studies tend to underestimate the full extent of dollarization.

Very few other country studies have also incorporated foreign currency deposits held abroad, given that the IFS time series has only become available in the early 1980s. 3/ A second potential data source for cross-border deposits, the U.S. Treasury Bulletin, though reaching back much further, only covers deposits held by foreign residents at U.S. commercial banks. This series has been sparingly used in empirical studies, as it is only useful in cases where there is sufficient reason to believe that a large share of foreign currency deposits of residents of a particular country is primarily held in the United States; this holds particularly for residents from Latin American countries. 4/ By contrast, the IFS series is ideally suited for an analysis of cross-border foreign currency deposits of Lebanese residents, who presumably invest a major share of their liquid assets in European and other Middle Eastern financial centers covered by the IFS series; it is therefore used in the course of this analysis.

1/ As pointed out by Savastano (1992), 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, more recently, Kamin and Ericsson (1993) and International Monetary Fund (1994a). However, according to Savastano, the usefulness of these estimations is doubtful, given the extremely restrictive assumptions, e.g. on the velocity of circulation of domestic money balances and other variables.

2/ The amount of US dollars circulating within the Lebanese economy was estimated in IMF (1994a), following the approach of Melvin and Afcha de la Parra (1989); see previous footnote. According to these estimates, the ratio of LL cash to total cash moved broadly in tandem with the ratio of LL deposits to total deposits, implying large fluctuations (see Chapter III). For end-1993, IMF (1994a) estimates that US$-denominated currency in circulation amounted to US$ 2.3 billion, which compares to an alternative estimate of US$ 1 billion quoted in World Bank (1994); this wide discrepancy once again emphasizes the problematic character of these estimations.

3/ In previous empirical studies, the IFS series was applied, inter alia, by Agénor and Khan (1992) in the case of 10 developing countries and Cléments and Schwartz (1992) in the case of Bolivia.

4/ The data series from the U.S. Treasury Bulletin was used, inter alia, by Savastano (1992) in the case of Bolivia, Mexico, Peru, and Uruguay, and by Rojas-Suarez (1992) in the case of Peru.

III. The Dollarization of Lebanon 1/

Before the outbreak of the civil war, Lebanon was the leading financial center in the Middle East with a sophisticated banking system, a flexible exchange rate system, and few, if any, restrictions on capital movements. Foreign currency deposits were offered to residents and non-residents alike, but did not account for a large share of total deposits until the late 1960s, when, in the aftermath of a banking crisis, residents increased their holdings of foreign currency to around 15 to 20 percent of total deposits.

This paper concentrates on the dollarization of the Lebanese economy that emerged in the following period as a result of the civil war and the accompanying deterioration of economic conditions. Currency substitution and dollarization in this context can be considered as a hedge against inflation or exchange rate depreciation, with the store-of-value motive initially dominating the substitution process, while the role of foreign currency deposits for transaction purposes gained more importance the longer the use of foreign currency persisted at increasingly high levels. 2/ The inflation rate and the exchange rate, in turn, were driven by economic and political events, the intensity of the warfare and expectations as to the future development of the country. 3/

Charts 1 and 2 illustrate the path of the dollarization of the Lebanese economy over the last quarter of a century and also emphasize the

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1/ This chapter describes the path of dollarization in Lebanon over the last two decades. Further descriptions of monetary developments in general and the use of foreign currency in particular in Lebanon can be found in Saïdi (1981, 1984, 1987), Short (1981), Saïdi and Huber (1982), Osseiran (1987), Towe (1989), International Monetary Fund (1994a), and World Bank (1994). Short (1981), Saïdi (1984), and, more recently, International Monetary Fund (1994a) have estimated traditional money demand functions for Lebanon and found stable relationships between money, prices and output, in the case of the IMF (1994a)-study after the correction of the impact of the civil war and experimenting with different monetary aggregates.

2/ The assumption that domestically held foreign currency deposits also serve, to an increasingly large degree, transaction purposes is illustrated by the fact that the Bank of Lebanon (BoL) established a clearing system for dollar denominated checks in 1990; before 1990, dollar-denominated check clearing had only been offered by two private institutions. Subsequently, from 1991 to 1993, the ratio between the value of dollar checks cleared and the total value of checks cleared ranged between 60 and 80 percent, with a rising tendency.

3/ The course of the exchange rate was, at least partially, also influenced by the relative growth of foreign currency deposits versus domestic currency deposits, as pointed out by Towe (1989). He also indicated that speculative bubbles may to some extent have influenced the path of the exchange rate in the 1980s.

CHART 1
LEBANON
DEGREE OF DOLLARIZATION, DEFINITIONS 1 AND 2
(In percent)

Degree of Dollarization (Definition 2)

Degree of Dollarization (Definition 1)

- 6a -
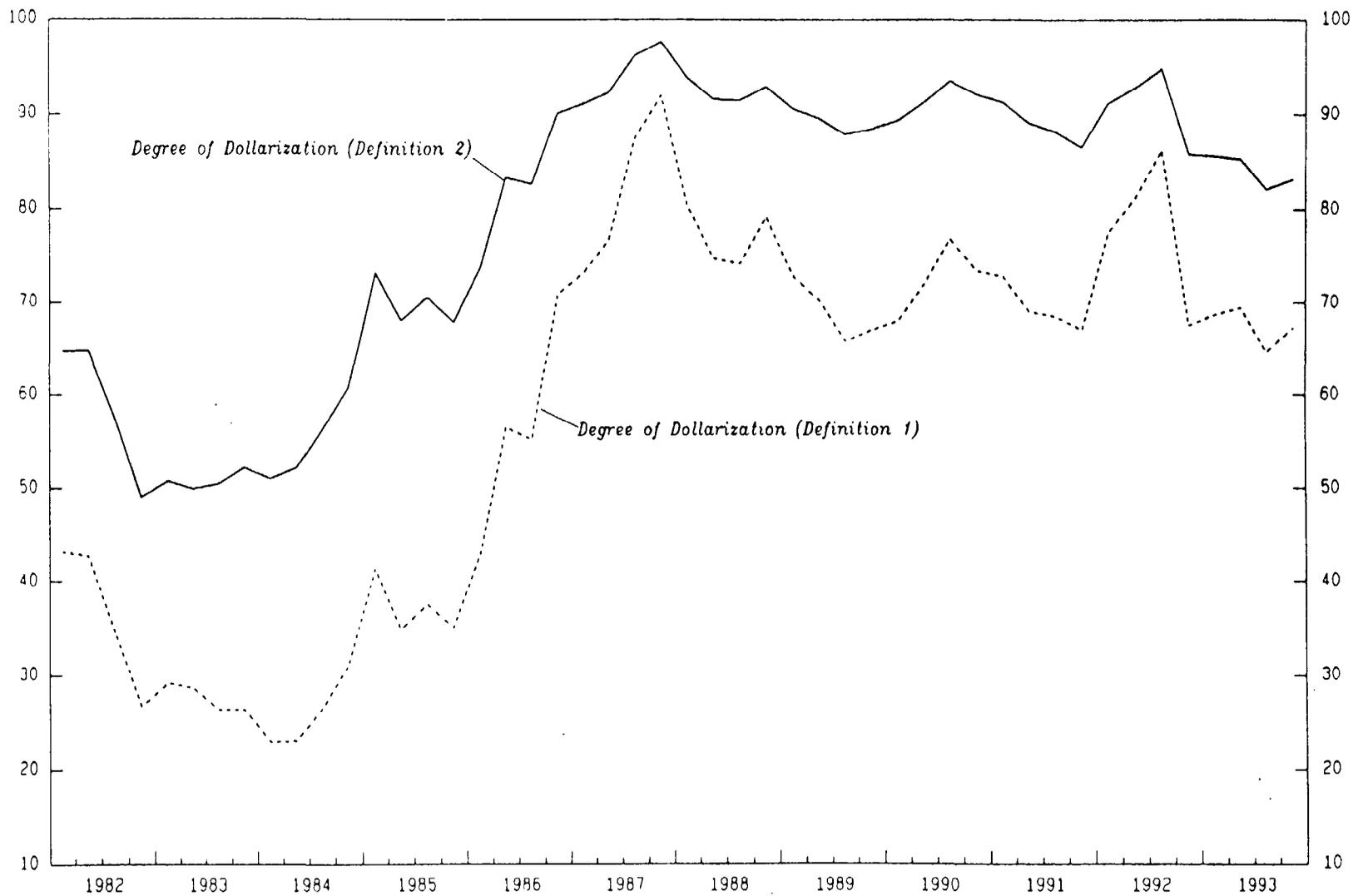
Sources: Bank of Lebanon; and International Financial Statistics.

CHART 2
LEBANON
DEGREE OF DOLLARIZATION AND DEPRECIATION RATE
(In percent)

Depreciation Rate (Right scale)

Degree of Dollarization - Definition 1 (Left scale)

1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993
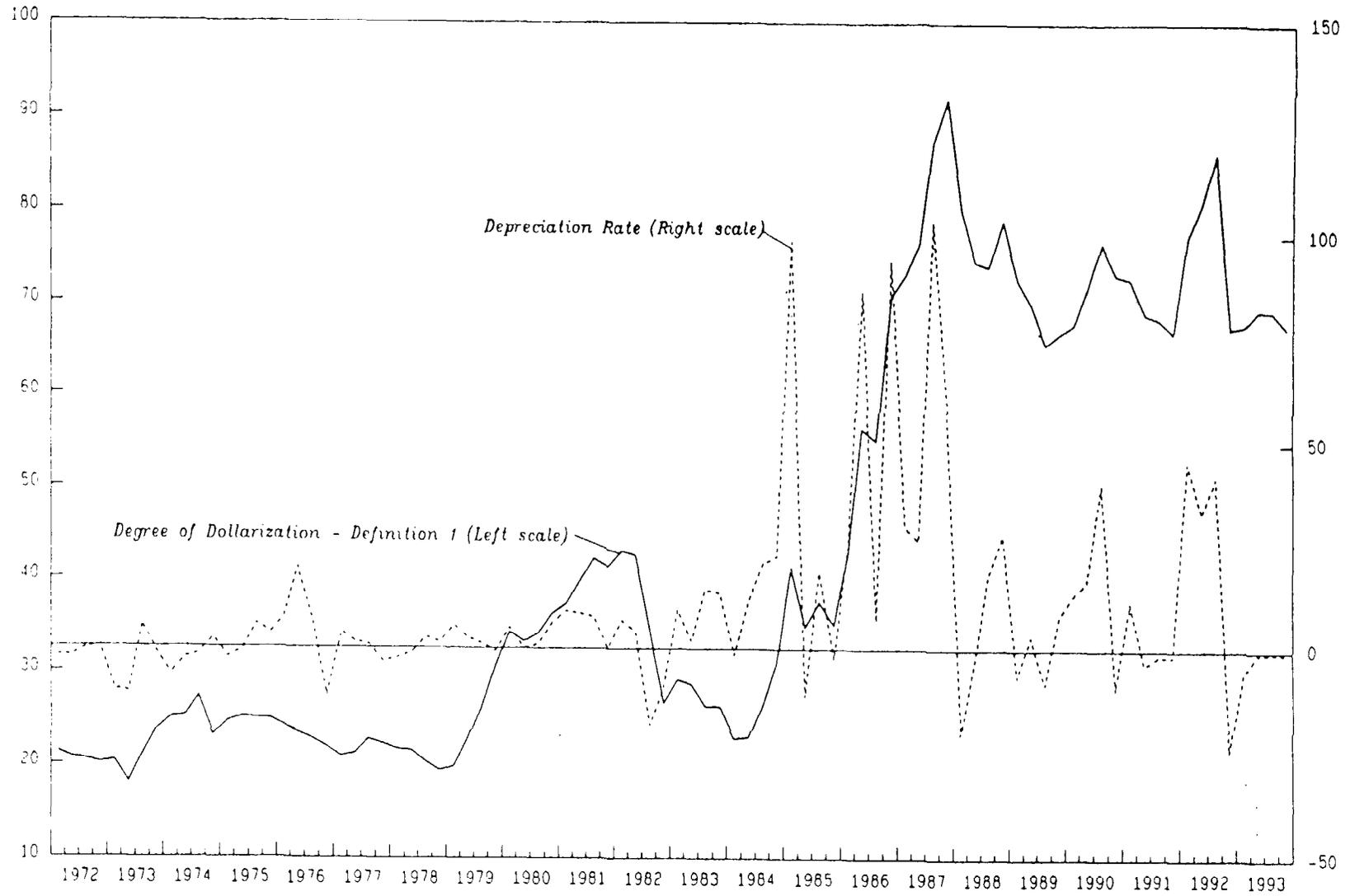
Sources: Bank of Lebanon; and International Financial Statistics.

close relationship between currency substitution and the depreciation of the currency resulting from the country's deteriorating economic, financial, and political situation. 1/ Chart 1 depicts the degree of dollarization in Lebanon, as measured by the two different definitions derived in the previous section, over the period from 1981 to 1993, when data for both definitions are available. Chart 2 compares the degree of dollarization with the quarterly depreciation rates of the Lebanese pound vis-à-vis the U.S. dollar from 1971 to 1993.

Chart 1 highlights the parallel behavior of both definitions of the degree of dollarization over the covered period. The curve representing Definition 2, which includes foreign currency deposits of Lebanese residents held abroad, moves at a much higher level than Definition 1, indicating that the degree of dollarization is much more pronounced than implied by using only figures from the domestic banking statistics. Interestingly enough, the curve representing Definition 2 shows the same characteristics and peaks as the Definition 1-curve, although the relative changes are smaller.

Chart 2 illustrates the close relationship between increases in the use of foreign currency and periods of rising depreciation rates throughout the observation period. 2/ As a general rule, situations of severe political crisis or more intense warfare coincide with an acceleration of inflation and currency depreciation and a pronounced rise of the dollarization ratio, as observed in 1979 to 1982, 1986 to 1987, and end-1991 to mid-1992. On the other hand, positive political developments, which increased the probability of stable economic and political conditions, such as the signing of the Taif Peace Accord in October 1989 or the appointment of Rafik Hariri as the new Prime Minister at the end of 1992, were accompanied by an appreciation of the Lebanese pound and sizable drops in the CS-ratio, although the latter remained at still very high levels.

A brief chronological description of the main developments during these tumultuous times follows. Throughout most of the 1970s, the degree of currency substitution in Lebanon fluctuated within a small margin at around 20 percent. This was even the case in 1975 when the civil war began and households almost doubled their holdings of LL cash, probably as a result of the political uncertainty and the difficulties in the payment system (e.g., closed banks and delays in check clearing owing to the war). During this period, depreciation rose to a degree previously unknown. Yet, households, accustomed to a traditionally strong domestic currency, may have expected the unrest to be merely temporarily, and thus did not convert their LL deposits into holdings of foreign currency. After a brief period of easing

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1/ As there are no reliable inflation data available in the case of Lebanon, this paper focusses on the relationship between currency depreciation and dollarization.

2/ As foreign currency deposits are converted into domestic currency to calculate the CS-ratio, the growth rate of the CS-ratio is also partially due to valuation changes.

warfare, the political situation deteriorated again in the late 1970s and contributed again to expectations of rising inflation, which this time coincided with a strong shift from LL deposits to foreign currency deposits, beginning in 1979.

The following years, which also comprise the Israeli military intervention in Lebanon in 1982, saw volatile movements in the exchange rate with periods of appreciation and depreciation, accompanied, however, by a generally declining tendency of the degree of dollarization. 1/ This trend reversed drastically in 1985/86 after the withdrawal of Israeli troops and the subsequent escalation of the factional war that also included random kidnappings of Westerners. This period was also marked by the presence of a weak government that contributed to the erosion of the public's confidence in a more stable economic and political future. This government also preempted increasingly large parts of the country's savings to finance its escalating fiscal deficits. As a consequence, a massive dollarization occurred, and capital outflows, in the absence of capital controls, jumped dramatically. Within only two years, the dollarization ratio skyrocketed from around 35 percent to 93 percent (Definition 1) and from 61 percent to 98 percent (Definition 2), respectively, accompanied by a large depreciation of the exchange rate. During that time, households also doubled their holdings of LL cash.

During the last six years of the observation period, periods of exchange rate appreciation and depreciation have alternated frequently. Overall, the degree of dollarization has shown a slightly declining trend since end-1987, although in periods of severe crisis, a temporary run into foreign currency deposits reoccurred, particularly in the third quarter of 1992 when the CS-ratio almost reached its previous end-1987 peak. Efforts to establish a permanent peace culminated in the signing of the Taif Peace Accord in October 1989, but sporadic factional fighting, political assassinations, border conflicts with Israel, and difficulties to establish a strong and credible government continued until 1992.

With the election of the new Parliament and the appointment of Rafik Hariri as Prime Minister in late 1992, the degree of dollarization dropped by roughly 20 percentage points to a level close to 68 percent (Definition 1) and by roughly 10 percentage points to 82 percent (Definition 2), with little further downward movement since then, despite of largely favorable macroeconomic and political conditions and an appreciation of the Lebanese pound against the U.S. dollar from LL 2,420 to LL 1,711. 2/ Casual evidence therefore seems to support the hypothesis of the presence of the ratchet effect.

1/ In the following, reference to Chart 1 is made when Definition 2 is mentioned.

2/ Over the same period, households decreased their holdings of LL cash by half.

IV. Currency Substitution and Dollarization in Other Developing Countries

As mentioned before, large-scale currency substitution and dollarization are phenomena common in countries with large fiscal deficits, high and variable inflation rates and recurrent devaluations, and/or situations of severe political crisis. This section briefly summarizes the experience with large-scale currency substitution and dollarization in a sample of developing countries that experienced periods of large macroeconomic disequilibria; it therefore does not enter into a discussion of currency substitution observed in stable industrial countries. 1/ But even when focussing only on the experiences of selected developing countries, the following description cannot be complete and comprehensive in light of the complexity of the issue; it therefore only attempts to identify and assess some common features.

The sample consists of six Latin American countries (Argentina, Bolivia, Chile, Mexico, Peru, and Uruguay), which have been in the center of empirical work on currency substitution and dollarization, and two Middle Eastern countries (Egypt and Yemen). 2/ Charts 3 and 4 depict the path of currency substitution and currency depreciation in these countries during the last few years. 3/

Three main messages can be derived from Charts 3 and 4. First, both charts illustrate the close relationship between currency depreciation and currency substitution; periods of high depreciation rates coincide with high currency substitution ratios, although in some countries a certain time-lag can be observed. Second, the charts also suggest the existence of the ratchet effect, the extent of which, however, differs from country to country. And third, the regulatory and institutional framework had a major impact on the path of currency substitution over time, which is particularly visible in cases where the national authorities temporarily suspended foreign currency deposits.

The presence of foreign currency deposits within a national banking system does not in itself imply that foreign currency is used as a major store-of-value medium or for purposes of making domestic transactions. The holding of accounts and banknotes in foreign currency is common and legal in

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1/ For a discussion of currency substitution in industrial countries, see, for example, Lane and Poloz (1992).

2/ In the case of Yemen, the time series refers to the Yemen Arab Republic and only covers the period up to the unification of the country with The People's Democratic Republic of Yemen in May 1990.

3/ The figures are based upon quarterly data time series from the IMF International Financial Statistics and represent only the periods for which data were available and immediately accessible. However, in most of the sample countries, the currency substitution process started much earlier than depicted in the graphs.

many countries, although frequently the national authorities have initially been hesitant in removing restrictions in this area. 1/ In a normal environment, these balances are used for transactions arising from trade and tourism, but they may also be built up, at least to some extent, for savings purposes and to diversify portfolios, provided that their real return is competitive. Currency substitution begins when the expected real return on foreign currency deposits becomes significantly more attractive than the one on domestic currency deposits, that is when, apart from possible changes in relative yields, the domestic currency is expected to depreciate considerably; in such an environment, foreign currency deposits are increasingly also used for strictly domestic transactions. Charts 3 and 4 indicate that in countries with periods of hyperinflation or highly variable inflation rates, such as Argentina, Bolivia and Peru, foreign currency deposits grew rapidly and in the end accounted for the major share of total deposits, sometimes by a large margin. On the other hand, casual evidence suggests that currency substitution is less of an issue in countries with moderate inflation and depreciation rates, such as Chile, Egypt and Yemen, or in countries where suitable alternative means of holding domestic assets exist, such as Brazil with its sophisticated system of indexation. 2/

An important feature common to many countries in the sample, particularly the Latin American ones, is the limited reversibility of the currency substitution process. Even when stabilization programs were successful and inflation came under control, the degree of dollarization remained high, continued to increase, or decreased either only marginally or only after a certain time lag (ratchet effect). This is also true for some of the countries which had finally given up their administrative de-dollarization efforts and re-admitted foreign currency deposits to their national banking system; households quickly built up substantial foreign currency holdings again and kept them at high levels even after more stable economic and political conditions were achieved. Casual evidence also

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1/ By legalizing foreign exchange deposits within the national banking system, often as part of an economic stabilization program after situations of severe internal and external disequilibria, or as part of efforts to liberalize the economy, the authorities generally expected a decline in capital flight and, in many cases, a sizable repatriation of funds and an increase in the supply of foreign exchange resources to their respective economies. Furthermore, the authorization and promotion of foreign currency deposits within the national banking systems contributed to the development of the respective banking systems by strengthening financial intermediation. It also enabled the authorities to better monitor and potentially control the substitution of currencies. In addition, the presence of foreign currency deposits increased the pressure on the national governments to keep possibly existing stabilization programs on track.

2/ For a detailed description of the debt correction and monetary correction system in Brazil, see, for example, Lees (1990).

CHART 3
DEGREE OF CURRENCY SUBSTITUTION AND DEPRECIATION RATE
IN ARGENTINA, BOLIVIA, CHILE, AND MEXICO
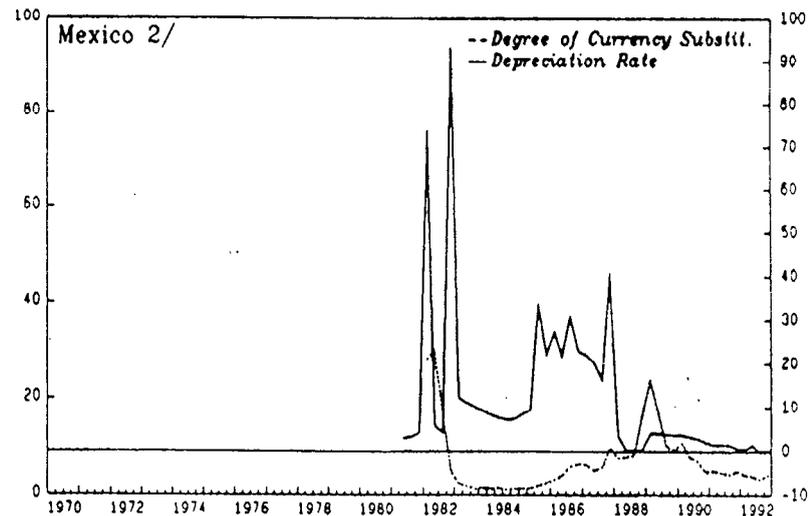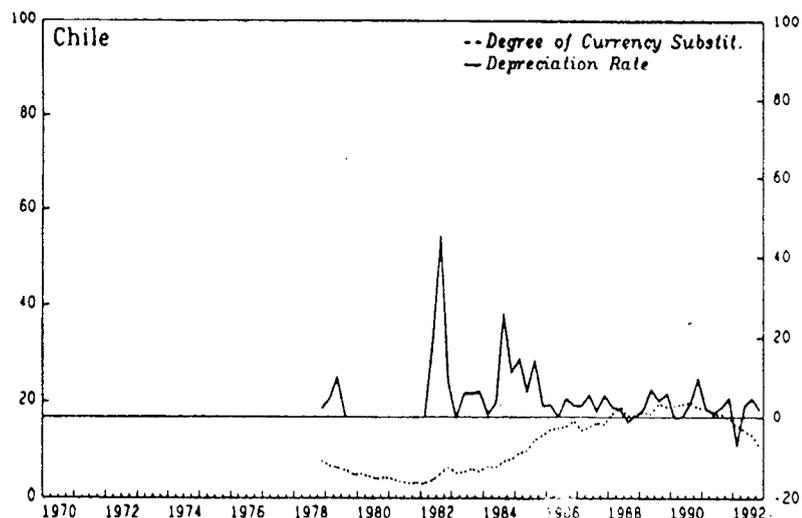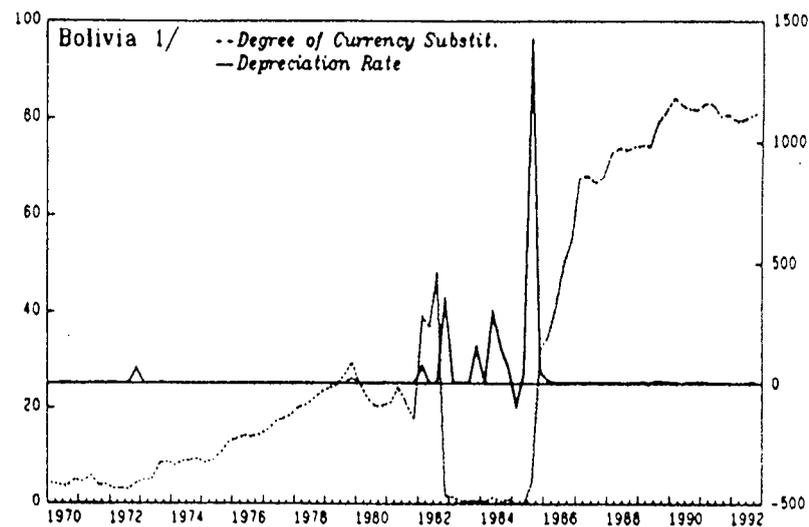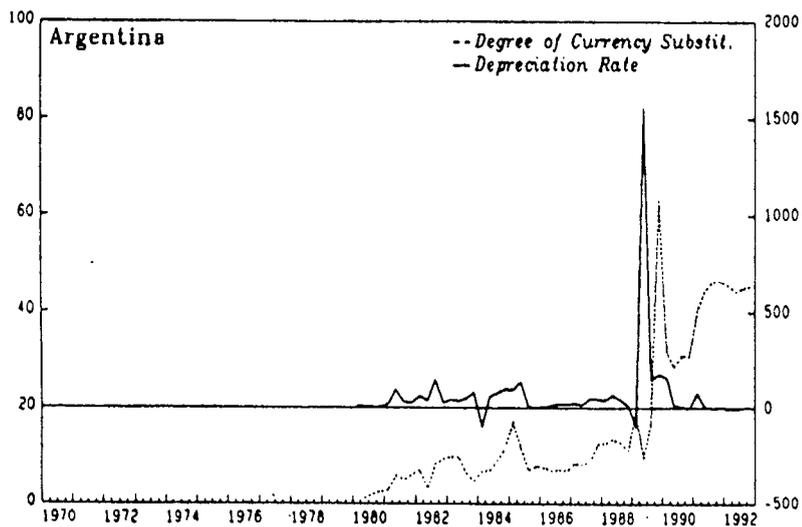
Source: International Financial Statistics.

1/ From end-1982 until mid-1985, foreign currency deposits were not allowed in Bolivia.
2/ From end-1982 until 1988, foreign currency deposits were not allowed in Mexico.

Note: Depreciation rate (Right scale) and currency substitution (Left scale); Data is in percent.

CHART 4
DEGREE OF CURRENCY SUBSTITUTION AND DEPRECIATION RATE
IN PERU, URUGUAY, EGYPT, AND YEMEN A.R.
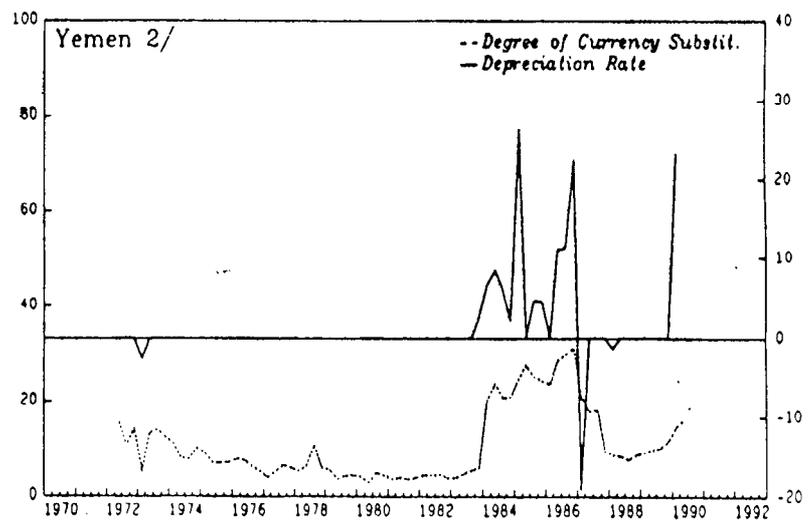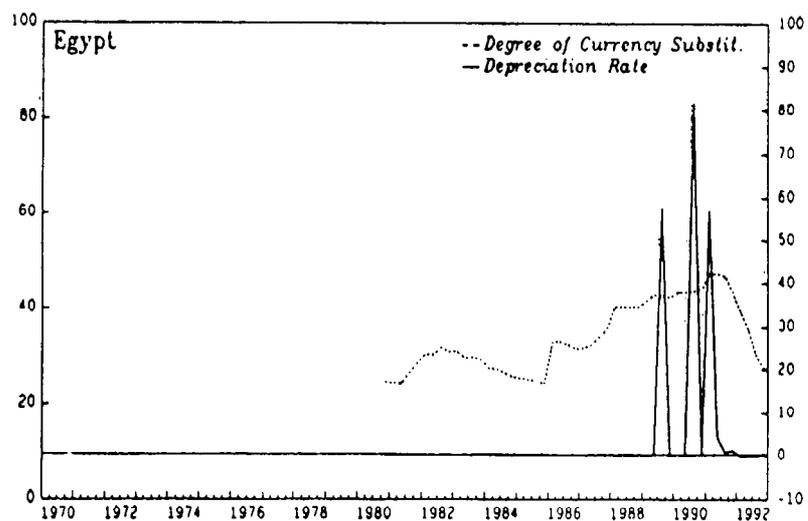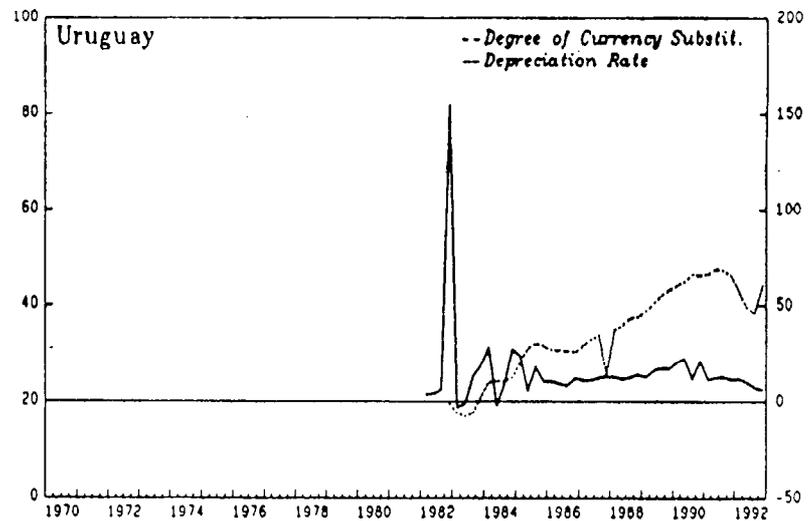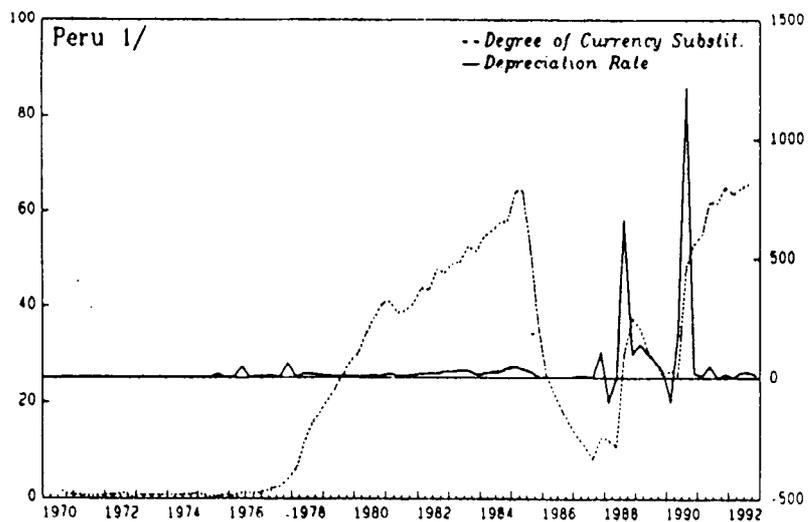

Source: International Financial Statistics.

1/ From 1985 until 1990, foreign currency deposits were not allowed in Peru.

2/ Time series ends with unification of Yemen A.R. and Yemen P.D.R. in May 1990.

Note: Depreciation rate (Right scale) and currency substitution (Left scale); Data is in percent.

suggests that the ratchet effect was particularly strong in countries with hyperinflation prior to the begin of stabilization policies.

Counterexamples are Egypt or Yemen, which only showed moderate depreciation and no noticeable ratchet effect. Movements in foreign currency deposits in these two countries seem to have responded to changes in the depreciation rate and the interest rate differential in both directions, thus implying a relatively symmetrical substitution process similar to the one observed in major industrial countries. For example, Egypt's dollarization ratio dropped by half during the last few quarters of the observation period, given relatively high domestic interest rates and the absence of depreciation.

However, there are also countries with relatively large inflation or depreciation rates and a comparatively weak ratchet effect, for example Poland and other formerly centrally planned economies in Eastern Europe, which, however, are not shown here in a chart due to a lack of complete and sufficiently long IFS data series. 1/ In these cases, households' trust in the final success of the stabilization efforts may have been particularly strong, inducing an immediate decline in the dollarization ratio. However, in such countries, the level of dollarization has generally been much lower than in the countries of the sample with a large ratchet effect. In addition, Sahay and Végh (1994) argue that the dollarization process may be easier to reverse when the public and the financial system have not yet fully adapted to functioning with foreign monies. Furthermore, some part of the apparent decline in the degree of dollarization in countries with a weak or non-existent ratchet effect may have also been promoted by administrative and other measures introduced with the specific objective to de-dollarize the economy.

These administrative and other measures are part of the regulatory and institutional framework, the design of and changes to which clearly affect the path of dollarization over time. 2/ This framework includes, inter alia, the extent of past and current restrictions to keep foreign currency deposits within the domestic banking system, the state of development of the financial sector, the extent of differential treatment of foreign currency deposits and domestic currency deposits in a country's system of reserve requirements, as well as the extent of possibly existing indexation systems. It also and particularly comprises attempts of the authorities to de-dollarize the economy either by promoting attractive interest rates on domestic currency deposits 3/ or by resorting to some

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1/ For a discussion of currency substitution and dollarization in economies in transition, see Box 9 in IMF World Economic Outlook (1994) and Sahay and Végh (1994).

2/ This issue was emphasized by Savastano (1992) and El-Erian (1987).

3/ For example, interest rates on money balances in domestic currency temporarily exceeded 100 percent in Bolivia and Uruguay and were well above 1000 percent in Argentina and Peru.

administrative measures, ranging from very targeted regulations 1/ to the complete confiscation or forced conversion of foreign currency deposits and the reimposition of foreign exchange controls. Among the sample countries, foreign currency deposits were temporarily suspended in Bolivia, Mexico, and Peru. By doing so, the authorities intended to compensate the impact of failed stabilization programs or other situations of political and economic crises and to regain their capability to conduct independent and effective fiscal, monetary and exchange rate policies. However, contrary to their intentions, such a forced de-dollarization did not generally reduce the demand for foreign currency, but instead induced a sizable capital flight and pushed the dollarized economy underground. 2/ Such de-dollarization measures were particularly fruitless in cases where confidence in government policies had eroded significantly over time and where large inflation and currency depreciation rates continued to prevail. As a consequence, economic literature on currency substitution largely considers selective de-dollarization measures, which do not address the underlying causes of currency substitution, such as an excessive fiscal deficit, to be ineffective and unsustainable over time. 3/

V. The Ratchet Effect

In the original meaning of the word, a ratchet is a mechanism that allows unrestricted movement, for instance of a wheel, in one direction but prevents or impairs a similar movement in the opposite direction. This concept has also been applied in different areas of economics, such as consumption theory and monetary economics. In the economic models from these areas that take the ratchet effect into consideration, it is assumed that the variable to be explained reacts differently to changes of one of the key explaining variables depending on whether the latter one is rising or falling, thus representing an asymmetric relationship between the dependent variable and one of the independent variables. The ratchet effect in these models is usually accounted for through the inclusion of the past peak value of the respective independent variable, in addition to the current value of that variable.

One of the earliest and most prominent applications of the ratchet effect dates back to 1952 when James Duesenberry formulated his relative income hypothesis. 4/ His theory argues that current consumption does not only depend from current income but also from past peak levels of income.

1/ For example, in Poland, effective January 1990, enterprises were no longer allowed to increase their foreign currency deposits, which led to an immediate and continuous decline in the dollarization ratio.

2/ See, in general, Calvo and Végh (1992) and Melvin and Fenske (1992) for the case of Bolivia.

3/ See, for instance, Calvo and Végh (1990), Calvo (1992), Dornbusch and Reynoso (1989), Dornbusch, Sturzenegger and Wolf (1990).

4/ Duesenberry (1952).

Consequently, his consumption function includes the highest previously achieved level of income as a determinant of the current level of consumption. He concludes that while households get accustomed to increasingly higher levels of consumption, they are hesitant to reduce their consumption standards once their income falls. As a consequence, the consumption function shows an asymmetric behavior: rising income immediately translates into increasing consumption levels, whereas declining income leads to only a small decrease of consumption, given the existence of the ratchet effect.

In the context of monetary economics, the ratchet effect was included in a variety of empirical studies on the demand for money in several countries, among them the United States as well as some high inflation Latin American countries. Although diverse in their specification and estimation method, these studies generally defined the ratchet variable as the largest previously achieved value of one of the independent variables over a given period, that is, either the past peak value of the interest rate, of the inflation rate, or of the depreciation rate of the domestic currency; rarely, a more flexible definition of the ratchet variable was chosen, for example, the difference between the current value of the selected independent variable and the moving average of its past and current values over a given period. 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.

Asymmetry or hysteresis was assumed to exist in the money demand function for the United States in the late-1970s and early-1980s when interest rates became more volatile and reached unprecedented high levels and empirical problems were observed with the traditional money demand approach. Enzler, Johnson and Paulus (1976) and Quick and Paulus (1979) developed money demand functions that added the most recent interest rate peak as one of the exogenous variables. In a more flexible approach, Simpson and Porter (1980) replaced the past interest rate peak by the difference between the current interest rate level and the n-period moving average of the current and past interest rate levels. The inclusion of the ratchet variable in both model versions implies that the demand for money falls when interest rates rise, while on the other hand money demand rises by a lesser extent when interest rates fall. The ratchet variable was found to be significant in both models, and the respective equations showed lower standard errors and a better fit than the more traditional equations; consequently, the results were judged as being "very promising".

The underlying assumption of these studies was that when interest rates and, consequently, the opportunity costs of holding money balances rise to unprecedented levels, households try to economize their money holdings. However, such strategies contain fixed costs--which go beyond regular transaction costs--, such as the costs for developing and getting used to new financial instruments, e.g., NOW accounts, or the costs of writing a cash management computer program. The willingness to bear these costs tends to be more pronounced, the higher the opportunity costs and the

more an awareness threshold can develop after an interest rate peak.
However, once these 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 decline again. In sum, reductions
in interest rates may not cause cash balances or traditional demand deposits
to rise again by the same amount as they had declined earlier during a
period of rising interest rates. Thus, the investment in the creation of
money substitutes has had permanent effects on the demand for money.

Such an asymmetry in the money demand function was also observed in
some of the empirical studies on high inflation countries during the 1980s,
for example, by Piterman (1988) on Argentina, Chile, Uruguay, and Israel, as
well as Melnick (1989), Ahumada (1992) and Kamin and Ericsson (1993) on
Argentina. However, instead of using the past interest rate peak as the
ratchet variable, these studies focused 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 that when inflation
rises to unprecedented levels, the demand elasticity of money is higher than
when inflation is falling. Piterman (1988) found evidence of asymmetry in
the case of countries whose inflation rate peaked at very high levels in the
1970s and later (Argentina, Chile, Uruguay, and Israel), whereas countries
with inflation peaks in the 1960s--before the globalization of financial
markets--or relatively low observed inflation peaks showed a symmetric
reaction of money demand to inflation. Piterman's results were largely
confirmed by the work of the other authors in the case of Argentina.

All of the above studies on high-inflation countries attributed the
existence of the ratchet effect to a costly process of developing, learning
and applying strategies to "beat" inflation; this phenomenon was also
described by Dornbusch and Reynoso (1989), Dornbusch, Sturzenegger and Wolf
(1990), and Sturzenegger (1992). Such strategies, commonly labelled as
financial innovations, include, inter alia, the rapid switching between
demand and savings deposits in domestic currency, the evolution of high
yielding or indexed money substitutes, the efficient use of overdrafts, the
application of (computer-based) portfolio optimization methods, and, most
notably, the flight into foreign currency assets; the latter was the
predominant strategy applied in Lebanon. Over time, an increasing
proportion of the population 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 to
maintain and possibly even expand the use of these substitute instruments
even when inflation declines or the exchange rate appreciates, making the
process hardly reversible; agents become "locked in" the new pattern. If at
all, only a significant decline in inflation or a considerable appreciation
of the currency may overcome the sunk costs in "inflation-beating"
strategies and provide enough incentives for households to eventually revert
to traditional domestic money balances. Guidotti and Rodriguez (1992)

developed a model that takes these costs into consideration and applies specifically to the case of a flight into foreign currency deposits. Their model includes a band for the differential between domestic and international inflation levels, within which households do not have an incentive to switch between local and foreign currency, reflecting the existence of the above-mentioned costs. Above the upper value of the band, the local currency gradually disappears, whereas below the lower value de-dollarization occurs.

The cementation of new payment and savings patterns may be further promoted by the design of and changes to the institutional and regulatory framework within a given country. This includes, for example, the creation of foreign currency denominated monetary policy instruments (e.g., in Bolivia and Lebanon), the establishment of a clearing and payment system in foreign currency under the authority of the central bank (e.g., in Lebanon), and the discrimination of a country's system of reserve requirements against domestic currency deposits (e.g., in Lebanon and several Latin American countries).

In addition, it can be assumed that a large degree of confidence in the success of the authorities' stabilization efforts is required to induce a de-dollarization, irrespective of cost aspects. However, this may take a considerable amount of time to build up even if current policies lead to a significant reduction in inflation or currency depreciation; the worse the credibility record of a government in the past, the higher the resistance of the public to attribute a certain extent of credibility to the authorities' current policy stance. In a country which just emerged from a civil war, like Lebanon, the time to rebuild credibility of and confidence in the government may be particularly long.

VI.   Econometric Analysis of Dollarization in Lebanon 1/

Econometric models to identify the determinants of currency substitution and dollarization have been developed for most of the countries mentioned in the Section IV. 2/ Although different in their approach and

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1/ A previous study on currency substitution in Lebanon, covering the period from 1977 to 1986, was conducted by Osseiran (1987).
2/ Recent econometric analyses on currency substitution in the sample countries of the previous section include studies on Argentina (Kamin and Ericsson (1993), Ahumada (1992), Melnick (1990), Piterman (1988), Fasano-Filho (1987), Canto and Nickelsburg (1987), Ramirez-Rojas (1985)), Bolivia (Melvin (1988), Melvin and Afcha (1989), Melvin and Ladman (1991), Melvin and Fenske (1992), Savastano (1992), Cléments and Schwartz (1992)), Chile (Piterman (1988)), Mexico (Gruden and Lawler (1983), Ramirez-Rojas (1985), Melvin (1988), Savastano (1992), Ortiz (1983)), Peru (Rojas-Suarez (1992), Savastano (1992)), Uruguay (Piterman (1988), de Melo (1986), Ramirez-Rojas (1985), Savastano (1992)), Egypt (El-Erian (1988), Haque (1990)), and Yemen A.R. (El-Erian (1988)). Agénor and Khan (1992) focused on ten developing countries (Bangladesh, Brazil, Ecuador, Indonesia, Malaysia, Mexico, Morocco, Nigeria, Pakistan, and Philippines). Other studies on developing countries refer to the Dominican Republic (Canto (1985)), Brazil (Calomiris

specification, most of these models are based on a simple structural model that includes the estimation of a money demand function and incorporates inflationary or exchange rate expectations and/or interest rate differentials as the main determinants of currency substitution.

The underlying assumption of most of these model specifications is that the demand for foreign currency by residents is driven by 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 of the inflation rate or exchange rate. The econometric models to capture the dollarization process in Lebanon developed in this paper are based upon similar assumptions, but also include a variable to capture the ratchet effect.

Both models of this paper use the dollarization ratio CS as the dependent variable, applying Definitions 1 and 2, respectively, as introduced in Section II; in the following, these model specifications are referred to as Models 1 and 2, respectively. CS is assumed to be a function of a number of variables expressing the determinants of the dollarization process. Adopting a linear specification of the relation between CS and the independent variables would have implied that, for extreme values of the latter, the fitted value of CS may have fallen outside the 0-1 range, which is impossible by definition. In order to bound the fitted ratio between 0 and 1, a logistic transformation is used, defining the dependent variable as the natural logarithm of $((1/CS^\beta)-1)$, with ß being a parameter representing the acceleration rate of the substitution process. [1]/

In line with the literature on currency substitution, CS is assumed to be a function of the interest rate differential and the expected depreciation. The inclusion of both variables in the models implies that uncovered interest rate parity is not given in the case of Lebanon; instead, imperfect substitutability between domestic and foreign assets is assumed, resulting from a risk premium related to political as well as economic factors. While it is possible to summarize both determinants--the interest rate differential and the expected exchange rate--in one independent variable, representing the difference in the expected real rates of return between foreign and domestic currency deposits, it was decided to include

2/ (...continued)
and Domowitz (1989)), Ecuador (Canto and Nickelsburg (1987)), Venezuela (Marquez (1987), Canto and Nickelsburg (1987)), and Israel (Piterman (1988)). Currency substitution in economies in transition is dealt with in Sahay and Végh (1994) and International Monetary Fund (1994b). For examples of currency substitution in industrialized countries see Lane and Poloz (1992), Batten and Hafer (1984, 1985, 1986), Bordo and Chaudhri (1982), Brillemburg and Shadler (1979), Brittan (1981), Daniel and Fried (1983), Marquez (1985), and Melvin (1985).

1/ The ß-parameter is included only on an experimental basis. Most of the estimations are run with ß equal to 1.

CHART 5
LEBANON
MODEL 1: EXCHANGE RATE RATCHET VARIABLE VERSUS CS-RATIO RATCHET VARIABLE
(In percent)
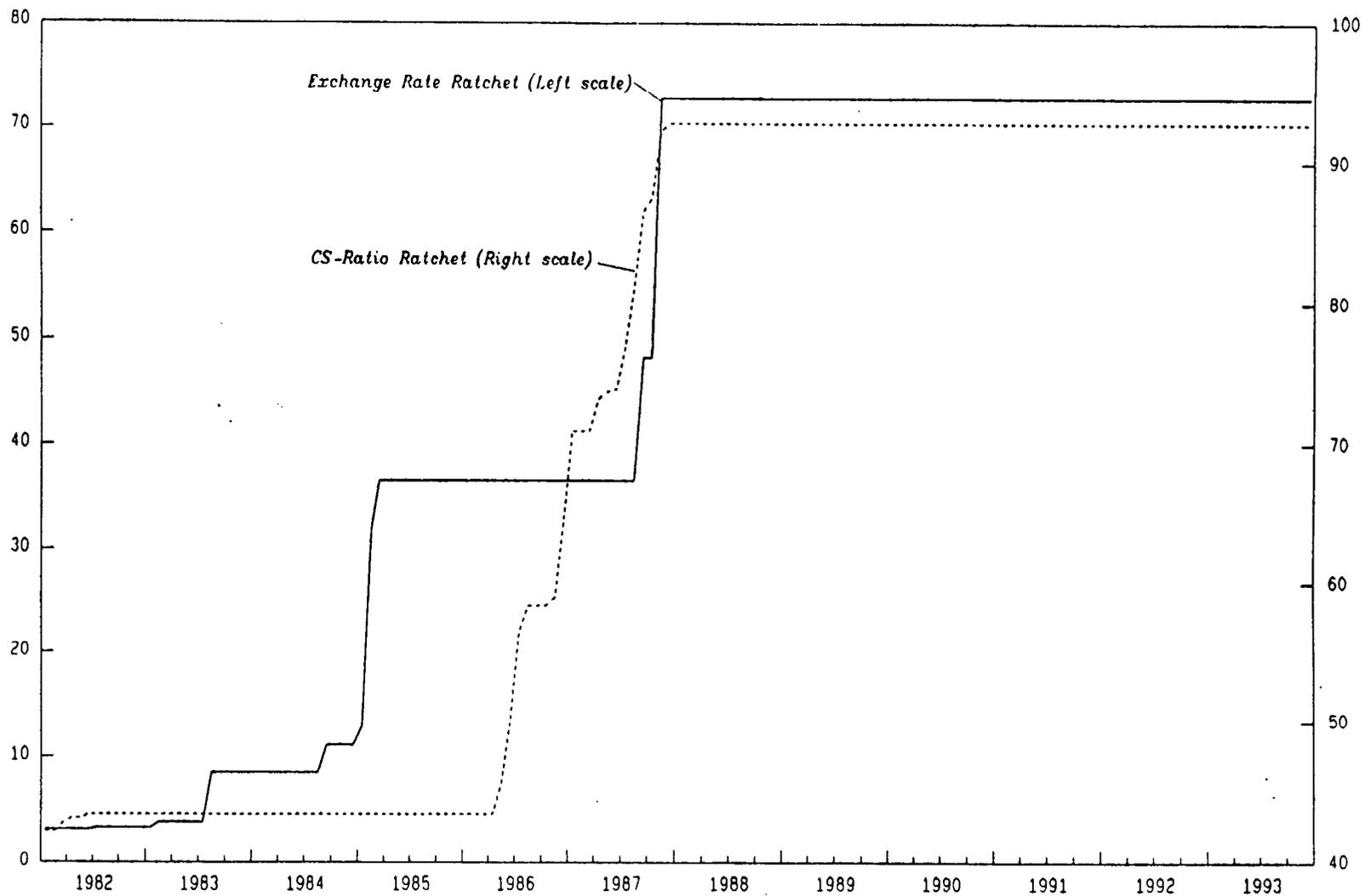
Source: Staff calculations.

them separately, owing to the uncertainty related to the measurement of the expected depreciation. Moreover, even if expected depreciation could be exactly measured, it would still be preferable to introduce it separately to test whether households react similarly to changes in interest rate differentials (which are observed) and to changes in expected depreciation; in addition, the interest rate differential in the case of Lebanon is relatively small compared to the changes in the expected depreciation. The expected depreciation is proxied by the depreciation rate observed during the current month. 1/ The interest rate differential is calculated by subtracting the interest rate on LL time deposits from the LIBOR interest rate for deposits with maturities up to three months. 2/

Furthermore, a ratchet variable is added to account for the persistence of the dollarization process. Two versions of the ratchet variable are tested. The first version uses the highest previously observed depreciation rate to represent the ratchet effect, hence following the approach chosen in other empirical studies on high-inflation countries, as discussed in the previous chapter 3/; this version of the ratchet variable is henceforth called the exchange rate ratchet. The second version of the ratchet variable, henceforth labelled the CS-ratio ratchet, is defined as the highest previously achieved value of the dollarization ratio.

It was decided to experiment with both definitions of the ratchet variable because of some dissatisfying features of the exchange rate ratchet. As can be seen in Chart 5, the exchange rate ratchet shows fewer relative peaks than the CS-ratio ratchet and is more determined by extreme outliers. In particular, the exchange rate ratchet reaches a relative peak in mid-1984, which is not surpassed until end-1987; consequently, the mid-1984 peak value--clearly an outlier--is continuously used in the regression during the dollarization "frenzy" in 1985 to 1987. It is at least questionable whether a sufficiently strong awareness threshold of the presence of large inflation and currency depreciation could build up among households--with the resulting flight into innovative money management techniques to "beat" inflation--on the basis of just one extreme depreciation month or quarter. On the other hand, the CS-ratio ratchet may be better suited to capture the dollarization process during these tumultuous years in the mid-1980s, as it gradually reaches new peaks during

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1/ This implies assuming static expectations, as deposit stocks refer to end-of-period data.

2/ According to representatives of the Lebanese banking community, the interest rate on U.S. dollar deposits in Lebanon is linked to LIBOR minus a margin of 1/8 of a percentage point; the margin has been relatively constant over time.

3/ These studies generally used the past peak inflation rate to measure the ratchet effect, but indicated the possibility to also use the past peak depreciation rate. As in the case of Lebanon no reliable inflation data on a monthly basis are available, only the depreciation rate can match the approach used in other studies.

that period and is relatively immune to outliers; it thus represents the process of developing, learning and slowly beginning to apply these new money management techniques in a much more accurate way, without at the same time compromising the idea behind the inclusion of the ratchet effect in the model structure. Another advantage of the CS ratio ratchet lies in the fact that it represents all the factors--not just the role played by the exchange rate--that in the past have influenced the dollarization process.

In addition to testing two different definitions of a past-peak ratchet variable, the possibility of a more flexible behavior, namely that the dollarization process is partially reversible albeit after a long delay, cannot be ruled out. Consequently, partial reversibility is allowed by experimenting with a ratchet variable that is defined as the maximum value of the depreciation rate or the CS ratio, respectively, during the past n years; n is then estimated through scanning over a reasonable parameter space; the value of n that minimizes the residual sum of squares is then selected as an indicator for the appropriate length of the ratchet variable. 1/

In order to capture adjustment lags, other than those related to the ratchet effect, the lagged dependent variable is also included in both modes. 2/ As to the dynamic specification, the approach followed was the one recommended by the Hendry school 3/, based on an initial over-parameterized specification with several lags on all regressors. 4/ 5/

As a summary, Models 1 and 2 view the degree of dollarization as a function of the expected depreciation, the interest rate differential, the lagged dependent variable, and the ratchet variable. Model 1 is calculated using monthly data, whereas for the estimation of Model 2 only quarterly data are available. The model structure can be expressed in a functional form as follows:

$$M_t = \alpha_0 + \alpha_1 M_{t-1} + \alpha_2 i_t + \alpha_3 e_t + \alpha_4 R_t + U_t$$

where:

1/ The scanning involved raising n from 1 to 4 years in annual steps and from 4 to 6 years in quarterly steps.

2/ The specification search also included lagged values of the interest rate differential and the exchange rate depreciation, but they were dropped due to low t-statistics.

3/ See, for example, Hendry (1979).

4/ For simplicity, the tables report only the final stage of the specification search.

5/ A scale variable is omitted, as in Cagan's (1956) money demand model for hyperinflating countries.

Table 1. Model 1: Estimates of the Determinants of Dollarization in Lebanon
with the Ratchet Variable Defined as the Highest Previously Achieved CS-Ratio

Equation	Length of Ratchet Effect In Years	Constant	Expected Depreciation	Interest Rate Differential	Lagged Dependent Variable	Ratchet Effect 1\	Adjusted R2	Standard Error	Sum of Squared Residuals	Durbin h-statistics	Chow
(1)	Unlimited	0.466** (3.41)	-0.021** (-3.63)	-0.149 (-0.20)	0.843** (17.60)	-0.611** (-3.05)	0.967	0.172	4.050	0.523	2.251
(2)	Unlimited	0.121** (2.65)	-0.014** (-3.13)	1.120 (1.81)	0.907** (26.42)		0.966	0.174	4.153	0.732	3.774##
(3) 2\	4 1/2 years	0.492** (3.66)	-0.021** (-3.77)	0.167 (0.24)	0.826** (16.75)	-0.630** (-3.28)	0.967	0.171	4.004	0.472	2.669#
(4) 3\	Unlimited	0.279** (3.04)	-0.020** (-3.69)	-0.215 (-0.32)	0.838** (17.45)	-0.564** (-3.13)	0.963	0.158	3.412	0.532	2.178

Note:
Values in columns 3 to 7 represent the coefficient estimates and, in parentheses below, the related respective value of the t-statistics.
* denotes significance; t>1.960 (α=0.05).
** denotes strong significance; t>2.576 (α=0.01).
Chow: Chow test with splitting date of October 1989, the month of the signing of the Taif Peace Accord.
the hypothesis of stability is rejected at the 5 percent level of significance; F>2.29.
the hypothesis of stability is rejected at the 1 percent level of significance; F>3.17.
1\ Ratchet effect as measured by the highest previously observed currency substitution ratio.
2\ Equation (1) with length of ratchet variable of 4 1/2 years.
3\ Equation (1) with acceleration rate of the dollarization process β=0.5.

Table 2. Model 1: Estimates of the Determinants of Dollarization in Lebanon
with the Ratchet Variable Defined as the Highest Previously Observed Depreciation Rate

Equation	Length of Ratchet Effect In Years	Constant	Expected Depreciation	Interest Rate Differential	Lagged Dependent Variable	Ratchet Effect 1\	Adjusted R2	Standard Error	Sum of Squared Residuals	Durbin h-statistics	Chow
(5)	Unlimited	0.194** (2.92)	-0.018** (-3.20)	-0.265 (-0.33)	0.892** (22.41)	-0.004* (-2.34)	0.966	0.174	4.139	0.683	3.049#
(6)	Unlimited	0.121** (2.65)	-0.014** (-3.13)	1.120 (1.81)	0.907** (26.42)		0.966	0.174	4.153	0.732	3.774##
(7) 2\	4 3/4 years	0.200** (3.22)	-0.017** (-3.37)	0.502 (0.77)	0.874** (21.54)	-0.003* (-2.53)	0.967	0.173	4.088	0.637	3.746##
(8) 3\	Unlimited	0.073 (1.82)	-0.017** (-3.22)	-0.263 (-0.36)	0.889** (22.02)	-0.003* (-2.31)	0.963	0.160	3.493	0.724	3.093#

Note:
Values in columns 3 to 7 represent the coefficient estimates and, in parentheses below, the related respective value of the t-statistics.
    * denotes significance; $t > 1.960$ ($\alpha = 0.05$).
    ** denotes strong significance; $t > 2.576$ ($\alpha = 0.01$).
Chow: Chow test with splitting date of October 1989, the month of the signing of the Taif Peace Accord.
    # the hypothesis of stability is rejected at the 5 percent level of significance; $F > 2.29$.
    ## the hypothesis of stability is rejected at the 1 percent level of significance; $F > 3.17$.
1\ Ratchet effect measured by the highest previously observed depreciation rate.
2\ Equation (5) with length of ratchet variable of 4 3/4 years.
3\ Equation (5) with acceleration rate of the dollarization process $\beta = 0.5$.

Table 3. Model 2: Estimates of the Determinants of Dollarization in Lebanon
with the Ratchet Variable Defined as the Highest Previously Achieved CS-Ratio

Equation	Length of Ratchet Effect In Years	Constant	Expected Depreciation	Interest Rate Differential	Lagged Dependent Variable	Ratchet Effect 1\	Adjusted R2	Standard Error	Sum of Squared Residuals	Durbin h-statistics	Chow
(9)	Unlimited	2.964** (4.70)	-0.104** (-5.97)	-0.066** (-2.74)	0.704** (6.95)	-4.197** (-4.59)	0.941	0.243	2.479	0.082	0.316
(10)	Unlimited	0.175* (2.20)	-0.092** (-6.00)	0.027 (1.88)	0.748** (10.37)		0.941	0.241	2.502	-0.073	0.355
(11) 2\	4 3/4 years	2.965** (4.89)	-0.100** (-5.99)	-0.058* (-2.55)	0.665** (6.32)	-4.220** (-4.77)	0.942	0.241	2.434	0.228	2.671#
(12) 3\	Unlimited	2.590** (4.46)	-0.100** (-5.92)	-0.064** (-2.73)	0.698** (6.90)	-4.033** (-4.60)	0.937	0.235	2.326	0.063	0.324

Note:
Values in columns 3 to 7 represent the coefficient estimates and, in parentheses below, the related respective value of the t-statistics.
    * denotes significance; t>2.021 (α=0.05).
    ** denotes strong significance; t>2.704 (α=0.01).
Chow: Chow test with splitting date of October 1989, the month of the signing of the Taif Peace Accord.
    # the hypothesis of stability is rejected at the 5 percent level of significance; F>2.62.
    ## the hypothesis of stability is rejected at the 1 percent level of significance; F>3.86.
1\ Ratchet effect as measured by the highest previously observed currency substitution ratio.
2\ Equation (9) with length of ratchet variable of 4 3/4 years.
3\ Equation (9) with acceleration rate of the dollarization process β=0.5.

Table 4. Model 2: Estimates of the Determinants of Dollarization in Lebanon
with the Ratchet Variable Defined as the Highest Previously Observed Depreciation Rate

Equation	Length of Ratchet Effect In Years	Constant	Expected Depreciation	Interest Rate Differential	Lagged Dependent Variable	Ratchet Effect 1\	Adjusted R2	Standard Error	Sum of Squared Residuals	Durbin h-statistics	Chow
(13)	Unlimited	0.251**	-0.088**	0.034	0.676**	-0.019*	0.942	0.240	2.412	-0.112	0.339
		(2.87)	(-5.76)	(0.20)	(7.36)	(-2.25)					
(14)	Unlimited	0.175*	-0.092**	0.027	0.748**		0.941	0.241	2.502	-0.073	0.355
		(2.20)	(-6.00)	(1.88)	(10.37)						
(15) 2\	5 1/2 years	0.211*	-0.080**	0.027*	0.550**	-0.019*	0.952	0.218	1.995	-0.436	1.083
		(2.94)	(-5.37)	(2.07)	(6.17)	(-2.48)					
(16) 3\	Unlimited	-0.038	-0.085**	0.053	0.676**	-0.018*	0.938	0.233	2.273	-0.121	0.341
		(-0.33)	(-5.72)	(0.03)	(7.36)	(-2.17)					

Note:
Values in columns 3 to 7 represent the coefficient estimates and, in parentheses below, the related respective value of the t-statistics.
    *   denotes significance; t>2.021 (α=0.05).
    **   denotes strong significance; t>2.704 (α=0.01).
Chow: Chow test with splitting date of October 1989, the month of the signing of the Taif Peace Accord.
    #   the hypothesis of stability is rejected at the 5 percent level of significance; F>2.62.
    ##   the hypothesis of stability is rejected at the 1 percent level of significance; F>3.86.
1\ Ratchet effect as measured by the highest previously observed depreciation rate.
2\ Equation (13) with length of ratchet variable of 5 1/2 years.
3\ Equation (13) with acceleration rate of the dollarization process β=0.5.

Table 5. Unit Root Tests for Model Variables

Variable	ADF - Test Definition of Model 1	ADF - Test Definition of Model 2
Degree of Currency Substitution	-9.37 **	-6.22 **
Expected Depreciation	-13.02 **	-7.82 **
Interest Rate Differential	-10.17 **	-6.96 **

Note: ADF - Test is the Augmented Dickey-Fuller-Test. The null hypothesis is that the variable is integrated of order 1; the null hypothesis is rejected when the value of the test statistic exceeds the critical value. ** denotes a variable for which the null hypothesis is rejected at the 99 percent level.

M_t — degree of dollarization CS in period t, defined as $\ln((1/CS^\beta)-1)$, with ß representing a possible acceleration rate of the substitution process;

M_{t-1} — lagged dependent variable to represent the stock adjustment mechanism;

i_t — interest rate differential (3 month LIBOR minus interest rate on LL terms deposits);

e_t — expected depreciation;

R_t — ratchet variable in period t;

The above specification was estimated for both models using instrumental variable least squares for the period from 1982 to 1993. Instrumental variables are used to eliminate the simultaneous equation bias resulting from the fact that the current exchange rate appears both on the left hand side and the right hand side of the equation. [1] [2] The use of standard least square procedures is appropriate owing to the stationarity of the time series. To check for data stationarity, the Augmented Dickey-Fuller test (ADF-test) was applied on all variables. The results, reported in Table 5, suggest that all variables are stationary.

Tables 1 and 2 show the results of the estimations for Model 1, which measures the degree of dollarization by strictly relying on domestic banking data. While Table 1 reports the results for Model 1 using the CS-ratio ratchet in the estimations, Table 2 indicates the respective results of the same model with the exchange rate ratchet. The results of Model 2, which measures the dollarization ratio by including also foreign currency deposits held abroad by Lebanese residents, are reported in Tables 3 and 4, respectively. In each of the four tables, the first equation represents the preferred equation which was obtained as a result of the specification search following the Hendry approach. The second equation in each table illustrates the impact of dropping the ratchet variable from the preferred equation, while the third and the fourth equations show the respective results of a re-estimation of the preferred equation either with a shorter-than-unlimited ratchet variable as a result of the scanning process described above or, for solely illustrative purposes, with an acceleration rate of the dollarization process of 0.5.

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[1] The instruments used for the exchange rate included all the strictly exogenous variables of the main model, plus the lagged values of the exchange rate.

[2] In different runs of the estimation, seasonal adjustment as well as different LIBOR and LL interest rates were tried. However, the results did not differ significantly.

Looking at the preferred equations in each table--equations (1), (5), (9), and (13)--, the fit of both models is good, as indicated by the relatively high adjusted coefficient of multiple determination (R^2). Durbin's h-statistics indicates the absence of first-order autocorrelation, and the application of the Breusch-Godfrey test (not reported) confirms the absence also of higher-order autocorrelation. All significant coefficients have the expected sign. 1/ In addition, most preferred equations pass the Chow test, indicating that stability of the coefficient estimates over time is given in the preferred equations; consequently, they can be used for the extrapolation of future developments. 2/

In line with the literature on currency substitution, the variable representing the expected depreciation shows a strong negative significance in both models. The large coefficient estimates and the strong positive significance of the lagged dependent variable indicate that households do not immediately and fully adjust their portfolios to changes in the real rates of return but after a certain time lag. The ratchet variable is significant in both models; however, when using the CS-ratio ratchet, both models show a 99 percent level of significance (equations (1) and (9)), whereas the exchange rate ratchet is only significant at the 95 percent level (equations (5) and (13)), thus providing a first indicator for the relative superiority of the CS-ratio ratchet vis-à-vis the exchange rate ratchet in the case of Lebanon. The interest rate differential is insignificant in the case of Model 1, irrespective of the definition of the ratchet variable. However, the estimation results are inconclusive regarding the interest rate differential in Model 2; while the version of Model 2 that uses the CS-ratio ratchet (equation (9)) shows a strong significance of the interest rate variable, the latter is insignificant in the case of an estimation of Model 2 with the exchange rate ratchet variable (equation (13)). To analyze the rationale behind these contradicting results, it is useful to recall the definitional differences between the two versions of the ratchet variable and to refer to Chart 6, which depicts the path of the degree of dollarization in Definitions 1 and 2 and the interest rate differential.

At first glance, Chart 6 supports the case of insignificance of the interest rate variable, as--contrary to the theory of currency substitution--the dollarization ratio in Lebanon generally rose in periods when the interest rate differential became more negative, and vice versa.

1/ The expected sign for the interest rate differential and the expected depreciation is negative as a result of the logistic transformation of the dependent variable.

2/ The Chow test was performed on the regressions by dividing the observation period into two unequal halves. The splitting date was chosen with the intention to separate the civil war period from the following period of relative peace. As a consequence, the splitting date chosen is the signing of the Taif Peace Accord in October 1989, which formally ended the civil war.

CHART 6
LEBANON
DEGREE OF DOLLARIZATION AND INTEREST RATE DIFFERENTIAL

Degree of Dollarization - Definition 2 (Left scale)

Degree of Dollarization - Definition 1 (Left scale)

Interest Rate Differential (Right scale)
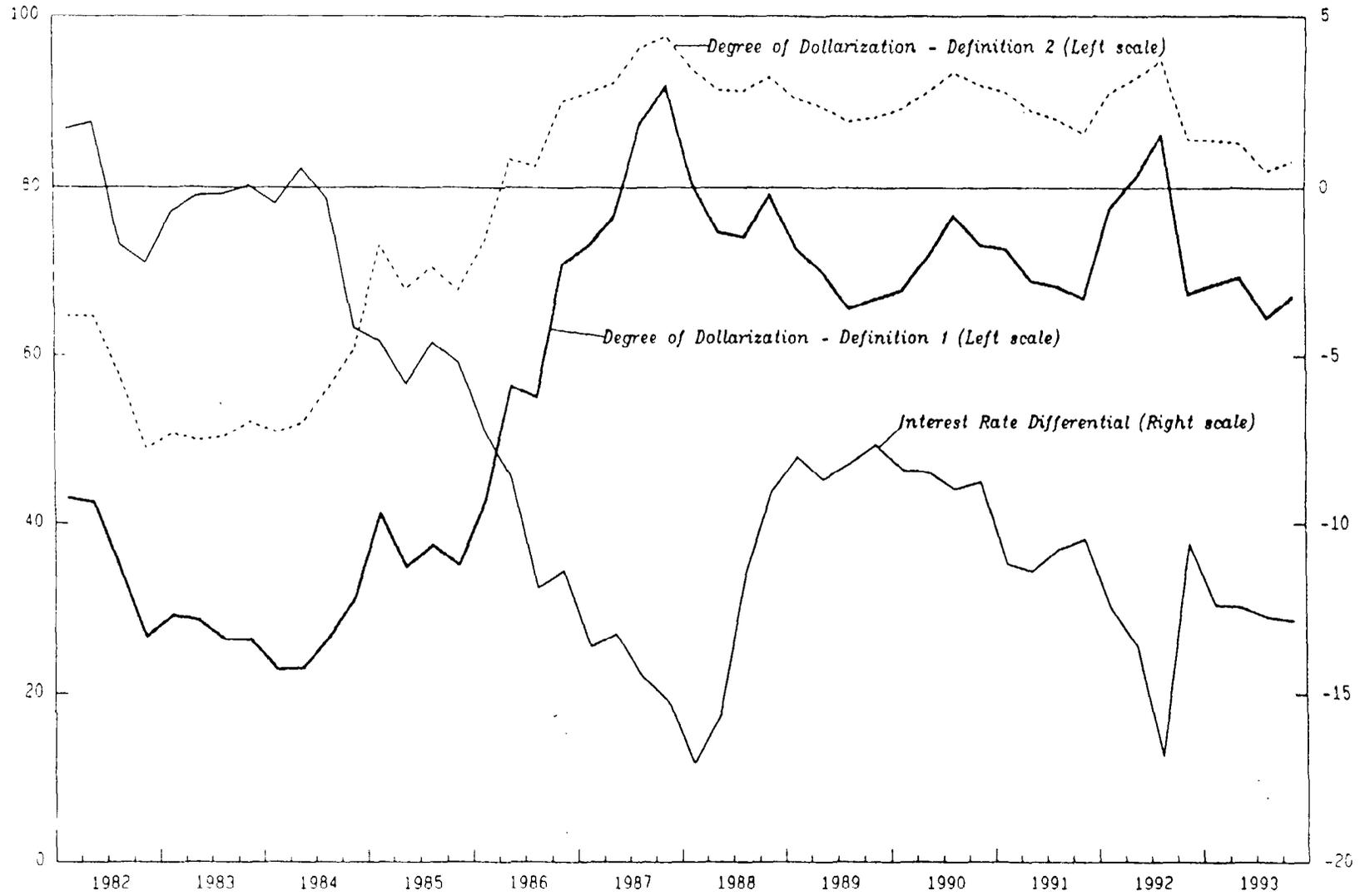
Sources: Bank of Lebanon; International Financial Statistics; and staff calculations.

Apparently, given the unambiguous estimation results of Model 1 and casual evidence from Chart 6, interest rate considerations did not play a major role in the households' portfolio decision process regarding the currency composition of their deposits held within the domestic banking system. Households seem to have been satisfied with the primary role of foreign currency deposits as a hedge against potential depreciation and did not consider nominal interest rates to be a decisive factor in this respect. This reflects the fact that during the entire observation period, the interest rate differential in the case of Lebanon has been much smaller than the one observed and tested in other empirical country studies on currency substitution, particularly in the case of some Latin American countries. In Lebanon, the nominal return on domestically held foreign currency deposits, which is firmly linked to LIBOR, has fluctuated between approximately 3 and 16 percent during that time 1/, with a declining tendency, while bank deposits in domestic currency have carried an interest rate between 10 and 25 percent; on the other hand, according to IFS, interest rates on bank deposits in local currency reached more than 100 percent in Bolivia and Uruguay and were well above 1000 percent in Argentina and Peru during their recent high dollarization periods. This low level of interest rates on domestic currency bank deposits in Lebanon can be attributed to the fact that, over most of the observation period, they were not market-determined but closely followed the regulated rates paid on treasury bills. 2/ The insignificance of the interest rate variable in Model 1 clearly also reflects the increasing role that domestically held foreign currency deposits have played as a transaction medium the longer the dollarization process has prevailed. This role is underlined by the already mentioned rising tendency in the ratio of dollar checks cleared to total checks cleared, which has occurred over the last few years irrespective of the movements in the exchange rate; the ratio reached roughly 80 percent in December 1993.

While the estimation results for Model 1 are uncontradictory with respect to the insignificance of the interest rate differential and can easily be explained, Model 2 requires a more differentiated view. The significance of the interest rate differential in Model 2 with the CS-ratio ratchet may be due to the already described higher store-of-value component of foreign currency deposits held abroad. This implies a more real-return-oriented approach of households holding foreign currency deposits outside Lebanon. These households may be characterized by a higher degree of maturity and sophistication, as they have to be able to make more complicated portfolio decisions by transferring and maintaining their balances abroad and overcome the higher learning and transaction costs of

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1/ The 3-month LIBOR is taken here as an example, but a similar range also exists for other LIBOR maturities.
2/ See International Monetary Fund (1994a).

such a decision. 1/ In turn, these higher costs make even marginally higher returns more desirable, thus raising the importance of the interest rate differential in the portfolio decision process. On the other hand, the insignificance of the interest rate differential in Model 2 with the exchange rate ratchet may be due to definitional problems of the latter, as explained above. The exchange rate ratchet is shaped by the erratic movements of the exchange rate, including distorting occasional outliers. Consequently, the relatively small interest rate differential may not be able to compensate the magnitude and the volatility of the exchange rate factor. In sum, given the relative deficiencies of the exchange rate ratchet, it makes sense to assume that the interest rate differential, albeit small, does matter to a Lebanese household investing abroad.

The Chow test results also support the relative superiority of the model specifications with the CS-ratio ratchet. The preferred equations of both models with the CS-ratio ratchet both pass the Chow test at the 5 and 1 percent level of significance (equations (1) and (9)); they can thus be used for the extrapolation of future developments. On the other hand, in the case of equation (5), which includes the exchange rate ratchet, we reject the hypothesis of stability at the 5 percent level of significance.

Tables 1 to 4 also indicate the impact on the estimation results if the ratchet variable in its respective definition is dropped from the model (equations (2), (6), (10), and (14)). Overall, the estimation results become worse. In general, the fit of the models tends to decline, albeit only marginally. In addition, the estimates become biased. The elasticities of the expected depreciation drop noticeably, in the case of equation (2) by one third, accompanied by a reduction in the respective t-values. On the other hand, the coefficient estimates and t-statistics of the stock adjustment variable increase considerably. These sizable changes in the coefficient estimates imply a largely reduced importance of the short-term impact of changes in the expected depreciation rate and an increased relevance of longer-term adjustments in the relative demand of households and enterprises for foreign currency. Moreover, if the ratchet variable is dropped, the interest rate differential shows the wrong sign and considerably different coefficient estimates, and either remains insignificant (equations (2), (6), and (14)) or becomes insignificant (equation 10)). In addition, the Chow test is no longer passed in Model 1 (equations (2) and (6)).

Tables 1 to 4 also report the results of the best-fitting equation for the case of a re-estimation of the preferred equations with a shorter-than-unlimited length of the ratchet variable, in order to allow for some reversibility in the dollarization process. The best-fitting equation was obtained through a scanning process which increased the length of the

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1/ It can also be assumed that such a sophisticated investor does not restrict his portfolio decisions to LIBOR-linked deposits but tries to benefit from higher returns in other currencies and other forms of assets.

ratchet variable in the preferred equation of the respective model specification successively from 1 year to 6 years, using the lowest residual sum of squares as the criterion to identify the best fit. Overall, the estimation results for both models seem to imply that the appropriate length of the ratchet variable is around 4 1/2 to 4 3/4 years (equations (3), (7), and (11)). 1/ However, while the fit of both models tends to improve with a shorter-than-unlimited ratchet variable, two major difficulties are observed. First, Model 1 does not pass the Chow test anymore (equations (3) and (7)). And second, the interest rate differential, though still insignificant, displays the wrong sign in equations (3), and (7), and even becomes significant at the 95 percent level with the wrong sign in the case of Model 2 with the exchange rate ratchet (equation (15)). On the other hand, the level of significance of the interest rate differential in Model 2 with the CS-ratio ratchet drops from 99 percent to 95 percent, keeping, however, the correct sign. In sum, given these problems with the estimations that contain the shorter-than-unlimited ratchet variable, the initial preferred equations with the past-peak definitions of the ratchet variable seem to be better suited to picture the dollarization process in Lebanon, especially when an extrapolation of future developments is sought.

The tables also contain, solely for illustrative purposes, the results for a reestimation of the preferred equation in each particular model after setting ß equal to 0.5, in order to assess the sensitivity of the results to the choice of that parameter. The results were substantially similar. 2/

As a summary, the results suggest--as expected and in line with the literature on currency substitution--that the expected depreciation does have an impact on the households' holding of foreign currency deposits. The interest rate differential is insignificant if only domestically held foreign currency deposits are considered; inconclusive results are obtained when cross-border deposits are included in the dollarization ratio, but some reasons speak for the significance of the interest rate differential. Most of the adjustment does not take place immediately, but after a certain lag, as indicated by the high coefficient estimates for the stock adjustment variable (M_{t-1}). Furthermore, the ratchet variable--in its both definitions applied--is significant in the case of Lebanon, indicating that past levels of dollarization or depreciation in an environment of high inflation and depreciation rates affect--to a large degree--the current relative demand for foreign currency deposits. The ratchet effect is particularly pronounced and unambiguous when defined as the past-peak dollarization ratio

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1/ The ratchet length of 5 1/2 years implied by equation (15) is not taken as indicative for the appropriate length of the ratchet effect, as the estimation results are ambiguous and biased, as explained below. This once again supports the thesis of relative inferiority of the model specification using the exchange rate ratchet.

2/ Largely identical results were also obtained when other values of ß were randomly tried out.

and is likely to last for at least 4 1/2 to 4 3/4 years. The existence of the ratchet effect stresses the lack of incentives for households to switch back to the domestic currency, given the "sunk" costs of developing, learning and using the foreign currency in all of its three functions, the cementation of the use of foreign currency through the existing system of reserve requirements and the establishment of the dollar check clearing system, as well as the eroded confidence in the policy ability of the government after 15 years of civil war. The lack of incentives is even more pronounced once the deposits are held abroad.

Some illustrative numerical examples for the interpretation of the estimation results may be useful. Beginning with Model 1, using a degree of currency substitution of 68 percent--approximately the level at end-1993--as a starting point, and assuming an increase of the expected depreciation rate by 1 percentage point as a result of rising inflationary expectations, equation (1) implies that the degree of currency substitution would increase to 68.46 percent in the short run and to 70.84 percent in the long run. 1/ If large depreciation rates reappeared in the magnitude of, say, 10 percent per month, the currency substitution ratio would rise in the short run to 72.39 percent and in the long run to 89.01 percent.

Using the same approach for Model 2 (equation (9)), but assuming a degree of currency substitution in the broader definition of 82 percent at the end of 1993, an expected 1 percent rise in the depreciation rate would result in an increase of the degree of currency substitution to 83.48 percent in the short run and to 86.60 percent in the long run. As the interest rate differential is only significant in Model 2 with the CS-ratio ratchet, an illustrative example of the impact of a rise in this differential is appropriate. If the differential increased by 1 percentage point, the currency substitution ratio would rise to 82.95 percent in the short-run and to 85.01 percent in the long run.

VII. Conclusions

It was shown that in the case of Lebanon, the currency substitution process is mainly driven by the expected depreciation rate. Moreover, households' decision to switch between the local and foreign currency takes time, as represented by the large estimated coefficient for the lagged dependent variable, and voluntary de-dollarization is slowed down by the presence of a strong ratchet effect, which lasts for at least 4 1/2 to 4 3/4 years. The interest rate differential generally only plays a minor role in households' portfolio decisions, given the close following of domestic interest rates to the regulated treasury bill rates, which led to a consistently small magnitude of the differential over time, and the heavy

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1/ The long-term effect is calculated by dividing the coefficient estimate for the expected depreciation variable by 1 minus the coefficient estimate of the stock adjustment variable.

use of domestically held foreign currency deposits also for transaction
purposes. However, the differential is likely to be somewhat more important
to more sophisticated investors who hold part of their foreign currency
deposits abroad.

In view of the evidence provided in this paper, should Lebanon try to
de-dollarize its economy? And if so, how could such a policy look like?
The answer to the first question is of largely political nature. Evidence
from other countries can at best be called mixed. And economic literature
on this issue offers broad and often contradictory views, with
recommendations ranging from aiming at a complete dollarization to a
complete de-dollarization of the economy. Calvo and Végh (1992) conclude
that "there does not seem to be a strong general case for or against
discouraging the use of foreign currencies." [1]

The answer to the second question involves a weighing of the costs
and benefits of the related policy measures. Even if the Lebanese
authorities decide to actively promote a de-dollarization, the scope of
possible policy measures is rather limited. Foremost, an elementary
precondition to effectively and sustainably induce a de-dollarization of the
economy would be to create a politically and economically stable environment
with solid government finances and low inflation rates. All other de-
dollarization measures will fail, if this basic precondition is not met, as
illustrated by the experience of several Latin American countries with
similar episodes of high currency substitution and dollarization.

In addition to bringing back political and economic stability as well
as credibility of and confidence in the government's policies, the
authorities could also encourage a continuous and noticeable appreciation of
the currency, making the holding of foreign currency more expensive over
time and thus decrease the importance of the costs that had initially caused
the built-up of the ratchet effect; however, possible negative side effects
of such a measure would have to be carefully taken into consideration.

Furthermore, the Bank of Lebanon could end the current discrimination
against domestic currency deposits in the system of reserve requirements and
ensure an at least equal treatment of deposits denominated in foreign and
domestic currency. Currently, no reserve requirements are imposed on
foreign currency deposits. As imposing reserve requirements on foreign
currency deposits may lead to an export of foreign funds and thus place an
undue burden on the country's financial system which is still recovering
from the impact of the civil war, a lowering and an eventual elimination of
the reserve ratio on domestic currency deposits appears to be the only
feasible way to end the current bias against domestic currency deposits in
the country's reserve system. Measures to increase the stability and
soundness of the banking system, e.g., in the areas of banking supervision
and the use of modern technology, could increase confidence in the Lebanese
financial system and thus accelerate the return of funds currently held

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[1] Calvo and Végh (1992), page 9.

abroad, which may further contribute to increasing the role of the domestic currency. Besides, the promotion of innovative financial products denominated in domestic currency, such as securities and certificates of deposits, as well as the development of underlying domestic financial markets and the creation of institutional investors as possible participants in these markets, such as pension funds, could further spur the use of domestic currency.

On the other hand, further administrative controls, as applied in some Latin American countries to force a de-dollarization, are likely to be counterproductive, given Lebanon's long tradition of absence of restrictions on cross-border financial transactions, the need to rebuild confidence to induce a repatriation of funds, and the necessity to restore Lebanon's role as one of the leading financial centers in the Middle East.

In addition, offering attractive interest rates on domestic currency deposits was one of the measures frequently applied in Latin American countries to induce a de-dollarization; however, very often only temporary relief was achieved, as the underlying fundamental problems leading to high inflation were not adequately addressed. As the interest rate sensitivity of Lebanese households has proven to be relatively low, only limited success can be expected from such a measure.

Overall, if the Lebanese authorities opt to encourage a de-dollarization of the economy, a limited scope of potential measures would be available. However, given the presence of the ratchet effect, significant de-dollarization as a result of all of these measures may not occur immediately but only after a certain time lag.

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