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Exchange Market Reform, Inflation, and Fiscal Deficits

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Abstract

This paper examines the short- and long-run effects of exchange market reform in developing countries. The first part reviews the recent experience of Guyana, India, Jamaica, Kenya, Sierra Leone, and Sri Lanka with exchange market reform. The second part studies analytically the short-run dynamics of the parallel market premium and the money supply upon unification, when the post-reform regime consists of either a pure float or a managed float. The third part discusses the impact of unification on inflation and quasi-fiscal deficits, and identifies a variety of implicit taxes and subsidies that must be taken into account in assessing the longer-run effects of exchange market reform.

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### Summary

Growing recognition of the costs associated with large differentials between official and parallel exchange rates has led numerous countries in recent years to attempt to unify their foreign exchange markets. This paper reviews some recent experiences with exchange market reform, examines some conceptual issues associated with the unification process, and extends the theoretical literature on the dynamics of exchange market unification.

The first part of the paper discusses the experience of Guyana, India, Jamaica, Kenya, Sierra Leone, and Sri Lanka in the early 1990s with exchange market reform. The review suggests that exchange market reform, launched in the context of a comprehensive macroeconomic program targeting most notably a sustainable fiscal position, significantly reduced inflation and raised reserve levels. However, in most of these countries, central banks continued to interfere (sometimes heavily) with the allocation of foreign exchange--and more generally with the functioning of the foreign exchange market--in the aftermath of reform.

The second part develops a theoretical framework for studying the dynamics of the parallel exchange rate, prices, foreign reserves, and the money supply when either a pure floating exchange rate regime or a managed float arrangement has been adopted in the postreform period. The analysis suggests that a variety of paths can be observed, depending on the nature of the postreform regime, the structural parameters of the model, and the length of the transition between reform announcement and actual implementation.

The last part of the paper focuses on the effects of unification on inflation. The "conventional" analysis of the unification process argues that the loss of the implicit tax on exports induced by exchange market unification may lead to a permanently higher inflation in the presence of fiscal rigidities. However, a variety of implicit taxes and subsidies must be taken into account in assessing the fiscal effects of exchange market reform. The first issue, as emphasized in the conventional analysis, is to determine whether the public sector is a net buyer or a net seller of foreign exchange prior to reform. The second and perhaps more important issue for many countries is to assess the extent to which the use of the official exchange rate for the valuation of imports for duty purposes provides an implicit subsidy to importers. It is argued (analytically, as well as with illustrative calculations) that, if the reduction in implicit subsidies to importers resulting from levying tariffs at the official exchange rate outweighs the loss in implicit taxes levied on exports repatriated at the official rate, exchange market reform may lead to reduced reliance on seignorage.



## I. Introduction

It is now well recognized that attempts at imposing restrictions on foreign exchange transactions conducted through official markets in developing countries have almost invariably led to the emergence of parallel markets. The evidence gathered in numerous studies suggests that the existence of such markets may entail a variety of economic costs, such as an increase in exchange rate and price volatility, a narrowing of the tax base (associated with the development of illegal activities), reduced flows of foreign exchange through official channels (as a result of the diversion of export remittances and private transfers from the official to the parallel market) and efficiency losses, resulting from incentives to engage in rent-seeking activities--such as corruption and bribery of government officials (Montiel, Agénor and Haque, 1993).

Recognition of the importance of these adverse and distortionary effects has led policymakers in many developing countries in recent years to seek ways to unify official and parallel markets for foreign exchange. In choosing the post-reform regime, very few countries have adopted a fixed exchange rate regime at the outset--in part because of the difficulties involved in choosing an appropriate level of the exchange rate. Instead, most countries have opted between two types of flexible exchange rate arrangements: auction markets--centralized arrangements in which the central bank sells at regular intervals a predetermined amount of foreign currency to operators (usually importers but also foreign exchange dealers) who satisfy some specific entry requirements 1/--and interbank markets, which are decentralized arrangements in which operators are commercial banks, importers (or other customers), and non-bank dealers. 2/ Although the relative merits of these arrangements remain a matter of debate, in recent years an increasing number of countries have tended to adopt an interbank market, owing in part to its more flexible nature (Galbis, 1993).

The purpose of this paper is to provide an overview of some recent experiences with exchange market reform in developing countries, and to examine some conceptual issues associated with the short- and longer-run effects of exchange market unification. We

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1/ In an auction market, bids offered by participants specify both the amount of foreign exchange desired as well as the price at which they are willing to purchase it. The "market" exchange rate is usually calculated as a weighted average of the rates proposed in all successful bids, or corresponds to the rate of the last successful bid.

2/ In an interbank market, the exchange rate is determined directly by transactions among banks and their customers, and by transactions between banks themselves. In principle, the Central Bank is not a major participant, but intervenes occasionally for smoothing or seasonal operations. As will be shown later, however, central bank intervention has often taken a more systematic form in practice.

begin in Section II by reviewing the recent experience of Guyana, India, Jamaica, Kenya, Sierra Leone, and Sri Lanka with exchange market reform. A formal framework is then developed in Section III to study the short-run effects of exchange market reform on the parallel market premium, the price level, and the money supply. We analyze both the case in which a perfectly flexible exchange rate regime is adopted after reform, and the case where a managed float is implemented after unification. Section IV focuses on the longer-run impact of exchange market reform on inflation, and fiscal deficits. The conventional view on the budgetary and inflationary effects of unification is reassessed, in light of the variety of implicit taxes and subsidies that are associated with multiple exchange rate regimes. Illustrative calculations of the net fiscal effect of exchange market reform are also presented for the countries whose experiences are reviewed in Section II. The main results of the paper are summarized in Section V.

## II. Exchange Market Reform: Recent Experiences

Since the early 1980s, a large number of unification attempts have taken place in developing countries, in an effort to reduce the role of government in the allocation of foreign exchange and alleviate some of the costs mentioned above. In this section, we review episodes of exchange market reform in Guyana, India, Jamaica, Kenya, Sierra Leone, and Sri Lanka. 1/ We highlight the course of some major financial variables during the reform process (the official exchange rate, the parallel market premium, inflation, the primary budget deficit, domestic credit, and gross reserves) and briefly describe the evolution of each country's foreign exchange arrangement. 2/ In what follows, and in line with the recent literature (Kiguel and O'Connell, 1995) we define "successful" unification as a reform that leads to a virtual disappearance of the parallel market premium, without significant increases in domestic inflation or recurrent balance-of-payments problems.

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1/ The countries selected here cover a broad range of approaches to reform, but share the characteristic that the post-reform regime in all of them took the form of the adoption of a flexible exchange rate arrangement. See Galbis (1993) on the experiences of Guyana, Jamaica, Sri Lanka. Lum and McDonald (1994) examine the operational issues involved in the functioning of interbank markets in some African countries, including Kenya and Sierra Leone. Other studies reviewing experiences with exchange market reform during the past two decades include Agénor and Flood (1992), Galbis (1993), and Kiguel and O'Connell (1995).

2/ Our review of exchange rate regimes highlights only those aspects that are deemed relevant for the issue at hand; a broader review would address several aspects discussed by Quirk (1989).

Following a marked deterioration in economic performance during the 1980s, Guyana initiated a medium-term recovery and adjustment program in 1988. Gradually, the Government took several measures including, inter alia, successive devaluations of the Guyana dollar, liberalization of prices and the exchange and trade regimes, tightening of credit policies, and reduction in public expenditures. Inflation remained high after the inception of the reform program (averaging about 80 percent until 1991), partly reflecting the immediate adverse impact of price and exchange liberalization. Thereafter, inflation started to decline and stood at around 10 percent in 1993 (Figure 1). Relatively stable exchange rates, owing to increased exports and capital inflows, and near-completion of price liberalization in 1991, contributed to the slowdown. Furthermore, in the background, the fiscal deficit as well as the rate of expansion of domestic credit were brought under control. The overall primary deficit of the Central Government, which had reached almost 10 percent of GDP in the late 1980s, improved steadily thereafter, registering a surplus during 1991-94. <sup>1/</sup> Gross international reserves of the Central Bank increased substantially beginning in 1990, reaching US\$269 million (about 9 months of imports) at end-1994.

Major liberalization in Guyana's foreign exchange market began in mid-March 1990 when foreign exchange transactions in the parallel market were legalized, and licensed banks and nonbank dealers were allowed to trade freely in the newly established "cambio" market. Subsequently, most transactions related to nontraditional exports and nonessential imports and services were shifted from the official market to the cambio market. While the exchange rate in the cambio market was freely determined, the official exchange rate of the Guyana dollar continued to be pegged to the U.S. dollar; it was subject to two sizable adjustments in April 1989 and June 1990. At the time of the latter devaluation, some additional transactions were shifted to the cambio market. In February 1991, when the two markets were effectively unified, the official market rate was devalued by more than 100 percent--reaching the level then prevailing in the cambio market. In September 1991, the official exchange rate was abolished. Nevertheless, certain transactions continued to be effected through the Central Bank at an average cambio rate. These included, on the receipt side, sugar and bauxite exports, and on the payments side, fuel and sugar imports and official debt-service payments. Mainly owing to high foreign exchange surrender requirements for some principal exports, the Central Bank maintained a strong role in the foreign exchange market. As of November 1994, surrender requirements applied only to receipts from sugar and gold exports, each at 60 percent--down from 80 percent at end-1993. The Central Bank sold

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<sup>1/</sup> However, the interest-inclusive consolidated public sector balance (that is, including the accounts of nonfinancial public enterprises and the central bank) remained largely in deficit, despite registering significant improvements. This pattern characterizes several of the other experiments reviewed below.

foreign exchange (through auctions) to the cambio market in the second half of 1993. However, due to the confusion by the non-systematic auction procedures, sales to the cambio markets were suspended at end-1993. During the period the trade system was considerably liberalized in tandem with developments in the foreign exchange market.

Reflecting acute foreign exchange shortages, the parallel market premium was extremely high in the late 1980s and, despite two large devaluations of the official rate, was not successfully reduced until after reform in February 1991. Since then Guyana's nominal exchange rate has been relatively stable, falling from G\$102 (February 1991) to G\$131 per U.S. dollar at end-1993 and to G\$142 per U.S. dollar at end-1994 (Figure 1).

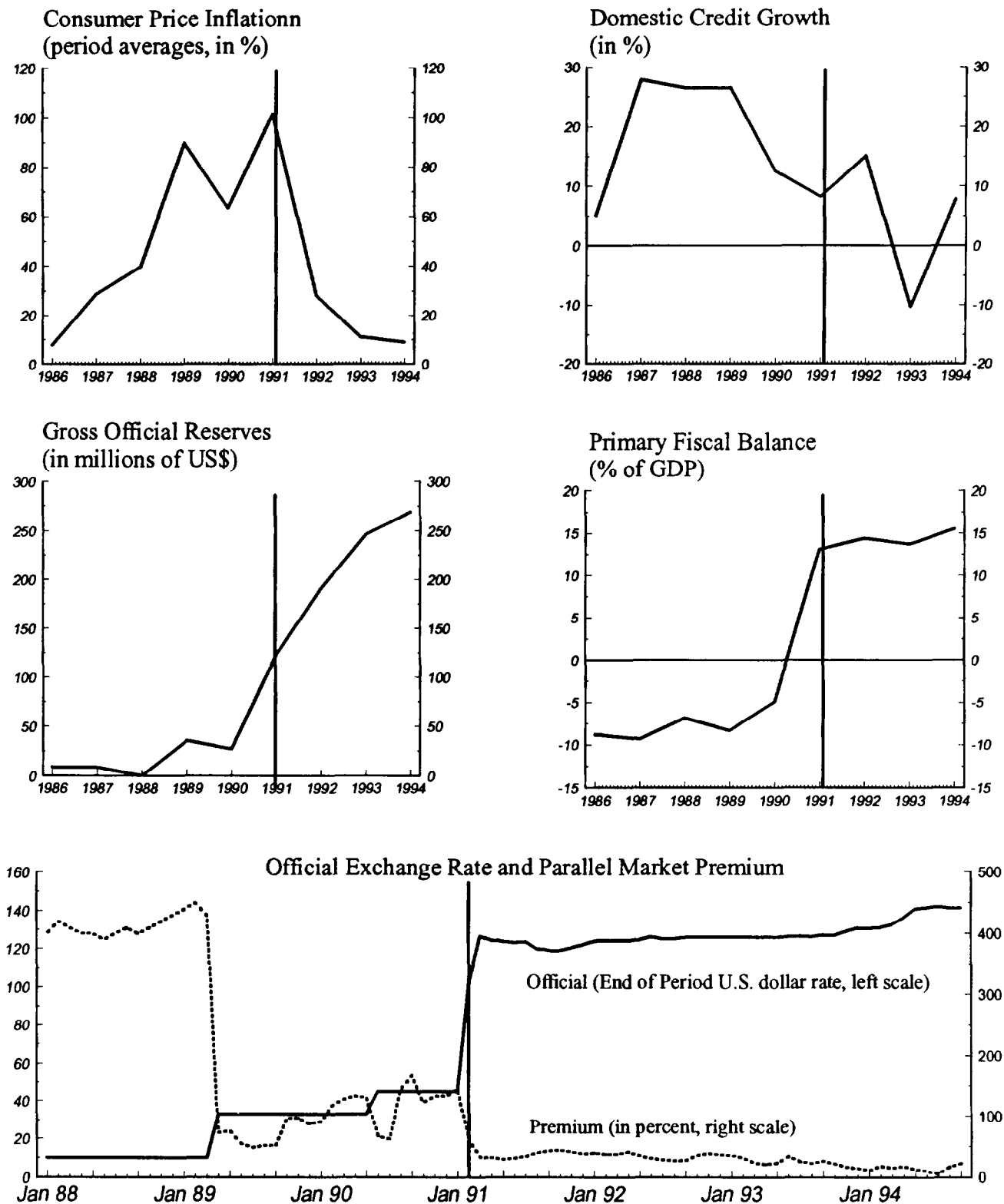
Following a balance-of-payments crisis in mid-1991, India embarked on a program of stabilization and structural reform targeting a substantial reduction in the public sector deficit, supported by currency depreciation and higher interest rates. During the first two years of adjustment, the Central Government deficit as well as the overall public sector deficit declined considerably, although pressures began to develop during the 1993/94 fiscal year (Figure 2). At the same time, major reforms were initiated, most notably in the areas of trade policy and exchange rate regime. Inflation, which was on the rise in the late 1980s (reflecting the deterioration in public finances, increased monetary accommodation, as well as the continuous depreciation of the rupee), peaked in 1991, but was brought broadly under control during the 1992/93 fiscal year. Gross reserves increased considerably during the two years of adjustment, mainly reflecting improvements in India's external position, and were further boosted since exchange market reform, the latter development reflecting deliberate interventions by the Central Bank.

The first major step toward foreign exchange market liberalization took place in March 1992. Until then, the exchange rate was determined on the basis of a basket of currencies of India's major trading partners. In March 1992, the so-called EXIM scrip scheme--a sort of a dual exchange rate system introduced in July 1991 whereby exporters were permitted to receive (tradable) import licenses equivalent to 30 percent of the value of their exports to purchase imports--was replaced by a formal dual exchange rate arrangement, as a transitional measure in the move toward a more market-determined exchange rate. Under the new system, foreign exchange at the official rate was being provided only for certain imports, including imports by government departments, crude oil, fertilizers, and essential drugs. All other imports and all capital transactions, except for official grants, but including interest payments on external debt, were financed at the free market rate. Exporters were required to surrender 40 percent of their receipts at the official exchange rate, and the remaining 60 percent were allowed to be sold at the free market rate. The balance was converted at the free market rate, and the proceeds were used to finance other permitted imports.



Figure 1

# Guyana: Inflation and Financial Indicators

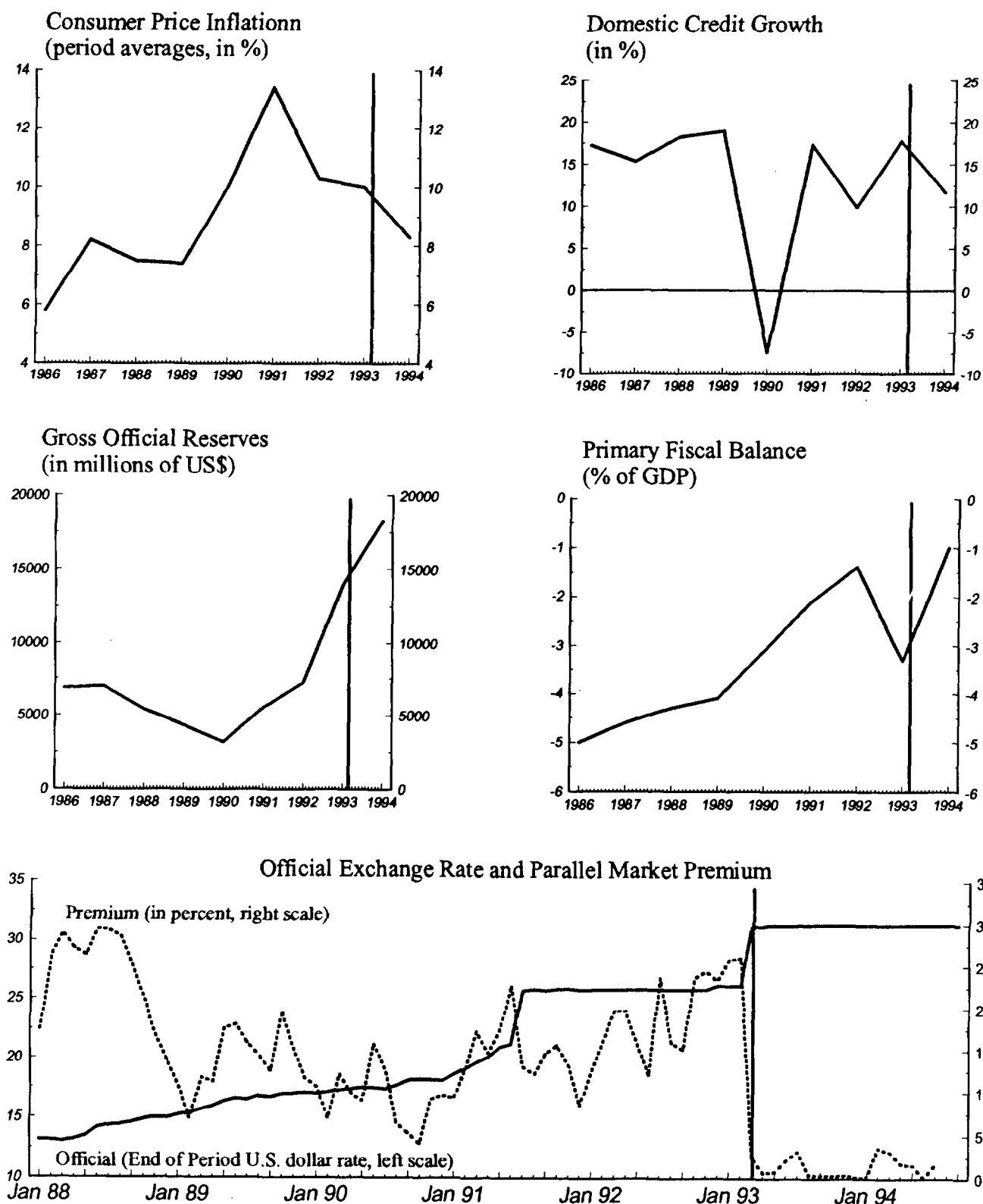


Sources: International Monetary Fund, World Economic Outlook and World Currency Yearbook.

Notes: A vertical line indicates the date of exchange market reform. 1994 figures are preliminary. Data on parallel market exchange rates indicate broad movements in the premium, and should be interpreted with some caution.

Figure 2

# India: Inflation and Financial Indicators



Sources: International Monetary Fund, World Economic Outlook and World Currency Yearbook.

Notes: A vertical line indicates the date of exchange market reform. 1994 figures are preliminary. Data on parallel market exchange rates indicate broad movements in the premium, and should be interpreted with some caution.

Foreign exchange markets were unified on March 1, 1993, and the exchange rate began to be determined fully in the interbank market, with all foreign exchange transactions conducted by authorized dealers. The latter were no longer required to transfer to the Central Bank any portion of foreign exchange that was surrendered to them by exporters. Following reform, all current receipts and payments began to be effected at market-determined exchange rates, resulting in a virtual disappearance of the parallel market. Liberalization of the foreign exchange market proceeded in tandem with trade reform, as India began with one of the most protective trade regimes in the world. Major steps in trade reform included elimination of most quantitative restrictions as well as sharp reductions in tariffs on imports of capital and intermediate goods, and abolition of licensing requirements for many categories of exports. 1/

Following the devaluation in July 1991 by about 20 percent (relative to the dollar), the rupee remained stable at Rs 26 per dollar until reform in March 1993. The premium was volatile and relatively high until then, despite steady depreciation of the rupee since mid-1980s (Figure 2). Upon unification, however, the parallel market premium virtually disappeared.

Jamaica began to implement stabilization measures and wide-ranging structural reforms in 1989. During the early stages, the record in correcting macro imbalances appeared mixed. During 1989-92, price increases accelerated, with inflation reaching almost 80 percent in 1992 (Figure 3). While the fiscal stance of the Central Government appeared broadly under control, as reflected in the improvements in the primary and overall fiscal balances through 1994, domestic credit expansion remained strong until 1993. Despite a primary budget surplus throughout, an important financial problem during the period was chronic losses by the Central Bank (that is, a quasi-fiscal deficit), mainly attributable to interest cost on open market instruments. 2/ Beginning in 1989, gross reserves started to increase. The build-up accelerated considerably in the aftermath of exchange market reform, and continued through 1994.

During most of the 1980s (more precisely, during 1983-89), the value of the Jamaican dollar was determined in a foreign exchange auction operated by the Central Bank. 3/ All other foreign exchange

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1/ However, despite these recent reforms, the trade system in India remains highly restrictive.

2/ It should be kept in mind that such losses complicate the measurement of seignorage as changes in reserve money in percent of output, as is done below.

3/ See Grosse (1994) for a description of the exchange rate system in Jamaica during the 1980s.

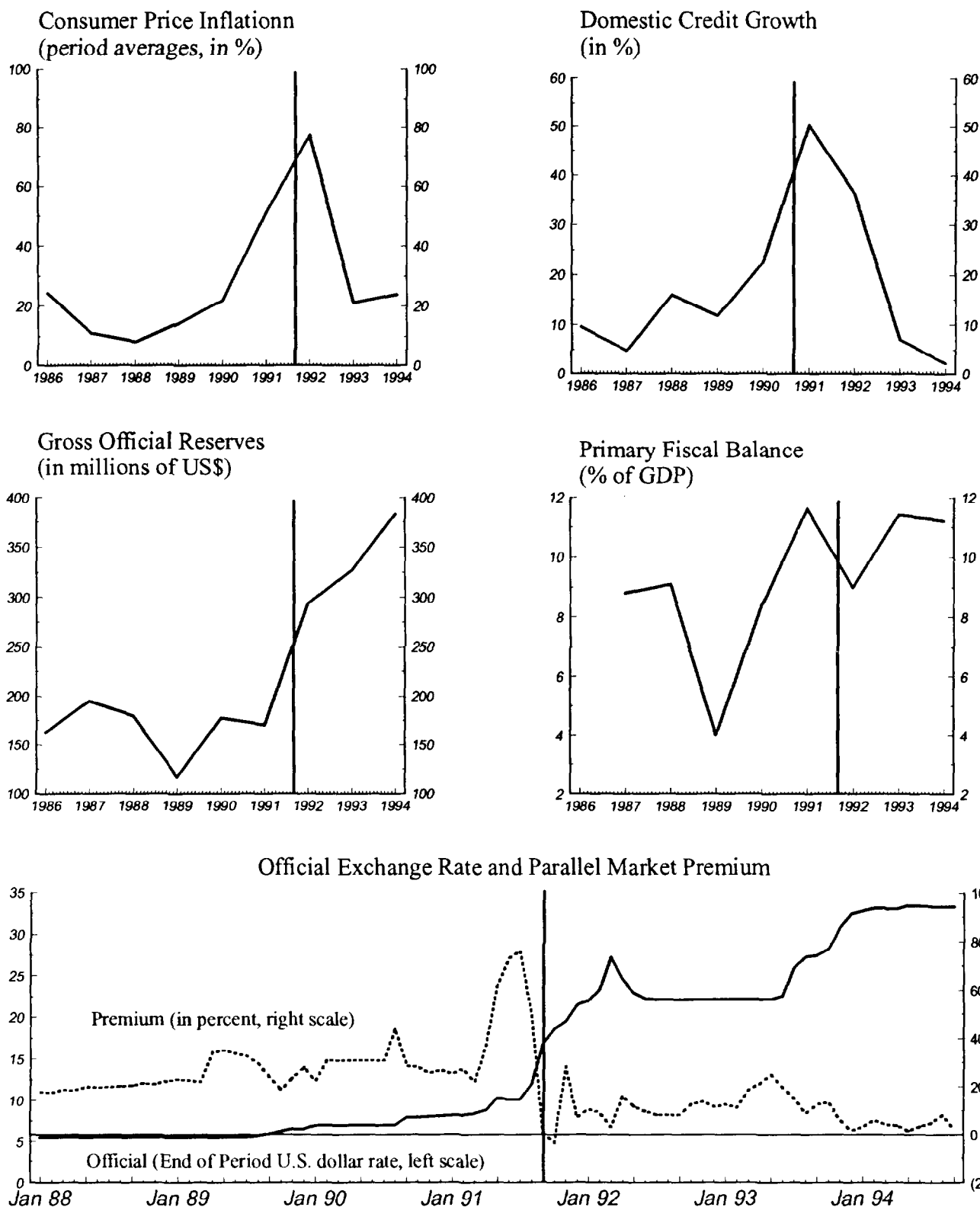
receipts were surrendered to the commercial banks at rates quoted by them. Following the suspension of the auctions for about a year, an interbank exchange rate system was introduced in September 1990. Initially, certain receipts from exports (mainly of traditional commodities) and tourism, official loan proceeds as well as divestment of government assets were to be surrendered directly to the Central Bank. Furthermore, the commercial banks sold a proportion of their purchases from the foreign exchange market to the Central Bank. After successive modifications to the interbank system, the foreign exchange system was fully liberalized in September 1991; all remaining restrictions on payments and transfers for current and virtually all capital transactions as well as the requirement that foreign exchange earnings be repatriated and surrendered to the banking system were eliminated. Furthermore, residents and non-residents have been allowed to maintain foreign currency accounts in Jamaica or abroad without any restrictions. By the end of 1993, proceeds to be sold directly to the Central Bank included official loans, divestment of government assets, and taxes on the bauxite sector. As the amount of foreign exchange sold directly to the Central Bank from the above sources fell short of the Bank's external debt obligations as well as its international reserve objectives, the Bank began to purchase foreign exchange from the interbank market (including directly from foreign exchange earners) at the prevailing exchange rate.

Since the introduction of the interbank market in September 1990, the value of the Jamaican dollar depreciated gradually with considerable acceleration in the period surrounding full liberalization in September 1991. After the rate appeared to have stabilized (at about J\$22 per U.S. dollar) around mid-June 1992, a further depreciation followed in the latter part of 1993, as the foreign exchange market came under pressure, following mainly a large increase in government wages. The rate appeared to have stabilized once again in early 1994, albeit at a higher plateau (at around J\$33 per U.S. dollar).

Kenya experienced sharply worsened economic conditions from late 1991 onward. Inflation accelerated, largely owing to an unsustainable fiscal stance, political and social instability were pervasive, and a number of key policy reversals were observed. Balance-of-payments support from the bilateral donors was suspended in late 1991, and in early 1993, a foreign exchange crisis had developed. Efforts to stabilize the economy resumed in April 1993 in the context of a macroeconomic program. Since then, Kenya's record in achieving macroeconomic stability and growth gradually improved, owing to implementation of significant reform measures. The primary balance of the central government registered small surpluses during 1993-94. Inflation, which had risen substantially over the recent years, began to decelerate in mid-1994 and turned negative during part of the year, somewhat assisted by the appreciation of the Kenya shilling. After considerable losses during 1990-92, reflecting the tightness of the foreign exchange situation in the country, the (gross) foreign exchange position of the Central Bank began to improve substantially

Figure 3

# Jamaica: Inflation and Financial Indicators



Sources: International Monetary Fund, World Economic Outlook and World Currency Yearbook.  
 Notes: A vertical line indicates the date of exchange market reform. 1994 figures are preliminary. Data on parallel market exchange rates indicate broad movements in the premium, and should be interpreted with some caution.



through the end of 1994; a strong balance of payments performance, both in the current and the capital accounts, accounted for this outcome.

The official rate of the Kenya shilling was pegged to a basket until October 1993, when the foreign exchange market was unified and the value of the shilling began to be determined on the free market. However, since October 1991 a series of reforms aimed at achieving a more market-determined rate were undertaken, which gradually helped the formal implementation of an interbank market (February 1993) as well as exchange market unification (October 1993). Broadly, reforms of the exchange and trade systems proceeded in tandem; these reforms included, most notably, the introduction of a system of foreign exchange bearer certificates (*FEBCs*) in October 1991 and an export retention scheme in August 1992. Under the *FEBC* scheme, both residents and nonresidents were allowed to use convertible foreign exchange to purchase *FEBCs*, which are denominated in U.S. dollars, without revealing the source of funds that were used to purchase them. <sup>1/</sup> The retention scheme, for its part, provided a basis for a legal parallel market in retained foreign exchange. Under the scheme, exporters of nontraditional goods were allowed to retain 100 percent of their foreign exchange earnings in foreign currency accounts in Kenya. This was extended in November 1992, to include 50 percent of earnings from traditional exports. In February 1993, commercial banks were authorized to operate the interbank market, and retained foreign exchange was allowed to be traded freely at negotiated rates; a 50 percent retention ratio began to apply to all tourism revenues. In late March 1993, however, the export retention scheme as well as redemption of *FEBCs* were suspended. While the latter was eliminated fully, the export retention scheme was reintroduced two months later (mid-May 1993) at the rate of 50 percent for all export earnings. In October 1993, the foreign exchange market was unified, and thereafter, the value of the Kenya shilling became fully market determined. In February 1994, export retention was raised to 100 percent, and the Central Bank began to set the official rate at the previous day's average market rate, thereby effectively abolishing the official rate; the rate, calculated as such, applied only to government and government-guaranteed external debt service payments and to government imports (with a specific budget allocation).

The movements in the premium appeared to have followed closely developments in the foreign exchange market and the uncertainties associated with economic policies and the political and social environment (Figure 4). In late 1992 the premium began to increase significantly, reflecting the worsening of the foreign exchange situation, but then came down gradually by mid-1993 as the official

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<sup>1/</sup> The *FEBCs* could be redeemed at any time at the then prevailing official rate, which were freely usable for both current and capital account transactions, and tradable in the secondary market at market-determined prices.

rate was devalued by about 100 percent (reaching KSh 64 per US\$1 in May 1993, from KSh 36 per US\$1 in February 1993). Since October 1993, reflecting the impact of exchange market reform and large capital inflows, the foreign exchange market eased considerably, and the exchange rate began to appreciate.

After a long period of deterioration in economic conditions, Sierra Leone began to implement a number of measures in 1989 designed to revive its economy, by curtailing pervasive government intervention and the protracted macroeconomic imbalances that had built up. After an initial period with mixed results, the economy began to respond favorably in early 1992. As fiscal discipline improved (enabling the Government to reduce considerably its indebtedness to the banking system), domestic credit expansion slowed down and inflation fell significantly. Progress in stabilizing the economy and deregulating the financial environment, and in particular through the significant liberalization of the exchange and trade system in April 1990, led (beginning in 1992) to a sizable increase in foreign assistance, large private capital inflows, and a buildup in reserves (see Figure 5). These favorable developments were accompanied by additional structural reform measures, most notably the removal of price controls and reform of the civil service.

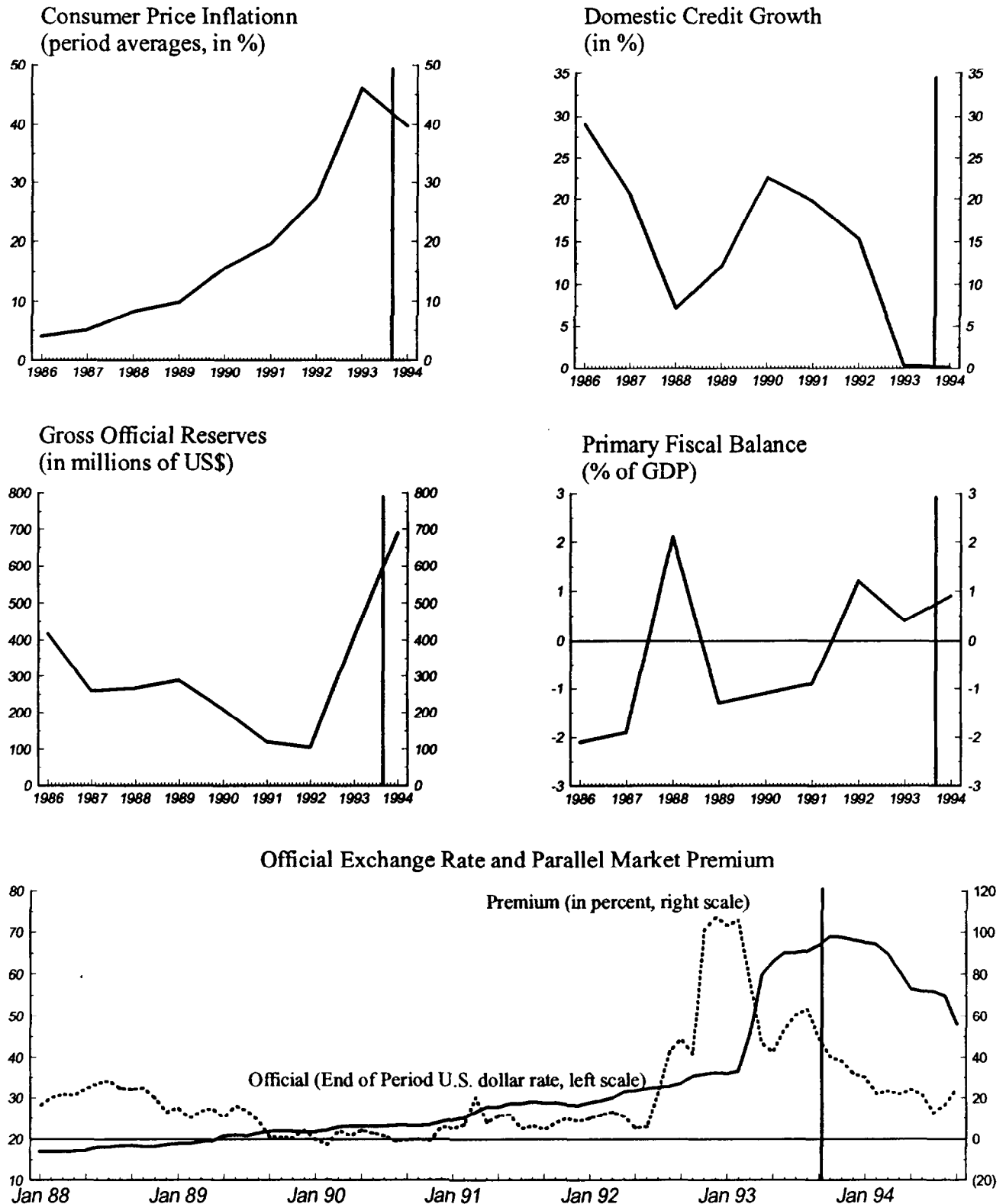
Throughout most of the 1980s, Sierra Leone maintained a fixed exchange rate regime with the external value of the leone pegged to either the US dollar or the SDR. During June 1986-April 1987, Sierra Leone experimented briefly with a floating system; at its termination, the currency was significantly revalued (from Le 45 per U.S. dollar to Le 23 per U.S. dollar). Thereafter, however, an adjustable peg system was adopted with a view to maintaining external competitiveness in the face of high inflation. In 1989, the authorities took additional steps to further liberalize the exchange and trade system. Specifically, all imports as well as export license requirements were abolished at end-1989, except for annual exporters' licenses for diamond and gold; all import bans, except for cigarettes, were removed in early 1990. In April 1990, the official and parallel markets were effectively unified, as the value of the currency began to be determined through a float in an interbank market, and virtually all restrictions on current international transactions were removed. Under the new system, commercial banks were allowed to buy and sell foreign exchange on a freely negotiable basis. All exporters were required to surrender all foreign exchange earnings to the commercial banks; traditional exports (coffee, cocoa, diamond) continued to be surrendered partially to the Central Bank, but the requirement was gradually eliminated. In November 1991, in addition to the commercial banks, foreign exchange bureaus were licensed to conduct spot foreign exchange transactions with customers, banks, and other bureaus.

Following the revaluation that took place in 1987, periodic, discrete devaluations were undertaken during 1988-89. The rate of depreciation of the currency accelerated in 1990 and 1991. However, with the sharp decline in the rate of inflation, relative stability



Figure 4

# Kenya: Inflation and Financial Indicators

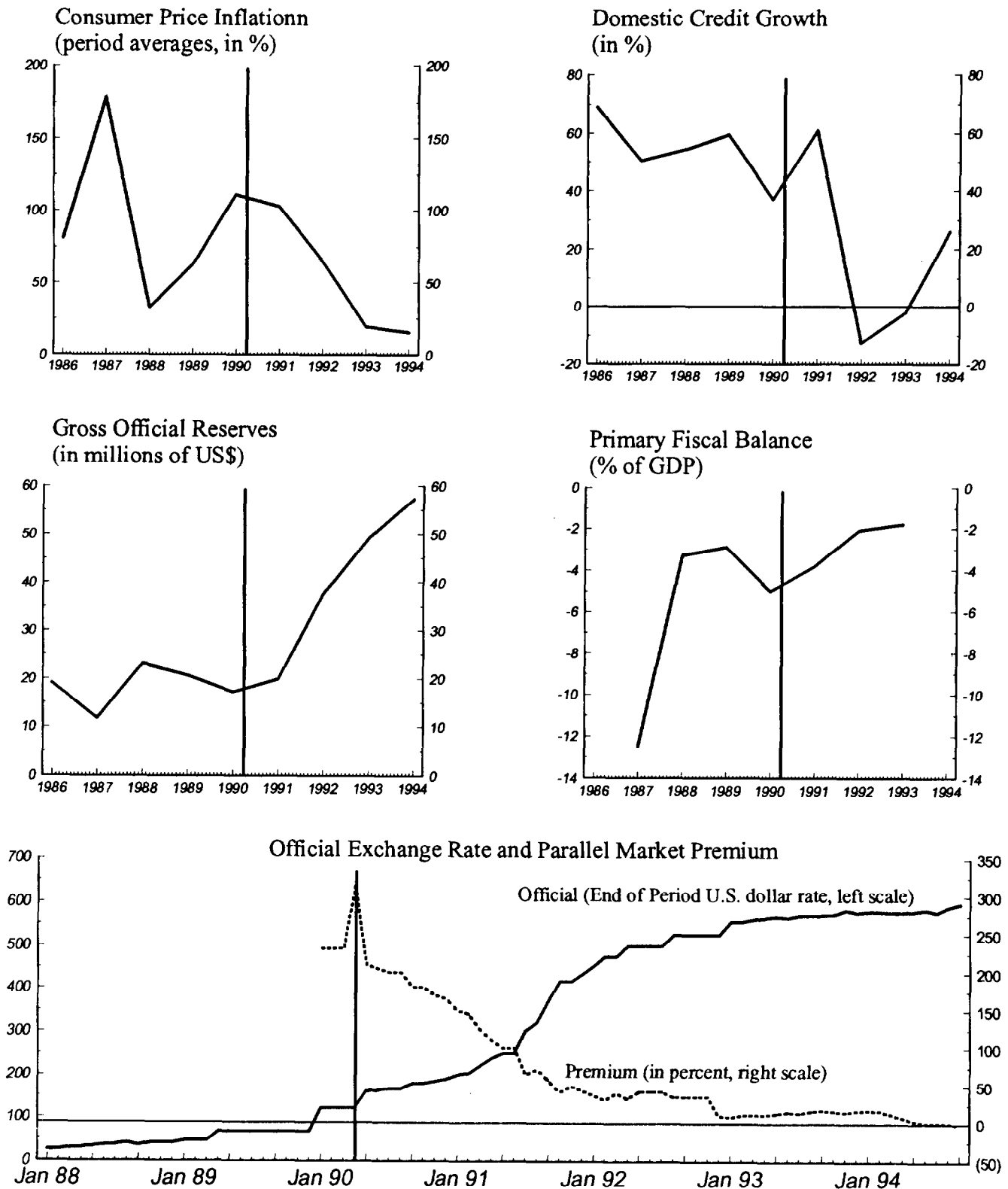


Sources: International Monetary Fund, World Economic Outlook and World Currency Yearbook.

Notes: A vertical line indicates the date of exchange market reform. 1994 figures are preliminary. Data on parallel market exchange rates indicate broad movements in the premium, and should be interpreted with some caution.

Figure 5

Sierra Leone: Inflation and Financial Indicators



Sources: International Monetary Fund, World Economic Outlook and World Currency Yearbook.

Notes: A vertical line indicates the date of exchange market reform. 1994 figures are preliminary. Data on parallel market exchange rates indicate broad movements in the premium, and should be interpreted with some caution. Data on the parallel exchange rate prior to end 1989 are not available.

was established during 1992-93 (Figure 5). With the development of a liberal foreign exchange system, the premium in the parallel currency market has virtually disappeared.

Following a prolonged period of poor economic performance, Sri Lanka began to develop a medium-term strategy in 1988 to address its macroeconomic imbalances. During the early 1990s, economic performance broadly improved, and inflation began to decelerate (Figure 6). Despite increases in interest payments, the budgetary performance of the Central Government began to improve as the primary budget deficit shrank considerably. During the same period, growth in domestic credit was significantly reduced, and gross reserves increased dramatically.

In August 1990, a considerably more market-oriented exchange rate system was adopted. Under the new system, the Central Bank began to calculate a reference rate for the Sri Lanka rupee vis-à-vis the U.S. dollar, as a weighted average of the previous day's rates for rupee/foreign currency spot transactions in the interbank market, including dealings with the Central Bank. A float was allowed to the extent that the rate was consistent with external objectives, whereby the Central Bank reserved the right to intervene in the foreign exchange market. Consistent with the new arrangement, the Central Bank also stopped providing forward cover to commercial banks for sales of foreign exchange, previously available for imports of essential items. The Central Bank took a number of factors into account when setting the rates, most notably competitiveness indicators, and then the interbank market operated within the boundaries of the Central Bank's spread. Until late 1991, the spread was maintained at around 0.08 percent, thereby substantially limiting (in effective terms) the role of the market forces. The spread was raised to 0.25 percent in December 1991, and 1 percent in March 1992. In March 1993, repatriation and surrender requirements on export proceeds were abolished. As of end-1993, the fundamental principles behind the functioning of the foreign exchange market remained broadly unchanged: the Central Bank set buying and selling rates every morning in terms of the intervention currency (the U.S. dollar), sometimes adjusting these rates during the day; the interbank market continued to operate within the boundaries of the Central Bank's spread.

After an accelerated depreciation in September 1989, the exchange rate was maintained constant till August 1990. Thereafter, the exchange rate depreciated gradually, reflecting broadly the pace of liberalization in the foreign exchange market. The premium, despite remaining volatile throughout, began to decline in 1991, and had virtually disappeared by early 1994 (Figure 6).

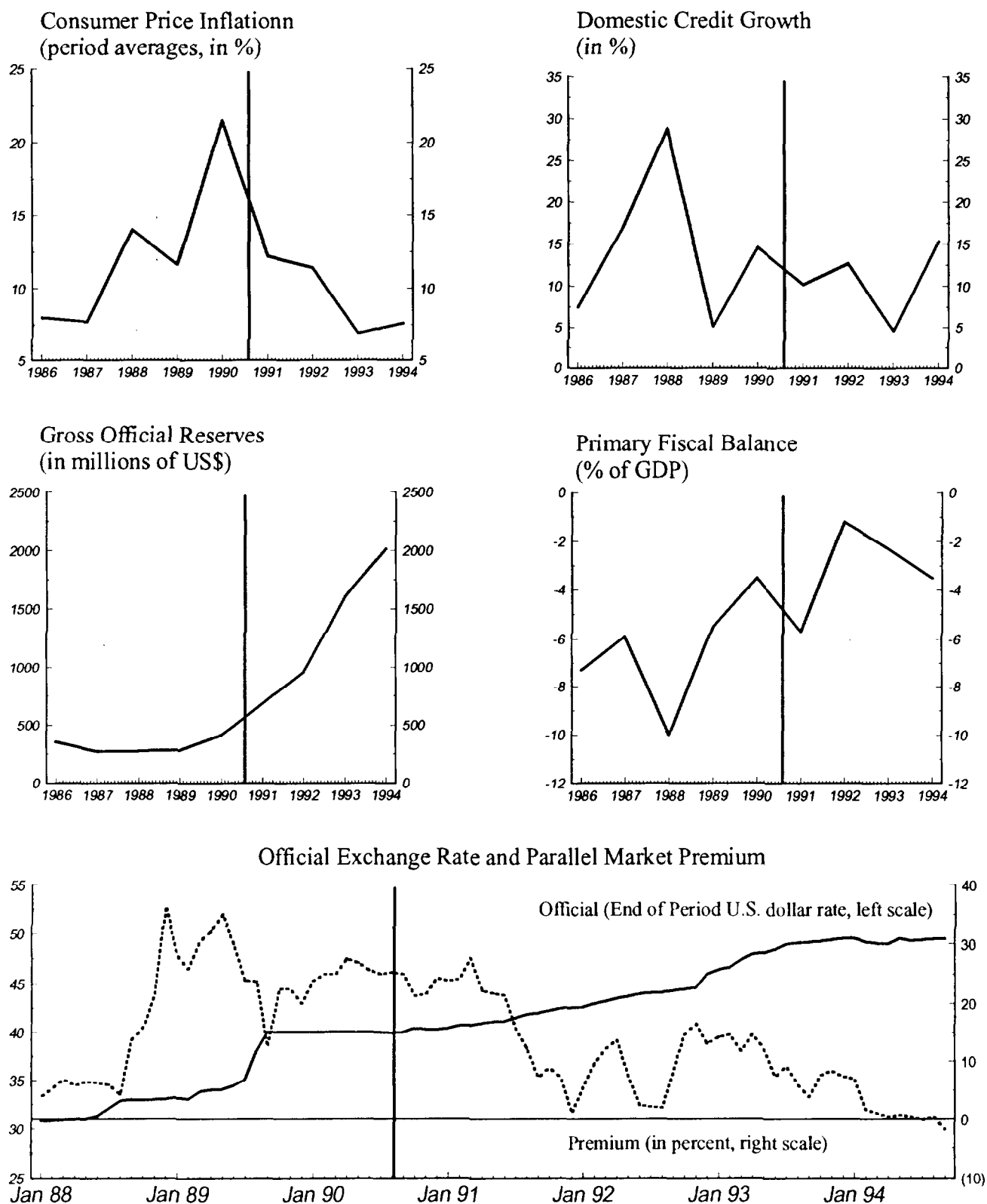
It is too early to judge the sustainability of the overall process of exchange market reform in the countries considered above. As partly reflected in our overview, the countries' experiences with foreign exchange market reform have been diverse, particularly in

relation to the pace and modalities of reform. Nevertheless, the review suggests some broadly common themes in these experiences. First, the liberalization of all foreign exchange markets took place in the context of a comprehensive reform program which, besides a strong orientation toward more market-oriented economic policies, targeted a relatively restrained fiscal position. In that regard, virtually all countries appear to have achieved some degree of success. Second, despite sizable exchange rate adjustments, inflation gradually declined, and was brought broadly under control in the aftermath of reform in almost all cases, although in India and Kenya, where the reform episodes are more recent, inflation appears to have remained higher than its historical levels. Third, successive devaluations of the official rate were instrumental during the reform process in achieving a unified rate as well as a reduction in the premium; at the end of each reform period, virtually all countries, partly reflecting the extent of the initial disequilibrium in the foreign exchange market, had reached unified rates generally more depreciated than those prevailing in the pre-reform period. Fourth, virtually all countries experienced rising gross reserves in the periods following reform (and in several cases prior to reform as well), owing to improved external positions, strong inflows of foreign grants and loans, and rerouting of foreign exchange through official channels; concurrently, domestic credit expansion was brought broadly under control in the aftermath of reform. Finally, as regards the operation of the foreign exchange market prior to liberalization, these markets had more or less similar characteristics: rationed official market with a fixed rate, and an active black market, where the currency floated freely, and foreign exchange traded at a premium, with the Central Bank maintaining a strong involvement in the foreign exchange market, mainly owing to high surrender requirements.

Clearly, much has been achieved in terms of breaking away with this typically repressed characterization, although it appears that further progress is needed in terms of enhancing the depth and flexibility of the markets to ensure sustainability of exchange market reform. Some restrictive features still prevail, including a strong administrative role for the Central Bank in the functioning of the foreign exchange market (Sri Lanka, for instance), excessive trade restrictions somewhat undermining the free functioning of the foreign exchange market (India, for instance), and a relatively dominant role of state enterprises in the economy as main "producers" of foreign exchange mainly in the traditional (primary-product) sectors (Guyana, for instance). Furthermore, an important feature of recent experiences is that monetary authorities have often interfered with the functioning of the foreign exchange market in the aftermath of

Figure 6

# Sri Lanka: Inflation and Financial Indicators



Source: International Monetary Fund, World Economic Outlook and World Currency Yearbook.

Notes: A vertical line indicates the date of exchange market reform. 1994 figures are preliminary. Data on parallel market exchange rates indicate broad movements in the premium, and should be interpreted with some caution.



reform, in both auction and interbank markets. 1/ While exchange market intervention has not been always systematic, it raises questions about viewing some of these developing countries as "true" floaters. 2/ Although in several of these cases (for instance India, Kenya, and Sri Lanka) the Central Bank intervened systematically, inter alia, to maintain a desirable level for the exchange rate, in some others (Jamaica, for instance), intervention conveyed a different purpose such as to replenish reserves of the Central Bank.

### III. Short-Run Dynamics of Unification

The evidence reviewed in the previous section suggests that, in practice, unification attempts have often been associated with various degrees of central bank intervention in the foreign exchange market in the aftermath of reform, in an attempt to influence the level of the exchange rate and/or the allocation of foreign exchange resources. While intervention has not always been systematic, studying the case in which it does occur systematically may provide useful insights in the dynamics of unification. Accordingly, in this section we examine the short-run effects associated with two types of post-reform arrangements: a pure float and a managed float. The model that we consider here generalizes in several respects those available in the existing literature. 3/ The analysis will show how the parallel exchange rate depends on the initial position of the economy, the nature of the post-reform regime, expectations about the timing of reform, the length of the transition period between announcement and implementation of reform, and the policy stance that agents expect policymakers to adopt after unification. After presenting our framework and examining the nature of the steady-state equilibrium in

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1/ Evidence of frequent exchange market intervention in floating rate regimes is also provided in a number of other studies. See for instance Kovanen (1994), who reviews the functioning of auction and interbank markets in several developing countries (including, among the countries studied here, Jamaica and Sierra Leone in the 1980s), Aron and Elbadawi (1994), who study auction markets in Sub-Saharan Africa in the 1980s, and Galbis (1993) and McDonald and Lum (1994), whose focus is on interbank markets for foreign exchange.

2/ The 1994 Annual Report on Exchange Arrangements and Exchange Restrictions published by the International Monetary Fund classifies all the countries in our sample as "independently floating"--except Sri Lanka, which is classified as "other managed floating." See Quirk (1994) for a general assessment of central bank intervention in the group of countries classified as "independent floaters."

3/ The short-run dynamics of exchange market unification have been examined by Agénor and Flood (1992), Agénor and Montiel (1994, chapter 14), Lai and Chang (1994), and Lizondo (1987). The analysis that follows dwells on Agénor and Flood (1992), who also discuss the real implications of exchange market reforms.

the pre- and post-reform regimes, we study the behavior of the parallel market premium and the money supply during the transition period between announcement and actual implementation of reform, and surmise on the experience of the countries reviewed in the preceding section.

# 1. The model

Consider a small open economy operating an informal dual exchange rate regime in which an official, pegged exchange rate coexists with a freely determined parallel rate. The official rate applies to current account transactions authorized by the central bank, while the parallel rate is used for capital account transactions and the remainder of current account items. Agents are endowed with perfect foresight and hold domestic and foreign currency balances in their portfolios. Domestic firms produce a single good whose output is entirely sold abroad, and is taken as exogenous. Agents consume imported goods, the demand for which depends on the level of real money balances. In each period, exporters surrender a given proportion of their foreign exchange earnings at the official exchange rate, and repatriate the remaining proceeds via the parallel market.

Formally, the model is described by the following log-linear equations:

$$m_t - p_t = -\alpha \dot{s}_t, \quad \alpha > 0 \quad (1)$$

$$m_t = \eta d_t + (1-\eta)R_t, \quad 0 < \eta < 1 \quad (2)$$

$$p_t = s_t, \quad (3)$$

$$\dot{R}_t = -\Phi(s_t - e_t) - \kappa(m_t - p_t), \quad \Phi, \kappa > 0 \quad (4)$$

$$\dot{d}_t = \mu, \quad \mu \geq 0 \quad (5)$$

where  $m_t$  denotes the nominal money stock,  $d_t$  domestic credit,  $R_t$  the stock of net foreign assets held by the central bank,  $p_t$  the domestic price level,  $e_t$  the official exchange rate,  $s_t$  the parallel exchange rate, and  $\dot{z}_t = dz/dt$ . All variables are measured in logarithms.

Equation (1) describes money market equilibrium. 1/ Equation (2) is a log-linear approximation that defines the domestic money stock as a weighted average of domestic credit and foreign reserves. Equation (3) indicates that the price level depends only on the parallel exchange rate, which measures the marginal cost of foreign

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1/ Since the parallel exchange rate can make discrete jumps,  $\dot{s}_t$  in equation (1) must be interpreted as the right-hand side time derivative of  $s_t$ .



exchange. 1/ Equation (4) describes the behavior of net foreign assets. The negative effect of the premium--defined as the difference between the official and parallel exchange rates--on the behavior of reserves results from its impact on under-invoicing of exports. The higher the parallel exchange rate is relative to the official rate, the greater will be the incentive to falsify export invoices and to divert export proceeds to the unofficial market. 2/ The demand for imports is taken to be proportional to the stock of real money balances. Finally, equation (5) indicates that the nominal stock of credit grows at a constant rate, which reflects underlying fiscal rigidities. 3/

## 2. The pre-reform equilibrium

Prior to reform, the forward-looking parallel rate  $s_t$  and the predetermined nominal money stock  $m_t$  are endogenous variables while the official exchange rate  $e_t$  is assumed set at  $\bar{e}$  by the authorities. Substituting equations (3)-(5) in (2) yields

$$\dot{m}_t = \eta\mu - (1-\eta)\Phi(s_t - \bar{e}) - \kappa(1-\eta)(m_t - s_t), \quad (6)$$

from which it can be shown that the net effect of a depreciation of the parallel exchange rate on the rate of money growth is ambiguous, since on the one hand it raises the incentives to underinvoice exports (which tends to lower accumulation of foreign reserves), while on the other it lowers real money balances, which reduces the demand for imports and tends to increase the rate of growth of official reserves. The net effect depends on the sign of  $(\kappa - \Phi)$ .

Substituting equation (3) in (1) yields, together with (6):

$$\begin{bmatrix} \dot{s}_t \\ \dot{m}_t \end{bmatrix} = \begin{bmatrix} 1/\alpha & -1/\alpha \\ (1-\eta)(\kappa - \Phi) & -\kappa(1-\eta) \end{bmatrix} \begin{bmatrix} s_t \\ m_t \end{bmatrix} + \begin{bmatrix} 0 \\ \eta\mu + \Phi(1-\eta)\bar{e} \end{bmatrix}. \quad (7)$$

The determinant of the coefficients matrix is equal to  $-\Phi(1-\eta)/\alpha$ , which is always negative--regardless of the sign of  $(\kappa - \Phi)$ . Thus the

1/ Assuming, as in Agénor and Flood (1992), that prices depend also on the official exchange rate would only complicate the algebra without affecting qualitatively the results discussed below.

2/ Agénor (1995) provides a formal derivation of the link between the premium, the under-invoicing share, and the volume of exports.

3/ This assumption follows the literature on speculative attacks and balance-of-payments crises (see Agénor and Flood, 1994).

two characteristic roots of the system (7) are real and have opposite sign, which indicates that the long-run equilibrium of the system is a saddlepoint. Let  $\rho_1$  denote the negative root and  $\rho_2$  the positive root. Solving for the particular solutions of equations (7) yields

$$s_t = s^* + C_1 \exp(\rho_1 t) + C_2 \exp(\rho_2 t), \quad (8a)$$

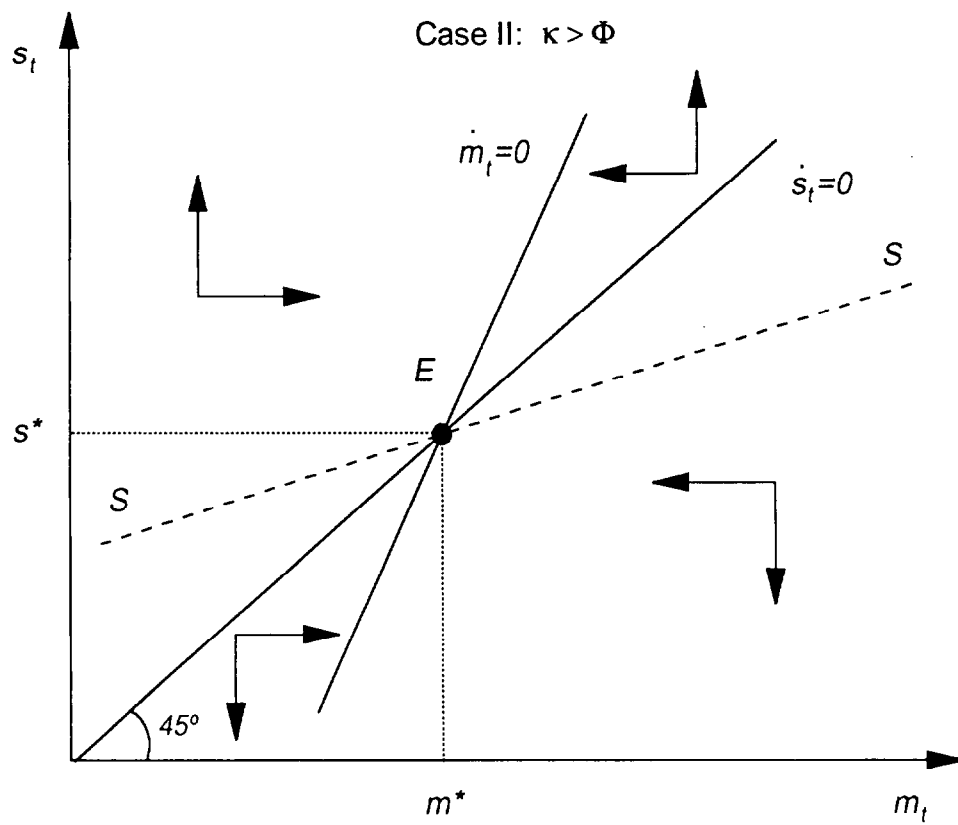
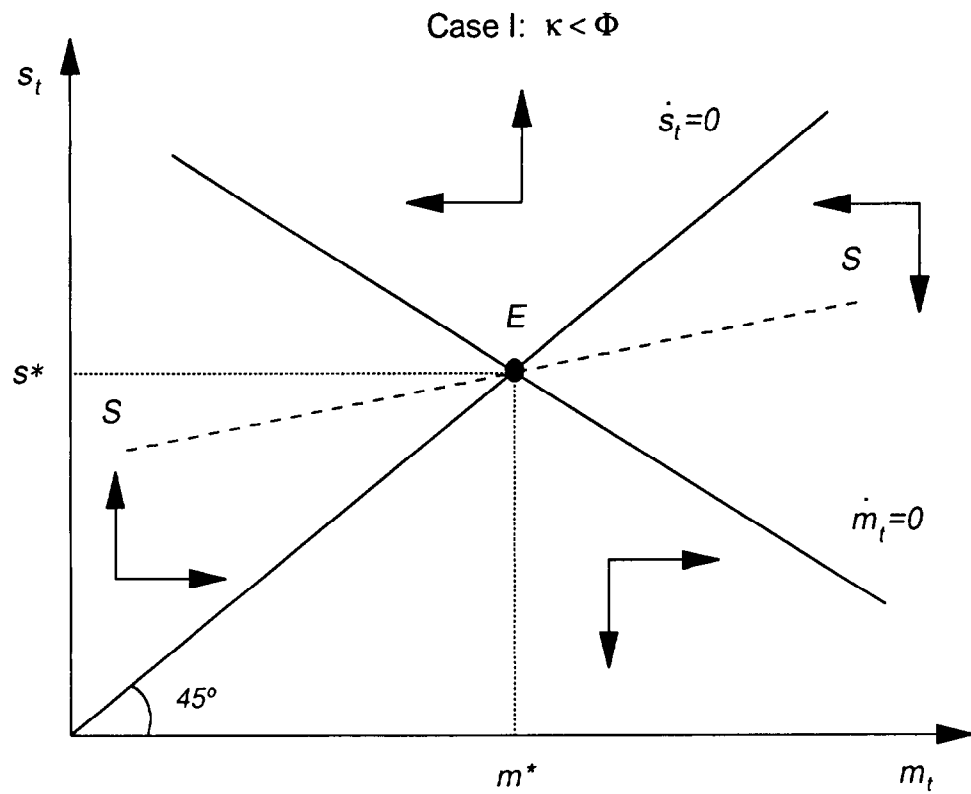
$$m_t = m^* + \gamma_1 C_1 \exp(\rho_1 t) + \gamma_2 C_2 \exp(\rho_2 t), \quad (8b)$$

where  $\gamma_1 = (1 - \alpha\rho_1) > 0$ ,  $\gamma_2 = (\alpha\rho_2 - 1) < 0$ , and  $s^* = m^* = \bar{e} + \eta\mu/\Phi(1 - \eta)$  denote the steady-state values of the parallel exchange rate and the nominal money stock.  $C_1$  and  $C_2$  are undetermined coefficients.

Let us first suppose that the existing exchange rate arrangement is expected to last forever. Stability requires therefore setting  $C_2 = 0$  in equations (8). Using an initial condition on the money stock thus allows the determination of  $C_1$ . The saddlepath SS--the unique stable branch of the system--shown in Figure 7 has positive slope (equal to  $1/\gamma_1$ ) and is flatter than the locus  $[\dot{s}_t = 0]$ , whose slope is unity in the  $s_t - m_t$  space. The economy's equilibrium path passes through the stationary point E. For any given value of the nominal money stock, rational agents will select the corresponding value of the parallel exchange rate that lies on the stable path. The upper panel of the figure corresponds to the case where  $\kappa > \Phi$ , and the lower panel to  $\kappa < \Phi$ . The direction of the arrows depicted in the two panels are determined by the sign of the coefficients appearing in equations (7). For instance, in the upper panel, for values of the parallel exchange rate located above (below) the  $[\dot{m}_t = 0]$  locus, the money stock is falling (increasing), as indicated by the arrows pointing west (east). For values of the money stock located to the right (left) of the  $[\dot{s}_t = 0]$  locus, the parallel exchange rate is appreciating (depreciating). An increase in the rate of growth of domestic credit shifts the  $[\dot{m}_t = 0]$  locus to the right while leaving the  $[\dot{s}_t = 0]$  locus unaffected, and raises in the same proportion the steady-state values of the parallel exchange rate and the nominal money stock. A devaluation of the official exchange rate also translates into a rightward shift of the  $[\dot{m}_t = 0]$  locus and leads in the

Figure 7

Steady-State Equilibrium prior to Reform





long run to an equi-proportional depreciation of the parallel exchange rate and the money stock. 1/

### 3. The post-reform regime

Let  $T > 0$  denote the future transition date announced at period  $t = 0$ , that is, the initial instant at which the policymakers intend to abandon the informal, dual exchange rate regime. In the post-reform regime (which is characterized by a uniform exchange rate), the central bank may adopt either a pure floating rate arrangement, or a managed float. A general specification that captures both of these options consists in formulating the change in foreign reserves as:

$$\dot{R}_t = -v(\epsilon_t - \tilde{\epsilon}), \quad t \geq T \quad (9)$$

where  $\epsilon_t$  denotes the unified exchange rate and  $\tilde{\epsilon}$  the "desired" level of the unified rate. 2/ The coefficient  $v \geq 0$  measures the degree of intervention in the foreign exchange market. If  $v = 0$ , the central bank will opt for a purely flexible exchange rate regime, in which official reserves remain constant. If  $v > 0$ , the central bank will adjust reserves so as to dampen deviations of the unified exchange rate from its desired value. 3/ In both cases, the demand for foreign exchange induced by private demand for imports is implicitly satisfied through adjustment of the capital account. 4/

1/ Note that in the steady state foreign reserves fall at a constant rate, which is proportional to the rate of credit growth. In practice, of course, the existence of a lower bound on reserves would eventually force the authorities to alter their credit policy to avoid a balance-of-payments crisis (see Agénor and Flood, 1994).

2/ We do not elaborate here on the factors affecting the desired unified rate. Important considerations are likely to be the relative composition of foreign exchange flows and the desired level of the current account.

3/ The case in which  $v \rightarrow \infty$  corresponds to the fixed exchange rate case, in which the unified rate is maintained continuously at the level  $\tilde{\epsilon}$ . Given the limited empirical relevance of this case--despite well-known benefits associated with the use of the exchange rate as a nominal anchor--we do not discuss it further.

4/ The required movement in the capital account is determined from equations (4) and (8). This assumption is particularly relevant if the exchange rate reform is part of a comprehensive and sufficiently credible reform program--such as the unification attempt of February 1989 in Venezuela, for instance--which attracts (or is supported by) external public financing and private capital inflows. Capital movements of this type are assumed to have no feedback effect on the short run behavior of the economy.

Consider first the case of pure floating ( $v=0$ ). Reserves are thus constant beyond  $t \geq T$  at, say,  $R_T^+$ . The unified flexible exchange rate is thus determined by setting  $s_t = e_t = \epsilon_t$  in equations (1)-(3), which implies that

$$\dot{\epsilon}_t = (\eta\epsilon_t - \tilde{m}_t)/\alpha, \quad \tilde{m}_t = \eta d_t + (1-\eta)R_T^+$$

The solution of this differential equation is given by

$$\epsilon_t = C \exp(\eta t/\alpha) + \tilde{m}_t, \quad (10)$$

which requires setting  $C = 0$  to ensure stability. Using equation (5) yields therefore

$$\epsilon_t = \tilde{m}_t, \quad t \geq T \quad (11)$$

Equation (11) shows that the post-unification floating rate depends, through the constant stock of reserves, on the unification date.

Consider now the case where the post-unification regime is a managed float ( $v > 0$ ). Setting  $s_t = e_t = \epsilon_t$  in equations (2), (3) and (5), and using (9) yields

$$\begin{bmatrix} \dot{\epsilon}_t \\ \dot{\tilde{m}}_t \end{bmatrix} = \begin{bmatrix} 1/\alpha & -1/\alpha \\ -v(1-\eta) & 0 \end{bmatrix} \begin{bmatrix} \epsilon_t \\ \tilde{m}_t \end{bmatrix} + \begin{bmatrix} 0 \\ \eta\mu + v(1-\eta)\tilde{\epsilon} \end{bmatrix}. \quad (12)$$

The determinant of the coefficients matrix is equal to  $-v(1-\eta)/\alpha$  which is negative, thus indicating that the equilibrium of the system is also a saddlepoint. The saddlepath solution is given by

$$\epsilon_t = \epsilon^* + C \exp(\nu_1 t), \quad t \geq T \quad (13a)$$

$$\tilde{m}_t = \epsilon^* + h_1 C \exp(\nu_1 t), \quad t \geq T \quad (13b)$$

where  $h_1 = -(\alpha\nu_1 - 1) > 0$ , and  $\nu_1$  is the negative root of system (12).  $C$  is an undetermined coefficient, and  $\epsilon^* = \tilde{\epsilon} + \eta\mu/v(1-\eta)$ .

The long-run equilibrium of the managed float regime is illustrated in Figure 8. The saddlepath AA also has a positive slope.

The steady-state value of the unified rate is equal to the desired exchange rate if the rate of growth of domestic credit is zero. An increase in the credit growth rate has the same qualitative effects as before: it expands the money stock and depreciates the flexible exchange rate.

#### 4. Dynamics in anticipation of reform

Under perfect foresight, private agents will begin adjusting the composition of their portfolios as soon as the central bank announces its intention to switch to a unified exchange rate regime at a well-defined date in the future. We begin by examining the short-run dynamics associated with an expected switch to a pure floating arrangement, and discuss subsequently the case of managed floating.

##### a. Pure float

To examine graphically the dynamics of unification under this type of arrangement, let us assume that the nominal credit remains constant over time ( $\mu=0$ ) at, say,  $\bar{d}$ . From equation (11), therefore, the post-reform exchange rate is constant and equal to

$$\epsilon_T^+ = m_T^+ = \eta\bar{d} + (1-\eta)R_T^+. \quad t \geq T \quad (11')$$

The solution values for the constant terms  $C_1$  and  $C_2$  appearing in equations (8) are thus determined by two conditions that "connect" the two regimes: an initial condition on the money stock  $m_0$ , and a condition which rules out any jump in the parallel exchange rate at the moment the reform is implemented:

$$m_0 = \bar{m}_0, \quad s_T = \epsilon_T^+, \quad (15)$$

Using equations (8), (11') and (15) yields the following two-equation system in  $C_1$  and  $C_2$ :

$$\gamma_1 C_1 + \gamma_2 C_2 = \bar{m}_0 - m^*, \quad (16a)$$

$$m^* + \gamma_1 C_1 \exp(\rho_1 T) + \gamma_2 C_2 \exp(\rho_2 T) = s^* + C_1 \exp(\rho_1 T) + C_2 \exp(\rho_2 T), \quad (16b)$$

where  $s^* = m^* = \bar{e}$  with  $\mu=0$ . Solving this system yields

$$C_1 = (\bar{m}_0 - \bar{e})(1-\gamma_2)\exp(\rho_2 T)/\Omega, \quad (17a)$$

$$C_2 = -(\bar{m}_0 - \bar{e})(1 - \gamma_1) \exp(\rho_1 T) / \Omega, \quad (17b)$$

where  $\Omega = \gamma_1(1 - \gamma_2) \exp(\rho_2 T) - \gamma_2(1 - \gamma_1) \exp(\rho_1 T)$ . Since  $\gamma_1 > 1$  while  $\gamma_2 < 0$ , the sign of  $\Omega$  is in general ambiguous. But it can be verified that for  $T \rightarrow 0$ , or for  $T \rightarrow \infty$ , the condition  $\Omega > 0$  holds.

Equations (8), (11') and (17) yield the final solution of the parallel exchange rate and the money stock during the transition period ( $0 < t \leq T$ ), as well as the value of the post-unification exchange rate:

$$s_t = \bar{e} + \frac{(\bar{m}_0 - \bar{e})}{\Omega} \left\{ (1 - \gamma_2) \exp(\rho_1 t + \rho_2 T) - (1 - \gamma_1) \exp(\rho_2 t + \rho_1 T) \right\}, \quad (18a)$$

$$m_t = \bar{e} + \frac{(\bar{m}_0 - \bar{e})}{\Omega} \left\{ \gamma_1(1 - \gamma_2) \exp(\rho_1 t + \rho_2 T) - \gamma_2(1 - \gamma_1) \exp(\rho_2 t + \rho_1 T) \right\}, \quad (18b)$$

$$\epsilon_T^+ = \bar{e} + \frac{(\bar{m}_0 - \bar{e})}{\Omega} \left\{ \gamma_1(1 - \gamma_2) - \gamma_2(1 - \gamma_1) \right\} \exp[(\rho_1 + \rho_2)T], \quad (18c)$$

where the expression in brackets in (18b) is equal to  $(\gamma_1 - \gamma_2) > 0$ . We will exclude in what follows the case where (for  $T > 0$ ) the unified exchange rate  $\epsilon_T^+$  is lower than the pre-reform official rate  $\bar{e}$ —an assumption which requires imposing  $\Omega > 0$ .

In general, the post-reform value of the unified exchange rate may be either more depreciated or more appreciated than the initial parallel exchange rate,  $s_0$ , obtained by considering the solution of equations (8) with  $C_2 = 0$ . Formally, since from equation (8) with  $\mu=0$  we have  $s_0 = \bar{e} + (1/\gamma_1)(\bar{m}_0 - \bar{e})$ , using equation (18c) the condition for  $\epsilon_T^+ < s_0$  can be shown to be given by  $\gamma_1 \exp[(\rho_1 + \rho_2)T] < \Omega/(\gamma_1 - \gamma_2)$ , or equivalently

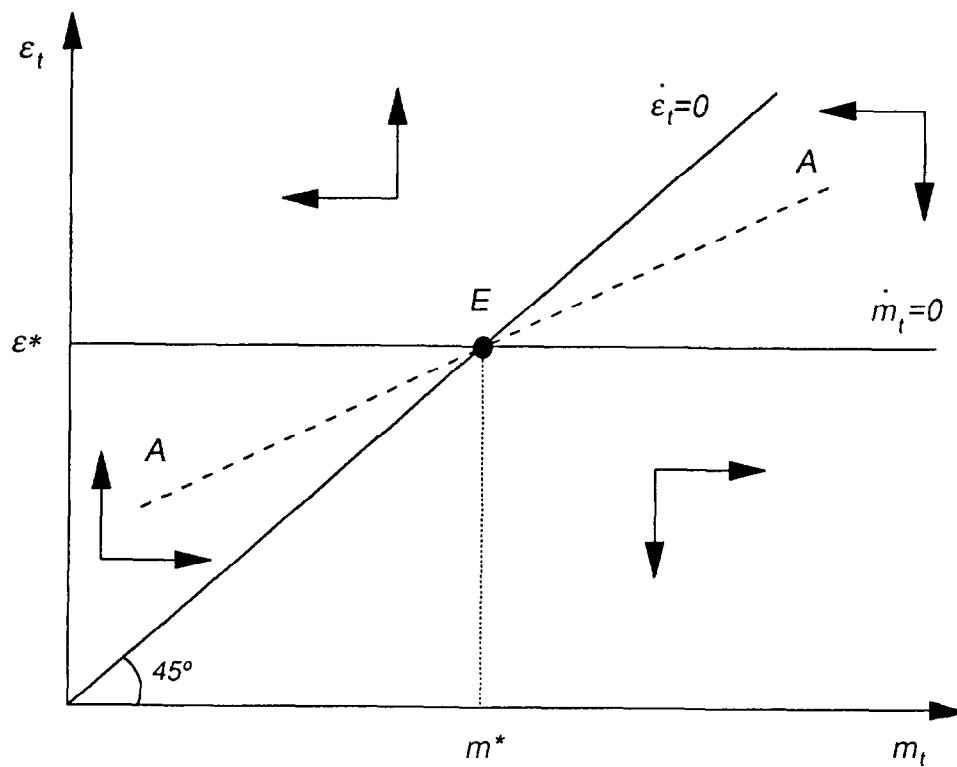
$$T < (\rho_1 + \rho_2)^{-1} \ln[\Omega/\gamma_1(\gamma_1 - \gamma_2)]. \quad (19)$$

Equation (19) is a nonlinear condition on the unification date, and cannot in general be solved analytically. The implications of this result for the short-run dynamics during the transition period can nevertheless be illustrated graphically, as shown in Figures 9 and



Figure 8

The Post-Reform Steady-State under Managed Float





10. 1/ We focus on a situation in which the initial value of the premium is positive (so that  $\bar{e} < s_0$ )--a realistic case for most countries contemplating reform. From the equation of the pre-reform saddlepath given above, this condition also implies that  $\bar{m}_0 > \bar{e}$ . The upper panel in Figure 9 illustrates the case where  $\bar{e} < s_0 < \epsilon_T^+$ , whereas the lower panel considers the case where  $s_0 > \epsilon_T^+ > \bar{e}$ .

The relationship between the money stock and the unified exchange rate at time  $T$  shown in equation (11') defines a "terminal curve", denoted  $CC$  in Figure 9, whose slope is equal to unity--and is thus identical to the slope of the  $[\dot{s}_t = 0]$  locus. The pre-reform saddlepath  $SS$  is thus, by construction, flatter than the terminal curve  $CC$ .

Consider first the case where the post-reform exchange rate is more depreciated than the initial parallel exchange rate, that is, the case in which condition (19) does not hold (upper panel of Figure 9). As assumed above, the position of the economy prior to reform announcement corresponds to a situation in which the premium is positive and is located on a point such as  $A$  on  $SS$ . As shown by equation (18c), the position of the unified exchange rate depends on the length of the transition date  $T$ . Consider first the case where the reform occurs "overnight", that is, where  $T \rightarrow 0^+$ . 2/ Upon announcement, the economy moves immediately to its post-reform steady state. The parallel exchange rate jumps from point  $A$  to point  $B$  (located on  $CC$ ), with no change in the initial--and therefore final--money stock, and a unified exchange rate equal to  $\epsilon_0^+$ .

Consider now the case where  $T$  is positive. At the moment the future reform is announced, the parallel exchange rate depreciates instantaneously (jumping to a point such as  $D$ ) and continues to

1/ The dynamics of unification under a pure float do not depend on the sign of  $(\kappa - \Phi)$ . However, this is not the case under a managed float, as shown below.

2/ To examine the effects of an "overnight" reform requires setting  $T \rightarrow 0$  in solutions (18). This yields  $s_0^+ \rightarrow \epsilon_T^+ = \bar{m}_0$ . To verify that the economy jumps upwards on impact requires showing that  $s_0^+ > s_0 = \bar{e} (1/\gamma_1)(\bar{m}_0 - \bar{e})$ . Using equation (18a) with  $t=0$  yields

$$(\gamma_2 - \gamma_1)(1 - \gamma_1)\exp(\rho_1 T) > 0,$$

which always holds, regardless of the value of  $T$ . Thus, the parallel exchange rate always jumps upwards.

depreciate during the transition period towards a point such as  $B'$  on curve  $CC$ , which is reached--without further jumps--at the moment the reform is implemented,  $T$ . The unified exchange rate is equal to  $\epsilon_T$ , which is more appreciated than  $\epsilon_0^+$ . Finally, if the exchange rate reform is announced to occur in the very distant future--that is, for  $T \rightarrow \infty$ --the announcement will have no effect on the path of the parallel exchange rate and reserves. The economy will remain at the initial position  $A$  upon announcement, and then move along the original saddlepath  $SS$  towards point  $E$ . <sup>1/</sup> There are, therefore, three possible paths for the parallel market exchange associated with unification: it can a) jump instantaneously to a more depreciated equilibrium level; b) jump instantaneously and continue to depreciate along an unstable trajectory during the transition period; c) appreciate continuously with no initial jump towards the unified exchange rate--which, if no reform is ever expected to take place, coincides with the official exchange rate. In the second and third scenarios, reserves fall continuously.

A different type of dynamics is illustrated in the lower panel of Figure 9. If the reform occurs overnight, the parallel exchange rate will depreciate immediately and jump from point  $A$  to point  $B$  located on  $CC$ , as before. If the reform is pre-announced, there are two possible outcomes. In the first scenario, following an initial upward jump from point  $A$  to a point such as  $D$ , the economy evolves along the unstable trajectory  $DB'$  during the transition period. At  $B'$ , however, the unified rate is more depreciated than the initial parallel exchange rate. In the second scenario, the parallel exchange rate jumps from point  $A$  to point  $D'$  upon announcement of the future reform, and evolves along  $D'B''$  during the adjustment period. Point  $B''$  is now characterized by an appreciated post-unification exchange rate relative to the initial parallel exchange rate ( $s_0 > \epsilon_T^+ > \bar{e}$ ), and corresponds to the case where condition (19) holds. In both cases, the transition process is characterized by falling reserves and a continuous appreciation of the parallel exchange rate.

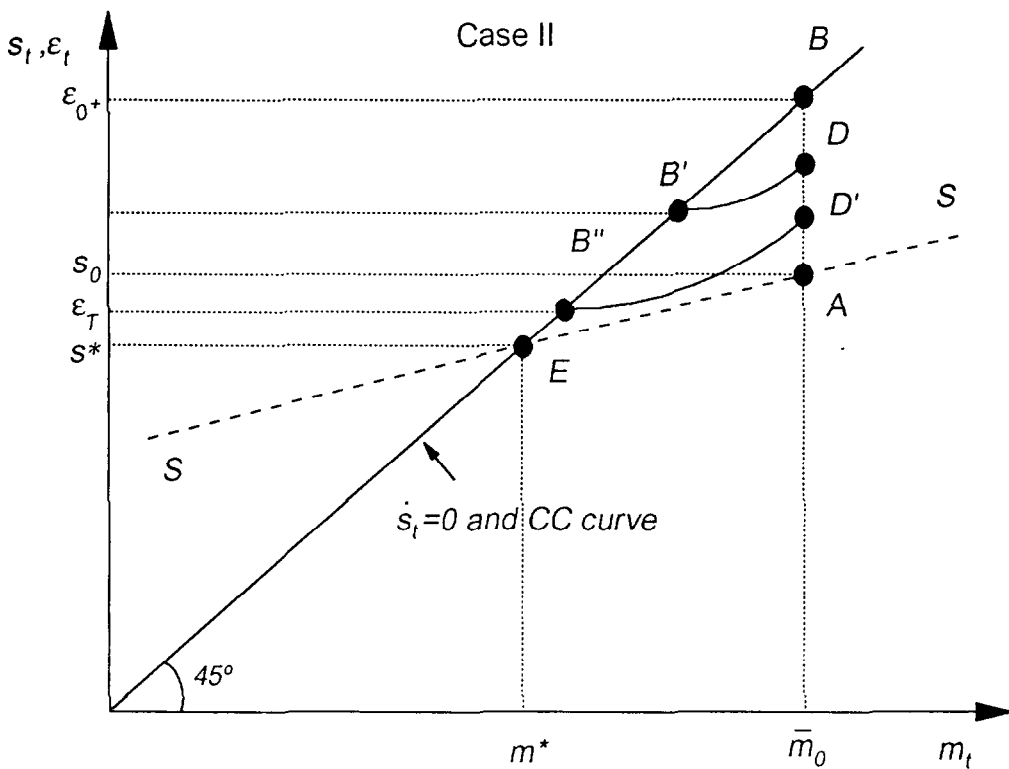
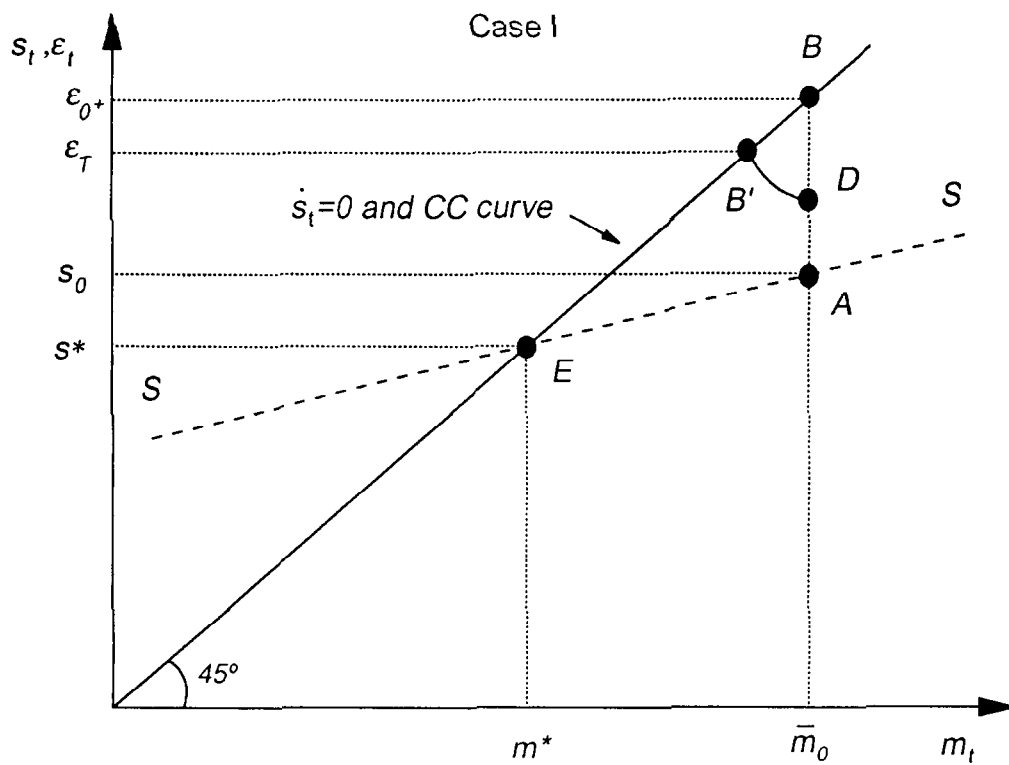
#### b. Managed float

Since private agents are endowed with perfect foresight, the solution values for the constant terms  $C$ ,  $C_1$  and  $C_2$  are again simultaneously determined by conditions that "connect" the two regimes. There are three such conditions under a managed float; an initial condition on the money stock  $m_0$ , and two conditions which rule out jumps in the parallel exchange rate and the money stock at the moment the reform is implemented:

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<sup>1/</sup> To show these results formally requires setting  $T \rightarrow \infty$  in equation (18).

Figure 9  
Unification Dynamics--Pure Float





$$m_0 = \bar{m}_0, \quad s_T = \epsilon_T, \quad m_T = \bar{m}_T, \quad (20)$$

where  $\bar{m}_T$  denotes the post-reform solution given by (13b).

Setting  $t = 0$  in equation (8b),  $t = T$  in equations (8) and (13) and using (20) yields

$$\gamma_1 C_1 + \gamma_2 C_2 = \bar{m}_0 - s^*, \quad (21a)$$

$$s^* + C_1 \exp(\rho_1 T) + C_2 \exp(\rho_2 T) = \epsilon^* + C \exp(\nu_1 T), \quad (21b)$$

$$s^* + \gamma_1 C_1 \exp(\rho_1 T) + \gamma_2 C_2 \exp(\rho_2 T) = \epsilon^* + h_1 C \exp(\nu_1 T), \quad (21c)$$

Assuming that the initial position is a steady-state equilibrium implies that  $\bar{m}_0 = s^*$ . The required solutions are thus given by

$$C_1 = -\alpha \nu_1 \gamma_2 (\epsilon^* - s^*) \exp(\nu_1 T) / \Delta, \quad (22a)$$

$$C_2 = \alpha \nu_1 \gamma_1 (\epsilon^* - s^*) \exp(\nu_1 T) / \Delta = -C_2 (\gamma_1 / \gamma_2), \quad (22b)$$

$$C = (\epsilon^* - s^*) \left\{ \gamma_2 (\gamma_1 - 1) \exp(\rho_1 T) + \gamma_1 (1 - \gamma_2) \exp(\rho_2 T) \right\} / \Delta, \quad (22c)$$

where  $\Delta = \gamma_1 (\gamma_2 - h_1) \exp[(\nu_1 + \rho_2)T] + \gamma_2 (h_1 - \gamma_1) \exp[(\nu_1 + \rho_2)T]$ .

Substituting equations (22) in equations (8) and (13) yields the solutions for the parallel exchange rate and the money stock prior to and after reform. A complete mathematical analysis of the transitional dynamics would proceed along the lines described earlier. However, we focus here only on a graphical presentation of the dynamics associated with the unification process, and consider throughout a situation where (as before) the initial value of the premium is positive ( $\bar{e} < s_0 = s^*$ ). As can be inferred from equations (8), this is always the case if  $\mu > 0$ .

Consider first the case where  $\kappa < \Phi$ . The dynamics of unification in this scenario are illustrated in Figure 10. Two sub-cases must be considered, depending on whether the steady-state value of the unified exchange rate  $\epsilon^*$  is higher or lower than the initial steady-state value of the parallel exchange rate,  $s^*$ . The upper panel illustrates the case where  $\epsilon^* < s^*$ . The position of the economy before the reform

announcement is at point  $E$ , while the position of the steady-state equilibrium in the post-unification regime is at point  $E'$ , which is located along the 45 degree line since in both regimes the flexible exchange rate is equal to the money stock in equilibrium. The transition between points  $E$  and  $E'$ , however, depends on how far in the future the reform date  $T$  is. Consider first the case where the reform occurs "overnight", that is,  $T \rightarrow 0^+$ . Upon announcement, the parallel exchange rate jumps downwards from point  $E$  to point  $B$  (located on the post-reform saddlepath,  $AA$ ), with no change in the money stock. From then on, the economy begins converging towards point  $E'$ , with a continuous appreciation of the parallel exchange rate and a fall in the money stock. If  $T$  is positive, the parallel exchange rate will appreciate instantaneously (jumping from  $E$  to a point such as  $D$ ) at the moment the future reform is announced, and will appreciate continuously during the transition period towards point  $B'$  located on the post-reform saddlepath  $AA$ , which is reached--without further jumps--at the moment the reform is implemented,  $T$ . Foreign reserves tend to increase during the adjustment period. After  $T$ , the parallel exchange rate continues to depreciate and reserves begin falling, until the post-reform steady state is reached, at  $E'$ .

The case where the steady-state value of the unified exchange rate is more depreciated than the initial steady-state value of the parallel exchange rate ( $\epsilon^* > s^*$ ) is illustrated in the lower panel of Figure 10. If the reform occurs overnight, the parallel exchange rate will depreciate immediately and jump from point  $E$  to point  $B$  located on the post-unification saddlepath  $AA$ . If the reform is pre-announced, the initial upward jump will be from point  $E$  to a point such as  $D$ , followed by a movement during the transition period along the unique, unstable trajectory  $DB'$  which causes the economy to arrive at the unique post-unification convergent path  $AA$  at period  $T$ . In this scenario, thus, the transition process is characterized by falling reserves and a continuous depreciation of the parallel exchange rate. After the reform is implemented, the economy proceeds along post-reform stable path, with a continued depreciation of the unified exchange rate and an increase in reserves, until the post-reform steady-state equilibrium is reached (point  $E'$ ).

Figure 11 considers the case where  $\kappa > \Phi$ . The logic of the analysis is very much the same as before, but the transitional dynamic path is quite different. If the post-reform steady-state value of the unified exchange rate is more appreciated than the initial steady-state value of the parallel exchange rate (as shown in the upper panel of the figure), an overnight reform will lead to the same adjustment path as before: an immediate downward jump in the parallel exchange rate, followed by a continuous appreciation and a fall in official reserves. However, if the reform is preannounced, the transition period will be characterized by a fall in the central bank's net foreign assets, instead of an increase as obtained previously. Similarly, if the post-reform steady-state value of the flexible exchange rate is more depreciated than the initial



Figure 10

Unification Dynamics--Managed Float ( $\kappa < \Phi$ )

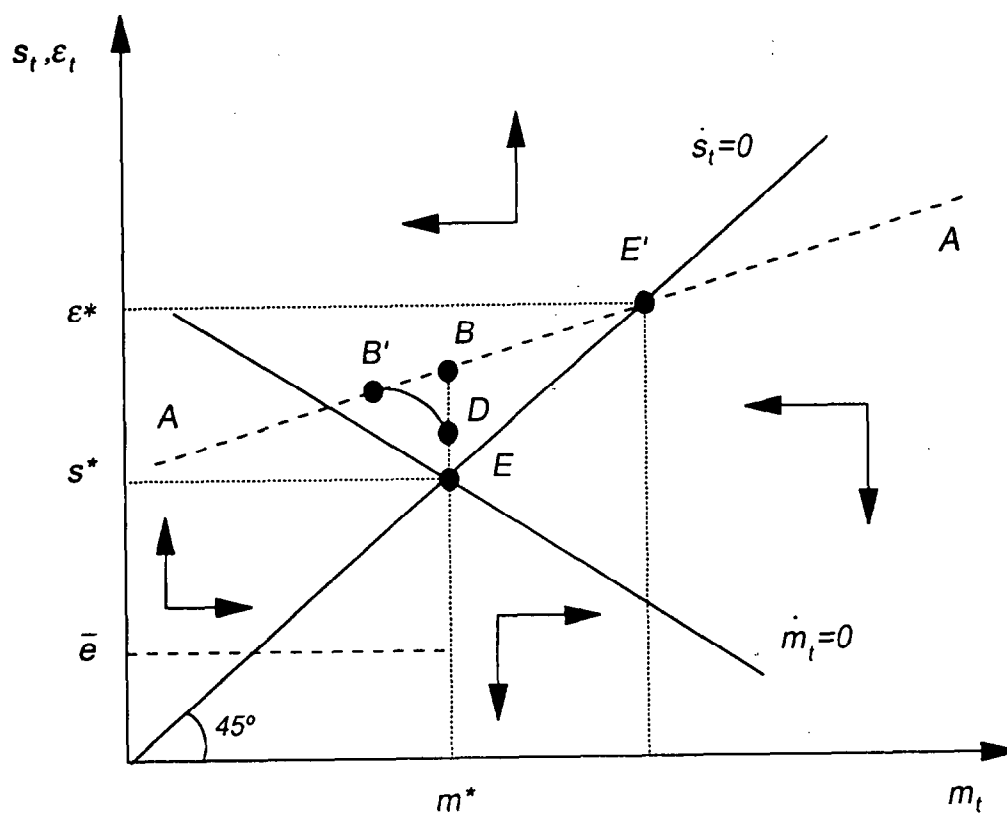
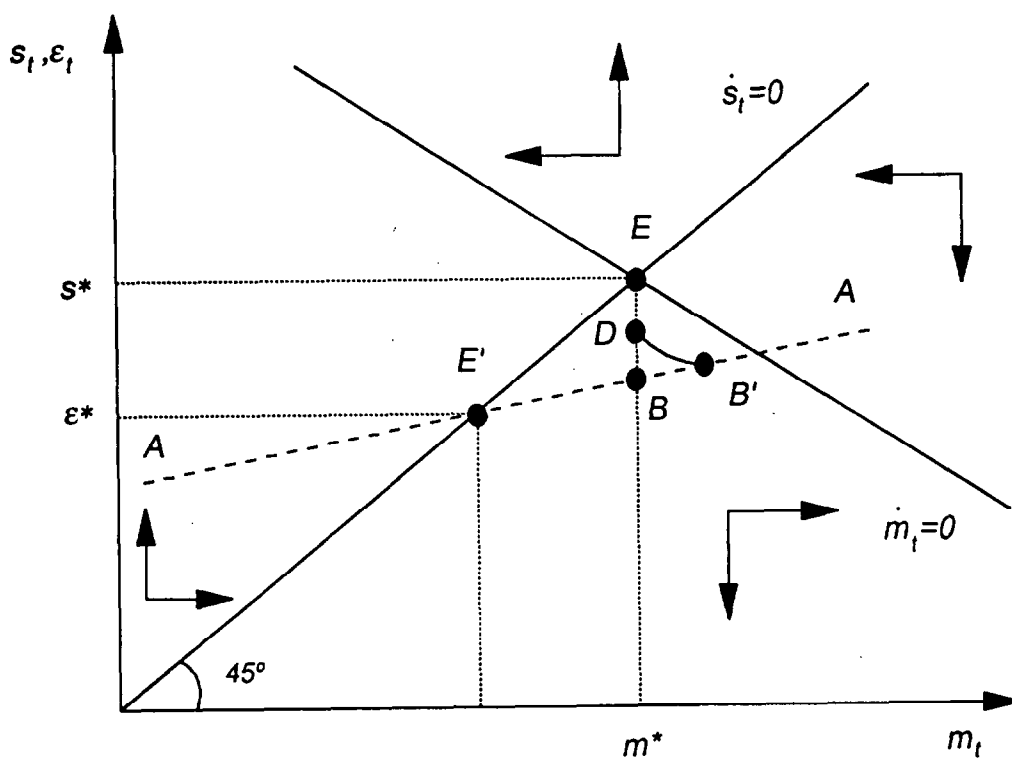
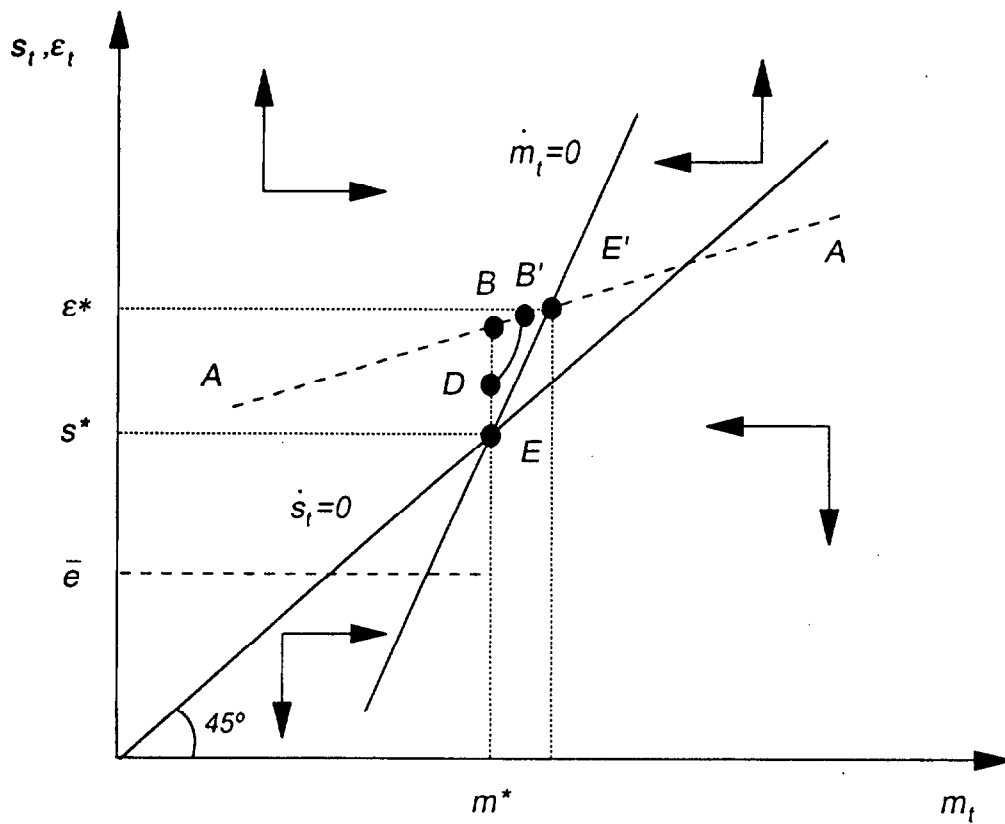
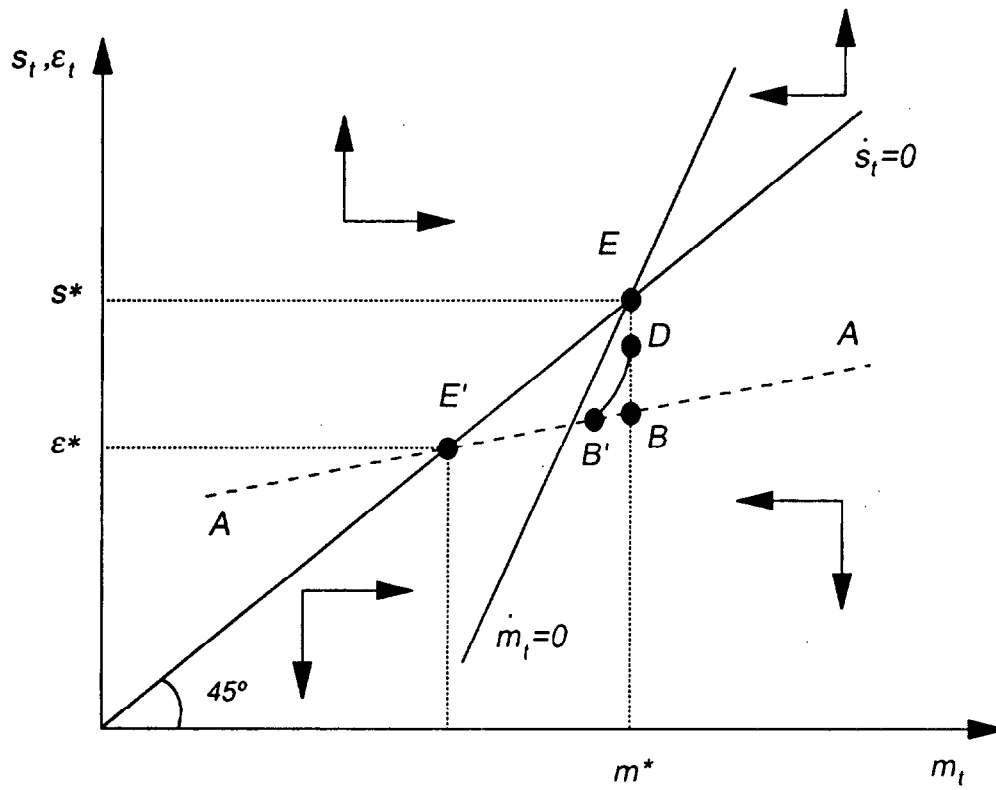


Figure 11

Unification Dynamics--Managed Float ( $\kappa > \Phi$ )



equilibrium value of the parallel exchange rate (as shown in the lower panel of the figure), the dynamics associated with a pre-announced reform will be characterized by an accumulation of foreign exchange reserves, rather than a continuous reduction in the central bank's net holdings of foreign assets.

In summary, the short-run behavior of the parallel exchange rate in anticipation of reform depends on the nature of the post-unification regime, the state of expectations about the timing of reform, the initial position of the economy, the length of the transition period between announcement and implementation of reform, as well as the macroeconomic policy stance that agents expect policymakers to adopt in the aftermath of reform. Under a pure float, it was shown that the unified exchange rate may be above or below the initial parallel exchange rate, depending on the length of the transition period and the parameter values. A similar result was obtained under a managed float, with the desired level of the exchange rate playing an important role. Underlying our analytical results is the intuitive argument that if an exchange rate reform is fully anticipated, agents will--in order to avoid capital losses--adjust their portfolios towards foreign-currency denominated assets if the post-unification equilibrium floating exchange rate is expected to be more depreciated than the pre-reform equilibrium parallel rate, and towards domestic-currency denominated assets if it is expected to be more appreciated. As a result of this portfolio adjustment, the parallel market rate will depreciate (or appreciate, under a managed float) immediately--at the moment the unification attempt is announced or when expectations are formed--towards the level asset holders expect the post-unification floating rate to be. After the initial jump, the parallel market rate may either steadily depreciate or appreciate toward the unified exchange rate during the transition to unification. Depending on the post-reform regime and the structural parameters of the model, however, foreign assets of the central bank may either increase or fall during the transition process.

The analytical model described earlier, although highly stylized, provides a useful framework for understanding the short-run dynamics associated with exchange market reform reviewed in the previous section. As shown in Figures 1-6, the parallel market premium prior to reform shows an upward trend in India and Kenya, although no discernible pattern emerges for the other countries. After the implementation of exchange market reform, the official rate jumped upward (entailing a sharp drop in the premium) in only three cases--Guyana, India and Sierra Leone. By contrast, in Jamaica, Kenya and Sri Lanka, where the process of reform was more gradual, the official rate continued to depreciate at more or less the same pace as registered immediately prior to reform. In all the countries considered, except for Sierra Leone, gross official reserves rose sharply prior to reform and continued to increase in the aftermath of reform. Although no information is available on the degree to which exchange market reform was anticipated by asset holders, the facts described above appear consistent with our description of exchange

rate dynamics under a post-reform managed float regime (since under a pure float reserves should fall continuously), particularly the case described in the lower panel of Figure 11. As shown in the Figure, despite an increase in the premium, the central bank accumulates reserves prior to reform because the reduction in real money balances (and thus in the demand for imports) is large enough to compensate for the positive effect of the premium on the propensity to underinvoice exports. The fact that the premium did not display any discernible tendency to increase prior to reform may reflect a variety of unanticipated shocks that may have led to temporary deviations from the equilibrium path. <sup>1/</sup>

#### IV. Unification, Inflation and Fiscal Deficits

The longer-run macroeconomic effects of exchange market reform have been studied most notably by Pinto (1991), who emphasized the fiscal implications of such reforms. The purpose of this section is threefold. It begins by summarizing Pinto's approach. It then highlights a series of additional issues that need to be taken into account when examining the links between exchange market reform, fiscal deficits, and inflation. Finally, it attempts to provide illustrative calculations aimed at measuring the fiscal impact of exchange market reform in the group of countries whose experience was discussed in Section II.

##### 1. Pinto's framework

In Pinto's (1991) framework, exports are partly smuggled out and partly sold through the official market. <sup>2/</sup> As a result, the parallel market premium acts as an implicit tax on exports repatriated through official channels. The government buys imported goods and uses the foreign exchange surrendered by exporters to pay for them. Excess foreign exchange is resold to the private sector at the official

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<sup>1/</sup> In practice, the date at which the reform will take place in the future may not be perfectly known by agents. A likely outcome of the introduction of uncertainty about the reform date is that expectations of reform would cause a jump in the parallel exchange rate at the moment the reform is implemented as well as erratic exchange rate movements prior to transition if this type of uncertainty varies over time (Agénor and Flood, 1992). In such conditions, it may be particularly difficult to interpret short-run movements in the parallel exchange rate.

<sup>2/</sup> Exporters in Pinto's model face rising marginal costs to smuggling. The allocation of output between the official and the parallel markets is thus determined in equilibrium by equating marginal returns. The optimal proportion of smuggled exports is in general positive and is an increasing function of the premium.

exchange rate. Thus, reserves remain constant over time (with private demand for imported consumption goods being satisfied through the parallel market), and changes in the money supply are determined only by domestic credit growth. In the steady state, the government finances its budget deficit by the inflation tax (whose yield depends on holdings of real money balances) and the implicit tax on exports. For a given level of the fiscal deficit, therefore, a tradeoff typically emerges between the inflation tax rate and the premium (see below). Formally, the government finances its deficit by credit from the central bank,  $D_t$ :

$$\dot{D}_t = E(G_t - \tau_t), \quad (23)$$

where  $E$  denotes the official exchange rate,  $G$  government imports and  $\tau_t$  conventional taxes. Both  $G_t$  and  $\tau_t$  are assumed fixed in terms of foreign exchange. Equation (23) implies that, in the absence of reserve accumulation:

$$\dot{m}_t = (G - \tau) - \epsilon m_t, \quad (24)$$

where  $m_t$  measures the real money stock in terms of the official exchange rate, and  $\epsilon$  the constant rate of depreciation of the official exchange rate. Equation (24) indicates that in the steady state ( $\dot{m}_t = 0$ ) the budget deficit is financed by the inflation tax  $\epsilon m^*$ .

To identify the steady-state revenue from the implicit tax on exports requires moving from the "recorded" deficit measured in terms of the official exchange rate (equation 24) to the "true" deficit measured in terms of the parallel exchange rate. Let  $\rho$  denote (one plus) the parallel market premium. The "true" long-run capital loss incurred by private asset holders as a result of the inflation tax is  $\epsilon m^* / \rho^*$ . Similarly, while officially-recorded taxes (measured in domestic currency) are equal to  $E\tau$ , the real tax burden is equal to  $\tau / \rho^*$ . As long as the long-run value of the premium is positive ( $\rho^* \geq 1$ ), the "true" fiscal burden imposed by the inflation tax and conventional taxes is lower than the recorded one. However, since real government spending does not depend on the premium, the difference between the "recorded" and the "true" tax burdens corresponds to the implicit tax on exports,  $G - \tau / \rho^* - m^* \epsilon / \rho^*$ . Since  $G - \tau = m^* \epsilon$ , this expression is equal to  $G(1 - 1/\rho^*)$ . Equivalently, the steady-state government budget constraint can be written as

$$G = \tau + m^* \epsilon = \rho^* \left( \frac{\tau}{\rho^*} + \frac{m^* \epsilon}{\rho^*} \right) = G \left( 1 - \frac{1}{\rho^*} \right) + \frac{\tau}{\rho^*} + \frac{m^* \epsilon}{\rho^*}, \quad (25)$$

which explicitly shows how the implicit tax on exports serves to finance government expenditure. 1/ If the inflation elasticity of the demand for domestic money is less than unity, a tradeoff will exist between the inflation tax rate and the premium for a given level of the fiscal deficit. 2/ Put differently, a decline in the implicit tax on exports must be compensated by an increase in the inflation (devaluation) rate. By unifying foreign exchange markets, the government loses the tax revenue implicit in the premium,  $G(1-1/\rho^*)$ . The larger the implicit tax on exports is prior to reform, the larger will be the jump in inflation upon unification since policymakers must compensate for a fall in revenue by an increase in monetary financing of the fiscal deficit and a higher tax on domestic money holdings. 3/

## 2. A generalized framework

While the emphasis on the implicit taxation of exports appears warranted in view of the experience of some developing countries (notably in Sub-Saharan Africa), Pinto's analysis neglects several potentially important sources of explicit or implicit taxes and subsidies that are often associated with informal dual exchange rate regimes. The first important issue is the extent to which the assumption of the central bank being a net seller or a net buyer of foreign exchange affects Pinto's analysis of exchange market unification. In general, the existence of a large differential between the official and parallel exchange rates has been shown to carry significant implications for the quasi-fiscal deficit of the public sector (see for instance Leone, 1994). In conventional accounting terms, the Central Bank makes a profit every time it buys foreign exchange (from, say, exporters) at a given official rate and sells it to importers at a more depreciated rate. Conversely, it incurs a loss when it sells foreign exchange (to, say, the government) at the given official rate and buys it at a more depreciated rate. Put differently, if the central bank buys foreign currency from exporters at an exchange rate that is more depreciated than the rate at which it sells it to domestic agents, it will provide a net implicit subsidy. Both types of operations affect central bank profits and the consolidated public sector deficit.

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1/ Note that, since central bank resells "excess" foreign exchange to the private sector at the official exchange rate, it provides an implicit subsidy to importers. This subsidy is, like government expenditure on imports, financed by the implicit tax on exporters.

2/ For the exact formulation of the tradeoff, see Proposition 2 in Pinto (1991, p. 129).

3/ Lizondo (1991) has extended Pinto's analysis to consider the case where the official market for foreign exchange clears through changes in foreign reserves, instead of assuming that agents are subject to rationing in the official market.

If all sales and purchases occur at the official exchange rate, there will typically be no effect on the central bank's profit and loss account as conventionally calculated. However, in a broader economic sense, the central bank would still collect a net implicit tax or provide an implicit subsidy (depending on whether it is a net buyer or a net seller of foreign exchange) in the presence of a parallel market for foreign exchange--even if all its foreign exchange operations occur at the same official exchange rate. Formally, let  $E(\text{sales-purchases})$  denote the domestic-currency value (measured at the official exchange rate) of net sales of foreign exchange by the Central Bank. Assuming that the parallel exchange rate  $S$  is a good approximation of the "equilibrium" exchange rate, this quantity can be decomposed as

$$E(\text{sales-purchases}) = S(\text{sales-purchases}) - (S-E)(\text{sales-purchases}).$$

The first term on the right-hand side of this identity measures the "true" value of net sales of foreign exchange, while the second term measures the implicit profit or loss associated with an overvalued official rate. Since  $S-E$  is generally positive, this term will be negative (positive) if sales of foreign exchange are larger (smaller) than purchases. The central bank will therefore provide an implicit subsidy if it is a net seller of foreign exchange. Conversely, the Central Bank will collect an implicit tax on private agents if it is a net buyer of foreign exchange.

Thus, in broad economic terms, whether exchange market unification raises or reduces implicit profits accruing to the Central Bank depends not only on the conventionally-measured quasi-fiscal effects of foreign exchange operations but also on whether the central bank is a net buyer or seller of foreign exchange. <sup>1/</sup> Net sales to the private sector tend to generate losses while net purchases tend to generate profits. This is, in substance, the point emphasized by Pinto (1991). In Pinto's formal framework, all foreign exchange operations of the central bank (sales to the government as well as sales to private agents) take place at the official exchange rate; the central bank is a net buyer of foreign exchange from the private sector. As a result, therefore, prior to reform there exists a quasi-fiscal surplus (in a broad sense), which is eliminated by

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<sup>1/</sup> Put differently, there are two types of quasi-fiscal taxes and subsidies: those generated by different exchange rates being applied to particular categories of foreign exchange transactions; and those that are related to the existence of a parallel exchange market, where the exchange rate reflects better than the (overvalued) official rate the marginal value of foreign exchange. Both sets of taxes and subsidies are in a sense implicit, but the former are reflected in (or can be traced from) the accounts of the central bank more directly than the latter.

unification. In general, of course, this needs not be the case, as discussed above.

In addition, there are a variety of implicit taxes and subsidies associated with multiple exchange rate regimes that are not directly related to foreign exchange operations between the Central Bank and domestic agents. In countries where inflows of foreign assistance take the form of direct budgetary support for the government, a depreciation of the official exchange rate towards its market value may raise revenue and reduce the deficit in domestic currency terms, whereas an appreciation would worsen the deficit. 1/ In practice, exchange market unification has often taken place in the context of a comprehensive reform program calling for substantial aid inflows. In such conditions, the Central Bank's position can switch from being a net buyer to being a net seller of foreign exchange. Agents would thus expect a decrease, rather than an increase, in money financing of the fiscal deficit following unification. In other cases where guaranteed prices to local producers of exported goods are fixed in domestic currency terms, unification will tend to reduce expenditure and thus also reduce the fiscal deficit.

More importantly perhaps, as recently reemphasized by Burgess and Stern (1993) and Nashashibi and Bazzoni (1994), import taxes are an essential source of fiscal revenue in the developing world, notably in Sub-Saharan Africa. In many countries, the official rather than the parallel market exchange rate (which reflects the marginal cost of foreign exchange, and is often highly correlated with changes in domestic prices) is used for customs valuation purposes. This practice is tantamount to providing an implicit subsidy to importers. 2/ In an inflationary environment, the size of this subsidy will tend to grow over time when the official, fixed exchange rate serves as a basis for customs valuation of imports. Nashashibi and Bazzoni (1994) have argued that this was the case notably during the early 1980s in Nigeria, Tanzania and Zambia. 3/ To the extent

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1/ This point has been emphasized by Kaufman and O'Connell (1991). However, if foreign assistance is treated as a financing item, valuation changes would have no effect on the deficit. The composition of public expenditure financed by foreign aid may nevertheless affect indirectly the level of implicit subsidies.

2/ If imported goods sold on the domestic market are valued at market-clearing exchange rate and prices, indirect taxes on domestic sales (such as a value added tax or excise duties) will not be subject to distortions of this type. However, to the extent that the exchange rate used to value imports is more depreciated than the equilibrium rate, indirect taxes will provide an implicit revenue (see below).

3/ A large premium may also act to reduce declared imports, thereby lowering revenue from import taxes by reducing the tax base. There is, however, an offsetting wealth effect which may dominate the former in a general equilibrium context.



that the subsidies provided through this channel are large relative to the revenue generated from the implicit tax on exports, it is intuitively clear that the net effect of exchange market unification may be a fall in the steady-state inflation rate--in contrast to Pinto's view.

Estimating the net effect of exchange market unification on implicit taxes and subsidies depends, in particular, on whether the focus of attention is the quasi-fiscal balance of the Central Bank (in a broad sense), or the overall balance of the consolidated public sector. Let us begin by considering the effect on the Central Bank's accounts. Suppose that all central bank foreign exchange operations take place at the same exchange rate, so that profits and losses as conventionally estimated in measuring quasi-fiscal deficits do not exist. *Ceteris Paribus*, the net effect of unification on the monetary authorities' quasi-fiscal deficit (measured in percent of output,  $Y$ ) can be estimated by determining the net position of the central bank in terms of its foreign exchange operations, and taking into account the overvaluation of the official exchange rate:

$$\text{net effect} = 100 \left( \frac{E^{\text{equil}}}{E^{\text{prior}}} - 1 \right) \left\{ (\theta \text{Exp} + \tilde{P}^{\text{cb}}) - S^{\text{cb}} \right\} / Y, \quad 0 < \theta \leq 1 \quad (26)$$

where  $E^{\text{equil}}$  is a measure of the "equilibrium" exchange rate (that is, an estimate of the "true" cost of foreign exchange),  $E^{\text{prior}}$  the exchange rate prevailing immediately prior to reform,  $\text{Exp}$  officially-recorded exports (measured in domestic currency terms),  $\tilde{P}^{\text{cb}}$  other sources of foreign exchange for the central bank, such as disbursements of foreign assistance as well as purchases corresponding to foreign exchange operations with the private sector (such as those related to private unrequited transfers),  $S^{\text{cb}}$  the domestic-currency value of total sales of foreign exchange by the central bank to the rest of the economy (for the purpose of imports and other transactions in foreign exchange, such as external debt payments) at the official exchange rate, and  $\theta$  the "effective" surrender requirement imposed on exporters (including public enterprises), which may differ--in countries where enforcement is weak--from the legislated surrender rate. The expression in (26) measures the difference between the implicit revenue resulting from acquisition or purchases of foreign exchange at the official exchange rate and the implicit subsidy provided to buyers of foreign exchange. The formula indicates that, as long as the central bank is a net buyer of foreign exchange prior to reform ( $\theta \text{Exp} + \tilde{P}^{\text{cb}} - S^{\text{cb}} > 0$ ), the quasi-fiscal deficit of the monetary authorities will deteriorate after reform--assuming, in particular, that inflows and sales of foreign exchange by the central bank are not immediately and directly affected by the reform. 1/

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1/ Note that if the equilibrium exchange rate is very close to the exchange rate prevailing prior to reform, the net effect will be close to zero.

Conversely, if the central bank is a net seller of foreign exchange prior to reform (and is thus incurring an implicit loss), the quasi-fiscal balance will improve. 1/

We now turn to the determination of the effects of foreign exchange market reform on the consolidated public sector, which we define as consisting of the central bank and the rest of the public sector (that is, the government and public enterprises). To do so requires accounting for a) foreign exchange operations of the rest of the public sector; and b) the implicit subsidies provided to importers as a result of taxation of foreign goods at the official exchange rate prior to reform.

Regarding the first issue, the rest of the public sector buys foreign exchange for the purpose of imports and servicing its external debt, whereas it sells foreign exchange obtained through disbursements of foreign loans, grants, or export proceeds of public enterprises. Assuming that all such operations are conducted through the central bank, deriving the net effect of exchange market unification on the broadly-defined quasi-fiscal deficit of the consolidated public sector requires netting out sales of foreign exchange by the rest of the public sector to the central bank (or equivalently purchases of foreign exchange by the central bank from the rest of the public sector, denoted by  $P_g^{cb}$ ), and sales by the central bank to the rest of the public sector (or purchases by the rest of the public sector from the central bank) for the payment of its imports and other foreign exchange transactions ( $S_g^{cb}$ ) from our formula (26):

$$\text{net effect} = 100 \left( \frac{E^{equil}}{E^{prior}} - 1 \right) \left\{ (\theta \text{Exp} + \tilde{P}^{cb} - P_g^{cb}) - (S^{cb} - S_g^{cb}) \right\} / Y, \quad (27)$$

---

1/ The assumption that exchange market reform has no immediate effect on officially-recorded exports and sales of foreign exchange by the central bank is not necessarily appropriate. To the extent, for instance, that exchange market unification eliminates incentives to smuggle and underinvoicing of exports, officially-recorded flows of exported goods may be subject to large and immediate shifts. Similarly, a large jump in the relative price of imports (associated with a significant depreciation of the official exchange rate upon unification) may sharply curtail demand for foreign goods and reduce sales of foreign exchange by the central bank. In practice, indirect effects can also be large: exchange market reform may take place in the context of a comprehensive adjustment program which calls for large inflows of capital to the public sector at the outset.

since the rest of the public sector's net foreign exchange position is  $(S_g^{cb} - P_g^{cb})$ . If the foreign exchange operations of the rest of the public sector are approximately balanced, then formulas (26) and (27) will yield equivalent results.

Regarding the second issue, let  $I$  be the domestic-currency value of total imports, and let  $\tau_I$  denote the average (effective) rate of taxation of imports. Assuming that tariff duties are assessed on imports valued at the official exchange rate, 1/ our modified formula becomes

$$\text{net effect} = 100 \left( \frac{E^{equil}}{E^{prior}} - 1 \right) \left\{ (\theta \text{Exp} + \tilde{P}^{cb} - P_g^{cb}) - S_P^{cb} - \tau_I I \right\} / Y. \quad (28)$$

where  $S_P^{cb} = (S^{cb} - S_g^{cb})$  denotes sales of foreign exchange by the central bank to the private sector. For a positive premium, the sign of the expression in brackets in (28) therefore determines whether exchange market unification leads to the elimination of an implicit subsidy to the private sector (which is the case if the expression in brackets is negative), thereby worsening the (broadly-defined) consolidated public sector deficit--and eventually increase reliance on the inflation tax, as discussed above. 2/

### 3. Illustrative calculations

In practice, estimating the net effect of exchange market reform on implicit tax and subsidy schemes is a complex and difficult task. A first approach consists in examining to what extent the reliance on seigniorage as a source of fiscal revenue changes in the aftermath of reform. Considering the countries whose experiences have been

1/ Importers have no incentives to value taxable imports at a more depreciated exchange rate as long as the tax rate is higher than the parallel market premium. To the extent that some transactions prior to reform are conducted at market-related exchange rates, our formula would overestimate the subsidy provided to importers.

2/ As noted earlier, to the extent that the domestic sale price of imports ( $I$ , valued as before at the official exchange rate) tends to reflect an exchange rate  $E^{loc}$  that is more depreciated than the "equilibrium" exchange rate  $E^{equil}$ , the public sector would also realize an implicit revenue on the indirect taxation (at the effective rate  $\tau_d$ ) on the sale of imported goods, equal to  $\tau_d I (E^{equil} / E^{prior}) (E^{loc} / E^{equil} - 1) / Y$ , which would lower the cost of the implicit subsidy to importers.

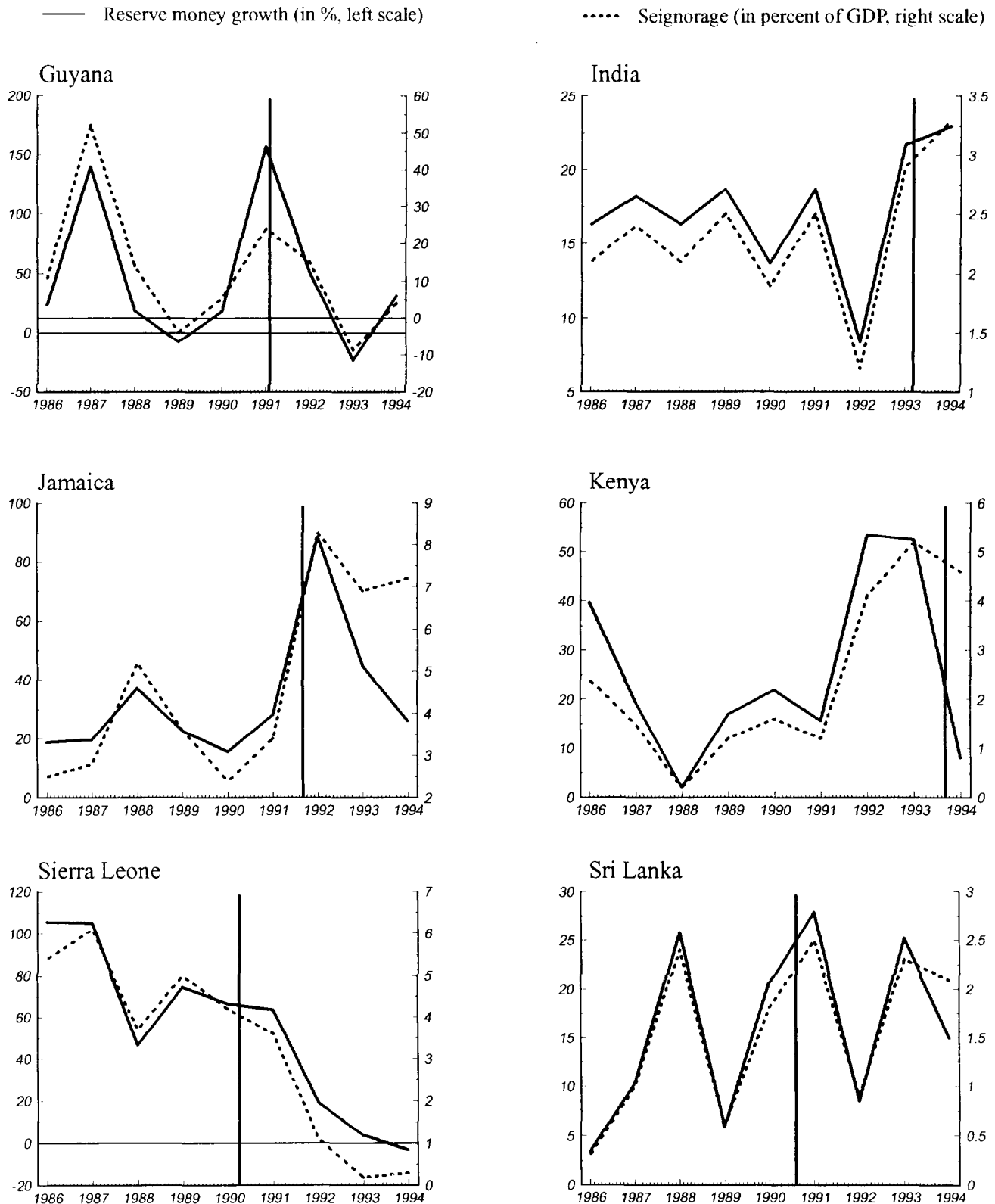
reviewed in Section II, it appears in that regard that the results are mixed (Figure 12). In terms of pre- and post-reform averages, seigniorage revenue appears to have declined in the case of Guyana and Sierra Leone, was broadly unchanged in Sri Lanka, and increased significantly in Jamaica. Although it is too early to pass judgement, it also appears to have increased in Kenya and India. Clearly, it is difficult to attribute the developments in inflation and seigniorage revenue to the impact of exchange market reform per se, particularly in cases where reform was part of a comprehensive stabilization package or structural adjustment program. However, judging from the cases reviewed here, one could surmise that results indeed came out to be more pleasant than suggested by Pinto's (1991) analysis. Specifically, as noted in Section II, inflation remained broadly under control in almost all countries, or at least displayed a reversal from an increasing trend--despite the mixed picture on the seigniorage front. It is possible that this favorable outcome might have partly resulted from downward revision in inflationary expectations, fostered by significant fiscal adjustment. Furthermore, taking into account the reserve build-up in virtually all countries, it appears that most of the increase in reserve money reflected changes in the foreign component of the monetary base, rather than a resort to monetary financing of fiscal deficits, as evidenced in low levels of credit growth (Figures 1-6). Jamaica is a case in point.

As indicated above, to estimate the full potential effect of exchange market reform on quasi-fiscal deficits and inflation requires consideration of all public sector entities, rather than only the central bank. We, nevertheless, performed illustrative calculations based on formula (28), which are discussed in more detail in the Appendix. Although relatively crude, the results suggest that the subsidy to importers resulting from valuation of imports at the official exchange rate prior to reform may have been large in some cases: about 10 percent of GDP for Guyana (prior to 1991) and Jamaica (prior to 1991), and 5 percent for Sierra Leone (prior to 1990). The implicit revenue registered by the central bank (as a result of being a net buyer of foreign exchange prior to reform) amounted to small positive numbers for India and Jamaica, and was significantly negative for Sierra Leone. Everything else equal, therefore, the net effect of exchange market reform appeared to have been a reduction in the (broadly-defined) quasi-fiscal deficit of the central bank and the fiscal authorities, thus reducing also reliance on seigniorage revenue. This conclusion appears to be consistent with our review of country experiences.

Our findings (although tentative) compare well with those obtained in a recent study by Kiguel and O'Connell (1995), which summarizes the results of a World Bank research project on parallel exchange markets involving detailed case studies of exchange market reform in eight developing countries during the 1980s (Argentina, Ghana, Mexico, Sudan, Tanzania, Turkey, and Zambia). The sample of countries reviewed by Kiguel and O'Connell (1995) covers both cases of rapid unification (Argentina at the end of 1989, Mexico in December

Figure 12

Unification Attempts: Reserve money growth and seignorage



Source: World Economic Outlook and staff estimates.

Note: A vertical line indicates the date of exchange market reform. 1994 figures are preliminary.



1987, and Venezuela in February 1989), and cases of gradual unification (Ghana, Sudan, Tanzania, Turkey, and Zambia). An important finding of the country studies reviewed by Kiguel and O'Connell is that the existence of a parallel market for foreign exchange was often associated with large quasi-fiscal losses. 1/ To a large extent, these implicit losses (which therefore did not appear directly in budgetary accounts) resulted from net sales of foreign exchange to the private sector at below market exchange rates. Ghana, Mexico, Tanzania, Venezuela and Zambia, in particular, incurred large (broadly-defined) quasi-fiscal losses as a result of the existence of parallel markets in foreign exchange. 2/ In Venezuela for instance, the loss was estimated at between 4.7 to 25.4 percent of GDP, depending on the value used to measure the "true" market value of foreign exchange. In most of these countries (particularly Mexico, Venezuela and Zambia), the reason why the central bank was a net seller of foreign exchange was related to the position of the consolidated public sector as a net "producer" of foreign exchange, either as a result of large external transfers to this sector, or because public sector enterprises were among the main exporters of the economy--thus representing "captive sources" of foreign currency. In a few other cases, such as Argentina and Tanzania, the central bank was a net buyer of foreign exchange from the private sector, thus generating sizable profits. Kiguel and O'Connell (1995) estimate that on net the multiple exchange rate system in Argentina led to profits of the order of 3.5 percent of GDP, while in Tanzania it generated a positive effect on the domestic currency budget equivalent on an annual basis to 2.1 percent of output. As argued earlier, therefore, exchange market reform has led to lower reliance on inflationary finance in some cases--Venezuela, for instance--by reducing the broadly-defined quasi-fiscal deficit. 3/

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1/ Evidence for other countries also suggests the existence of sizable losses associated with multiple exchange rate systems. For instance, the multiple exchange rate system operating in Peru prior to unification is believed to have generated foreign exchange losses of the order of 2 percent of GDP.

2/ In addition, the high premium that prevailed in Ghana in the early 1970s had an adverse effect on declared exports and imports, which limited the revenue generated by trade taxes.

3/ Kiguel and O'Connell do not present systematic evidence suggesting that the inflation rate rose or fell in the aftermath of the unification attempts. As noted above, isolating the effect of exchange market reform on inflation is in any case difficult.

## V. Summary and Conclusions

In recent years, growing recognition of the substantial economic costs associated with the distortions induced by large differentials between official and parallel exchange rates has led numerous countries to attempt to unify their foreign exchange markets in the context of their stabilization and adjustment programs. The purpose of this paper has been to review some recent experiences with exchange market reform, to examine some conceptual issues associated with the unification process, and to extend the theoretical literature on the dynamics of exchange market unification.

The first part of the paper discussed the experience of Guyana, India, Jamaica, Kenya, Sierra Leone, and Sri Lanka in the early 1990s with exchange market reform. Our review emphasized, in particular that exchange market reform, launched in the context of a comprehensive macroeconomic program targeting most notably a sustainable fiscal position, achieved significant reduction in inflation and much higher reserve levels. Reforms, therefore, were broadly successful. It would be incorrect, however, to argue that the countries became "true floaters" since, in the aftermath of reform central banks continued to interfere (sometimes heavily) with the allocation of foreign exchange and more generally with the functioning of the foreign exchange market.

The second part developed a theoretical framework for studying the dynamics of the parallel exchange rate, prices, foreign reserves and the money supply when the monetary authorities decide to adopt either a pure floating exchange rate regime or a managed float arrangement in the post-reform period. It was argued that studying the case of a managed float with a well-defined exchange rate target provided a convenient analytical simplification in light of the evidence suggesting that central banks have intervened (in both auction and interbank market arrangements) more or less systematically in the process of exchange rate determination. The analysis suggested that a variety of paths can be observed, depending on the nature of the post-reform regime, the structural parameters of the model, and the length of the transition period between reform announcement and actual implementation. Despite its highly stylized nature, the theoretical model provided a useful framework for interpreting the experiences reviewed in the first part of the paper.

The last part of the paper focused on the effects of unification on inflation. We began by reviewing Pinto's (1991) analysis of the unification process, which emphasizes that the loss of the implicit tax on exports induced by exchange market unification may lead to a permanently higher inflation in the presence of fiscal rigidities. We then pointed out that, in addition to issues raised in Pinto's analysis, there are a variety of implicit taxes and subsidies that must be taken into account in assessing the fiscal effects of exchange market reform. The first issue is to determine whether in general the



public sector is a net buyer or a net seller of foreign exchange. The second and perhaps more important issue for many countries is to assess the extent to which the use of the official exchange rate for the valuation of imports for duty purposes provides an implicit subsidy to importers. Pinto's (1991) emphasis on the inflationary effect of the loss of the implicit tax on exports is therefore not necessarily warranted. It was argued in particular that if the reduction in implicit subsidies to importers resulting from levying tariffs at the official exchange rate outweighs the loss in implicit taxes levied on exports repatriated at the official rate, exchange market reform may lead to a fall in the inflation. Although accounting for the variety of implicit and explicit taxes in existence prior to reform is difficult in practice, we provided illustrative results for several countries suggesting that unification may indeed lead to lower reliance on seigniorage.

APPENDIX

Quasi-Fiscal Effects of Exchange Market Reform

This Appendix describes how formula (28) can be used to estimate the potential effect of exchange market reform on quasi-fiscal deficits and inflation. The first step is to determine (as indicated in the text) whether the Central Bank is a net buyer/net seller of foreign exchange. To do so we have used changes in net foreign assets of the Central Bank which, by definition, should reflect developments in the Bank's net foreign exchange position, or equivalently the net effect of market sales and purchases. Thus, when changes in the net foreign asset position of the central bank are broadly negative prior to reform (indicating a net seller position), the central bank should be gaining from reform as long as the post-reform exchange rate is more depreciated than the official pre-reform rate. Admittedly, this is a crude indicator. It would require several adjustments, most notably pertaining to foreign exchange operations of the rest of the public sector channelled through commercial banks, valuation changes (owing to exchange rate movements) as well as developments in specific items in the central bank's balance sheet, such as international arrears as well as the effect of changes in world interest rates on international reserves. Increases in net foreign assets may thus reflect other factors than "purchases" of foreign exchange--such as operations related to exports repatriated at the official exchange rate--or acquisition of foreign exchange (such as through official borrowing and foreign grants). Furthermore, owing to the existence of multiple exchange rates in many cases prior to reform, specific components of the central bank's foreign exchange budget would need to be tracked down to determine transactions effected at these multiple exchange rates--as conventionally done in estimating quasi-fiscal deficits. Nevertheless, we suggest that changes in net foreign assets of the central bank would still be a useful estimator to calculate the net amount of subsidies provided, or taxes levied, by the central bank. Furthermore, in line with the discussion in the text, we also take into account post-reform fiscal gains from international trade taxes. By adding the two figures, we then obtain some measure of the net effect of reform at the level of both monetary and fiscal authorities, as summarized in equation (28) in the text.

APPENDIX

We use the post-reform exchange rate as a proxy for the equilibrium rate. 1/ To obtain a proxy for the net foreign exchange position of the central bank, we take an average for three years prior to the year of reform. As regards the premium, we use the differential between the post- and pre-reform rates, and take 12-months average around the month of reform. We use that same rate at each period, as an average indicator for the extent of disequilibrium. The results indicate that the implicit revenue derived by the Central Bank amounted to 0.2 percent of GDP for India and Jamaica, -0.2 percent for Kenya, -21 percent for Sierra Leone, and approximately 0 for Sri Lanka. 2/ Thus, while the Central Bank might have been benefiting slightly from operating with an overvalued exchange rate in India and Jamaica, in the case of Sierra Leone it was experimenting sizable losses. As regards the subsidy provided to importers through taxation at the official exchange rate, given the relative importance of international trade taxes (measured in percent of GDP) in all these countries, the effect appeared very large. The net subsidy to importers amounted to about 10 percent of GDP for Guyana and Jamaica (prior to 1991), 5 percent for Sierra Leone (prior to 1990), 1 percent for India (prior to 1993), 0.4 percent for Kenya (prior to 1993), and 0.2 percent for Sri Lanka (prior to 1990). Consequently, the net overall effect of operating an overvalued official exchange rate turned out negative in virtually all cases, indicating large losses prior to reform to the monetary and fiscal authorities combined--and large gains associated with unification.

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1/ An alternative approach, followed for instance by Kiguel and O'Connell (1995), consists in using the pre-reform parallel exchange rate as a proxy for the equilibrium exchange rate. However, such a rate may be subject to severe distortions. To the extent that exchange market reform is accompanied by the removal of restrictions on foreign exchange transactions, the use of the market-related, unified rate prevailing immediately after reform as we do here may be more appropriate.

2/ Additional details regarding these calculations are available from the authors upon request.

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