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Real Exchange Rate Misalignment and Growth Dynamics: Evidence from Low-Income Developing Economies

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ABSTRACT

Most empirical research on real exchange rate misalignment and economic growth adopted a symmetric method, under the assumption that overvaluation and undervaluation have the same effects on economic growth. But recent studies show possible asymmetric impacts of exchange rate misalignments on economic growth. This study, therefore, investigates the asymmetric impact of real exchange rate misalignment on economic growth for ten lower-middle-income economies (LMIEs) (Bolivia, Cameroon, Ghana, India, Morocco, Pakistan, the Philippines, Nepal, Sri Lanka, and Vietnam) between 1990 and 2023. The results reveal significant differences across countries concerning the impact of misalignment on economic growth, in case of both the linear and nonlinear ARDL models. The findings from the NARDL show that the impacts of undervaluation and overvaluation on economic growth are asymmetric and specific to the country. The results suggest that overvaluation has a positive and significant long-run impact on growth in Cameroon, India, Pakistan, Nepal and Vietnam, but undervaluation has a significant negative impact in the Philippines, Nepal and Sri Lanka. The results contradict the traditional notion that the undervaluing of currencies always stimulates economic growth in lower-middle income economies. Accordingly, the study suggests the formulation of exchange rate policies based on country specific structural conditions – export structure, import dependency, productivity and financial development – instead of a common formula for exchange rate competitiveness.

Keywords: *real exchange rate misalignment and overvaluation; BEER;NARDL; middle-income economies*

INTRODUCTION

The real exchange rate (RER) is an important macroeconomic variable within an open economy as it influences both external competitiveness, relative prices, capital inflows, trade outcomes, inflation and resource allocation in the tradable/non-tradable sector. The RER indicates price changes relative to other currencies and so is a better indicator of external competitiveness than is the nominal exchange rate. If the RER is relatively stable and close to its equilibrium, relative prices can help to optimally allocate resources and can play a role in maintaining internal and external balance. However, if this is not the case and there exists persistent deviations from the equilibrium, then the incentives for production, consumption, investment and trade will change. There are two types of exchange rate misalignment: an overvalued exchange rate and an undervalued exchange rate. Overvaluation happens when the RER is above its equilibrium value and can depress the competitiveness of domestic producers, stimulate imports, discourage exports and inhibit investment in tradable activities. Undervaluation, on the other hand, is when the RER is lower than its equilibrium, which can depress the foreign-currency price of domestic tradables, and improve external competitiveness. The growth consequences of undervaluation, on the other hand, are still not clearly known, however, both theoretically and empirically. In imperfect capital and product markets, a competitive or moderately

undervalued exchange rate may lead to increased tradable production, learning-by-doing, productivity growth and structural change. However, over- or overprolonged undervaluation can create inflationary pressures, misallocate resources and lead to macroeconomic imbalances. The literature has two general views on the impact of the real exchange rate on economic growth. In the neoclassical growth theory, while capital accumulation, labour, technological progress, and institutional quality are important, exchange rate policy plays only a relatively minor role in the formulation of long-term economic growth. Structuralist and development-oriented views, on the other hand, give a more dynamic role to the real exchange rate in the growth process. In this view, a competitive real exchange rate can offer incentives to the tradable sector, encourage export-oriented investments and spur productivity growth in the presence of market failures that hinder structural change (Frenkel, 2004; Rodrik, 2008). The empirical evidence is thus inconclusive and does not show a consistent link between exchange rate misalignment and economic growth. Previous cross-country research in general indicated that overvaluation was negatively related to economic performance. The negative consequences of exchange rate distortions and the need for an outward orientation were highlighted by Edwards (1989), Cottani et al. (1990) and Dollar (1992). Following contributions, however, especially those from Rodrik (2008), the focus moved to the growth-augmenting aspects of undervaluation. Gala (2008) and Berg and Miao (2010) also noted investment, productivity and structural transformation as potential means by which a competitive exchange rate could impact economic growth. However, research focused on other measures and empirical specifications have challenged the causality of the positive link between undervaluation and growth (Habib et al., 2017; Ribeiro et al., 2020). A key assumption of the traditional literature is the symmetry assumption. The standard assumptions of linear models are that the magnitude of the deviation from the equilibrium is the same regardless of whether the deviation is positive or negative. The assumption might be limiting since an appreciation or depreciation of the exchange rate may have different economic pathways. For instance, an appreciation makes exports less competitive and at the same time lowers the domestic cost of machinery, intermediate inputs and energy. On the other hand, depreciation can boost export demand and raise the price of imported capital goods, intermediate goods and energy. Therefore, the strength and direction of the impacts of appreciation and depreciation do not have to be equal. This concern is receiving attention in the nonlinear literature as both threshold models and nonlinear autoregressive distributed lag (NARDL) specifications. While some countries report asymmetric impacts on India (Iqbal et al., 2023), Turkey (Khalid et al., 2023, 2024), and Tunisia (Hadj Amor et al., 2023), the direction and magnitude of these impacts differ significantly across countries (Abbasi & Iqbal, 2025; Tsen, 2013). There is some evidence that undervaluation and overvaluation has a negative impact on economic growth, and other evidence that the impact of exchange rate deviations can become negative after a certain threshold. Likewise, recent studies indicated that the growth promoting effect of undervaluation might become less pronounced when the deviation from equilibrium is more than a certain threshold (Couharde et al., 2025). The present study is motivated by this diversity of the empirical evidence. The existing literature on asymmetric exchange rate misalignment and economic growth is mainly based on single-firm / single-country studies, especially in emerging and developing economies. On the other hand, cross-country studies are typically based on pooled or panel estimators that can assume a common link between the economies being examined, which may have rather different production systems, institutional frameworks, financial systems, and exchange rate regimes. This method could also mask economy-related country-specific responses. The present study overcomes this shortcoming by using the same definition of exchange rate misalignment for all countries as well as the same econometric model, but by interpreting the estimated effects differently for each country. This method allows for cross-country comparisons of asymmetric responses in a systematic manner while avoiding applying a common growth effect to all economies. The study has three objectives. First, it estimates equilibrium real effective exchange rates (REERs) and measures the extent of exchange rate misalignment for each of the ten middle-income economies. Second, it explores the short-run and long-run impacts of overvaluation and undervaluation on economic growth in nonlinear autoregressive distributed lag (NARDL) models. Third, it highlights the asymmetric impacts at the country level and draws policy implications, but does not primarily identify an optimal rate of exchange based on the estimated relationships.

The rest of the paper is organized as follows. In section 2, the literature and empirical studies will be discussed, in order to find out the gap in the research. Section 3 is the conceptual framework, data, variables and econometric methodology. The empirical results for the ten middle-income economies are discussed in Section 4. This study is summarized, and policy implications, limitations and future research are presented in Section 5.

LITERATURE REVIEW

Productivity, competitiveness and growth

The exchange rate-growth literature has moved beyond the broad study of nominal depreciation and exchange-rate regimes and volatility to a more theoretically-based study of the concept of equilibrium real exchange rates and misalignment. These ideas should be differentiated. A volatile exchange rate, swinging around an appropriate equilibrium, or a relatively stable exchange rate, that is persistently misaligned can both be an economy's case. Therefore, exchange-rate volatility and exchange-rate misalignment are two different economic phenomena and can have different effects on growth. The literature on exchange-rate volatility suggests that it is a negative determinant of productivity and growth, especially in the presence of low financial development. Aghion et al. (2009) demonstrate that exchange-rate volatility can decrease productivity development via investment constraints and financial constraints. Other negative associations are reported for emerging Europe and East Asia (Schnabl, 2009), developing countries (Barguellil et al., 2018) and a number of country and regional samples. Further, the meta-analytical evidence also shows negative average volatility impact from policy and competitive real exchange rates are more likely to be associated with stronger growth (Ridhwan et al., 2024).

Equilibrium exchange rates and misalignment

The actual definition of misalignment will be dependent on the method used to estimate the equilibrium real exchange rate. The purchase of PP purchase of parity gives a simple benchmark but deviations from PPP are frequent due to differences in productivity, trade barriers, and capital flows and structural transformation (Rogoff, 1996). The FEER approach characterizes the equilibrium real exchange rate as being in terms of internal and external balance (Williamson, 1994), while the BEER approach views the equilibrium real exchange rate as the function of observable macroeconomic fundamentals (Clark & MacDonald, 1998). Another useful technique to separate out the persistent and cyclical components is statistical filters like the Hodrick–Prescott filter. The BEER framework has proven to be very appropriate for developing and emerging economies, because in these economies it permits exchange rates to be allowed to freely adjust with fundamentals. The Balassa–Samuelson mechanism can appreciate the real exchange rate for a given country relative to the productivity/income of another. The external wealth and sustainability are quantified by net foreign assets, the external position is determined by terms of trade, the external buffer and external wealth can be embodied by international reserves, financial development affects the flow of such capital and its absorption in the domestic economy, and the quality of the institutions can affect productivity and investor confidence. The empirical signs, therefore, are theoretically guided but need not be the same in different countries.

Linear models and evidence on misalignment and growth

In a standard empirical specification, misalignment is assumed to be a single variable, and hence the symmetric effects assumption. The effects of overvaluation for a long period of time are described by Edwards (1989) and Cottani et al. (1990). Razin and Collins (1997) differentiate between harmful overvaluation and the possible positive that occurs with moderate undervaluation. According to Rodrik (2008) undervaluation can facilitate growth through an increase in the tradable sector of the economy, particularly in cases where market failures limit investment and structural change in certain economies. The literature also offers similar evidence for a positive relationship between more competitive real exchange rates and growth as presented in the papers by Gala (2008) and Vieira and MacDonald (2012).

There is not complete consensus about the linear evidence. Conrad and Jagessar (2018) argue that undervaluation and overvaluation both can negatively impact growth in Trinidad and Tobago. Developing countries might want to deliberately undervalue their exports, but this is not a valid argument, as Schröder (2013) argues. The direct effect of undervaluation can be reduced to a statistically small impact once income distribution and technological catch-up are taken into account, as shown by Ribeiro et al. (2020). The apparent growth effect of exchange-rate misalignment could reflect underlying structural dimensions and not just a stand-alone exchange-rate channel.

Nonlinear and asymmetric evidence

Shin, Yu and Greenwood-Nimmo (2014) have developed the NARDL approach which allows the separation of positive and negative changes in a variable and the estimation of long run and short run effects. In the misalignment literature, positive changes may be interpreted as an increase in overvaluation, and negative changes as an increase in undervaluation: the data can therefore be used to test if the two circumstances have differential impacts on growth. An alternative is the threshold model in which the growth effect has a threshold that shifts when the misalignment is sufficiently high. The country evidence varies. Iqbal et al. (2023) discover that the asymmetric outcomes exist in case of India, with overvaluation being related to the decrease in growth and undervaluation to the increase in growth. Some other patterns are reported in Turkey by Khalid et al. (2023) and in Pakistan by Khalid et al. (2024). Hadj Amor et al. (2023) find nonlinear and threshold effects for Tunisia. According to Tsen (2013), the growth impact of misalignment in Malaysia may vary across the direction of the shocks. These differences suggest that the asymmetry pattern may not be a universal mark pattern. Panel studies are broader, but will answer a different question. The evidence of nonlinear or threshold effects found between countries are presented in Béreau et al. (2012), Aflouk and Mazier (2013), Couharde and Sallenave (2013) and Tipoy et al. (2018). The methods used by Ramos-Herrera (2024) are the panel ARDL and the panel NARDL approaches. These models can be helpful to estimate average relationships but may mask country-specific adjustment processes.

In the present study, country-specific NARDL estimation is thus employed instead of a pooled average response. The research gap and the contribution is as follows: The empirical design is motivated by three gaps. Firstly, the symmetric viewpoint is now increasingly questioned and the nonlinear literature is not unanimous about the direction of the asymmetry. Second, asymmetric evidence exists for developing and emerging economies with systematic country-specific evidence for lower-middle-income economies being limited. Third, because of variations in the methods used in measuring equilibrium exchange rates and the different econometric specifications, it is not necessarily possible to tell whether any disparities in results are methodological in nature or represent differences across countries. This study tackles these challenges by using the same BEER–HP–NARDL framework in ten economies of varying income levels, but keeping the country-specific variation unchanged. This contribution will thus be methodological and substantive. Methodologically, the paper does not try to impose a common asymmetric coefficient across countries and a consistent measurement and estimation approach for all ten economies. Questioning it from a substantive perspective is whether the theoretical implications of overvaluation and undervaluation stand when the same model is used for middle-income economies of different production structures, institutions, financial systems and external positions. The contribution is not to argue that there is a universal effect, but to pinpoint regular similarities and economically significant differences in the limited number of middle-income economies studied.

CONCEPTUAL FRAMEWORK, DATA AND METHODOLOGY

Conceptual framework

The empirical approach is a three-step process. A BEER equation is first estimated for the country using a macroeconomic and institutional fundamental approach, and the equilibrium REER is thus calculated. Second, the persistent component of the fundamentals is obtained by applying the Hodrick–Prescott filter and replacing it in the estimated long run relationship, getting the equilibrium REER. Third, the

misalignment measure is also computed as a difference between the observed and the equilibrium REER and is included in the linear ARDL and nonlinear ARDL growth equations. The theoretical discussion is based on the idea that the equilibrium exchange rate is not necessarily fixed at the PPP level, but depends on the external wealth of a country, the relative productivity of a country, the terms of trade, reserves, and financial development and institutional quality. This is in line with the BEER tradition of Clark and MacDonald (1998) and empirical implementation of Iqbal et al. (2023). The method is particularly pertinent when there are dynamic shifts in the structure and/or external positions.

Sample, data and variables

The analysis is based on 10 selected lower middle-income economies, covering a period over 1990–2023 while the sample of countries include low income developing economies such as Bolivia, Cameroon, Ghana, India, Morocco, Pakistan, Philippines, Nepal, Sri Lanka and Vietnam are all lower-middle income economies. The selection of countries is solely based on data availability. Annual data have been taken mainly from the World Bank, World Development Indicators, Worldwide Governance Indicators and the IMF International Financial Statistics. Construction and definition of variables is given below:

Table 1. Variables, definitions and data sources

Variable	Definition	Source
REER	Real effective exchange rate index (2015=100)	WDI/IFS
GDPPC	Log GDP per capita, constant 2015 USD	WDI
NFA	Net foreign assets, % of GDP	WDI/IFS
TOT	Log terms of trade index	WDI
RES	Total reserves, % of GDP	WDI
DCPS	Domestic credit to private sector, % of GDP	WDI
VA	Voice and Accountability percentile rank	WGI
MIS	Real exchange-rate misalignment	Author's own calculation
GDS	Gross domestic savings, % of GDP	WDI
OPEN	Trade openness	WDI
INFL	Inflation, GDP deflator, annual %	WDI

The regression equations are presented in the log form. Some ratio variables are retained in levels due to the possibility of a low value or even a negative value, especially for net foreign assets. The institutional measure such as Voice and Accountability was initially included in the fundamentals specification but was removed due to high collinearity with other institutional variables in the provided estimates. To determine and to get the variables of equilibrium exchange rate, we follow the following model:

Estimation of equilibrium REER

The long-run BEER relationship is estimated separately for each country as:

$$REER_t = \beta_0 + \beta_1 GDPPC_t + \beta_2 NFA_t + \beta_3 TOT_t + \beta_4 RES_t + \beta_5 DCPS_t + \beta_6 VA_t + \varepsilon_t \quad (1)$$

Under the Balassa–Samuelson mechanism the sign of GDP per capita is expected to be '+' (positive). Finally, a better net foreign asset position is likely to lead to a more appreciating equilibrium rate, and an improvement in terms of trade may lead to income effects that increase the real exchange rate, but it may alos have ambiguous effect own to the fact that substitution effects may also dominate. Variable for reserves have been added on the right side indicating that an increases in reserves may cause equilibrium exchange rate to appreciate. This is also a general consensus that financial development and the quality of institutions will improve the equilibrium REER by increasing the capital inflows, investor confidence and resource allocation.

Construction of exchange-rate misalignment

The annual series of the fundamentals is filtered with $\lambda = 100$ for the HP filter. The remaining permanent filtered components are then used for the estimated long run BEER equation to calculate the equilibrium REER for each country and year. Misalignment is then labeled as the log difference between the observed and the equilibrium REER:

$$\mathbf{MIS_t = \ln(REERt) - \ln(REERt^*)}$$

An increase in the observed REER compared to its estimated value is defined as overvaluation, and is represented by a positive MIS. Negative MIS means that observed REER is below the equilibrium, it is interpreted as undervaluation. The HP filter is simple and easy to implement, but sensitive to the smoothing parameter and can have endpoint bias. These restrictions apply to the latest observations.

Linear ARDL growth model

The baseline growth equation is the relationship between log real GDP per capita and misalignment and a set of conventional growth controls:

$$\ln GDPPC_t = \alpha_0 + \alpha_1 MIS_t + \alpha_2 GDS_t + \alpha_3 OPEN_t + \alpha_4 TOT_t + \alpha_5 INFL_t + \alpha_6 DCPS_t + u_t \quad (2)$$

The ARDL framework is suitable for the short annual sample as it allows for the inclusion of I(1) and I(0) variables but not an I(2) variable, and it can estimate both long-run and short-run relationships. To determine cointegration, Pesaran, Shin and Smith's (2001) bounds test is employed and then an error-correction representation is developed.

Nonlinear ARDL model

MIS is decomposed into positive and negative partial sums to show asymmetric effects. Let ΔMIS_t be the first difference of misalignment. The sum of positive and negative parts are:

$$MIS^+_t = \Sigma(j=1 \text{ to } t) \max(\Delta MIS_j, 0) ; \quad MIS^-_t = \Sigma(j=1 \text{ to } t) \min(\Delta MIS_j, 0)$$

The two partial sums are used to replace MIS in the nonlinear growth equation:

$$\ln GDPPC_t = \alpha_0 + \alpha_1 MIS^+_t + \alpha_2 MIS^-_t + \alpha_3 GDS_t + \alpha_4 OPEN_t + \alpha_5 TOT_t + \alpha_6 INFL_t + \alpha_7 DCPS_t + u_t \quad (3)$$

The periods in which the real exchange rate is overvalued are indicated by MIS^+_t and those of undervaluation by MIS^-_t A negative coefficient on MIS^+_t is consistent with the conventional notion that

an overvalued exchange rate has a negative effect on economic growth. Likewise, a negative coefficient of MIS^{-}_{t} is in line with the Rodrik-type prediction that undervaluation spurs growth. A positive coefficient of either component, on the other hand, would suggest some deviation from these standard theoretical expectations.

Estimation and diagnostic procedures

ADF and Phillips–Perron unit-root tests are used to verify that none of the variables is I(2). The maximum lag order is determined based on the annual sample, and the lag structure that is preferred is determined through AIC. Then, the fundamentals and linear growth and NARDL equations are subjected to bounds tests. A negative and significant error-correction coefficient is expected where convergence towards the long-run equilibrium is present. Breusch–Godfrey serial correlation test, Ramsey RESET misspecification of functional form tests, and CUSUM and CUSUMSQ tests for parameter stability are used to assess the reliability of the models. This is particularly important in the case of the latter because the Asian Financial Crisis, Global Financial Crisis and the COVID-19 period are all included in the sample. Long run and short run Wald tests are designed to give formal tests of symmetry.

RESULTS AND DISCUSSION

Equilibrium REER fundamentals

Equation (1) shows a stable long-run relationship between the REER and its determinants for the ten middle income economies. The reported bounds F-statistics are greater than the upper bounds and the error-correction terms are negative and significant in most specifications. Overall, the findings are consistent with the BEER interpretation that the equilibrium exchange rate responds to changes in productivity, external assets, terms of trade, reserves, financial development and financial institutions. The importance of relative income is positive in six out of the ten economies, yet it is negative in case of Ghana and Pakistan. This offers some evidence to support the Balassa–Samuelson mechanism; namely, that the productivity/income effect of real appreciation is positive.

However, the divergent results in the ten economies demonstrate that the productivity/REER relationship is not automatically symmetric and may be affected by the composition of trade, the external financing of trade, as well as the composition of domestic demand. The net foreign asset (NFA) ratio is also significant for eight out of ten economies and is in general found with the positive sign as expected, except for India, the Philippines and Vietnam. It is expected and justified from an economic perspective because an economy's external position can influence the equilibrium exchange rate via wealth, capital flows, debt service and external sustainability. The variable of terms of trade is significant in case of six countries. Its impacts is positive in case of India and Nepal which is consistent with the income effect associated with higher export prices, whereas negative coefficients can be the result of substitution effects, reserve accumulation or exchange-rate management as is observed in the case of Morocco, Pakistan, the Philippines and Vietnam. Reserves have significantly negative coefficients in case of many of the countries. Domestic credit is significant in five countries and the sign is mixed among economies. Voice & Accountability is positive and significant in case of six countries only.

Linear ARDL growth results

The estimated long-run coefficients of the real effective exchange rate (REER) fundamentals are reported in Table 2, and were computed using the ARDL bounds-testing procedure for the sample of lower-middle-income economies. The computed F-statistics are higher than the upper bound critical value at the conventional levels of significance for all the countries in the panel and thus the existence of a stable long run relationship between the REER and its determinants is confirmed; the coefficients are thus interpreted as the long run elasticities of the equilibrium exchange rate. The coefficient on

relative income per capita (LYPC), the usual proxy for the Balassa-Samuelson effect, is positive and statistically significant for Bolivia, Cameroon, Nepal, Sri Lanka and Vietnam, thus consistent with the Balassa-Samuelson hypothesis that productivity growth relative to trading partners is correlated with the real appreciation of the equilibrium exchange rate. For Ghana and Pakistan, the coefficient is negative and significant, indicating that expansion of income in these two economies does not appear to be associated with the expected increase in the relative price of the tradables, and may instead represent catch-up in productivity in the tradable sector, or income growth from remittances and commodity inflows. The coefficient is not statistically different from zero for India, Morocco, and the Philippines, suggesting that there was no significant channel of the Balassa-Samuelson in the sample period for these three economies.

The net foreign assets (NFA) entry is positive and significant for Bolivia, Ghana, Morocco, Pakistan, Nepal, and Sri Lanka, as in the portfolio-balance approach, an increase in the net external position must be accompanied by a real appreciation to achieve the trade balance that is consistent with servicing the net foreign position. The coefficient is negative and significant for India and the Philippines, which could be explained by the fact that the net foreign assets accumulated in these economies are reserve driven and not private wealth driven. For Cameroon and Vietnam the coefficient is not statistically significant. The terms of trade (LTOT) coefficient is positive and significant for India and Nepal, which signifies that the terms of trade improvement has a stronger income effect, increasing expenditure on non-tradables and increasing the equilibrium REER. For Morocco, Pakistan, the Philippines and Vietnam, the coefficient is negative and statistically significant, suggesting that the substitution effect is more pronounced in these economies, which would correspond to a relatively high import intensity of production, or to terms-of-trade gains from cheaper imported inputs. For Bolivia, Cameroon, Ghana and Sri Lanka the coefficient is not significant. International reserves (TRES) have a negative and significant coefficient for Bolivia, Ghana, Morocco, Nepal, Sri Lanka and Vietnam, reflecting the same sign of the motive for holding international reserves as that of currency depreciation.

The positive and significant coefficient for Cameroon and India indicates that the appreciation of these economies is driven by the inflow of capital and not competitiveness. The coefficient is not important for the Philippines and Pakistan. Domestic credit to the private sector (DCPS), a proxy for financial deepening, shows a positive and significant sign for Bolivia and the Philippines, in line with the fact that financial deepening lowers liquidity constraints and increases the demand for non-tradables, thus improving the equilibrium exchange rate. For the economies of Cameroon, Ghana and Morocco, the coefficient is negative and significant, indicating that credit expansion has been used for investment in the capacity of the sector of tradables and hence had a depreciating effect on the equilibrium REER. For India, Pakistan, Nepal, Sri Lanka and Vietnam, the coefficient is not significant. Last but not least, the structural effect of sectoral value added growth on an equilibrium REER is heterogeneous across the sample and positive if the growth of value added comes from the tradable sector and negative if the increase of value added comes from the non-tradable sector, as shown by the sign of the coefficient on value added (VA). Coefficient is not significant for Cameroon, Ghana, Pakistan, Sri Lanka. The findings are broadly consistent with the theoretical priors of the behavioural equilibrium exchange rate literature—although the estimated magnitudes and signs of the coefficients vary widely across countries, as does the literature, reflecting the fact that lower-middle income countries also have a very high degree of heterogeneities in the cross-country characteristics of trade structures, financial depth and reserve-management practices (Edwards, 1989; MacDonald, 2000; Montiel, 1999).

Table 2. Long-run REER fundamentals: Lower-middle-income economies

Country	F	LYPC	NFA	LTOT	TRES	DCPS	VA
Bolivia	13.68	1.137**	0.016*	0.028	-0.017*	0.009*	0.043***
Cameroon	15.73	0.529***	-0.001	-0.063	0.011***	-0.023***	-0.003

Ghana	7.14	-0.526***	0.017**	0.215	-0.015**	-0.024***	0.002
India	35.07	-0.021	-0.012***	0.496**	0.019***	0.002	0.005**
Morocco	35.82	-0.060	0.028***	-0.608**	-0.019**	-0.024**	0.020***
Pakistan	8.55	-1.047**	0.038***	-0.513*	-0.023	0.012	0.001
Philippines	10.6	-0.272	-0.017**	-2.104***	0.007	0.013**	-0.02**
Nepal	7.77	0.873***	0.012***	1.127***	-0.015**	0.003	-0.011***
Sri Lanka	7.76	0.721***	0.026***	0.306	-0.063***	0.003	-0.001
Vietnam	10.12	0.591***	-0.002	-0.567*	-0.010***	0.002	-0.013***

Short-run dynamics

The linear ARDl based short run results are given in the appendix. It shows significant cross-country differences in the effects of economic fundamentals on real exchange rate misalignment. The short-run coefficients are often different from the long-run coefficients, which reflect systematic equilibrium effects, and can be sensitive to lags, and so also display temporary adjustments, transitional shocks and delayed responses. Thus, the interpretation should be based on the prevailing economic processes and not on the individual lag coefficients. Overall, the distorting short-run response of the real exchange rate measure to per-capita income tends to be positive, except in some countries like Ghana, India and Pakistan where the sign of the coefficient is negative or ambiguous. This implies that the adjustment of the real exchange rate can take place, in the first instance, because of increase in the domestic demand, capital inflows, and relative prices; the improvement in domestic economic activity can affect the real exchange rate in a non-uniform manner between economies. The lagged and even adverse reactions, especially in India and Pakistan, suggest that the connection between income growth and the real exchange rate is country-specific and goes through trade, inflation, and external finance conditions. The short-run empirical evidence for real exchange rate misalignment (MIS) is very mixed. Significant responses are found in a number of countries, but the signs of the response often vary with the lags. This is economically feasible because exchange-rate misalignment does not impact economic outcomes immediately. The first round of exchange rate changes may impact the costs of imports, the competitiveness of exports, and the domestic prices, while the second round of changes in the volume of trade and expectations may offset the first round. Several countries, therefore, did not show a consistent, significant contemporaneous effect, indicating that the effects of misalignment are mainly realized over time rather than in the short-term. In countries like India, Morocco, Nepal, Ghana, Sri Lanka, and the Philippines, trade openness (OPEN) generally has a positive contemporaneous effect, suggesting that increased openness to international markets can have an initial impact on the real exchange rate by enhancing trade and capital-market linkages. In some countries, however, the negative coefficients at the later time-lags suggest a partial counter-trend at later time-lags. This is in line with the concept of openness creating an “immediate demand” or “capital-flow” response, and then adjustment through import and export flows and price changes. T

The short-run impacts of the terms of trade (LTOT) are also very country specific. In Ghana and Vietnam initial positive responses are observed, while in India, Pakistan and the Philippines initial impacts are negative. This is in line with the export composition and commodity dependency differences. The impact of an improvement in the terms of trade, via a rise in foreign-exchange earnings, may be to appreciate the real exchange rate in export-oriented economies, but may be less pronounced or even have an opposite sign in import-dependent economies. The short-term impacts of inflation (INF) are typically rather small but statistically significant and can be positive or negative, depending on the country. While positive in Pakistan and Ghana, the effects in India, Morocco, Philippines, Sri Lanka,

and Vietnam are negative. This variation suggests that inflation does not only influence the real exchange rate via domestic prices, but also via the interaction with adjustment in the nominal exchange rate. If depreciation is nominal, then the real exchange rate can be fairly stable even if there is domestic inflation, and if depreciation is not nominal, then domestic inflation could lead to real appreciation. The impact of domestic credit on the private sector (DCPS) also is highly dynamic. Positive and negative effects are observed in several economies, especially Cameroon, Ghana, India and Pakistan, across lags. This implies that credit expansion works on the real exchange rate via several channels: first, an appreciation pressure can be generated by an increase in domestic demand and second, an increase in investment and import demand can negatively impact the trade balance initially and trigger exchange-rate adjustment later. The stability of the coefficients over the lags, therefore, lends support to the dynamic transmission mechanism.

NARDL results: asymmetric effects

Table 3 gives more robust evidence of the asymmetry of long-run real exchange rate misalignment for lower-middle income economies. The bounds-test statistics suggest that most of the countries exhibit a stable long-run relationship, and the error-correction terms in most of the countries are highly significant, reinforcing the notion that short-run deviations are corrected toward the long-run equilibrium. What is more important is that the result of the NARDL test indicates that the relationship between the real exchange rate and growth is not symmetrical due to overvaluation and undervaluation; the direction and size of asymmetry is not uniform across different countries. A significant findings is that there is a long-term positive relationship between overvaluation and certain economies such as Cameroon, India, Pakistan and Vietnam. This effect is particularly strong for India, with the coefficient on overvaluation being high and statistically significant. This doesn't mean all that persistence of overvalued currencies is good for economic performance. Instead, it could simply be a consequence of a temporary decrease in the domestic price of imported capital goods, intermediate inputs, and technology, especially in those economies that rely on imported technology and inputs for production. The results are consistent with the literature that focuses on the exchange-rate-appreciation effect through the investment and cost-of-importation channels, but inconsistent with the classic competitiveness argument on how steady overvaluation would stifle export activities.

Pakistan’s performance is of special significance. The coefficient on undervaluation is not statistically significant and overvaluation has a positive and statistically significant long-run effect. A high degree of asymmetry is seen in this: the Pakistani economy seems to react differently to the appreciation and depreciation of real exchange rate. The high reliance on imports of energy, machines, intermediate goods and other critical inputs to Pakistan may be one of the reasons. An understanding of an RE can reduce the cost of these imports to the domestic economy and temporarily boost production and investment. Despite this, the result should be treated with caution since the foreign trade competitiveness of a country may be undermined by an overvalued exchange rate at the same time that it contributes to the increase of an external imbalance. Therefore, the positive sign does not mean that the government should aim for an overvalued currency. The results for Nepal and the Philippines give the best illustration of the reverse trend. Undervaluation is found to have a negative and statistically significant effect on the two countries' long-run, while overvaluation is positive but non-significant effect. This indicates that as long as the currency deprecation continues, the export-oriented argument's benefits of increased competitiveness are not guaranteed. The negative answer could be a sign of the high reliance of these economies on imports: the depreciation increases the cost of imported fuel, machinery, intermediate goods, and consumer goods. The export-competitiveness effect of the depreciation is therefore likely to be less important than the cost effect of the depreciation.

This outcome is of special importance for the literature from the structuralist side, which emphasises the crucial role that domestic productive capacity and the capacity to increase tradable production play for the benefits of a competitive exchange rate. Overvaluation has a positive and statistically significant effect for Vietnam, and undervaluation has a positive effect that is not statistically significant. The weak side and strong side might be the outcome of Vietnam's strong involvement in global production

networks. A valued currency can help to lower the cost of intermediate inputs and capital goods that are imported for any export production. The finding thus implies that in highly trade-integrated economies, the links between exchange-rate competitiveness and economic performance are more complicated than the standard export-price channel. There is strong evidence of long run cointegration in both countries, but no evidence of either overvaluation or undervaluation in either Ghana or Sri Lanka. This implies that, in the long run, exchange-rate misalignment is not the primary factor underlying the dependent variable, once other fundamentals are taken into account. Structural factors like productivity, trade composition, external financing and domestic macroeconomic conditions can have a more important influence in long-run adjustment for these economies. Morocco is also an interesting case, showing a negative coefficient (albeit small) for overvaluation and a positive but small coefficient for undervaluation. So while the indicators are mostly in line with the usual competitiveness argument, the estimates do not offer a good statistical basis to substantiate the systematic long-run asymmetric effect. Learning strategies: Error correction and adjustment The error-correction coefficients are significant clues regarding the rate at which the economies get back to the long-run equilibrium after short-run disturbances. The estimates when ECM is negative, and statistically significant, as in Cameroon, Ghana, Morocco, Pakistan, the Philippines, Nepal and Vietnam, suggest that the rates of convergence towards equilibrium are stable. The Vietnam country shows a relatively high EZM coefficient of around −0.78, meaning that a significant amount of a disequilibrium is corrected in one period.

The adjustment process is also relatively fast in Pakistan with ECM coefficient of −0.96. The positive ECM coefficients in Bolivia, India and Sri Lanka should be taken with a grain of salt. There is, however, a higher level of explanatory power of the models and a positive and significant adjustment coefficient does not follow the conventional stable error-correction mechanism. These cases may be a sign of an unstable adjustment process or model-specific dynamics or may require further diagnostic investigation. Therefore, the long-run asymmetric coefficients presented here should be interpreted with a certain degree of caution in comparison to those for economies where the ECM adjustment is negative in the usual direction. Evidence of asymmetry Asymmetric adjustment is well documented overall, but is present in some respects. The majority of the specifications pass the stability diagnostics (as reported in the CUSUM/CUSUMSQ columns), but there is evidence of instability for the specifications of Bolivia, India, the Philippines and Vietnam for one of the two diagnostics. This is crucial as asymmetry is not just a statistical phenomenon—the estimated relationships are stable across the diagnostic tests in most countries. The findings thus give reason to doubt the idea that overvaluation and undervaluation are just opposites of the equilibrium. Rather, the effects on the economy will be influenced by the direction of the exchange-rate change and by the structural features of each economy. Evidence from Pakistan, Nepal, the Philippines, India and Vietnam in particular, shows that the same change in exchange rates can have vastly different impacts in different countries.

Table 3. NARDL long-run coefficients: Lower-middle-income economies

Country	F	ECM	OVER-VAL	UNDER-VAL	R^2	CUSUM/CUSUMSQ
Bolivia	5.64***	0.069	0.756	0.169	0.98	S/US
Cameroon	7.29	-0.299***	1.194***	0.032	0.99	S/S
Ghana	10.21	-0.060***	0.972	1.893	0.99	S/S
India	24.5	0.15***	3.377***	0.889	0.99	S/US
Morocco	12.79	-0.25***	-0.647	0.629	0.99	S/S
Pakistan	4.59	-0.96***	0.698***	-0.085	0.99	S/S

Philippines	7.75	-0.21***	0.321	-1.18**	0.99	S/US
Nepal	8.56	-0.400***	0.661***	-0.562***	0.99	S/S
Sri Lanka	9.77	0.10***	0.433	-3.34*	0.99	S/S
Vietnam	10.94	-0.784***	0.950***	0.279	0.99	US/S

The overall pattern of the LMIC results is not consistent with a Rodrik-type pattern. In Cameroon, India, Pakistan, Nepal and Vietnam, OVER-VAL is statistically significant and positive, whereas only Morocco has a negative and significant overvaluation coefficient in the LMIC cases. The values of UNDER-VAL are negative and significant in the Philippines, Nepal and Sri Lanka, reinforcing the model's sign convention that increased undervaluation would facilitate growth. Nepal is very special in that both are important, giving a strong indication of the different long-run effects of the two directions of misalignment. Overall, the evidence from the ten middle income economies does not substantiate a general proposition that overvaluation negatively affects growth. The significant positive OVER-VAL coefficients are found in Cameroon, India, Pakistan, Nepal and Vietnam, and the significant negative coefficient is found in Morocco. If we examine the significant negative coefficients for the Philippines, Nepal and Sri Lanka, they remain in line with the growth enhancing effects of undervaluation as per the model's sign convention for UNDER-VAL. The mixed signs suggest that structural conditions in the countries, not just the direction of misalignment, are determining the effect on growth.

There are three possible explanations. Firstly, from growth to appreciation, there is a possibility of a real appreciation due to stronger growth which would lead to higher capital inflows and productivity. Second, appreciation can lower the domestic cost of foreign capital goods and intermediate inputs which can help the investment of foreign-dependent economies. Thirdly, commodity-price and external shocks can have simultaneously positive effects on the terms of trade, increase national income and appreciate the real exchange rate. The mechanisms could be different in the 10 economies and the present single-equation model cannot capture them adequately.

In particular, this third one is important for Algeria, Colombia, Indonesia and Malaysia and may be relevant for China, due to its export and reserve patterns. These mechanisms are not completely separable using the current single-equation design. The conclusions given are thus interpreted with caution. The country-specific NARDLs are proof of the existence of different long-run relationships between misalignment of the exchange rate and economic growth. These are not stand-alone causal estimates. An important reason for this qualification is that the literature has suggested the endogeneous relationship between growth and the real exchange rate (Habib et al., 2017) and the provided model does not instrument the misalignment measure.

Non-linear short-run dynamics

The NARDL results (see appedexA1) are more economically interesting since positive and negative movements in the real exchange rate yield different impacts. In the very short run the results, overall, offer weak support for a common asymmetric reaction to over- and undervaluation, as a large number of the contemporaneous coefficients on overvaluation and undervaluation are not statistically significant. It's significant that the misalignment of the exchange rate does not necessarily lead to economic adjustment right away. On the contrary, its impact is likely to be delayed. However, there are some economies that show economic significant asymmetry. In the case of Ghana, there is a significant positive short-run effect on undervaluation but no significant effect in the case of overvaluation. This offers some backing for the structuralist thesis that a more competitive exchange rate will bring short-run economic advantages, but not necessarily in all subsequent periods. India has better evidence of ‘asymmetry'. The subsequent lags are followed by a significant negative overvaluation, and undervaluation has a significant negative contemporaneous effect. The outcome indicates that positive

and negative deviations from equilibrium are not opposites: Overvalued currency can have negative adjustment effects in the future, while undervaluation can have different preliminary effects. This is in line with the general literature which highlights that the impact of exchange-rate misalignment is strongly influenced by the nature and duration of the misalignment. The short run asymmetric pattern is quite prominent in Pakistan. Contemporaneous effect of overvaluation is positive and statistically significant; and the effect of undervaluation is statistically insignificant. This implies that short-run adjustment of the Pakistani economy is not symmetrical around the deviations from the exchange rate. Positive response due to overvaluation is likely to be temporary gains in domestic purchasing power and reduced import prices, but cannot be used as a justification for the continued benefits of overvaluation. In fact, the long-run consequences are in another direction; the short-run response is different from the long-run equilibrium consequences. Vietnam is the most straightforward example of a country with a short-run asymmetry. The coefficients sign for both overvaluation and undervaluation are statistically significant and variable in sign across lags. This suggests that a deviation of the exchange rate can trigger a large reaction, which is partly offset. These reversals are in line with the adjustment process via trade flows, expectations, capital movements and domestic prices and illustrate why treating the exchange-rate adjustment process as a simple linear process is not supported. The non-linear specification offers relatively weak support for Sri Lanka and Nepal in terms of short-run effects being systematically different when prices are overvalued or undervalued. In such economies, the reactions of the control variables – especially of income, openness, inflation, and domestic credit – seem more relevant to the immediate asymmetry in exchange-rate changes than the initial asymmetry.

This study aimed to analyze the basics of real exchange rate misalignment and the effect on economic growth in ten lower middle income countries (Bolivia, Cameroon, Ghana, India, Morocco, Pakistan, Philippines, Nepal, Sri Lanka and Vietnam) under both linear and non-linear (asymmetric) ARDL frameworks. There are some generalizations that can be made. Firstly the determinants of the equilibrium real exchange rate vary widely from country to country. None of the fundamentals – productivity, net foreign assets, terms of trade, trade openness, domestic credit, and structural transformation – is uniform across the sample. In Bolivia, Cameroon, Nepal, Sri Lanka and Vietnam, productivity gains are linked to a real appreciation, while real depreciation is linked to productivity gains in Ghana and Pakistan, which are consistent with the Balassa–Samuelson mechanism, and a competitiveness-driven tradable-sector channel, respectively. The divergence shows that a universal theoretical model of the equilibrium exchange rate is not feasible for developing countries as the transmission mechanism varies with the rise in productivity in either the tradable or non-tradable sector. Secondly, misalignment does not impact growth in a symmetric way, and the finding is rather asymmetric concerning the impact exchange rate misalignment. The non-linear (NARDL) results indicate that overvaluation and undervaluation tend to have asymmetric effects on economic growth. The findgs show that exchange rate misalignment has positive long-run effects on economic growth in case of Cameroon, India, Pakistan, Nepal and Vietnam (likely due to cheap imported capital goods and inputs) and only a negative overvaluation effect in Morocco.

In contrast, undervaluation has significant negative long run effects in the Philippines, Nepal and Sri Lanka, reflecting the traditional logic that depreciation encourages growth via export competitiveness, but this is not the case in each country: Ghana, for example, has no significant long run misalignment effect whatsoever after accounting for other fundamentals. Such heterogeneity runs contrary to any "one-size-fits-all" generalization by Rodrik that undervaluation is always beneficial for growth in developing economies. Third, there are differences in the evidence of short-run dynamics and long-run relationships. The signs of the short-run coefficients on the income, misalignment, openness, terms of trade, inflation, and credit variables are often reversed across lags, particularly in the non-linear specifications, which is consistent with delayed and multi-stage adjustment processes: first-round price and competitiveness effects followed by second-round trade-volume and expectation effects. This is to underscore that the interpretation of the short-run coefficients should not be taken as evidence for or against the long-run equilibrium relationships. Fourth, the adjustment to long-run equilibrium is mostly stable but not always, and not all the time. The important negative error-correction terms in Cameroon, Ghana, Morocco, Pakistan, Philippines, Nepal and Vietnam support a conventional and steady error-

correction mechanism, and especially in Vietnam and Pakistan it is a rapid one. A notable exception is the positive (and, in theory, anomalous) ECM coefficients in Bolivia, India and Sri Lanka, which should be interpreted with greater care until further diagnostic analysis is conducted. Fifth, most importantly, the country-specific approach is a key finding. The key factors that explain the heterogeneity of the results—export composition, import dependence, financial depth and institutional quality—are more important than income level per se.

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Appendix A1: Short Run Results

BOLIVIA

Model 2

Linear ARDL Model Estimates							
Panel A: Short Run Coefficient Estimates							
Variables/Lags	0	1	2	3	4	5	6
ΔLYPC		0.941 (5.13)***	0.256 (1.28)				
ΔMIS	-0.240 (-1.68)	0.275 (1.53)	0.763 (3.21)***	-0.855 (-4.8)***			
ΔGDS	-0.013 (-2.4)**						
ΔOPEN	0.005 (4.83)***	-0.001 (-1.79)					
ΔLTOT	-0.348 (-3.5)***	-0.051 (-0.77)	0.275 (3.80)***	-0.058 (-1.25)			
ΔINF	0.004 (1.47)	0.015 (4.68)***	0.002 (2.22)**	-0.004 (-3.9)***			
ΔDCPS	-0.005 (-3.9)***	0.005 (2.91)**	-0.006 (-3.3)***	0.001 (1.35)			

Model 3

Non-Linear ARDL Model Estimates							
Panel A: Short Run Coefficient Estimates							
Variables/Lags	0	1	2	3	4	5	6
LYPC		1.069 (8.33)***					
OVER-VAL	-0.052 (-0.33)						
UNDER-VAL	-0.011						

	(-0.08)						
GDS	-0.005 (-1.07)						
OPEN	0.002 (2.26)**						
LTOT	-0.016 (-0.25)						
INF	0.0009 (0.63)	0.001 (1.13)					
DCPS	-0.003 (-2.7)***	0.005 (3.11)***	-0.002 (-2.64)**				

CAMEROON

Model 2

Linear ARDL Model Estimates							
Panel A: Short Run Coefficient Estimates							
Variables/Lags	0	1	2	3	4	5	6
ΔLYPC		0.838 (3.78***	-0.726 (-2.00)*	0.370 (1.47)			
ΔMIS	-0.012 (-0.09)	-0.428 (-3.0)**	0.015 (0.13)	-0.264 (-2.75)**			
ΔGDS	-0.002 (-0.64)	0.005 (1.64)					
ΔOPEN	-0.0006 (-0.816)	-0.002 (-2.53)**	0.001 (1.85)*				
ΔLTOT	0.040 (1.19)	0.052 (1.55)					
ΔINF	-0.001 (-0.88)	0.002 (1.39)	-0.0007 (-0.005)	0.001 (1.47)			
ΔDCPS	-0.006 (-1.11)	0.019 (2.26)**	-0.015 (-2.05)**	0.012 (2.55)**			

Model 3

Non-Linear ARDL Model Estimates							
Panel A: Short Run Coefficient Estimates							
Variables/Lags	0	1	2	3	4	5	6
LYPC		1.039 (9.95)***	-0.339 (-3.7)***				
OVER-VAL	0.141 (1.30)	0.216 (1.52)					
UNDER-VAL	0.009 (0.11)						
GDS	0.004 (2.25)**						
OPEN	0.001 (2.28)**	-0.0001 (-0.27)	0.002 (4.85)***				
LTOT	0.022 (0.98)	0.037 (1.46)	-0.100 (-4.1)***				
INF	-0.0008 (-0.81)						
DCPS	-0.006 (-1.83)*	0.009 (2.41)**					

GHANA

Model 2

Linear ARDL Model Estimates							
Panel A: Short Run Coefficient Estimates							
Variables/Lags	0	1	2	3	4	5	6
ΔLYPC		-0.523 (-2.00)	0.723 (4.53)**	0.653 (4.35)**			
ΔMIS	0.296 (6.91)***	0.088 (2.50)*	0.027 (1.00)	-0.041 (-1.67)			
ΔGDS	0.0009 (2.09)	-0.0007 (-1.05)	-0.002 (-3.08)**	-0.003 (-3.93)**			
ΔOPEN	0.001	-0.0003	-0.0007	-0.0006			

	(9.24)**	(-1.00)	(-2.01)	(-2.92)*			
ΔLTOT	-0.066 (-1.71)	-0.005 (-0.17)	0.183 (3.46)**	0.028 (0.72)			
ΔINF	0.0004 (2.58)*	-0.001 (-10.)***	-0.0007 (-2.86)*				
ΔDCPS	-0.009 (-5.9)***	-0.018 (-4.8)***	0.012 (11.1)***	0.017 (4.71)***			

Model 3

Non-Linear ARDL Model Estimates							
Panel A: Short Run Coefficient Estimates							
Variables/Lags	0	1	2	3	4	5	6
LYPC		0.739 (6.92)***	0.262 (2.54**				
OVER-VAL	0.019 (0.37)						
UNDER-VAL	0.258 (4.71)***	-0.052 (-1.15)	-0.048 (-1.14)				
GDS	-0.0007 (-1.09)	0.000 (0.06)	-0.001 (-1.57)				
OPEN	0.001 (6.37)***	-0.002 (-6.0)***	0.0004 (1.66)				
LTOT	0.054 (1.48)	-0.060 (-1.57)	0.081 (1.90)*				
INF	0.0001 (0.91)	-0.001 (-6.2)***	0.0001 (0.76)				
DCPS	-0.009 (-5.55)	0.001 (0.99)	0.012 (8.02)***				

INDIA

Model 2

Linear ARDL Model Estimates							
Panel A: Short Run Coefficient Estimates							
Variables/Lags	0	1	2	3	4	5	6

ΔLYPC		-0.381 (-0.73)	-0.795 (-1.80)	3.221 (3.40)**			
ΔMIS	1.044 (3.00)**	1.179 (2.55)*	-0.012 (-0.09)	0.318 (1.31)			
ΔGDS	0.037 (3.59)**	-0.001 (-0.21)	0.048 (3.19)**	-0.021 (-2.80)**			
ΔOPEN	-0.007 (-2.58)*	0.014 (3.26)**					
ΔLTOT	-0.456 (-3.57)**	0.064 (0.61)	0.208 (1.42)	-0.465 (-2.96)**			
ΔINF	-0.004 (-0.73)	-0.036 (-3.4)**	0.007 (1.66)	0.032 (3.27)**			
ΔDCPS	-0.030 (-4.8)***	-0.022 (-2.73)**	-0.017 (-2.55)*	0.018 (2.76)*			

Model 3

Non-Linear ARDL Model Estimates							
Panel A: Short Run Coefficient Estimates							
Variables/Lags	0	1	2	3	4	5	6
LYPC		1.110 (13.2)***					
OVER-VAL	0.156 (0.89)	-0.67 (-3.3)***	-0.384 (-1.80)*				
UNDER-VAL	-0.557 (-2.46)**						
GDS	0.008 (3.19)***						
OPEN	0.003 (1.75)*	0.0003 (0.21)	-0.004 (-2.3)**				
LTOT	-0.190 (-2.65)**	0.223 (3.10)***	-0.174 (-2.7)**				
INF	-0.007 (-3.0)***						

DCPS	-0.013 (-5.5)***	0.009 (4.14)***	0.003 (1.56)				

MOROCCO

Model 2

Linear ARDL Model Estimates							
Panel A: Short Run Coefficient Estimates							
Variables/Lags	0	1	2	3	4	5	6
ΔLYPC		0.213 (1.46)	0.558 (4.94)***				
ΔMIS	0.438 (2.13)**						
ΔGDS	0.002 (1.16)	-0.002 (-1.28)					
ΔOPEN	0.002 (3.42)***						
ΔLTOT	-0.068 (-0.91)						
ΔINF	-0.005 (-2.7)***	-0.001 (-0.65)	-0.005 (-3.2)***				
ΔDCPS	-0.006 (-3.8)***	0.002 (1.26)					

Model 3

Non-Linear ARDL Model Estimates							
Panel A: Short Run Coefficient Estimates							
Variables/Lags	0	1	2	3	4	5	6
LYPC		0.018 (0.16)	0.729 (7.83)***				
OVER-VAL	-0.643 (-1.41)	0.023 (0.04)	0.457 (1.18)				
UNDER-VAL	0.158 (0.35)						
GDS	0.002						

	(1.44)						
OPEN	0.002 (4.31)***	0.0008 (1.22)	0.001 (1.41)				
LTOT	-0.096 (-1.26)	0.141 (1.71)					
INF	-0.002 (-1.38)	-0.0009 (-0.66)	-0.003 (-2.20)**				
DCPS	-0.005 (-3.9)***						

PAKISTAN

Model 2

Linear ARDL Model Estimates							
Panel A: Short Run Coefficient Estimates							
Variables/Lags	0	1	2	3	4	5	6
ΔLYPC		0.446 (1.78)*	-0.397 (-1.35)				
ΔMIS	-0.052 (-0.45)	0.248 (2.29)**	-0.374 (-2.7)***				
ΔGDS	-0.004 (-0.95)	-0.009 (-1.73)	-0.012 (-- 2.22)**				
ΔOPEN	-0.003 (-1.11)	-0.003 (-1.80)*	-0.009 (-2.68)**				
ΔLTOT	-1.327 (-0.91)	4.544 (1.47)	-3.399 (-1.93)*				
ΔINF	0.001 (2.13)**	0.001 (2.13)**					
ΔDCPS	0.011 (2.44)**	0.009 (1.98)*	-0.006 (-1.90)*				

Model 3

Non-Linear ARDL Model Estimates							
Panel A: Short Run Coefficient Estimates							
Variables/Lags	0	1	2	3	4	5	6

LYPC		0.150 (0.56)	-0.119 (-0.59)				
OVER-VAL	0.454 (2.38)**	0.222 (1.29)					
UNDER-VAL	-0.082 (-0.68)						
GDS	-0.0002 (-0.06)						
OPEN	0.001 (0.60)	-0.001 (-0.54)	-0.004 (-2.13)**				
LTOT	1.117 (3.47)***	-1.266 (-3.6)***					
INF	0.001 (2.74)***	0.0009 (1.86)*					
DCPS	0.008 (3.14)***						

PHILIPPINES

Model 2

Linear ARDL Model Estimates							
Panel A: Short Run Coefficient Estimates							
Variables/Lags	0	1	2	3	4	5	6
ΔLYPC		0.866 (9.79)***					
ΔMIS	0.094 (0.84)	0.049 (0.51)	-0.199 (-2.0)*	-0.201 (-2.14)*			
ΔGDS	0.019 (3.57)***	-0.012 (-2.70)**	0.015 (3.0)***	-0.009 (-2.16)*			
ΔOPEN	0.003 (2.17)*	-0.0004 (-0.30)	-0.003 (-3.2)***				
ΔLTOT	-0.322 (-3.6)***						
ΔINF	-0.005	-0.000	-0.007	-0.002			

	(-1.96)*	(-0.008)	(-3.0)***	(-1.08)			
ΔDCPS	-0.002 (-1.93)*	-0.001 (-0.50)	0.004 (1.36)	0.003 (2.01)*			

Model 3

Non-Linear ARDL Model Estimates							
Panel A: Short Run Coefficient Estimates							
Variables/Lags	0	1	2	3	4	5	6
LYPC		0.788 (4.06)***					
OVER-VAL	0.147 (0.70)	0.291 (1.04)	-0.370 (-1.82)*				
UNDER-VAL	-0.036 (-0.14)	-0.21 (-1.05)					
GDS	0.011 (2.18)**	-0.015 (-3.1)***	0.008 (1.78)*				
OPEN	0.003 (1.76)*	0.0008 (0.49)	-0.004 (-2.8)***				
LTOT	-0.133 (-1.30)						
INF	-0.003 (-1.19)	0.001 (0.64)	-0.003 (-1.34)				
DCPS	-0.0008 (-0.38)						

NEPAL

Model 2

Linear ARDL Model Estimates							
Panel A: Short Run Coefficient Estimates							
Variables/Lags	0	1	2	3	4	5	6
ΔLYPC		0.236 (1.15)	0.723 (3.41)***				
ΔMIS	-0.013 (-0.19)	0.134 (1.56)	0.163 (2.14)**				

ΔGDS	0.004 (3.21)***	0.001 (0.98)	-0.002 (-1.83)*				
ΔOPEN	0.003 (3.51)***	-0.0005 (-0.56)	-0.001 (-1.07)				
ΔLTOT	0.001 (0.029)	-0.148 (-2.20)**					
ΔINF	0.0006 (0.91)	0.002 (2.60)**	0.002 (2.89)***				
ΔDCPS	0.0006 (0.97)						

Model 3

Non-Linear ARDL Model Estimates							
Panel A: Short Run Coefficient Estimates							
Variables/Lags	0	1	2	3	4	5	6
LYPC		0.599 (5.0)***					
OVER-VAL	-0.022 (-0.19)	0.287 (2.42)**					
UNDER-VAL	-0.040 (-0.30)	-0.184 (-1.30)					
GDS	0.003 (2.93)***						
OPEN	0.0008 (0.87)	-0.001 (-1.92)*					
LTOT	-0.020 (-0.51)						
INF	-0.0005 (-0.58)						
DCPS	0.0002 (1.41)	0.0009 (3.49)***					

SRI LANKA

Model 2

Linear ARDL Model Estimates							
Panel A: Short Run Coefficient Estimates							
Variables/Lags	0	1	2	3	4	5	6
ΔLYPC		1.241 (8.25)***	-0.294 (-1.70)*				
ΔMIS	-0.022 (-0.20)	0.217 (1.56)					
ΔGDS	0.004 (1.79)*	-0.001 (-0.52)	-0.005 (-2.9)***				
ΔOPEN	0.002 (2.86)	-0.003 (-3.1)***					
ΔLTOT	-0.110 (-1.64)	0.071 (1.11)					
ΔINF	-0.003 (-5.0)***	0.001 (2.41)**	0.003 (3.08)***				
ΔDCPS	0.001 (1.15)						

Model 3

Non-Linear ARDL Model Estimates							
Panel A: Short Run Coefficient Estimates							
Variables/Lags	0	1	2	3	4	5	6
LYPC		1.412 (7.48)***	-0.431 (-2.01)*				
OVER-VAL	0.067 (0.49)						
UNDER-VAL	-0.399 (-1.46)	0.445 (1.26)					
GDS	0.005 (2.19)**	-0.005 (-2.33)**					
OPEN	0.003	-0.004	0.002				

	(3.26)***	(-4.0)***	(2.44)**				
LTOT	-0.106 (-1.41)	0.095 (1.15)	0.008 (0.109)				
INF	-0.002 (-3.9)***	0.001 (2.67)***	0.002 (2.09)**				
DCPS	0.0001 (0.11)						

VIETNAM

Model 2

Linear ARDL Model Estimates							
Panel A: Short Run Coefficient Estimates							
Variables/Lags	0	1	2	3	4	5	6
ΔLYPC		0.691 (5.55)***					
ΔMIS	-0.202 (-2.17)**						
ΔGDS	0.005 (3.11)***	0.004 (1.90)*	-0.004 (-2.12)**				
ΔOPEN	0.0003 (1.05)	0.0004 (1.32)	-0.001 (-3.5)***	-0.001 (-2.49)**			
ΔLTOT	0.593 (4.13)***	-0.331 (-2.10)**					
ΔINF	-0.001 (-1.48)	-0.002 (-2.04)*	-0.001 (-2.8)***				
ΔDCPS	0.0006 (1.04)	0.0007 (0.86)	0.002 (2.51)**				

Model 3

Non-Linear ARDL Model Estimates							
Panel A: Short Run Coefficient Estimates							
Variables/Lags	0	1	2	3	4	5	6
LYPC		-0.468 (-0.99)	0.543 (1.00)	-0.375 (-0.72)	0.516 (1.42)		

OVER-VAL	0.869 (3.43)***	-0.461 (-3.5)***	0.337 (3.15)**				
UNDER-VAL	-4.444 (-3.7)***	0.844 (0.77)	3.818 (3.00)***				
GDS	0.003 (1.94)						
OPEN	0.0005 (1.77)	0.002 (3.70)***	-0.0004 (-1.45)				
LTOT	0.721 (6.52)***	0.157 (0.79)	-0.145 (-1.09)				
INF	0.0005 (0.59)	-0.003 (-2.93)**	-0.0004 (-1.35)				
DCPS	-0.0004 (-0.75)	-0.002 (-2.21)*	0.004 (3.42)***				