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Exchange Rate Pass-Through and Inflation in Dollarized Economies: Evidence from the Middle Eastern and North African Countries

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Abstract

The investigation of exchange rate pass-through is an important issue in international finance. The relationship between exchange rate pass-through and exchange rate arrangements such as the dollarization regime has been examined in recent decades. For this purpose, the main objective of this study is to investigate the effect of exchange rate pass-through on the domestic inflation in selected Middle Eastern and North African countries with emphasis on the dollarization regime over the period from 1994 to 2012. The empirical model has been estimated by GMM approach for these countries. The main findings of this paper reveal that exchange rate appreciation (currency depreciation) has a positive and significant influence on the domestic inflation, and this effect is greater than in highly dollarized economies.

Keywords: Dollarization, Exchange Rate Pass-Through, Generalized method of moments, Inflation.
JEL Classification: C23; F31; F33

1. Introduction

The relationship between changes in exchange rates and the import prices, none as Exchange rate pass through (ERPT), has been in the center of economists' attention since the 1980s. While exchange rate pass-through has long been of interest, the focus of this interest has evolved considerably over time. After a long period of debate over the law of one price and convergence across countries, beginning in the late 1980s exchange rate pass-through studies emphasized industrial organization and the role of segmentation and price discrimination across geographically distinct product markets. More recently, pass-through issues play a central role in heated debates over appropriate monetary policies and exchange rate regime

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optimality. Low pass-through in import prices means that nominal exchange rate fluctuations may lead to lower expenditure switching effects of domestic monetary policy, thereby leaving monetary policy more effective for dealing with real shocks. Many studies are focused on the determinants of exchange rate pass through in developing and developed countries over recent years. These studies are mostly conducted on describing the factors of microeconomics such as market structure, demand price elasticity, price discrimination, and the effects of macroeconomics variables and especially currency and monetary regimes on currency rate pass through for the group of developing countries.

Owing to high inflation and unstable economic structures, it is expected that the dollarization policy take place in most developing countries in a few years. Dollarization, in a broad sense, is increasingly becoming a defining characteristic of many developing countries and emerging markets. Governments often borrow in dollars; individuals can hold dollar-denominated bank accounts, firms and households can borrow in dollars both domestically and from abroad. Regarding the fact that in a currency system based on dollarization, foreign currency substitutes the current currency of the country, changes in currency rates are expected to have a substantial effect on the consumer price level. In other words, in these conditions, the exchange rate pass through in prices would be higher. It is necessary to have a practical study in the case of countries which have experienced the dollarization system because of having higher inflation rates. In this paper, the countries located in the Middle East and North Africa have been chosen and dynamic Panel Data is used to estimate the research model for the aforementioned countries during 1994-2012.

The rest of the paper is organized as follows: Section 2 provides an overview of the literature about pass-through of exchange rate. The methodology and data are discussed in Section 3, and Section 4 reports the findings of the empirical analysis. Section 5 summarizes the study's major findings.

2. Literature review

In recent years there has been an impressive development of the literature on the macroeconomic implications of real exchange rate depreciations. In the aftermath of the Asian and Latin American crises of the 1990s, researchers began to challenge the common consensus that a real depreciation has a positive impact on aggregate demand and is expansionary, which is the traditional implication of models in the spirit of Mundell–Fleming.

The countries affected by the aforementioned crises experienced large depreciations that were at the same time accompanied by severe disruptions in the real sector of their economies. Behind all these contractionary episodes, there was usually a story of a currency mismatch generated by a high level of indebtedness in foreign currency. As a result, the standard Mundell–Fleming model was extended along the lines of Krugman (1999)

which incorporated, on top of the usual competitiveness effect, the negative impact on firms' net worth of a drastic exchange rate reduction. This additional consequence of real depreciations, known as the balance-sheet effect, produces a reduction of domestic investment that attenuates and may even compensate for the competitiveness effect on output.

Since then, this balance-sheet effect has been widely studied both theoretically (Aghion et al., 2001; Cespedes et al., 2003, 2004; Choi and Cook, 2004; Batini et al., 2007; Magud, 2007, among others), and empirically (Harvey and Roper, 1999; Calvo and Reinhart, 2002; Carranza et al., 2003; Aguiar, 2005, among others). Most of these analyses have stressed the negative impact on firms' net worth induced by a real depreciation, and the subsequent contractionary impact on output. However, there has been little attempt to analyze the consequences on macroeconomic variables other than output. In particular, the inflation pass-through literature has generally overlooked this balance-sheet effect and it remains the standard view that inflation pass-through is higher in highly dollarized economies than in non-dollarized ones (Reinhart et al., 2003; Choudhri et al., 2005, for some evidence to the contrary).

The objective of our paper is to conduct a more in-depth analysis of the pass-through from exchange rate changes into inflation by taking into account the balance-sheet effect likely present in highly dollarized economies (HDEs).

2.1. Exchange rates pass-through in highly dollarized economies (HDEs)

A real depreciation impacts domestic prices through the main channels. We could distinguish a direct channel- a real depreciation increases the relative prices of imported goods, which feeds into domestic inflation via the composition of the consumption bundle- and three indirect channels through output.

It is in these latter channels that we find the main differential features for HDEs. In an HDE a real depreciation can generate three effects on output. The first is the traditional expansionary competitiveness effect. A real depreciation reduces the relative price of the country's tradability, which initially leads to a larger demand for these trades and, as a consequence, to an increase in investment by the firms that have to meet this demand. The extent of this effect will be related to the degree of openness of the country and the capital intensity of the country's output.

Second, a real depreciation generates an indirect contractionary effect related to the increase in the financial cost of capital: imported capital goods become relatively more expensive. This effect will be more intense in a country that relies heavily on imported capital goods. However, it should not offset the competitiveness effect: it is the necessity of the firm to increase investment in order to meet the larger demand for its output that generates this added financial cost.

Third, and specific to HDEs, a real depreciation leads to a destabilization of the balance-sheet of firms with a currency mismatch between assets and liabilities. Agents with debt denominated in foreign currency but with assets -or income flows- denominated in domestic currency experience an instant deterioration in their net worth. This deterioration in the balance-sheets may be transferred to the firm's investment decisions via, for example, some financial restriction. If firms have to use their net worth as collateral for their investment decisions, their capacity to borrow is reduced after the real depreciation (e.g., Kiyotaki and Moore, 1997). Thus, a real depreciation could end up affecting aggregate demand negatively. This "balance-sheet" effect, which directly hinges on a financial restriction in the presence of a currency mismatch, has been studied by Aghion et al. (2001), Cespedes et al. (2003, 2004), Choi and Cook (2004) and Magud (2007), among others. The extent of this effect will depend on the degree of the dollarization of liabilities- "currency mismatch"- of the economy and on the proportion of tradable versus non-tradable in the composition of output. For non-tradable firms, the currency mismatch between assets and liabilities is likely to be acute, since their flow of income is denominated in domestic currency. Alternatively, for tradable firms the final balance-sheet effect may be attenuated. There are two basic reasons for this attenuation. First, if we think of both the assets of tradable firms (the flow of revenues) and the foreign debt to be denominated in foreign currency, a real depreciation may be irrelevant or, if the firm has also debt denominated in local currency, it may be positive given that the depreciation reduces the relative value of the said debt. Second, tradable firms are subject to the positive competitiveness effect to which non-tradable firms are not.

3. Model Specification, Data and Methodology

According to the economic literature as well as empirical studies by Carranza et al. (2009) and Fetai (2010), the following dynamic model has been specified:

$$P_{it} = \alpha_i + \beta_1 P_{it-1} + \beta_2 ER_{it} + \beta_3 DO_{it} + \beta_4 OPEN_{it} + \beta_5 GDP_{it} + \beta_6 Cap_{it} + U_{it} \qquad (1)$$

where P is the domestic inflation rate; $P_{it\text{-}1}$ represents the inflation index of each country in t-1 time as a proxy for inflation persistence; ER: the nominal exchange rate; DO: economic dollarization degree; OPEN: trade openness degree; GDP: growth rate of gross domestic output; Cap: growth rate of gross domestic fixed capital formation and U_{it} represents the error term. Also, the subscript "t" represents one of these 19-year periods, whereas i represents the country. Our analysis is based on the 19-year period covering 1994–2012 for the selected countries in the Middle East and North Africa (Bahrain, Egypt, Iran, Jordan, Kuwait, Lebanon, Oman, Saudi Arabia, UAE,

and Yemen). All variables are from World Development Indicators (WDI). According to the index that is defined as Reinhart et al. (2003), the dollarization measure is the composite index as the (normalized) sum of bank deposits in foreign currency as a share of broad money, total external debt as a share of GNP, and domestic government debt denominated in (or linked to) a foreign currency as a share of total domestic government debt. In addition, trade openness (OPEN) is measured by the foreign trade volume as a share of GDP, that is, (X+M)/GDP where X and M are export and import respectively. Moreover, Gross fixed capital formation as a share of GDP consists of plant, machinery, and equipment purchases, construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings, land improvements (e.g., fences and ditches). According to the 1993 SNA, net acquisitions of valuables are also considered capital formation.

The method of fixed effects is designed to control for the unobserved country-specific time-invariant effects in the data. However, it corrects for the possible correlation between these effects and some of the independent variables, conditioning them out by taking deviations from time-averaged sample means. The result of applying such a procedure is that the dependent variable is stripped of its long-run variation–an approach that may be inappropriate for studying a dynamic concept.

The most widely used alternative to the within estimation are the methods for dynamic panel estimation. The dynamic panel GMM estimators as Arellano-Bond difference system GMM are specifically designed to capture the joint endogeneity of some explanatory variables through the creation of a matrix of "internal" instruments. Arellano-Bond difference GMM uses lagged level observations as instruments for differenced variables.

GMM-based estimation is a technique for instrumental variable estimation and has several advantages over conventional IV estimators (2SLS). The conventional IV estimator is inefficient in the presence of heteroskedasticity. GMM makes use of the orthogonality conditions to allow for efficient estimation in the presence of heteroskedasticity of unknown form14. This analysis applies GMM-based Arellano-Bond linear dynamic panel estimation (Arellano and Bond, 1991; Arellano and Bover, 1995) commonly referred to as a difference GMM estimator. We used a one-step Arellano-Bond estimator with robust standard errors. A two-step estimator is more efficient, but the standard error might be downwardly biased for small samples (Arellano and Bond, 1991), as is the case here. Arellano-Bond estimation takes the first-difference from of Equation (1).

When transforming the regressors into first difference, potential biases caused by omitted variables and the fixed country-specific effect (geography and demographics, which may be correlated with the explanatory variables) are removed, as these do not vary with time. Under conventional IV estimation, these effects would be contained in the error term unless specified.

Another drawback of IV estimation is that the presence of the lagged dependent variable may give rise to autocorrelation, whereas in difference GMM estimation this problem is resolved as the first-differenced lagged dependent variable is also instrumented with its past levels.

Finally, the difference GMM estimator was designed for small time dimension and large cross sections which suited us as in our case time is equal to 18 years while cross sections are 10.

To control for endogeneity, the difference GMM estimator adds lagged levels of the endogenous regressors in addition to using the exogenous variables as instruments. This is because the error term in first-difference tends to be correlated with the first-difference of the dependent variable. By instrumenting lagged values of regressors it makes them pre-determined and therefore, these are not correlated with the error term.

This analysis also uses lagged values of dependent and independent variables in level form as instruments in equation of first-difference form. However, this method can only control the weak forms of endogeneity since it assumes these variables are weakly exogenous, which means that they could be affected by dependent variables but are not correlated with the error term. The validity of this assumption can be tested using the Sargan test of over-identifying restrictions, which tests the overall validity of the instruments and the second-order serial correlation test that hypothesizes that the error term is not serially correlated (Arellano and Bond, 1991; Arellano and Bover, 1995; Blundell and Bond, 1998).

4. Results

In order to evaluate the effect of exchange rate pass-through on inflationary environment in the Middle Eastern and North African countries with the dollarization system, a generalized method of moments has been used. The results have been reported in Table 1.

Table 1. the results of the estimated model

Variables	coefficients	z-statistic	p-value
P_{it-1}	0.73	123.85	0
ER_{it}	2.63	48.53	0
DO_{it}	0.25	5.95	0
$OPEN_{it}$	-0.19	-7.89	0
GDP_{it}	-0.29	-3.56	0.04
Cap_{it}	-0.08	113.24	0
Sargan statistic	12.39	----	----
Degrees of freedom	25	----	----
p-value of Sargan test	0.98	----	----
Number of observations	161	----	---

Regarding the results, the exchange rate has a positive and significant relationship with domestic prices in the mentioned countries. Hence, by increasing one percent in exchange rate, the inflation rate increases 2.63 percent. Moreover, economic dollarization has a direct relation to inflation rate, too. However, trade openness has a negative relation to the prices. In other words, by increasing the trade volume, the transition effect of exchange rate on domestic prices can become lower. Owing to increment of openness, each country has the main role in determining international prices, so it's expected that under these conditions exchange rate changes have lower transition effects on the import and consumer prices. The market size variable that is measured by the growth rate of gross domestic product (GDP) has negative influences on the inflation rate. In order words, by increasing the size of the economy, the power of countries in contract to the effect of exchange rate changes on domestic prices have been increased and currency rate has lower transition effects on the price of domestic and consumer goods. Besides, increase of the growth rate of gross fixed capital formation set the stage for decreasing in inflation pressure from the demand side.

What is more, in terms of the Sargan test statistic, there is no correlation between instrumental variables and residuals, so the validity of instrumental variables is confirmed in the model. Moreover, Arellano and Bond (1991) test has been used to determine the order of residuals autocorrelations.

Table 2. The results of Arellano-Bond test

Correlation rank	z-statistic	p-value
1	-1.28	0.003
2	0.27	0.75

According to the results in Table 2, the order of autocorrelation among residuals is one, so the Arellano and Bond method is an appropriate test to omit the fixed effect of the model. In other words, the order of autocorrelation implies the optimum lag for the variables. As a result, the estimated model with the first differential order is the best model.

5. Conclusion

This paper empirically analyzes the relationship between exchange rate pass-through and inflationary environment in some Middle Eastern and North African countries over the period of 1994-2012. For this purpose, the dynamic panel data approach and the generalized method of moment estimation are applied to estimate the model. The results indicate the positive and significant impact of nominal exchange rate changes, the degree of economic dollarization, and persistence of inflation on the growth rate of consumer prices. Likewise, the influences of growth rate of gross domestic fixed capital formation, growth rate of gross domestic product (GDP), and economic openness on inflation rate are negative and significant.

On the basis of the presented results, simulations of an empirical model show that the effects of the dollarization degree on inflation rate can have a quantitatively significant effect on the relationship between pass-through of exchange rate and the price level. In other words, by increasing the domestic debt in foreign currency and replacing domestic currency with foreign currency, large depreciations have a greater effect on inflation rate or the growth rate of consumer prices. The results of our extensive empirical analysis are consistent with the accepted view that pass-through coefficients are larger in HDEs. Also, the results of this paper are consistent with the theoretical framework of exchange rate pass-through and empirical studies such as Carranza et al. (2009) and Fetai (2010).

This finding may assist policymakers and monetary authorities in formulating policies. In essence, when designing and implementing exchange rate based stabilization policies, they should take into account that by adopting the dollarization system, the inflationary environment is more affected by the nominal exchange rate variations.

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