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**Real Exchange Rate Behavior and Economic Growth:
Evidence from Egypt, Jordan, Morocco, and Tunisia**

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Abstract

This paper examines the effect of the real exchange rate misalignment (RERMIS) on the collective economic growth of Egypt, Jordan, Morocco, and Tunisia. The paper constructs three measures of exchange rate misalignment based on purchasing power parity; a black market exchange rate; and a structured model. The empirical investigation confirmed the adverse effect of RERMIS on growth, using all measures of RERMIS, as predicted by endogenous growth models. The results also highlighted the role of other factors; specifically, capital growth and population have the theoretical signs predicted by the Solow growth model and are statistically significant.

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I. INTRODUCTION

Correction of a real exchange rate misalignment (RERMIS) is widely acknowledged as one of the crucial conditions for improving economic performance and ensuring macroeconomic stability. It is argued that RERMIS can, *inter alia*, lead to a reduction in economic efficiency, a misallocation of resources, and capital flight. As a consequence, RERMIS has received considerable attention in policy discussions as an important source of macroeconomic disequilibrium whose correction generally entails both demand management policies as well as real exchange rate (RER) adjustments.[2]

Evidence from Latin American, Asian, and African countries supports the view that the link between RER (see Box 1) behavior and economic performance is strong. It is argued that while unstable RERs undermined export growth in Latin America, their stability was central in promoting East Asian expansion. On the other hand, many African countries experienced sustained RERMIS which, in turn, stymied the development of agriculture and reduced the domestic food supply.[3]

Few empirical investigations, however, have explored the adverse effects of RERMIS on economic performance because of the lack of consensus on what constitutes an appropriate indicator of misalignment and the methodology for producing it.[4] Studies on Arab countries' exchange rate policies and their impact on economic performance are rare, and no empirical studies have investigated the impact of RERMIS on growth. This paper attempts to fill an important void by examining the exchange rate policies of four Arab countries: *Egypt, Jordan, Morocco*, and *Tunisia*, and by investigating the impact of these policies (i.e., any resulting real exchange rate misalignment) on their collective economic growth from 1970 to1996.[5]

In studying the effects of RER misalignment, the paper constructs three alternative measures of misalignment: (i) a purchasing power parity (PPP) based measure; (ii) a black market rate based measure; and (iii) a model based measure, which aims to capture the so-called *"policy induced misalignment"*.

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[2]Indeed, Fischer (1987) recognized the importance of RERMIS and argued for the inclusion of avoidance of an overvalued exchange rate to *Haberger's thirteen rules for good economic policy management* (1984).

[3]World Bank (1984) and Ghutani et al. (1985).

[4]Razin and Collins (1997), Ghura and Grennes (1993), Cottani et al. (1990), and Edwards (1988).

[5]These countries were selected due to their recent experience with stabilization and economic reform. It should also be noted that, since the empirical investigation was carried out on the collective data of the four countries, the results may not apply equally to individual countries.

Box 1: Measuring Real Exchange Rate

The RER in the literature is defined as the relative price of tradable goods with respect to the price of non-tradable goods:

$$ER = \frac{PT}{PN} \tag{1}$$

where P_T and P_N are the domestic price indexes of tradables and non-tradables, respectively. Although this concept of the RER is analytically useful, it is difficult to calculate in practice. Following many researchers, we also utilize the following operational definition of the RER :

$$ER = \frac{EP_T^*}{PN} \tag{2}$$

where E is the official nominal exchange rate measured as the amount of domestic currency per unit of U.S. dollar, and P_T^* is the foreign currency price of tradables. Following many studies [Ballasa (1990), Edwards (1990, 1989, 1988), and Cottani et al. (1990)], we have employed the U.S. price index (WPIUS) as a proxy for P_T^* and domestic CPI as the proxy for P_N. Thus,

$$ER_{it} = \frac{E_{it} WPIUS}{CPI_{it}} \tag{3}$$

The RER is deemed to be a good proxy for a country's degree of competitiveness in international markets. A decline in the RER represents a real exchange appreciation or a rise in the domestic cost of producing tradable goods. An increase, on the other hand, reflects a real exchange rate depreciation or an improvement in the country's international competitiveness

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The remainder of the paper is organized as follows: Section II provides a brief description of possible channels through which RERMIS might influence growth. Section II reviews the exchange rate policies in Egypt, Jordan, Morocco, and Tunisia. Section IV constructs the RERMIS measures, and section V presents the empirical estimation of the growth model. Finally, section VI concludes the paper and highlights issues for future research.

II. REAL EXCHANGE RATE MISALIGNMENT AND ECONOMIC PERFORMANCE

RERMIS describes a situation in which a country's actual RER deviates from its long-run, sustainable equilibrium level RER. An exchange rate is identified as undervalued (overvalued) when it is more depreciated (more appreciated) than its equilibrium level; misalignment could refer to either situation. In practice, however, RERMIS has come to be

associated with overvaluation, particularly in the case of developing countries.[6] It is widely acknowledged that such misalignments adversely affect economic growth by:[7]

1.   *Undermining external competitiveness* by overpricing exports. This would result in a deterioration in the external balance and a depletion of foreign exchange resources. This, in turn, may ultimately lead to a sharp devaluation in the wake of an external balance of payments crisis with the associated adverse impact on domestic prices and production.

2.   *Causing a misallocation of resources* by distorting the prices of domestic goods relative to each other and to international prices. This would adversely affect domestic investment, causing losses to domestic production through reduced efficiency.

3.   *Adversely affecting domestic financial markets*, by increasing uncertainty in financial markets and by encouraging speculation against the domestic currency. If the overvaluation is sustained, many industries and banks may fail due to speculation. In the latter case, the government may have to bear heavy costs to bail out the financial system.

RER behavior and economic growth are linked in two ways (Cottani et. al, 1990): First, the RER is one link between policy and performance. Consequently, policies aimed at stabilizing the RER around a realistic level may encourage growth via this mechanism. Large swings in RER are associated with greater uncertainty with respect to relative prices which, in turn, causing greater risks and shorter investment horizons. This leads to high adjustment costs, as production moves back and forth from tradable to non-tradable sectors, and increased interest rate volatility owing to financial instability. RERMIS also lowers profitability in the industries in which relative prices are reduced and often takes the form of domestic currency overvaluation, thus hurting tradable activities.

Second, both economic growth and the RER are influenced by policy, which in turn increases the correlation between the variables without necessarily implying causality in one direction or the other. Policies that produce a stable environment and encourage a more efficient utilization of resources also lead to stable and well aligned RERs. It should be noted that, while the first link suggests that the RER is an immediate determinant of growth performance, the second link implies that RER behavior is a reflection of polices that have broader implications on performance than those directly associated with the RER.[8]

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[6]The risk of having an undervalued exchange rate that creates a large trade surplus and a very strong traded goods sectors is more difficult to recognize.

[7]See Dornbush (1988) for more details.

[8]These relationships give credence to the notion of using a RERMIS measure that is determined by a structured model, which would capture policy induced misalignment, to study its effect on economic performance.

III. EXCHANGE RATE POLICIES IN EGYPT, JORDAN, MOROCCO, AND TUNISIA:
A BRIEF HISTORICAL REVIEW

All four Arab countries considered in this paper have, in the past, resorted to direct management of foreign exchange transactions over long periods of time through the use of multiple exchange rate (MER) arrangements and/or through quantitative and cost management of foreign exchange allocations.[9] The main motive for this policy was to counter the adverse impact on the external current account of an exchange rate policy that maintained an overvalued exchange rate. The purpose this policy was to contain inflation and budgetary costs (including costs to public enterprise and governmental budgets) of domestic policy imbalances (and sometimes external shocks). The application of MER systems, in all four countries, was also motivated by the need to attract remittances of nationals working abroad on which governments relied heavily as a source of foreign exchange but whose flows could not control.[10]

As is the case whenever an exchange control is imposed, an unofficial exchange market developed in these countries to meet the needs of those who had no access to official sources of foreign exchange. In the late 1980s and early 1990s, all four countries substantially reformed their foreign exchange systems as part of comprehensive economic reform programs, which called for, inter alia, major alignments of exchange rates, as well as the unification and liberalization of foreign exchange markets. The exchange rate policies pursued by the four countries prior to implementing reforms, as detailed below, resulted in significant misalignment of their real foreign exchange rates.

A. Exchange Rate Policy: Egypt

Egypt introduced MER to influence the supply and demand for foreign exchange in early 1969 by applying various premiums and surcharges on the official exchange rate. On September 1, 1973, an official parallel market was established to replace all premiums and surcharges. This was intended primarily to attract workers' remittances, but also to encourage tourism and, to a lesser extent, certain exports. The exchange rates in the parallel market were determined as a premium over the official rate. Exchange rates in the parallel market remained

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[9]Under a quantitative management system, the allocation of foreign exchange resources among different uses is entirely a function of administrative decision and excludes any role for a price mechanism in determining foreign exchange allocation. A cost management approach (sometimes referred to as Multiple Currency Practices) involves the introduction of a variety of taxes, subsidies and regulations that can produce similar effects on international transactions as the MER system can.

[10]The MER systems in these countries were introduced either as a simple premium over the official rate (as in Morocco and Jordan) or a more elaborate regime of complex and fragmented MER for various transactions (as in Egypt).

Figure 1. Evolution of the RER in Egypt, Jordan, Morocco, and Tunisia
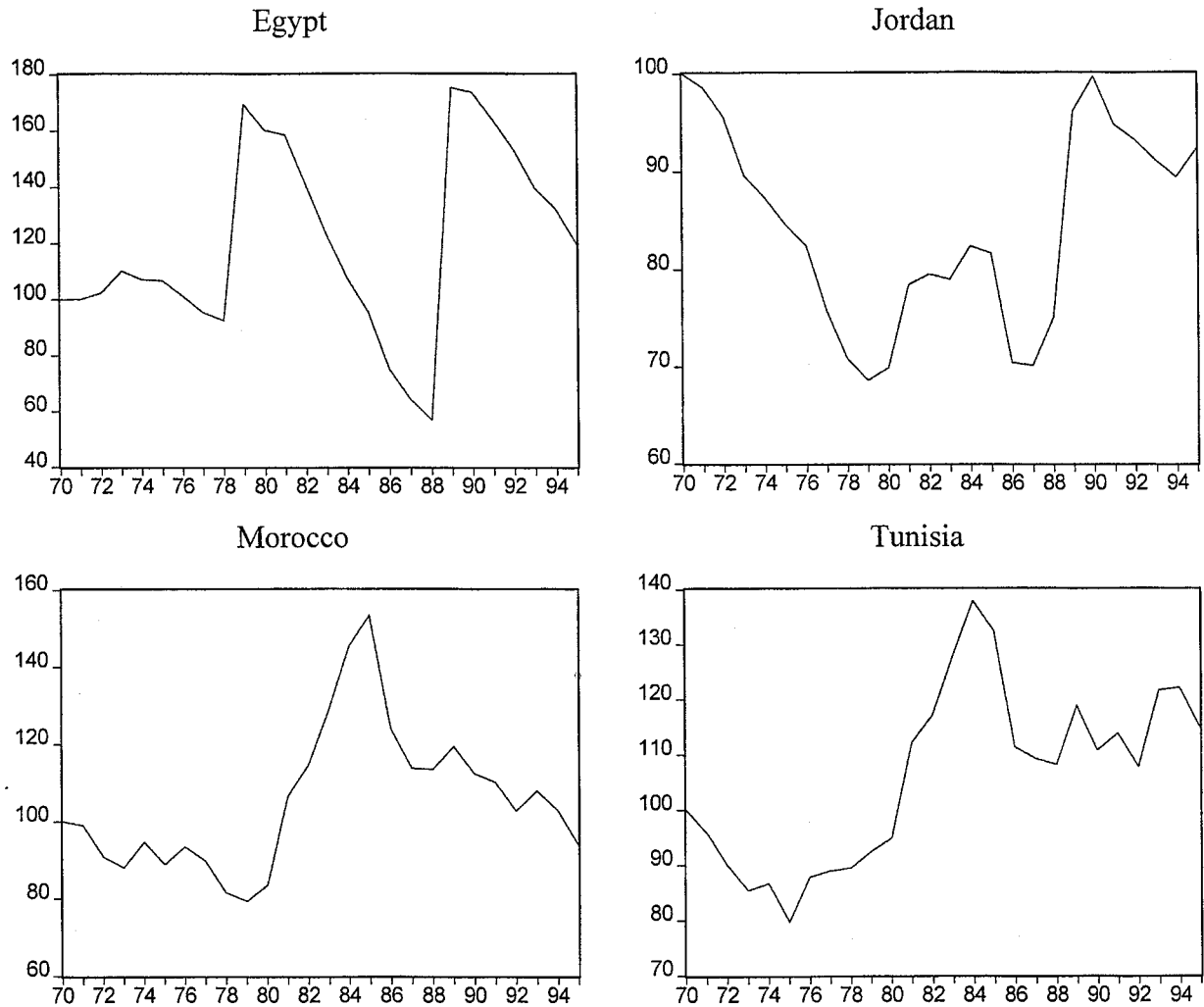
relatively unchanged through 1974 and 1975. However, in September 1975, a resident import exchange rate was established, thereby, permitting local companies to import using Egyptian pounds via foreign companies with trading interest in Egypt.

The link between the official market and the parallel market was cut in November of 1976 when the parallel rate was independently established. The parallel market was able to attract sufficient foreign exchange to build substantial surplus. As a result, the coverage of the parallel market was gradually expanded to cover some of the public sector imports. During 1976 and 1977 the majority of international transactions were shifted to the parallel market, with the exception of imports of basic commodities and exports of cotton, rice and petroleum which remained at the official rate. To further attract workers' remittances, the government allowed the importation of goods for use by residents who possessed their "own exchange."The rapid growth of earnings of the Egyptians working abroad in the mid 1970s and the new law of 1976 allowing residents to hold foreign exchange have, in effect, created a third "free" market (or "own exchange" market).[11]

The incremental adjustments to exchange rate during 1974-77 did not, however, stop the steady appreciation of RER of the pound. A major exchange rate re-alignment occurred on January 1, 1979. At that time, the government unified the exchange rates of the central bank pool and the commercial banks pool, resulting in a significant depreciation of the RER of the pound. By 1981, the pound came under increasing pressure in the "own exchange" market and was trading at a substantial discount compared to the established rates. The increasing diversion of foreign exchange away from the banking system forced the government to offer premiums over official exchange rates and to introduce other exchange measures. While succeeding in alleviating some of the immediate pressures on the banking system foreign exchange pool, these measures reversed the move toward unifying the exchange rates.[12]

The exchange policy that Egypt pursued from 1979 to 1988 has resulted in a steady appreciation of the RER of the pound, which rose by about 67 percent during this period, substantially reducing Egypt's export competitiveness. The increased spread between the exchange rate of commercial bank pool and the "own exchange" rate prompted the government to establish a new bank foreign exchange market (the new bank market) in May 1987, where the exchange rate reflected, at least in principle, the free market rate. The reform was mainly aimed, as it was the case in previous reforms, at workers' remittances and tourist expenditures.

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[11]By the end of 1976, the foreign exchange market was fragmented into three pools: (i) the central bank pool which was mainly reserved for transactions by the central government (ii) the commercial bank pool which governed the transactions of the public sector companies and, (iii) the free market pool for private sector transactions.

[12]An attempt at unifying the exchange rate was carried out in January of 1985 by prohibiting imports through the "own exchange market" and depreciating the exchange rate in the commercial banks pool. The reform proved unsuccessful and was rescinded in April 1985.

Nevertheless, all transactions were gradually shifted to the new market; the commercial banks pool market was closed in March 1988, resulting in another major exchange rate re-alignment and a significant depreciation of the RER of the pound.

As part of a comprehensive reform plan, a free foreign exchange market for current account transactions was established on February 26, 1991; a unified exchange rate replaced all other existing exchange rates. On June 2, 1994, the foreign exchange market was further liberalized by easing capital account restrictions.[13]

B. Exchange Rate Policy: Jordan

Until the breakdown of the Sterling area on June 23, 1972, the Jordanian dinar was primarily linked to the Pound Sterling. On February 22, 1975, the dinar was linked to the SDR; a policy that lasted until 1986.[14] The dinar exhibited relative stability during 1975–85; it was supported by large capital inflows, mostly in foreign aid from Gulf Arab countries and remittances form large number of Jordanians working abroad (mainly in the Gulf countries). This exchange rate polices has resulted in a RER appreciation of about 31 percent during 1970–79. Although the economic stabilization efforts in early 1980s partially reversed this trend, the RER of the dinar remained relatively more appreciated at the end of 1985 when compared to the 1970 level.

The period 1986–92 was characterized by increased instability in the foreign exchange markets and by shifts in exchange rate regime as the government attempted to stabilize the exchange rate. The ensuing recession during the second half of the 1980s and the balance of payment pressures, forced the partial floatation of the dinar. On October 15, 1989, the dinar was put on a managed float and devalued by about 12 percent. The pressure on the exchange rate, however, continued in the following three months thereby prompting extensive government intervention in the foreign exchange market to ensure the compliance of foreign exchange dealers with the foreign exchange regulations. Recognizing the ineffectiveness of these measures to halt the fall of the dinar, the authorities devalued the dinar by about 13 percent in early February 1989 (the exchange rate was fixed at USD1.76 per one dinar). The devaluation was accompanied by the closure of the exchange houses.

The crises, however, continued to deepen, with the spread between the official market and parallel market exchange rates rising rapidly. In an attempt to stabilize the market, the JD was delinked from the USD, on May 30, 1989, and linked instead to a trade-weighted basket of

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[13] See Mongardini (1998) for further discussion of issues relating to Egypt's real exchange rate.

[14] In response to the weakening of the US dollar (USD) in 1985 and to the resulting appreciation of the dinar, the link to SDR was replaced by a basket of currency with the weight of the USD higher than its weight in the SDR.

currencies. On July 31, 1989, a two-tier exchange rate system was established, comprising an official and free market exchange rates. The official exchange rate was applied to the public sector's imports of essential goods and transfers to Jordanians studying abroad. The dual exchange system was terminated on February 17, 1990, and the exchange rates were unified at USD1.49 per ne dinar. These exchange rate adjustments resulted in a sharp depreciation of the RER of the dinar to about its 1970 level. Significant restrictions, however, remained on banks' dealings in foreign exchange. The dinar was formally pegged to the USD on October 23, 1995.

C. Exchange Rate Policy: Morocco

The Moroccan dirham experienced significant instability in early 1970—reflecting the instability of the French franc (FF) to which the dirham was fixed. The link to the FF was cut on May 17, 1973 and the dirham was put on a managed float regime, with the objective of maintaining a relatively stable effective rate for the dirham in relation to a basket of major foreign currencies. As a result of continued foreign exchange pressures, a premium dirham rate was created on July 30, 1973, thereby paying a 5 percent premium on foreign currency remittances by Moroccan nationals working abroad. A second supplementary premium dirham rate for foreign currency remittances by nationals working in France was established on June 5, 1978, on the basis of one dirham per one FF. The premiums was terminated on December 31, 1980. Despite the incremental depreciation of the dirham during the 1970s, the RER appreciated by over 16 percent during 1970–80, mainly reflecting continued domestic price pressures.

On September 23, 1980, the weights in the currency basket, to which the dirham was linked, were changed in order to take into account the changes in Morocco's foreign trade pattern and the structure of currencies used in external settlements.[15] Simultaneously, the authorities started a gradual depreciation of the dirham. The exchange rate policy during 1980–85 aimed at achieving substantial, albeit gradual, real depreciation of the dirham. Together with the appreciation of the U.S.dollar, this policy resulted in RER depreciation of about 84 percent.

The worsening of Morocco's terms of trade and the associated deterioration of the balance of payments position that started in 1986 led to a significant real appreciation of the dirham. The relative tightening of policies succeeded in stabilizing the RER from 1987 to 1990. Continued balance of payments pressures, however, forced a devaluation of the dirham by about 9.3 percent in 1990. Subsequently the dirham was pegged against the basket and, as a

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[15]In practice, the dirham was linked to the FF. The link to other currencies in the basket was through the cross rates established in the Paris exchange market. The exchange system, however, remained highly centralized.

result, the RER of the dirham continued to appreciate.[16] In January 1993, full current account convertibility was established, and during the year, virtual capital account convertibility was established for non-residents only. A major step toward liberalizing the foreign exchange market was taken with the establishment of the interbank market in June 1996.

D. Exchange Rate Policy: Tunisia

Similar to the experience of the Moroccan dirham, the Tunisian dinar experienced significant instability in early 1970, reflecting the instability of the FF to which the dinar was informally linked. To increase the stability of the dinar, it was linked to the German mark (DM) in addition to the recently unified FF. During the first half of the 1970s, the dinar experienced substantial RER appreciation. In April of 1978, the dinar was linked to a new basket comprising the FF, DM and USD. The basket was expanded in 1981 to include the Italian lira and the Belgian franc and later to include the Dutch florin and the Spanish peseta. These policies succeeded in reversing the RER appreciation, and the dinar depreciated in real terms by 73 percent from 1975 to 1984.

The ensuing recession and balance of payments problems of the mid-1980s exerted significant pressures on the dinar. In response, attempts were made in 1985 to stabilize the exchange rate by changing the weights of the currency basket. These corrections, however, were ineffective thereby forcing the authorities, on August 1986, to begin depreciating the dinar until early 1989. The nominal depreciation of the dinar during 1985–88 was not sufficient, however, to maintain the RER level, resulting in a real appreciation by about 18 percent in the face of continued economic instability.

The depreciation of the dinar, coupled with an ambitious economic reform program in the late 1980s and early 1990s, stabilized the foreign exchange markets, allowing the liberalization of the exchange rate for current account purposes in December of 1992. However, foreign exchange transactions were kept exclusively at the central bank until the establishment of the interbank spot exchange market in march 1994. Additional liberalization of the foreign exchange market during June–July 1997, increased the flexibility of the spot market (e.g., raising the foreign exchange exposure limit from 5 percent to 10 percent) and allowed banks to transact in the forward foreign exchange market, including the quoting of forward exchange rate up to 12 months for import purposes and 9 months for export purposes.

IV. MEASURING REAL EXCHANGE RATE MISALIGNMENT

In spite of the increasing awareness of the adverse consequences of RERMIS for economic performance, few empirical studies have directly attempted to address this issue. Edwards (1988) attributed this mainly to difficulties inherent in constructing meaningful measures of misalignment. Indeed, how to determine whether the RER is misaligned (i.e., out

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[16]Except for a series of small adjustments in 1992.

of line with respect to its long-run equilibrium level) has been an important issue for policy makers.[17]

Existing empirical studies have utilized three different measures of RERMIS: *a measure using the PPP* [Ballassa (1990), Agarwala (1983), and Cottani et al. (1990)]; *a model based measure using official exchange rates* [Edwards (1988b), 1989, Cottani et al. (1990), Ghura and Grennes (1993)]; and *a measure using black market exchange rate premium* [Edwards (1989, 1990)]. Edwards detected some advantage in using black market premium (over official rate). Cottani et al. (1990) provided empirical support for the model-based measure but none for the PPP measure, whereas Ballassa (1990), using the PPP theory, found empirical support for the negative impact RERMIS on exports.

It should be noted that all the three measures of RERMIS are conceptually different and they could potentially move in opposite directions. The model-based measure of RERMIS has an attractive feature compared to both the PPP and the black market measures of RERMIS. It allows the equilibrium RER to change continuously thereby reflecting changes in economic fundamentals and macroeconomic as well as trade policies. To ensure the robustness of the empirical investigation, this paper will employ all the three measures of RERMIS when examining the adverse impact of RERMIS on growth.

Conceptually, the index of RERMIS can be defined as:

$$ERMIS_{it} = \left(\frac{ERER_{it}}{RER_{it}} - 1 \right)$$

(4)

where ERER stands for the equilibrium RER, (t) is time index and (i) is a country index.

The first measure of RER misalignment is based on the PPP theory: the RERMIS is calculated as the deviations of the actual RER from some base year in which the RER is believed to be in equilibrium. Following Cottani et al.(1990) and Ghura and Grennes (1993), the present paper uses the average of the three highest values of RER over the period 1970–95 as a proxy for the equilibrium RER.[18] Thus, the PPP measure of misalignment is defined as:

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[17]A recent study by Clark and MacDonald (1998) compares two approaches for evaluating the degree by which a country's real effective exchange rate is in line with economic fundamentals.

[18]By selecting the three highest values of the RER as a reference, one chooses devaluation years that may or may not be "equilibrium years". Nevertheless, since devaluations generally occur at times of balance of payment crises or when the external sector is clearly out of equilibrium, it is reasonable to assume that the RER is closer to equilibrium when a devaluation takes place than otherwise.

$$RERMIS_{it} = \left(\frac{(\sum_j \text{max} RER_{ij})/3}{RER_{it}} - 1 \right)$$

(5)

where $[(\Sigma_j \text{ max } RER_{ij})/3]$ (j=1,2,3) is the average of the three highest values of RER for the ith country. A major drawback of the PPP measure of RER distortion is that it fails to capture changes in the sustainable equilibrium RER produced by changes in economic fundamentals such as terms of trade, capital inflows, technology, and trade policies.

The second measure of misalignment utilizes the premium of the nominal black market exchange rate (B) over the official rate (E) as a proxy for RER misalignment and is computed as:

$$RERMIS_{it} = \left(\frac{B_{it}}{E_{it}} - 1 \right)$$

(6)

This measure intends to capture: (i) misalignment in the RER; (ii) distortions in the foreign exchange market; and (iii) the extend of exchange control and import rationing in the economy.

The third measure of RERMIS is based on a formal model of equilibrium RER determination developed by Edwards (1989) and applied by Edwards (1990, 1989, 1989a) and Cottani et al. (1990). The advantage of the model-based measure of misalignment is that it captures the effect of changes in economic fundamentals and domestic macroeconomic, trade and exchange rate policies on the equilibrium RER.

Even though the misalignment in the RER is not observable, it can be empirically obtained by using the following relationship between the actual RER and the equilibrium RER (ERER):

$$\log_e (RER_{it}) \equiv \log_e(ERER_{it}) - [\log_e(ERER_{it}) - \log_e(RER_{it})]$$

(7)

where the term in the squared brackets on the right-hand-side of the above identity reflects the gap between the actual RER and the equilibrium exchange rate, i.e., the RER misalignment. Once the nature of the relationship between each of the two terms on the right hand side of (7) and its respective determinants is known, regression analysis can be employed to determine the empirical relationship between $\log_e(RER_{it})$ and $\log_e(ERER_{it}) - [\log_e(ERER_{it}) - \log_e(RER_{it})]$. In turn, the estimated parameters of the equation for RER in conjunction with some criteria to determine years in which unsustainable polices were pursued can be used to construct the model-based misalignment in the RER.

The RER equation in the present study draws on empirical form used by Cottani et al. (1990) and is expressed as:

$$RER_{it} = \alpha_0 + \alpha_1 TOT_{it} + \alpha_2 CLOSE_{it} + \alpha_3 CAPFY_{it} + \alpha_4 EXCR_{it} + \alpha_5 NDEV_{it} + \alpha_6 t + \epsilon_{it} \qquad (8)$$

where
RER= the actual real exchange rate, as measured above;

TOT= the terms of trade measured as the ratio of the index of dollar value of export prices to the index of dollar values of import prices;

CLOSE=[Y/(X+M)] is the ratio of GDP over the sum of imports (M) and exports (X);

CAPFY= the capital inflow measured as the difference between net change in reserves and trade balance scaled by GDP;

EXCR= the excess domestic credit, measured as the difference between growth in domestic credit and real GDP growth;

NDEV= is the growth in the official nominal exchange rate;[19]

(t)= time index;

(I)= country index ;

ϵ= is the disturbance term.

The impact of terms of trade on the RER hinges on whether the income effect dominates the substitution effect [Edwards (1989)]. If the income effect outweighs the substitution effect, an increase in TOT will lead to an appreciation of the equilibrium RER and vice versa. The variable CLOSE is employed as a proxy for policies pursued in influencing trade in general. Trade restrictions will reduce openness and often lead to an appreciation of the RER. An increase in net capital inflows will result in higher current expenditure on all goods, including non-tradables. This, in turn, will lead to an increase in the price of non-tradables, or equilibrium real appreciation in that period. In order to capture the effects of technological factors (the Ricardo-Ballasa effect) a time variable is included. It is argued that productivity improvements in rapidly growing economies will lead to an appreciation of their equilibrium RER.

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[19]NDEV is treated as an exogenous variable since it is a policy instrument that is often used by policy makers to achieve real exchange rate devaluation.

Following Edwards (1989), the variable EXCR (which captures the effect of domestic credit policy) is constructed as:

$$EXCR_{it} = \frac{\Delta D_{it}}{M_{i,t-1}} - \Delta logey_{it}$$

(9)

where Δ is the first difference operator, D, M, and y are, respectively, the total domestic credit, the broad money stock, and the real GDP.[20] An increase in EXCR (i.e., lax credit policy) will lead to inflation in the economy and, in turn, appreciate the RER.

Prior to estimating the relationship between the RER and its determinants, it is important to consider whether the data are stationary. This is because the classical regression model is appropriate only if the variables of interest are stationary.[21] We employ the Phillips-Perron test, introduced by Phillips and Perron (1988), to determine the order of integration of the variables of interest. The Phillips-Perron test statistics are modifications of the Dickey Fuller t-statistics that take into account the less restrictive nature of the error process. The Phillips-Perron test is an attractive alternative to the standard ADF test since the choice of the lags in the ADF has been criticized as arbitrary. Based on the results of the Phillips-Perron test, reported in Appendix I, great care was taken to ensure that the variables involved are stationary and are integrated of the same order.

Once the time series properties of the variables are investigated, we estimate equation (8) using iterative three stage least squares (3SLS) on a system of equations with the same slope parameters for all country.[22] In the estimation, it assumed that the variables CLOSE, CAPFY, and EXCR are endogenous. The estimated equation, using the pooled data for the four countries (with the absolute value of the t-ratios in parentheses) is:[23]

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[20]This measure assumes that money demand has a unitary elasticity with respect to real income.

[21]The two widely quoted papers concerning the impact of the RER misalignment on the economic performance–Cottani et al. (1990) and Ghura and Grennes (1993)–did not investigate the time series properties of the variables involved in their investigation. This casts some doubts on the validity of their empirical findings; if the variables of interest are integrated of different orders, regression results using such variables will not be reliable.

[22]All data used in this study were obtained from World Bank's World debt tables, International Monetary Fund's International Financial Statistics and World Economic Outlook, and World Currency Year Book. The sample period is 1970–95.

[23]The instrument list for the estimation includes constant, current and once lagged values of the exogenous variables, US inflation, and population growth.

$$RER_{it} = -0.0034 * TOT_{it} -0.1035 * CLOSE_{it} -0.1554 * CAPFY_{it} -0.1446 * EXCR_{it}$$
$$\quad\quad (2.02) \quad\quad\quad (2.74) \quad\quad\quad (2.09) \quad\quad\quad (2.63)$$

$$+0.0081 * NDEV_{it} -0.0018 * t \quad\quad\quad\quad\quad\quad\quad\quad\quad\quad (10)$$
$$\quad (26.2) \quad\quad\quad (1.95)$$

The estimated coefficients are statistically significant and have the expected signs. *The regression result shows that the RER appreciates if, (i) the terms of trade improves; (ii) capital inflows increase (iii); the degree of openness declines; (iv) excess domestic credit increases; and (v) technology improves.*

Next, we construct a model-based measure of RER misalignment. The three sources of misalignment considered in the present paper are: (i) excess domestic credit; (ii) excessive net capital inflows; and (iii) inward oriented trade strategies. Using a procedure similar to that employed by Cottani et al. (1990), the model-based misalignment is computed as:[24]

$$RERMIS_{it} = (e^{-MIS_{it}} - 1) \quad,\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad (11)$$

$$MIS_{it} = -0.145 * EXCR_{it}|_{EXCR_{it}>0} -0.155 * CAPFY_{it}|_{t-s} -0.103 * log e\left(\frac{CLOSE_{it}}{(\sum_j minCLOSE_{ij})/3} \right)$$

where $[(\sum_j min CLOSE_{ij})/3]$ (j=1,2,3) is the average of the three lowest values of [Y/(X+M)] for each country, and where (s) represents the year in which excessive borrowing from the rest of the world may have taken place.

The first source of misalignment suggests that expansionary monetary and fiscal policies which expand domestic credit beyond its sustainable level will cause the RER to become overvalued and raise the degree of misalignment.

The second source of model based misalignment requires further explanation. Cottani et al. (1990) start with the concept of a sustainable value for the net capital inflow given by

$$CAPFY_{it} = (g^e_{it} - r^*_{it}).F_{it} \quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad (12)$$

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[24]Note that the computation of RERMIS excluded the variables NDEV, TOT, and t, because the aim is to calculate the policy induced part of the misalignment which is captured by EXCR, CAPFY, and CLOSE.

where F is the desired stock of foreign debt as a percentage of GDP, g^e is the expected growth rate in GDP, and r^* is the world real interest rate. It is argued that if in a particular year the capital inflow exceeds this sustainable level, the equilibrium RER will appreciate. In order to detect the years in which countries may have over-borrowed from the rest of the world, the following procedure was utilized. First, the expected growth rate was proxied by lagged GDP growth. Second, the real interest rate was calculated by subtracting expected foreign inflation from the nominal cost of credit for each country. The nominal cost of credit for each country was proxied by the average nominal interest rate on public and publicly guaranteed loans and expected foreign inflation was proxied by lagged U.S. inflation. Accordingly, if $g_{it}^e > r_{it}^*$ then both positive or negative values of $CAPFY_{it}$ were considered sustainable. However, $g_{it}^e < r_{it}^*$, then positive values for $CAPFY_{it}$ were considered unsustainable. The three measures of the RERMIS for all four countries are presented in Figure 2 below.

V. THE IMPACT OF MISALIGNMENT ON THE ECONOMIC GROWTH OF THE ARAB COUNTRIES

Having constructed the three measures of real exchange rate misalignment, we are now in a position to investigate the impact of real exchange rate misalignment on the economic performance in conjunction with other variables. Prior to a more detailed analysis, Figure 3 illustrates the negative relationship between per capita growth rate and model based measure of RERMIS. Although this does not suggest a causal relationship or a model, the result is interesting since it confirms theoretical expectations.

We estimate the following equation to investigate the impact of RERMIS on economic growth in conjunction with other variables:

$$PCGR_{it} = \beta_0 + \beta_1 RERV_{it} + \beta_2 RERMIS_{it} + \beta_3 SIY_{it} + \beta_4 TOTG_{it} + \beta_5 POPG_{it} + v_{it} \qquad (13)$$

where PCGR, RERV[25], SIY, TOTG, and POPG are, respectively, the growth in real per capita GDP, the RER variability, investment to GDP ratio, the terms of trade growth, and population growth. We estimate equation (13) by using iterative three stage least squares (3SLS) on a system of equations with same slope parameters for each country and assume that the variable SIY is endogenous in estimation. Table 1 below summarizes the results:

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[25]Following Cottani et al. (1990), the RER instability is defined as erratic deviations around some average level. We use the coefficient variation of the RER around its mean for the period under consideration as a measure of instability.

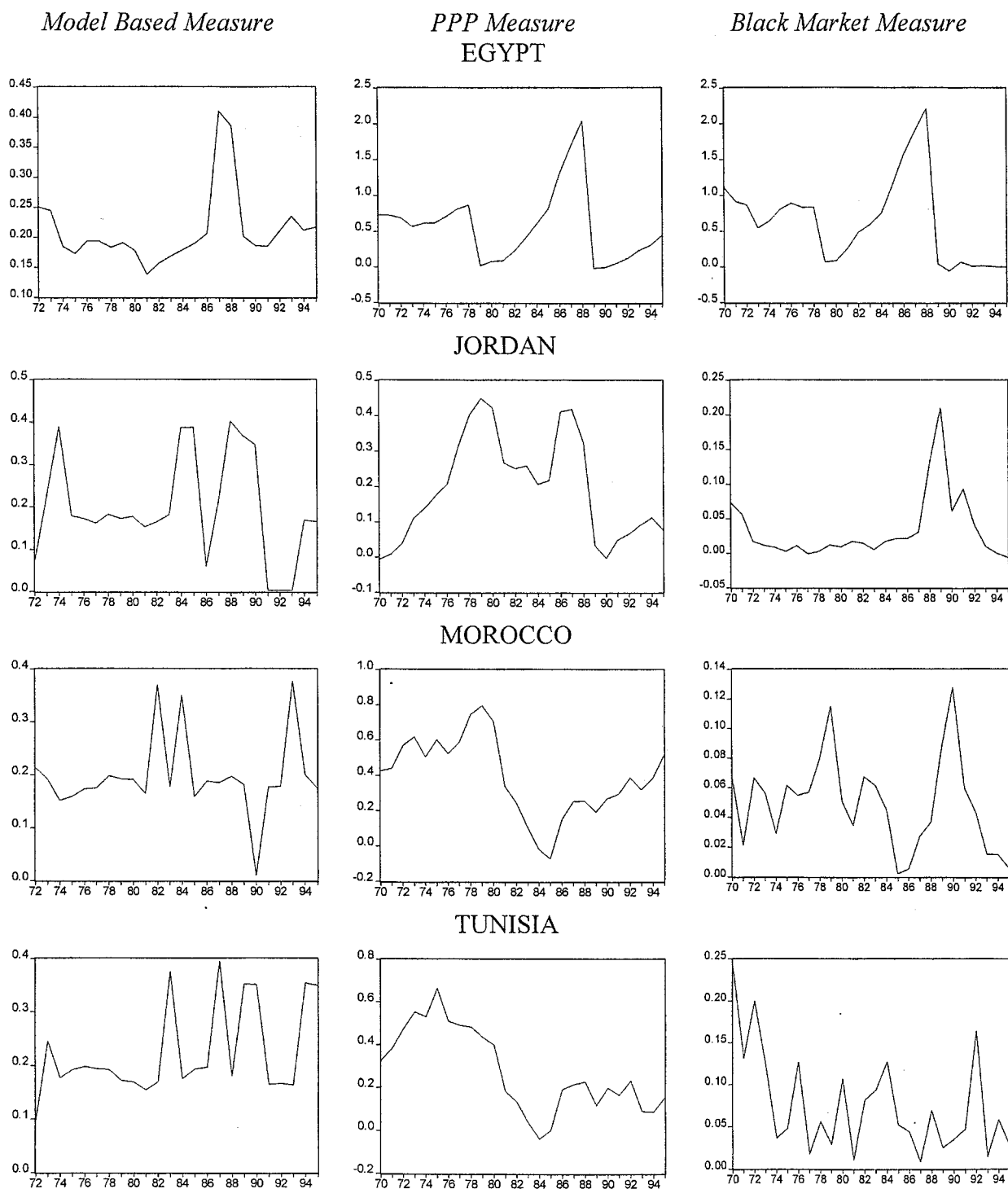Figure 2. Evolution of Different Measures of RER Misalignment

Model Based Measure   *PPP Measure*   *Black Market Measure*

EGYPT

JORDAN

MOROCCO

TUNISIA

Figure 3. Per Capita Growth Rate and RERMIS

Model Based Measure of RER Misalignment
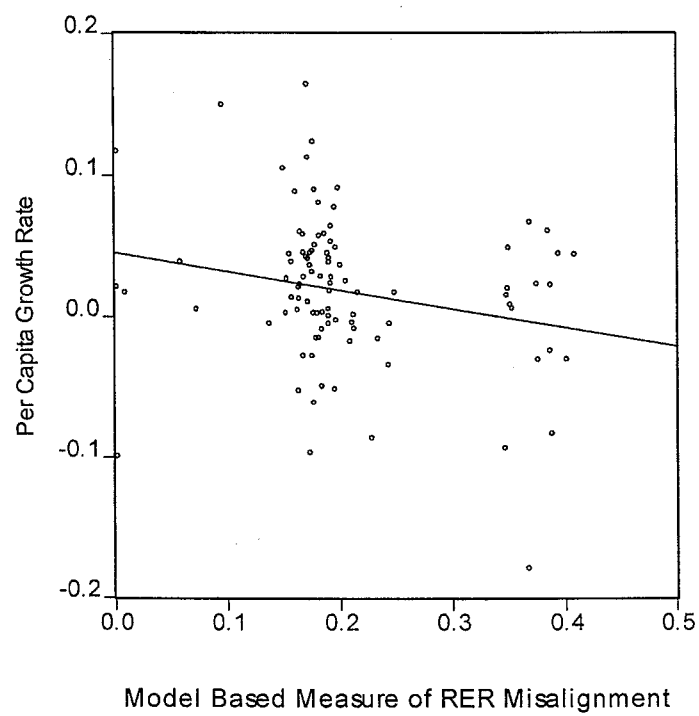
Table 1. Iterative 3SLS Estimates of Growth Equation: 1970–95

Independent Variables	Regression Number		
	(1)	(2)	(3)
RERV	-0.0163 **	-0.0158 **	-0.0159 **
	(2.29)	(2.06)	(2.13)
MODEL	-0.1568 ***	-	-
	(2.66)		
PPP	-	-0.0268 **	-
		(2.16)	
BLACK	-	-	-0.0221 *
			(1.93)
SIY	0.3911 ***	0.3597 ***	0.3629 ***
	(3.86)	(3.43)	(3.45)
TTG	0.0007	-0.0005	-0.0003
	(0.27)	(0.18)	(0.14)
POPG	-1.4586 ***	-1.0709 ***	-1.1211 ***
	(4.71)	(3.23)	(3.37)
Intercept	0.0892 ***	0.0445 ***	0.0466 ***
	(5.63)	(5.05)	(5.31)

Notes: Regression number 1, 2 , and 3 employs model based measure of RERMIS, PPP based measure of RERMIS, and black market based measure of RERMIS, respectively. Numbers in parentheses are the absolute value of the t-ratios. *, **, and *** indicate significant at 90 percent, 95 percent, and 99 percent levels.

The empirical findings underscore that growth is adversely affected by all measures of RERMIS, confirming the harmful effects of economic mismanagement on economic growth predicted by endogenous growth models. It is interesting to note that the negative effect of model based measure of RERMIS on growth is significantly larger than in the other measures—a finding in line with Ghura and Grennes (1993).

As can be seen from Table 1, other factors also influence growth. Specifically, growth in both capital stock (measured by the investment to GDP ratio) and population have the theoretical signs predicted by the Solow (1956) growth model. The results indicate that the terms of trade growth does not have a statistically significant effect on growth, which must be contrasted with strong negative effect of RERMIS. *The empirical evidence suggests that the decline in the rate of economic growth in the countries involved during the study period can be attributed more to economic mismanagement more than to decline in external terms of trade.*

VI. CONCLUSION

During the 1970s and 1980s, the four Arab countries considered in this study—Egypt, Jordan, Morocco and Tunisia—have pursued exchange rate policies that resulted, in certain periods, in an overvalued exchange rates by utilizing, in various degrees, MER systems and quantitative and cost management applications. These policies were motivated by the need to protect the external balance position from the cost of unsustainable domestic expansionary policies (and sometimes external shocks). The economic literature has argued that such misalignment of exchange rates would have an adverse impact on economic growth due to the resulting deterioration in the external competitiveness and misallocation of domestic resources.

This paper investigated the empirical relationship between RERMIS and economic growth in these four countries. Utilizing three different measures of RERMIS, this paper argues that these policies did indeed have a resource cost. The empirical results underscored the adverse impact of the RERMIS, stemming from the exchange rate policies in these countries, on their economic growth during 1970-1990. The liberalization and economic reform policies initiated by these countries in the late 1980s and early 1990s have resulted in major alignments in their RERs toward a more sustainable equilibrium, thereby enhancing the growth prospects of these countries.

Finally, several additional issues may warrant further investigation in future research. Other Arab countries could be included; the impact of regional differences on the results could be investigated; the effect of different data constructions on the outcome could also be considered.

Order of Integration: Phillips-Perron (P-P) Unit Root Test Statistics

EGYPT		JORDAN	
RER	-2.61	RER	-1.93
ΔRER	-4.66 ***	ΔRER	-3.38 *
TOT	-2.05	TOT	-3.57 *
ΔTOT	-4.12 **	ΔTOT	-
XCR	-3.61 *	XCR	-4.02 **
ΔXCR	-	ΔXCR	-
CLOSE	-1.91	CLOSE	-2.29
ΔCLOSE	-4.78 ***	ΔCLOSE	-4.28 **
NDEV	-4.73 ***	NDEV[a]	-3.06 **
ΔNDEV	-	ΔNDEV	-
CAPFY	-2.56	CAPFY	-2.87
ΔCAPFY	-6.16 ***	ΔCAPFY	-7.16 ***
SIY	-1.39	SIY	-2.15
ΔSIY	-4.00 **	ΔSIY	-4.60 ***
POPG[a]	-3.85 ***	POPG[a]	-2.83 *
ΔPOPG	-	ΔPOPG	-
PCGR[a]	-2.68 *	PCGR[a]	-3.02 **
ΔPCGR	-	ΔPCGR	-
MOROCCO		**TUNISIA**	
RER	-1.56	RER	-2.14
ΔRER	-3.29 *	ΔRER	-4.24 **
TOT	-1.78	TOT	-2.63
ΔTOT	-5.36 ***	ΔTOT	-6.75 ***
XCR	-5.42 ***	XCR[a]	-3.03 **
ΔXCR	-	ΔXCR	-
CLOSE	-2.72	CLOSE	-2.20
ΔCLOSE	-4.55 **	ΔCLOSE	-4.54 **
NDEV[a]	-2.92 *	NDEV[a]	-3.40 **
ΔNDEV	-	ΔNDEV	-
CAPFY	-2.35	CAPFY	-2.55
ΔCAPFY	-4.01 **	ΔCAPFY	-6.07 ***
SIY	-1.98	SIY	-2.03
ΔSIY	-4.79 ***	ΔSIY	-4.26 **
POPG	-10.04 ***	POPG[a]	-3.38 **
ΔPOPG	-	ΔPOPG	-
PCGR[a]	-7.76 ***	PCGR[a]	-7.43 ***
ΔPCGR	-	ΔPCGR	-

Notes: Variables are defined in the text over the 1970-1995 period. Each regression includes a constant term and a time trend except those with superscript a in which the time trend turned out to be insignificant and was excluded. *, **, and *** indicate rejection of the null hypothesis of a unit root at the 90 percent, 95 percent, and 99 percent significance levels. Critical values are from MacKinnon (1991).

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