Inflation and Exchange Rate Regimes: Evidence from MENA[1] Countries

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Abstract

In this study, we empirically test whether pegged regime was successful in achieving price stability in 17 MENA countries over the 1980-2007 period.

Taking into account country heterogeneity, as well as endogeneity of exchange rate regimes we estimate dynamic panel-data models of the effects of exchange rate regimes on inflation using various classification schemas. Our results give evidence of strong relationship between the choice of exchange rate regime and inflation. The disjunction between *de jure* and *de facto* policies yields different results. *De jure* fixed exchange rate was not successful in assuring lower and stable inflation rate as theoretically supposed because monetary policy commitment was lacking credibility. On the contrary, using *de facto* measures of exchange rate policies, inflation rate is found to be much lower under *de facto* pegged regimes than under *de facto* flexible regimes. A robustness test account for discrepancy between *de jure* and *de facto* behaviour show that a credible fixed exchange regime as well as a fear of floating behaviour contribute significantly to lower inflation rate.

Key Words: Inflation, Exchange rate regime, Instrumental variable GMM
Jel Code: F31, F33

[1] MENA stands for Middle Eastern and North African countries

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1. Introduction

Over past decades, MENA has experienced several inflationary shocks. To deal with price volatility and to curb inflation, many MENA countries have chosen the policy of fixed exchange rates as the preferred policy anchor. The idea was that by pegging their national currencies to the currency of a country with strong institutions and traditions of stability they import credibility and confidence to their economies. However, the decision of pegging the exchange rate comes at the expense of loosing monetary policy independency. Nevertheless, the under-developed monetary institutions undermine the capacity of monetary authorities to use discretionary monetary policy successfully. In addition, fixed exchange rate regime- to the limit of its sustainability- appears to be the best means in achieving price stability as for various reasons[2], many MENA countries were reluctant to let the nominal exchange rate adjust freely. Indeed, exchange rate as a nominal anchor provides a highly visible commitment, inciting an optimal macroeconomic performance especially if political costs of loose monetary and fiscal policies are high.

In the early 1990s, some MENA countries, while ensuring reforms, have adopted more flexible exchange rate policies allowing some scope for monetary policy independency. Greater exchange rate flexibility seems to perform relatively well in term of inflation performance during these last past years.[3] The run-up of USA's inflation rate and subsequent dollar depreciations coupled with world market price explosion have exacerbated inflation in all MENA countries with pegged regimes to the US dollar returning to the forefront the debate about the appropriateness of fixed exchange rate to the US dollar in assuring price stability. However, although this question has been renewed recently, there was no explicit study that tries to evaluate the experience of different MENA counties with pegged regimes.

[2] These reasons are related to the fear of floating hypothesis proposed mainly be Calvo and Reinhart (2002) and to the original sin hypothesis proposed by Eichengreen and Hausmann (1999). The flexibility of exchange may be an independent source of inflation for countries that are more open (higher pass-through from exchange rate to inflation), with high liability dollarization or with high ratio of debt in foreign currency.

[3] Several countries, Turkey, Egypt, have put in place, more recently, an inflation targeting frameworks or some form of this monetary policy framework while other MENA countries such as Morocco and Tunisia are implicitly targeting inflation, and are slowly moving towards an inflation-targeting regime. (See Neaime 2008 for more detail).

Several influential papers try to assess the relationship between the choice of a particular exchange rate regime and inflation using a worldwide sample of countries. The results were highly dependent on the sample selection, methods of estimation, classification schemas used as well as the boundary between fixed and flexible exchange rate regimes, making it difficult to assign a univocal relation between exchange rate regime choice and inflation outcome, but open an empirical question pertaining to analyse this relation in a specific region or sub-sample of countries.

In this paper, we depart from many existing empirical studies in an essay to set out the relative importance of the link between exchange rate regimes and inflation performance in seventeen MENA countries for the period from 1980 to 2007. More precisely, we aim to test empirically if either *de jure* or *de facto* pegged exchange rates were successful in insuring low and more stable inflation during the past three decades.

The rest of the paper is organized as follows; in the next section, we review some empirical studies conducted on the relationship between the nature of the exchange rate regime and inflation performance. Then, we present some stylized facts on the connection between exchange rate regimes and inflation behaviour in our sample, focusing briefly on signal country experience with various exchange rate regimes. In section four, we develop the model and the testing methodologies, present our empirical results and provide a robustness test to evaluate the effects of discrepancy and/or consistency between *de jure* and *de facto* behaviour on inflation outcome. Finally, section five conclusion.

2 Inflation Performance and Exchange Rate Regime: A Literature Review

The earlier research on the relationship between exchange rate regime and inflation performance was based on the concept of the nominal anchor. In an environment of high inflation, pegging a country's currency to a major currency with which enjoy low inflation was regarded as a precommitment mechanism to anchor inflationary expectations which is to guarantee a stable currency (credibility effects) [4], as well as to ensure fiscal policy discipline (, i.e. balanced state budget).

[4] See Giavazzi and Giovannini, 1989; and Klein and Shambaugh 2007

This analysis suggests that in the context of fixed exchange rate, being a high visible commitment, expectations may respond to the exchange rate movements raising the political cost of loose monetary and fiscal policies, thus allowing government to resist to the temptation of following lax excessive macroeconomic policies in order to maintain confidence in the fix, Obstfield and Rogoff (1995), Ghosh et al (1996, 1997).

This conventional wisdom, according to which fixed rate regimes provide more fiscal discipline than flexible regimes, has been questioned theoretically and empirically by Tomell and Velasco (2000). In their inter-temporal approach, they show that a lax fiscal policy today is reflected more quickly in current exchange-rate movements under floating exchange rate, whereas pressures are allowed to build and accumulate under fixed rates until they overwhelm the system. So a floating rate can provide indeed more incentive for consistent fiscal behaviour.

Notwithstanding the above theoretical explanations, empirical evidence shows that the credibility and macroeconomic discipline of fixed rates is neither automatic nor guaranteed. In practice, policy makers could use "cheap talk" to pursue time-inconsistent policies. Government may have incentive to create surprise inflation in order to achieve a short term gain impairing hence to their credibility. [5] The lack of credibility induces changes in future expectations, leading to higher inflation rates..

In spite of the theoretical links, the empirical evidences have proven to be elusive rather turns to find a favourable link between fixed exchange rate regimes and price stability.
Such relation is found to be highly dependant on a plentiful of factors, including the characteristics of countries under study, as fixed exchange rate regimes seem operate with varying strength in different economies; the quality of institution; the level of details in the regime classification ; the sensitivity of results to the classification algorithm included ; the influence of shocks and exchange rate collapse on the outcome and therefore on capturing the true impact of exchange rate regime on inflation (survivor bias); the effects of changes in inflation expectations when the exchange rate regime switch (Lucas critique).

[5] The theoretical reasoning follows from Barro and Gordon Model which shows that policy makers are concerned not only about inflation as policy goals but also with the fact that inflation (at least to the extent that is unexpected) may carry benefits as well. Therefore peg does not eliminate the incentive to create an inflation bias thereby printing more money in order to expand the economic activities in the short run. Assuming rational expectations, this may impairs the credibility because public realizes the authorities incentives and adjust their prices and wages accordingly so inflation surprise can not work systematically and the country end up with higher inflation rate without any gain in term of output growth.

Moreover, many of these studies recognize the difficulty in assessing the impact of exchange rate regime on inflation, due to the possible effect of endogeneity, and have attempted to control for this endogeneity in several ways.

Here we present a short review of empirical studies that have investigated the relationship between exchange rate regime and inflation controlling for some of the previously mentioned factors.

Ghosh, Guld, Ostry, and Wolf (1997) analyse inflation performance across different exchange rate regime either *de jure* or *de facto* for a sample consisting of a significant number of countries (136 industrialized and developing countries) covering the period from 1960 until 1990. They found that inflation rate and inflation volatility was both lower and more stable under pegged regimes than under intermediate[6] and floating regimes. This good inflation performance under fixed exchange rate is achieved, in part, through discipline effects -a tight monetary policy- thereby lower money supply growth. This effect seems to be greater than the credibility effects steaming from a more robust demand for money. Controlling for exchange rate endogeneity did not change their results. However, testing the robustness of results under a cross sub-groups points out two exceptions. For countries with very low inflation rates (generally high-income countries) where credibility is gained from other mechanisms such as the absence of capital controls and for countries with frequent change in their parities, where credibility is low; the choice of the exchange rate regime have only a small marginal effect.

In Contrast, Levy-Yeyati and Sturzenegger (2000) ,using their *de facto* classification of exchange rate regimes for 159 countries during 1974-1999 period, found that inflation was quite similar in countries with fixed or pure floating regimes but were much higher in countries with intermediate regimes.

Rogoff, Husain, Mody, Brooksand Oomes (2003) found, separating the 120 economies in their sample into three groups; developing, emerging markets and advanced, during the 1940-2001 period, that exchange-rate flexibility was associated with higher inflation rate in developing economies. One explanation is that theses countries lack sound institutions and a strong anti-inflation track record. These economies may have gained credibility and enhanced policy discipline (thereby, lowering interest rates) by adopting pegged rates. They also found that inflation performance in emerging markets did not exhibit a significant relationship with the degree of exchange-rate flexibility, while for advanced economies evidence indicates that

[6] The coefficient for intermediate regime was statistically insignificant.

inflation decline with exchange-rate flexibility because of enhanced credibility and policy discipline under strong institutions, an independent central bank with a clear anti-inflation mandate.

Bleaney and Francisco (2005), Using data from a large sample of developing countries from 1985 to 2001, find that hard peg arrangement exerts a negative significant impact on inflation in comparison to soft peg and floating regimes. Comparing soft peg with floating regime show a high sensitivity of results to the classification methodology employed. For example, while there were no significant difference between soft peg and floating regimes under *de jure* IMF, *de facto* Levy-Yeyati and Sturzenegger (LYS) and Bubula Otker-Robe (BOR) classifications, inflation rate was shown to be significantly higher using Shambaugh (JS) and Reinhart and Rogoff (RR) *de facto* classifications.

Domac, Peters and Yuzefovich. (2004) perform their analysis on a sample of 22 transition economies through 1999s. Controlling for Lucas critiques and exchange rate endogeneity, they found that the credibility associated with fixed exchange rate helps policy makers to achieve lower inflation outcome. Same results were found by Moreno (2000 and 2001) on a sampler of 98 developing countries for the period 1974-1999. His conclusion about the superiority of pegged regime did not change after excluding high inflation episodes and period of currency crisis preceded by a peg. More recently, De Grauw and Schnabl (2008) conduct their investigation using GMM estimation technique, to account for endogeneity, on on 19 South Eastern and Central European countries over the period 1994-2004. Their findings reveal that exchange rate stability contributes significantly to low inflation rate. Or, by removing the outliers from the sample and by conducting their analysing on two sub-periods; a high inflation period (1994- 1997) and a low inflation period (1998-2004), the evidence in favour of negative association between exchange rate stability and inflation disappears.

Concerning MENA countries, the first study, to our knowledge, that tried to address this relation is this of El-Achkar and Shahin (2009). Using pooled OLS regression and IMF *de jure* and Bubula Otker Robe classification, they did not find any significant difference between exchange rate arrangements and inflation performance in sample of eighteen MENA countries over the period of 1975 to 2005. Even after running the regression on sub-regional sample, the fixed exchange rate regime dummy still insignificant. The authors acknowledge that their results may be driven by endogeneity of exchange rate regime, nevertheless, they did not control for it. In this paper, we also examine the experience of MENA countries in the last three decades but unlike El-Achkar and Shahin (2009) we control directly for country

heterogeneity by running fixed effects estimation using *de jure* as well as two *de facto* classifications. Our finding is then tested for potential endogeneity as such test can change the interpretation of results. Our results reveal a discrepancy in performance between *de jure* and *de facto* pegged policies. Official declaration of fixed exchange rate seems to be insignificant however, controlling for endogeneity show that inflation rate was higher in countries claiming to be fixer while de facto fixer realise better inflation performance than countries with more flexible arrangements. Indeed, credibly pegged regime where the official *de jure* and the real *de facto* behaviour are consistent and / or fear of floating practice, where announced floating regime was *de facto* peg one, contribute significantly to lower inflation.

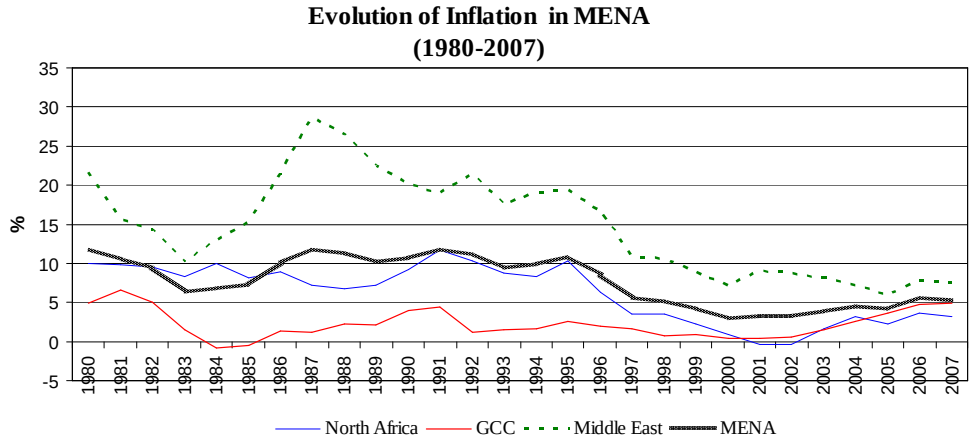
3 Inflation and Exchange Rate Regime in MENA

In this section, we first present an overall picture of inflation development in MENA, and then we compare inflation performance under pegged and non pegged exchange rate arrangements using various exchange rate classifications. Finally, we examine each country-specific experience under alternative exchange rate policies.

3.1 Inflation Evolution: an overview picture

Figure (1) gives an over all picture on the evolution of inflation in MENA as a group and a comparative inflation performance at regional level.

Figure 1



Over the past three decades, the dynamic process of inflation is affected by a combination of global and domestic factors. At the beginning of 1980s, inflation showed a declining trend culminating ultimately in price collapse. However, at the end of 1985 the situation changed

rapidly. The inflation surged extremely fast and became more volatile till mid 1990s, the ongoing geopolitical tension, as like the Iranian-Iraqian wars in 1988, Gulf war 1990-1991 was in cause. In the late of 1990s and early 2000s, inflation has declined from double to signal digits, reflecting improvements in the terms of trade and stronger demand management policies.

A new phase of acceleration in inflation starts thereafter. This new increase could be explained by exogenous shocks to the region, such as American-led war against Iraq in 2003, which has had serious consequences for the region countries and higher prices for oil and other commodity prices on international market, reflecting growing demand from emerging market countries. Even more, the subsequent weakness of the dollar has added additional inflationary pressure in countries that peg to the US dollar. This is due not only to nominal depreciation and higher prices for imports, but also to constraining central banks independency in their use of interest rates to tackle rising inflation taking in mind that the room to manoeuvre in the area of interest rates depends on the degree of capital account liberalisation.

Regionally, there were no much differences in inflation convergence. Whereas, inflation rate was much lower in average in the Gulf countries than in the other regions in MENA. However, by the end of 2000s, inflation differential between the three regions became small. Moreover, average inflation rate in the Maghreb countries was superior to that of the Gulf countries due in part to the appreciation of their currencies face to the US dollar. The magnitude of differences during early 1980 to mid 1990s was many time higher than late 1990s and 2000s.

3.2 Inflation and Exchange Rate Regime: de facto/ de jure?

In this sub-section, we use official *de jure* IMF exchange rate classification in addition to two alternatives *de facto* classifications; Levy-Yeyati and Sturzenegger (2005) (in what follows, LYS) and this of Reinhart and Rogoff (2007) (in what follows, RR) to assess statically whether inflation is lower under fixed exchange rate regimes than under more flexible ones. The rule we use to separate exchange rate regime categories into pegged regimes and non pegged regimes depend on the widths of bands within the fixed exchange rate is allowed to move. In this case history offer some gaudiness, countries that keep its exchange rate with in +-2% bands have been considered as pegged. This rule seems to be appropriate to ensure the

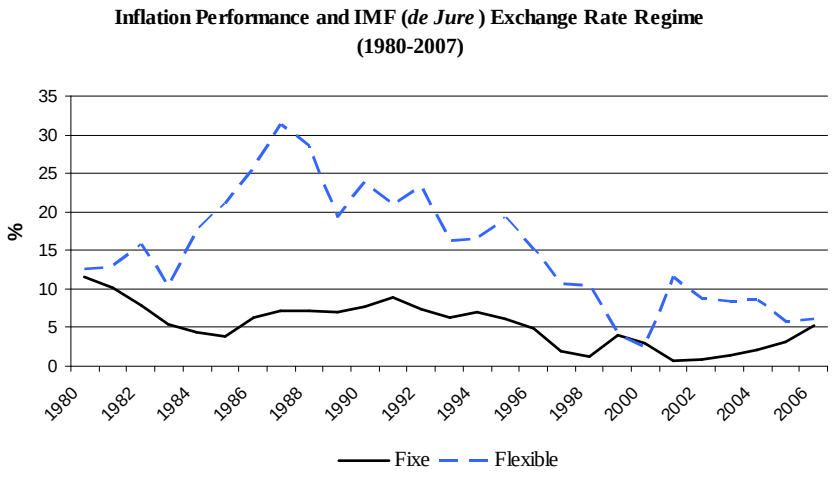
comparability of results across these three classifications even if their definition of pegs is rather different. Since, crawling peg within +-2 in the RR classification is only included in the pegs category.

In fact, several authors consider crawling pegs and bands categories in the intermediate categories. Even Ghosh, Gulde, Ostry and Wolf (2002) include it in the more flexible arrangement when they try to regroup exchange rate observation in only two sub-groups.

The theoretical problem with intermediate regimes is that they offer policy makers more flexible mechanism to deal with external negative shocks such as freedom to slow down disinflation, to augment fiscal expenditures in order to counteract recession. Therfore, it is not obvious whether crawling pegs and bands regimes serve as a nominal anchor or as an instrument to limit output loose. These exchange rate regimes make it easier to flout the rules of the pegged exchange rate. In contrary, Bleneay and Francisco (2005) argue that pegs is only crawl as a result of inflation, so that treating a crawling peg like other than a peg would bias the results toward finding of lower inflation for pegs [7].

The following figures (2 to 4) compare average inflation performance of MENA under fixed and more flexible exchange rate arrangements, using de jure IMF classification and two de facto alternative classifications.

Figure 2



[7] Crawling pegs categories were included in the fixed group, except in the case of LYS classification since it is not obvious how to distinguish crawling pegs and dirty float regimes from each other and thus, we grouped them together in the more flexible categories to avoid measurement errors.

Figure 3

Inflation Performance and RR (*de Facto*) Exchange Rate Regime (1980-2007)

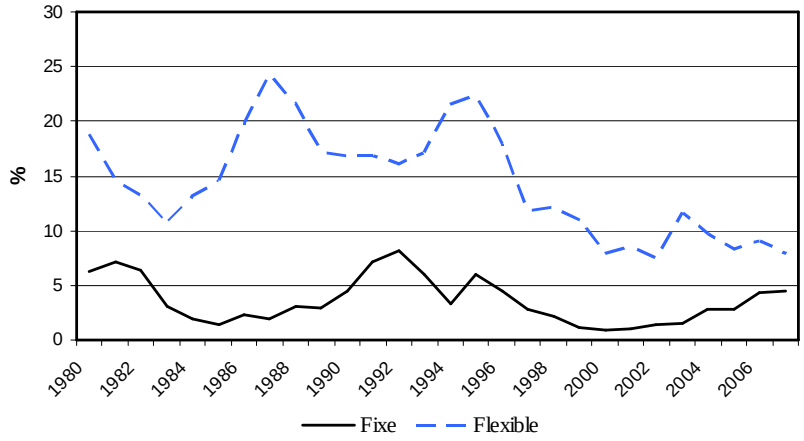
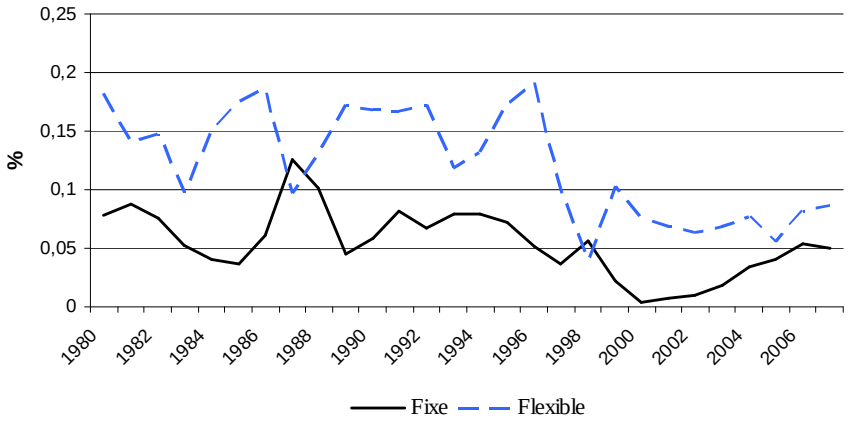


Figure 4

Inflation Performance LYS (*de Facto*) Exchange Rate Regime (1980-2007)



We see obviously that no matter which classification is employed, the different classifications assign the lowest value to the fixed exchange rate and the highest one to the flexible ones.[8] Moreover, the superiority of pegs group in term of inflation appears more clearly with RR classification. Indeed, inflation appears to have consistently worsened during mid-1980s until the early 1990s and that inflation performance since 2002 reveals an apparent convergence between countries with fixed and flexible regimes. Pegged group shows upward trend in

[8] Our results may be influenced by the fact that the sample includes countries that had already adopted floating regimes, and which moved to more flexible regime after a crisis. Nevertheless, even after removing high inflation, the group of countries under fixed exchange rate regime show better inflation performance.

inflation rates while flexible group shows a downward trend in inflation rate however, this trend was not rather continuous.

3.3 Inflation and Exchange Rate Regime: A Country-Specific Experience

The credibility of fixed regimes may be viewed with different degree in different countries. Even more, exchange rate peg may become more credible over times as long as monetary and fiscal policies are consisting, or less credible as ream of nominal depreciation mounts.[9] Indeed, institutional framework, level of international reserves and political stability may make a given regime more or less stable. The credibility and the longevity of pegs regimes in the region have been influenced as much by diverging macroeconomic conditions. Adding the instability of regional security, the sustainability of fixed rate was often tested by speculators. So evaluation country specific experience may be also matter for evaluating the impact of fixed exchange rate policies on inflation performance.

Table (2, annex I) presents before and after comparison of average changes in inflation rates when a country in our sample switched from one *de jure* regime to another for the 1980 - 2007 period.

A closer look reveals some divergent picture to the relation between exchange rate flexibility (rigidity) and average inflating rate in our sample. For example, while some MENA countries (e.g Egypt, Algeria, Tunisia, Turkey and Yemen) witnessed a reduction in average inflation rate when they moved toward more flexible exchange rate arrangements, other MENA countries who stayed or moved to more rigid form of exchange rate regimes (e.g, Lebanon, Morocco and Jordan) experienced a pronounced reduction in inflation.

However, in general the Gulf's Countries also known as the Gulf Cooperation Council Countries (GCC) register the best inflation performance than other MENA sub-groups.

The GCC countries were successful in maintaining a highly credible and long standing *de facto* pegged exchange rate to the US dollar, consistent economic policies and flexible labour and product markets. Overall, the peg to the dollar has worked well in these countries, keeping

[9] Aizenman and Glick (2007) show that there is a large gain from choosing a pegged exchange rate as long as the regime remains in place for long time, not only in order to mitigate the inflation bias from the well-known time inconsistency problem, but also to steer the economy away from the high inflation equilibria. However, the cost of regime's change and the output contraction will be great.

inflation relatively low and strengthening confidence in currencies and in the economies more generally. Nevertheless, there were some differences across countries in GCC region. Five Gulf countries were categorized as showing limited flexibility vis-à-vis the US dollar. Starting 2000, the regime is classified as adjustable peg to the US dollar in a step towards the single currency. Inflation performance was a little bit better under limited flexibility regime than under conventional peg. AK, UAE, QTR, while KWT and BHR have shown some moderated decrease in inflation. Inflation average in Oman was about 0.9% under its pegged exchange rate to the signal US dollar, which has been maintained over all the period.

However, since 2002, the GCC countries suffer increasing inflationary pressures casting doubts on the appropriateness of keeping this strong connection with the US dollar. High oil prices generate increases in the monetary base, while in the same time the domestic monetary policy was subordinated to that of the united state as the domestic interest rate has to be aligned to the lower US rate encouraging hence credit expansion. This occurs at a time when the rapidly growing economies of the GCC countries would have required more stringent monetary policies. In addition to the liquidity effect, the depreciation of the dollar raises prices for a wide range of imported goods, with significant repercussions on the costs of domestic production and living cost, prompting hence demand for wages increases, fuelling inflation pressure that was initiated by high oil prices.

Maghreb countries (Arab Maghreb Union), has enjoyed recently a favourable convergence in inflation performance. This is due in grand party to the appreciation of their currency against the US dollar which was very helpful in containing inflation.

Among Maghreb countries, Morocco has shown better inflationary performance under conventional fixed peg arrangements against a composite of currencies that have been in place since 1990. Before this date, Morocco has a managed floatingt regime. Average inflation declined to 3.6 percentage points following their adoption of pegged exchange rate regime.

Libya has an average inflation of 4% under the conventional fixed peg to a basket of currencies. Libya ensure stability in inflation which may be not related to the fixed exchange rate regime but to the structure of its economy characterized by a low population, large petroleum resources and a real financial power.

Over period 1980-1988, Tunisia had a conventional peg to a composite of currencies and a managed float regime since then. However, through the second period exchange rate has been characterized as a crawling bands regime in 1999 and 2000 and as a crawling peg during

2003-2005. While inflation rate was, in average, lower under more flexible exchange rate arrangements, it was 1.5 percent point lower under crawling peg and bands than under managed float regime.

Algeria operated under a conventional fixed peg against a composite of currencies until 1994. In 1995, the country has opted for a managed float regime. Due to the high dependence of the economy on oil revenue, the country was very sensitive to term of trade shocks. The oil crisis occurred in 1986 has seriously affected the economy. Inflation rate, budget deficit and debt ratio has risen continuously. Faced with all these difficulties, the country give up the peg and opted for managed float regime. The average inflation rate has declined by 3 percentage points in the years following the adoption of the new regime.

As for Algeria, other MENA countries (e.g. Egypt, Iran, and Turkey) have been moving away from employing the exchange rate as a nominal anchor. Following several shocks, the central banks with finite reserve were not able to defend a tight nominal anchor commitment.
In Egypt the exchange rate was fixed to the US dollar. However, the economy was subject to several external shocks; sharp drop in oil prices and the associated revenues, to the Gulf War in the 90s that caused the remittances of individuals working there to fall. All these shocks have affected the economy negatively and contributed to a large macroeconomic distortions (e.g. balance of payment deficit, high inflation, and significant level of debt) inducing also a foreign exchange reserve losses in defending the peg.
All these disruptive shocks weakened the confidence in the Egyptian currency which was subject to several devaluations. Under such a pressure, the authorities put in place a managed floatting regime. Through 1980s, period under fixed rate regime, inflation was about 14% comparing to 3% under managed float regime. However, in 1999, Egypt has re-linked its currency to the dollar within horizontal bands but, the pressures on the exchange rate have not eased causing a depreciation of over 35% vis-à-vis the dollar since mid-2000 until early 2003 when Egypt re-adopted a floating exchange rate regime. Recently (since 2007), the monetary authority has met in place an inflation target system that seems to perform well in reducing inflation.

Iran's economy has a fixed exchange rate to special drawing right (SDR) until 1992. As for Egypt, several shocks have obligated the monetary authorities to end up the peg and an independent float regime has been put in place until 1995. Thereafter the country operates

under a managed floatting regime. Inflation varied from 14.5% under the pegged rate to 18% under floating regimes. Recently, the country is classified as having a crawling peg regime with average inflation of 14%.

From 1982 to 1998, Turkey was operating under a managed float regime. Inflation has registered an average rate of 12.4 percent. In an attempt to stabilize, the economy that was plagued by chronic high inflation, high real interest rates and deteriorated debt dynamics, the authorities launched an inflation stabilization program in January, 2000 and the country introduced a crawling peg regime. However, the country's expansionary fiscal policy prevented the regime from sufficiently curbing inflation. In addition, serious weaknesses in the banking system and severe terms of trade shocks, flag growing macroeconomic vulnerabilities, has led to the collapse of the stabilization program. As a result, a floating exchange rate regime was adopted on February 22, 2001. After the adoption of the independent floating regime, inflation has reduced by 10 percent point.

From 1980 to 1998, Lebanon was operating under independent floating regime. Through this period, the country experienced a period of monetary instability and high inflation rate (18% in average) which arrived to its peaks at the end of civil war. In 1999, Lebanon has opted to peg its currency to the US dollar. The decision was based on the expectation that the dollar peg would maintain stability and strengthen confidence in the economy, which was suffering from low growth rate, high level of inflation, unemployment and budget deficit as well as a huge foreign debt accumulation. Lebanon was successful in maintaining the peg due to the undertaken reforms, which aimed primarily to stimulate growth, and rationing public expenditure. The acceleration of the privatization program was undertaken in an effort to increase the government's financial position and to absorb any space outside of the effect exerted by the public sector on the foreign exchange market. During the fixed exchange rate regime, the gain of credibility was very helpful in stabilising inflation that has dropped to 2.6% percent.

Jordan has maintained an official fixed exchange rate to the U.S. dollar with open capital control since 1999. Before this date it has a peg to a trade-weighted basket of currencies. However, In 1988/1989 the Jordanian economy experienced bad economic shock, large currency outflows and erosion in foreign exchange reserves due to political fluctuations in the region. As the pressure became very serious, the central bank was obligated to respond by putting a

managed float in place, devaluing the currency, and restricting capital outflows. Nevertheless, this does not still for long time; in 1990, the Jordanian dinar re-pegged to a basket of currencies and at the end of 1990s, the Central Bank of Jordan has tightened its exchange rate regime by a peg to the US dollar. The inflation rate has decreased by 2 percent point after the adoption of the more rigid regime.

Syria has a fixed peg to the U.S. dollar through all the period. The exchange rate system was characterized by multiple exchange rates accompanied by capital and foreign currency controls. The system of exchange rates has undergone considerable changes in the last decade. Syria has made a substantial progress in reducing the distortions of exchange rates. A unification and realignment of exchange rates has been implemented since 1999. Since 2007, the exchange-rate regime is classified as a peg within horizontal bands to a basket of currencies. The composition of the country's foreign-exchange reserves was gradually altered, so that by the beginning of 2007 half of the stock of reserves was denominated in euro.

Finally, for the Yemen, the poorest state in MENA, data on inflation were not available before 1990. However, the Yemen was having a fixed peg to the US dollar until 1996. In1997 the Yemen has abolished the system of multiple exchange rates and put in oeuvre a free floating exchange rate system until 2006 when it became a tightly managed floating regime. Inflation however has decreased significantly from 25% to 8% and 10% percent respectively.

4 Empirical Evidences

In this section, we test the connection between exchange rate regime and inflation empirically in order to see whether the conclusion issued from simple descriptive statistics still hold.

4.1 Model Specification

Our data constitute an unbalanced panel due to missing observations; the actual sample contains 446 observations. The main source of our data is the IMF‘s *International Financial Statistics* (IFS 2009) and the *World’s Bank’s Development Indicators* (WDI). See table (3) in the appendix for more detail on the construction and sources of data.
Our dynamic model of inflation can be written as:

$$\pi_{i,t} = \alpha_0 + \lambda \pi_{i,t-1} + \beta_1 M1_{i,t} + \beta_2 GDP_{i,t} + \beta_3 ERR_{i,t} + \beta_4 OPEN_{i,t} + \beta_5 Oil_{i,t} + \varepsilon_{i,t}$$

Where $\pi_{i,t}$ refer to inflation rate and $\pi_{i,t-1}$ is a lagged inflation rate which captures inflation persistence as well as the role of expectation λ <1

The term $\varepsilon_{i,t}$ is a mean zero disturbance: E(ε)=0 and $\varepsilon_{i,t}$ is a specified error component model:

$$\varepsilon_{i,t} = \mu_i + e_{i,t} \qquad i = 1, \ldots, I, \qquad t = 1, \ldots, T \qquad \text{where ;}$$

μ_i is country-specific effect and $e_{i,t}$ is white noise and E(μ_i) = E($e_{i,t}$) =E($\mu_i e_{i,t}$)=0

We assume initially that the transient errors are serially uncorrelated but we relax this assumption latter.

The framework of our analysis can be described as a monetary model of inflation, in which inflation is determined by two fundamental causes, the growth rate of money $M_{i,t}$ and real output $GDP_{i,t}$. The changes in real GDP and money capture the impact of supply response and changes in money supply on inflation. It is supposed that prolonged increases in prices are associated with increases in the nominal quantity of money. However, a country with a higher growth rate of output tends to have lower rate of inflation for a given rate of money growth. Therefore, difference in the growth rates of output explains some of the imperfect association between money growth and inflation.

To this model, we add our variable of interest, the type of exchange rate regime *ERR i,t.* Using various classification strategies, the exchange rate regime variable is measured as a dummy variable that takes the value of 1 if a fixed exchange rate regimes are in place and 0 otherwise. We expect that fixed rate helps in stabilisation inflation, but to the extent it is credible.

We also add openness to trade variable *OPEN i,t* to control for potential disciplinary effect.[10] The sign of this variable could potentially carry a positive or negative sign as the current literature is some what divergent. For example, Romer (1993) argue that in a more open

[10] Fiscal stance captured by government budget balance to GDP could be an important factor that may play a key role in the evolution of prices in MENA however data were not available for grand number of countries. In addition, available data was subject to larger real time measurement errors. Nevertheless, although the fiscal policy consideration is not directly considered in the regression, its impact on inflation is introduced indirectly through the money supply growth variable. Sarget and Wallace (1981) argue that for certain time path of fiscal deficit effectively commits government to follow a policy of inflationary deficit finance.

economies, policy makers have less incentive to adopt an expansionary monetary policy as an unanticipated monetary expansion induces real exchange rate depreciation which, in turn, generates a large increase in inflation. However, Romer's argument has been challenged by Lane (1995). Lane argues that, the openness inflation relationship is rather due to imperfect competition and nominal price rigidity in the non tradable sector. Given the predetermined prices in the non tradable sector, a surprise monetary expansion increases production in the non tradable sector which is socially beneficial. In consequence, in a more open economy, where the share of non tradable in the consumption is smaller, an inverse relationship may exist between openness and incentive to unleash surprise inflation. Moreover, Alfaro (2005) obtains a positive relationship between trade openness and inflation for 130 countries over the period 1973-1998.

In addition to this factor, we include real oil price shock $Oil_{i,t}$. A rise in oil price is likely to increase the cost of production and to decrease aggregate demand (consumption and latter investment) reducing real output supply and hence the demand for real cash balances leading price level to raises given a nominal quantity of money, (Gordon, 1984).

However, we could expect that oil prices shock affects differently oil's importing and oil's exporting countries. For oil importing countries a positive relation between oil prices increases and inflation may holds while for oil exporting countries, a rise in oil prices (a positive term of trade shock) raises directly the country's currency value and net wealth, leading to higher consumption and investment. However, the total effects of real oil-price shocks on inflation depend on several factors like as; shock persistence, the dependency of the economy on oil revenue, the type of exchange rate regime, and the value of the dollar and how is fiscal policy reaction. As since a 70% of MENA are oil exporter's countries, we expect that negative oil price shocks will causes prices to rise.

Finally we include, time dummy (Time-dum) to account for period of worldwide high inflation volatility.[11]

All these variables (except for exchange rate regime dummy and openness variable) are measured in log differences. Summary statistics as well as the paire-wise correlation matrix is shown in tables (4) and (5) in the annex I.

[11] We have first started our estimation employing a large number of factors that could affect on price stability, like as –beside to variables retained- real exchange rate depreciation, interest rate, openness, inflation in USA, growth in OCED countries. A stepwise regression helped us sorting the significant explanatory variables for all countries.

4.2 Estimation Methodology

Pooled least square estimation is applied first to our data for comparison purpose. However, pooled ordered least square (OLS) regression may suffer from omitted-variables bias leading to overestimation of the lagged inflation rate, Bond (2002). To correct for this bias we then use fixed effects estimator (FE). Our choice of fixed effects, as opposed to the random effects estimator is supported by the results of Hausman-type specification test as well as the Breush Pagan multiplier test (1980).[12]

However, in the dynamic fixed effects model, individual country effects may be correlated with the error term due to demeaning process leading to downwards bias of the coefficient of lagged dependent variables. Fortunately, in large T panel, the country fixed effects which shown in the error term decline with time, similarly the correlation of lagged dependent variables with the error term will be insignificant, Roodman (2006)

Further, Breusch-Pagan / Cook-Weisberg test for heteroskedasticity based on the OLS estimates fails to reject the hypothesis of residuals homoskedasticity chi2(7) = 354.46 and p-value = 0.0000). In addition, Wooldridge test for autocorrelation does indicate first order autocorrelation of the residuals (F(1,16) = 314.115 with p-value= 0.0000)

We thus add feasible general least square (FGLS) estimator allowing for country-specific effects with first order autoregressive, and heteroskedastic error term, (Kmenta 1986).

In addition, it is necessary to test for the stationarity of our variables of interest. We use the test proposed by Maddala and Wu (1999) which, in contrary to the more popular panel data stationarity test of Im Pesaran and Shin (2003), is applicable to an unbalanced panel. The Fisher test rejects the null hypothesis that all panels' series are non-stationary in level for all our variables except for openness variables, so we take it in first difference.

We should note that fixed-effects estimator does control for unobserved unit heterogeneity, but at the expense of excluding time-invariant or rarely changing variables.[13] For a discussion, see Plümper and Troeger (2007).

One solution is to use random effects estimator (RE). Including random effects estimator based on a feasible general least square FGLS[14], may performs better in this case than fixed

[12] Hausman test rejects the null of no systematic difference between the Within and GLS coefficient estimates (chi2(7) = 24.74 with Prob>chi2 = 0.0008) , supporting a fixed effects model and, Breusch and Pagan Lagrangian multiplier test for random effects rejected the random effects model in favour of fixed effects (chi2(1) = 1.35 with Prob > chi2 = 0.2458)

[13] In our sample, exchange rate regime tends not to change much over time in particular under RR classification that shows long lived regimes.

effects (OLS) , even if Haussmann test suggest that random effects is inconsistence and that fixed effects specification is required.

Controlling endogeneity of exchange rate regime:

The three estimations procedures mentioned before are very likely to be inconsistent and biased as they impose strict exogeneity assumptions of *Xi,t* and orthogonality between *Xi,t* and *ui*. However, in our estimation, explanatory variables are likely to be endogenous, in particular, exchange rate regime variable, as it is expected that low inflation country is probably more able to maintain a pegged exchange rate trivially; persistent high inflation is inconsistent with maintaining a fixed rate. So that if inflation and exchange rate regime are simultaneously determined suggesting a correlation between exchange rate regime and the error term, i.e. $E(ER_{it}\ \varepsilon_{it}) \neq 0$, the reported estimates for exchange rate regime dummy are not consistent and therefore not useful to make inference on the estimated parameters. In order to consistently estimate the impact of exchange rate regime on inflation performance we use instrumental variable (IV) techniques. As we find evidence of heteroskedasticity and serial correlation in our data we opt for linear instrumental variable 2 steps GMM as it is more efficient than the simple IV estimator since errors are robust to both arbitrary heteroskedasticity and arbitrary autocorrelation, Baum, Schaffer and Stillman (2003)[15]

Since the exchange rate regime is a dummy variable, we prefer to instrumentalise it by its predicted probability issued from a logit model estimate.[16]

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[14] In the FGLS structure, the omega matrix has a specific random effects structure. Rather than depending on T(T+1)/2 unrestricted variance and covariance as it is the case in the normal GLS model. Omega only depends on the variance of μ_i and e_{it} regardless the size of T. See Plumper and Troegere (2007)

[15] Unlike some recent papers on exchange rate regime and inflation performance, see De Grauw and Schnabl (2008), this paper does not use the first difference and system Arellano-Bond (1991) or Blundell-Bond (1998) system GMM estimator. One important reason is that these estimators perform better when the dependent variable is moderately persistent. However, in our dataset the lagged dependent variable, although significant, is notably more persistent than in studies of De Grauw and Schnabl . Also, the dataset here does not meet the "short time period, many cross sections" criteria.

[16] We use logit model estimate of exchange rate regime: $ER_{it} = \beta_t X_{it} + e_{it}$ where X_{it} is a vector of explanatory variables. We then calculate the probability $Pi_{tk} = \Pr[Y_{it} = k] = \dfrac{\exp(\beta_i X_{it})}{\sum_{j=1}^{n} \exp(\beta_j X_i t)}$ and inter it into the IV/GMM regression.

The consistency of IV does not require the endogenous variable(s) to be continuous; however results will not be as efficient as with the system estimation using logit models but they will have the advantage of being consistent under a broader range of assumptions compared to that of system estimation results.[17] Notwithstanding, it was difficult to find an adequate instrument that are stationary, not related to inflation, with sufficiently data availability, while instrumenting exchange rate regime by its predicted probability may provide us by nearly ideal instrumental variables that are easily available, highly correlated with the endogenous regressors and plausibly exogenous (not correlated with the error term or with contemporaneous inflation rate).

In selecting the relevant instrumental variables, we seek guidance from exchange-rate-regime choice literature. The instrumental variables estimators are in general only as good as the model is correctly specified in particular, instruments must be valid, i.e. orthogonal to the error term, and the excluded instruments must be strongly correlated to the endogenous variables, See Baum (2007) for detail.

We check for the validity of the instrument by means of Anderson's (1951) canonical correlations test,[18] which is used to check for underidentification of the model. A rejection of the null implies that the model is identified. Another alternative test of underidentification is the Cragg-Donald(1993) statistics which is a Wald test.

However, there might be still a problem with the excluded instruments, since they might be only weakly correlated to the endogenous regressors; so that even rejecting the null of underidentification using the tests mentioned above at conventional significance levels is not enough.

A rule of thumb often adopted in empirical studies, based on results from Staiger and Stock (1997), is to look at the value of the F statistics in the first stage regressions of the endogenous variables on the instruments: if the F statistics is around 10, the instruments can be deemed

[17] Angrist and Krueger (2001) argue that using a nonlinear first stage to generate fitted values that are plugged directly into the second-stage equation does not generate consistent estimates unless the nonlinear model happens to be exactly right. But, he adds that fitted values from a nonlinear model may still be used as an instrument for an endogenous dummy variable, provided a linear model is used to generate first-stage predictions of the endogenous dummy variable from these nonlinear fitted values and all other exogenous covariates in the second-stage equation. So that our approach is valid.

[18] is used to check for underidentification of the model, i.e. that the excluded instruments are not relevant: these tests are distributed as a chi-square(*r)* where *r* is the number of excluded instruments minus the number of endogenous variables).

strong. In addition, the statistic of Cragg Donald (1993) is another test weak instrument suggested by Stock and Yogo (2005)[19].

In this case, if the calculated statistic is lower than the tabulated statistic of Cragg Donald, this indicates that the instruments could suffer from a certain weakness according to the size of error (r) which one is ready to admit.

The diagnostic tests show that F statistic in the first stage of the IV procedure is larger than 10 and that there is no evidence of under or over-identification. Instrument list and several diagnostics test are reported under each table (6.1 , 6.2 , and 6.3) showing the results of estimation for *de jure*, RR and LYS *de facto* fixed exchange rate regimes respectively.

The Xtivreg2 routine provided in STATA enables us also to test the exogeneity assumption of our regressors variables by the means of C or GMM distance test distributed as a chi-square(r), where r is the number of suspect regressors for the C statistics to be sure that we can treat them as exogenous.

We perform these tests by incorporating exchange rate regime dummy as an endogenous variable and we test for the exogeneity (orthogonally) of lagged inflation rate, money supply, real GDP growth rate and openness to trade. Concerning exchange rate regime variable, the endogeneity C-test does not rejects the null hypothesis according to which the exchange rate regime can be treated as exogenous at 23% for *de jure* IMF. Conversely, the endogeneity C-test reject the null of exogeneity in the case of RR and LYS *de facto* classifications at 6% and 2% respectively, assuming that the exchange rate regime is endogenous to inflation rate. Concerning other explanatory variables, they all pass the orthogonally C-test, suggesting that we can treat them as exogenous.

4.2 Results and Analysis

Tables (6.1 ,6.2 , and 6.3) report the estimation results obtained employing pooled OLS, within fixed effects, feasible least square and instrumental variables/GMM estimator for either *de jure* IMF and *de facto* classifications of RR and LYS respectively.

[19] Sotck and Yogo(2005) tabulate the critical value of Andersson F statistic which are supported in xtivreg2 software in stata. This give the value of test statistic below which the bias from possibly weak instrument exceed a certain size (30, 20, 10 and 5%). in all our regression except for LYS classification, this statistic exceed comfortably the critical value reported for 5% bias implying a bias of well under 5% except for LYS where the bias is 20%.

A first look at the results indicates that almost all explanatory variables are highly significant with the expected sign. The results obtained, however, with FGLS estimator show very small standard error in comparison to other estimators, and the estimated coefficients are also highly significant and correspond in magnitude to those obtained with fixed effects estimation.

Lagged inflation rate[20] is highly significant with a coefficient of around 0.65 pointing an important role for expectations in deriving inflation. This could reflect either low credibility of the monetary policy or/ and uncertainty concerning economic development and geopolitical changes in the region.

Inflation is indeed found to be strongly positively related to money growth and negatively related to real GDP growth. This is in line with the quantity theory of money and consistent with many empirical studies. Figure (5) shows a positive strong relation between inflation and money growth average, and figure (6) shows a negative correlation between inflation and real GDP growth average.

Openness to trade variable seems to be positive impact on inflation, which is not in line with Romer's prediction. However, this positive relation was found by Alfaro (2005) when she controlled for fixed effects. We think that this positive effect for openness variable may reflect other channels through which openness affects inflation, like higher pass through. As it is expected, the more open appears the country, the more exchange rate movements are transmitted through import prices to CPI changes.

Regarding real oil shock, it is found to be very significant in explaining inflation in MENA. The sign of the variable's coefficient is negative as expected, suggesting that inflation decreases following a rise in oil prices.[21] Such association might reflect the negative impact of an increase in non-oil production on inflation, a tight demand policy, and even more an effective expenditure management.

[20] We note that lagged inflation rate variable tends to be upward biased under pooled OLS estimators due to omitted variables bias, Bond (2002) and to be downward biased in the fixed effects (within) estimator due to the demeaning process needed to eliminate country fixed effects. Fortunately, the bias in the fixed effects estimation decreases the longer the time dimension of the data.

[21] Oil price increases may lead to a rise in inflation rate, however its effects is not instantaneous. re-estimation the equation for different lag for real oil price shocks reveal that oil prices increase need some time (two years, according to our estimations) to materialize into higher inflation rate.

More precisely, since most countries in our sample are oil-exporting countries, a rise in oil price will raise foreign reserve receipts, providing government with more income to finance investment projects without inducing budgetary deficit which, in turn, can help raise potential output growth rate and thus reduces inflation. Figure (7) in annex I shows positive correlation between oil price shock and real growth in MENA over the period 1980-2007.
Nevertheless, we could expect a serious negative effect of high oil price on net oil importing countries in our region as high oil price could reduce output and consumption. However, until more recently most MENA countries subsidize the domestic oil price shielding hence the production sector of the economy. The fiscal tension induced by this subsidies and its effects on inflation depend on how persistent this rise in oil price is. Oil importing countries may profit also from increasing oil prices because of enhanced official foreign exchange receipts from workers' remittances and direct investment inflow from Gulf countries increasing hence demand on domestic currency.

The significance of money supply growth, oil shocks, and openness to trade holds across models while the significantly of real GDP growth changes through employed estimation methods. Time dummies also enter in all specifications with a very significant positive coefficient emphasizing the negative impact of exogenous shock in MENA economies on inflation dynamic.

What about the contribution of our variable of interest, **does exchange rate regime matter for inflation**?

Estimation results indicate that exchange rate regimes really matter for inflation although there was a discrepancy between words and deeds.
The coefficients estimates for *de jure* fixed exchange regime is insignificant under different estimators although showing the negative expected sign except under fixed effects estimation. Even after controlling for endogenity, the fixed exchange rate dummy remains insignificant and with a positive sign. These results suggest that the signaling effect of fixed exchange rate regime on expectations was not effective in reducing inflation.

Does de facto pegging lead to better inflationary performance?

Controlling for actual behaviour rather than government proclamations reveals remarkably different results pointing out a credibility problem. De facto pegs regime contribute to lower

inflation. This result is however more pronounced in the RR than in the LYS *de facto* classification. The coefficient estimate of (RR) *de facto* pegged exchange regime is statistically significant through all models while the coefficient estimate of *de facto* (LYS) pegged exchange was not significant, although showing the negative expected sign. Controlling for exchange rate endogeneity reveal that LYS *de facto* pegged regime was significantly associated with lower inflation rate.

It worth mentioning here that differences in the significance of results under the two *de facto* classifications employed are not surprising since the construction of theses two measures, although reflecting certain policy decisions or outcomes, is methodologically different. [22]
For example, Levy-Yeyati and Sturzenegger (2005) compute the volatility of reserves and the nominal exchange rate, and then use cluster analysis to group countries in five categories. According to their method, a one period devaluation causes a break in the peg as the changes in the exchange rate relative to the changes in reserves volatility is gauged as being too large to be considered as a peg inducing hence a large number of regime switches.

In turn, Reinhart and Rogoff (2004) focus on the volatility of the nominal exchange rate and on the conditional probability of the exchange rate staying within a given range over a rolling five-year window making it difficult to compare it with other classifications. They also use separate treatments for countries with either official dual or multiple rates or active parallel (black) markets, where such a rate exists, to obtain a measure of volatility and hence determining whether a peg continues from one year to the next. So devaluation can occur within a 5-year interval without breaking the peg resulting in longer fixed exchange rate regimes than in LYS classification.

We think that RR classification is better employed to capture *de facto* exchange rate policy in MENA since parallel and multiple exchange rates are very widespread especially in countries with fixed official exchange rate regimes (e.g. Algeria, Iran, Syria, Egypt, Turkey, Libya, Yemen) . [23]

[22] See for example Bleaney and Francisco (2007), Klein and Shambaugh (2007) how discuss this issue in more detail.
[23] A large part of economic transaction is done at the parallel market rate, as it is more advantageous. Moreover, parallel rates tend to be most volatile when there is a large parallel-market premium, which is often an indicator of inconsistent monetary and exchange rate policies. For example, the average premium for the period 1980-1996 was 270% in Algeria, 70% in Egypt, 3.8% in Morocco and 5.6 %in Tunisia. The multiplicity of exchange

Although RR classification seems to be more pertinent in the case of our sample, however, it has some limitation that was evocated by Bleaney and Francisco (2007) and Shambaugh (2004). First, Bleaney and Francisco argue that the Reinhart-Rogoff (2007) classification may produce outlying results unfavourable to floating regimes. It occurs that RR, while using nominal exchange rate as the principal variable of identification, takes also account of high inflation countries which makes much more likely to identify a country-observation as a float if the inflation rate is over 25% than if it is under 25%, or as a free falling if inflation rate is over 40% in at least one year in the sample.

We account for any potential bias against floating regimes by setting all free falling episodes equal to zero instead of considering it in the de facto floating category. The coefficient of the peg dummy still indicates a negative significant sign. The only contrast to the previous results is that now the coefficient of the peg appears to be insignificant in the IV estimation. However, Stock and Yogo (2005) statistics indicates a weak instrument problem with a bias of 15% compared to OLS estimates.

Still, one limitation evocated by Shambaugh (2004) who notes that countries with constant official exchange rate but volatile black markets will be classified under the floating categories -as it is known to be more flexible than official rates- while it would be more plausibly and more suitable to classify it under the fixed category. This will be of special interest when one studies inflation performance of peg since the country makes no declaration or attempt to control for parallel market rate stability. This country is more similar to one that has stabilized its official exchange rate via control on trading and other capital control mechanism.

However, in this context, the more appropriate question is not whether these countries have to be placed in fixed categories or not, but rather a more appropriate question is whether capital control represents a deviation of the peg? However, if one need to consider the monetary constraint imposed by the fixed exchange regime, this case would be pertinent in countries with no capital control as the monetary policy will be devoted to exchange rate management.

In our sample, dual and multiple exchange rates have been used as a form of back door floating and they were often accompanied by strong capital control. Policy makers are not

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rate regimes has been reduced remarkably these recent years du to the exchange rate policy reforms and trade liberalisation.

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constrained in their managements of the monetary policy. In fact these countries assign, with some exception, a higher weight to employment and growth and low cost to inflation as they are more occupied by reducing unemployment and boosting economic activity in times of weak growth, but they may rather find it optimal to mimic the action of more inflation – averse policymakers to build reputation no matter whether this announced policy were carried out.

4.3 Robustness Analysis: words versus deeds classification

Our previous results show that inflation performance of countries operating under *de facto* fixed exchange rate regimes has been superior to that of countries operating under *de facto* flexible regimes. By contrast, the signal send by announcing *de jure* fixed exchange rate has no advantage in reducing inflation. In this latter regard, the credibility of pegged exchange rate is an issue of concerns. It is hence important to distinguish between stated and implemented policies of the monetary authority and the implication of potential divergence on inflation outcomes.

Models in the Barro-Gordon point to the anti-inflationary gain from credibly fixing the exchange rate to the nominal anchor. However, credibility of pegged policies was often threatened as countries are likely to have difficulty in maintaining a time consistent policy especially when the underlying fundamentals do not support the regime choice.

Alesina and Wagner (2006) stipulate, linking exchange rate policies to the overall institution quality, that pegged regimes are very demanding and require good institutions able to ensure the credibility and the sustainability of the fixed rate. In consequence, countries with weak institution would be more likely to announce a fixed exchange regime and then forced to abandon it. In consequence, it would be better for countries with weak institutions to declare a floating regime while intervene heavily.

A same argument was provided by Genberg and Swoboda (2005). They suggest that *de jure* declared regime does not really reflect the true goals of actual intent of the policy. Government may be reluctant to commit it self to fixed exchange regime in order to retain some flexibility face to shock or simply to elude the speculative currency attacks the announced of pegs often invite.

According to Barajas, Erickson and Steiner (2008) , what seem to be a fear of floating is in reality fear of declaring. The declaration in it self is consequential as public monitor the

policy maker's action and hold them accountable if their actions (*de facto*) were not in line with the announced (*de jure)* commitment. The cost of inconsistency will be higher under *de jure* fixed regimes than under *de jure* floating regimes where there is no such commitment, so the problem of reputation becomes less important providing also a certain room of manoeuvre to react periods of crisis and weak economic growth.

However, one can question about the quality of signal that *de facto* peg, or *de jure* float sends compared to more transparent signal under the *de jure* fixed exchange regime.

Alesina and Wagner (2006) claim that fear of floating is indeed a signalling devise serves to signal to imperfectly informed market some characteristics of the country namely strong institution and competent macroeconomic management. Consistently, Barajas, Erickson and Steiner (2008) add that, a country that fixes its exchange rate *de facto* while declares a floating exchange regime is not necessary breaking the commitment but try to send a particular signal. Announcement of float should not be viewed as commitment not to intervene but rather a lack of commitment to a particular exchange rate regime. However, it is not always obvious if the market will receive this signal and interpret it as country would hope.

Guisinger and Singer (2010) admit that *de facto* pegging may helps government to overcome the time inconsistency problem, but argue that while *de facto* peg provides a relatively noisy signal to the public, *de facto* peg backed by an official declaration send a stronger signal of policy intention.

They explain that albeit fluctuations in the exchange rate are easily monitored, the public is uncertain as to whether the pegs reflect conscious attempts by the government to import the low-inflation credibility of another country. Exchange rate stability may be just incidental (e.g. absence of shocks) or simply an externality that arise when two countries adopt the same monetary policies due to high integration[24].

Parting from hypothesis evocated above, we check for the robustness of our results by conducting words versus deeds discrepancies analysis, matching *de jure* exchange policies (words) with *de facto* policies (deeds) for both RR and LYS.[25] This yields four categories as follow:

[24] As with Switzerland and Germany, Genberg and Swoboda, (2005).

[25] However we have to mention that the definition of pegs regimes we have adopted when conducting our discrepancy analysis is different, thus caution should be exercised when drawing a general inference or trying to compare results under both de facto classification.

- Credible pegs regime (J_fix-F_fix) were the commitment *de jure* and the behavior *de facto* were observed, (example, GCC countries, Morocco, Jordan, Lebanon in the late 1990s)
- Fear of pegging (J_fix-F_flex): when *de jure* commitment to fixed rate is announced while the *de facto* regime is more flexible. This case was observed in the 1980s when several countries in MENA confronted with disruptive macroeconomic condition that required a higher degree of flexibility to deal with. This was especially the case of Syria, Libya, Algeria, Egypt and Jordan.
- Feart of float (J_float-F_fix): were a country declares a floating regime while follows unofficial exchange rate target. This situation has been widespread in the 1990s and 2000s (for example: Egypt, Algeria, Tunisia)
- Consistent floating regime (J_float-F_float), where exchange rate variability of exchange rate is consistent with the announced floating regime. (For example, Turkey, Yemen).

Figure (8 &9) compares the distribution of country inflation observation and median inflation rate across these different exchanger rate policies for the period 1980-2007. It shows that median inflation rate was much far lower under both credible pegs and fear of floating regimes than under fear of pegging and floating regimes.

Our baseline equation is then re-estimated after incorporating three dummies variable reflecting the different scenarios presented above with floating regime being the omitted category. The results of estimation, presented in table (9), reveal some interesting finding:

a- De jure pegs policies when it is backed de facto contribute significantly to lower inflation rate suggesting that the effectiveness of de jure pegs regime depend not only on the announced commitment but also on the reputation of meeting policy announcement. This result is in line with this of Guisinger and Singer (2010).

b- For the case where the announced policies are a float but the de facto behaviour indicates a peg (fear of floating), it was also significantly associated with lower inflation rate providing an empirical support to Alesina and Wagner (2006) hypothesis.

c- In the case where the announced policies are a peg but the monetary policy behaviour indicate more flexible behavior (fear of pegging), the estimated coefficient of the dummy variable is negative, but statistically weak.

d- Using fixed effects estimators reduce all the coefficient of exchange regimes dummies to non significance. In fact, we argue that fixed effect estimation for pegs exchange rate dummies may be driven by the exclusion of the GCC countries. These countries have de jure pegs to the US dollar that had already de facto been in place for long time, so estimation results issued from FGLS estimation , that reflect between country variation, seem to be more appropriate to capture the role of credible pegs policies associated with strong institution on inflation performance.

6 Conclusion

In this paper we have empirically tried to asses the relationship between exchange rate regimes and inflation performance for 17 MENA countries over the period 1980-2007. Using various exchange rate classifications and controlling for macroeconomic variables, that are conventionally associated to inflation, we find that *de jure* fixed exchange regime alone does not contribute to lower inflation rate however; it plays a significant role in anchoring expectation and improving credibility and hence reducing inflation when it is backed by de facto consistent behavior. Considering *de facto* pegs regimes they were strongly associated with lower inflation. Theses results still hold even after addressing potential endogeneity concern. In addition countries who seeking exchange rate stability while avoiding speculation attacks by adopting a fear of floating behavior yields broadly similar results as those of *de facto* pegged regime.

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Figure 5
Inflation and Money Growth Average, (1980-2007)

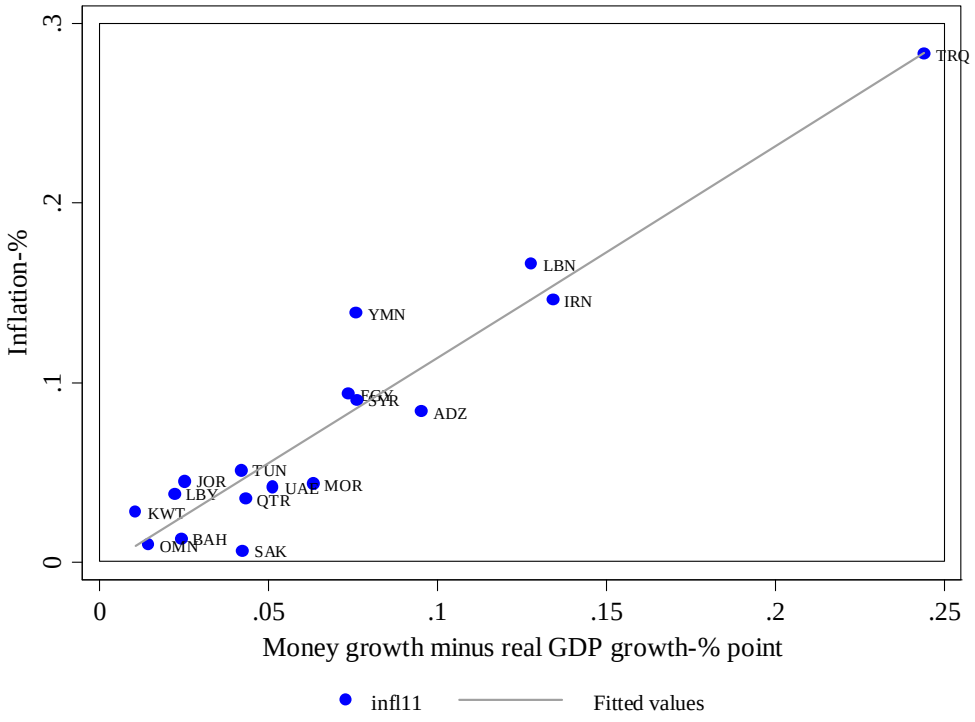


Figure 6
Changes in Real Oil Price and Mean Real Growth Rate (1980-2007)

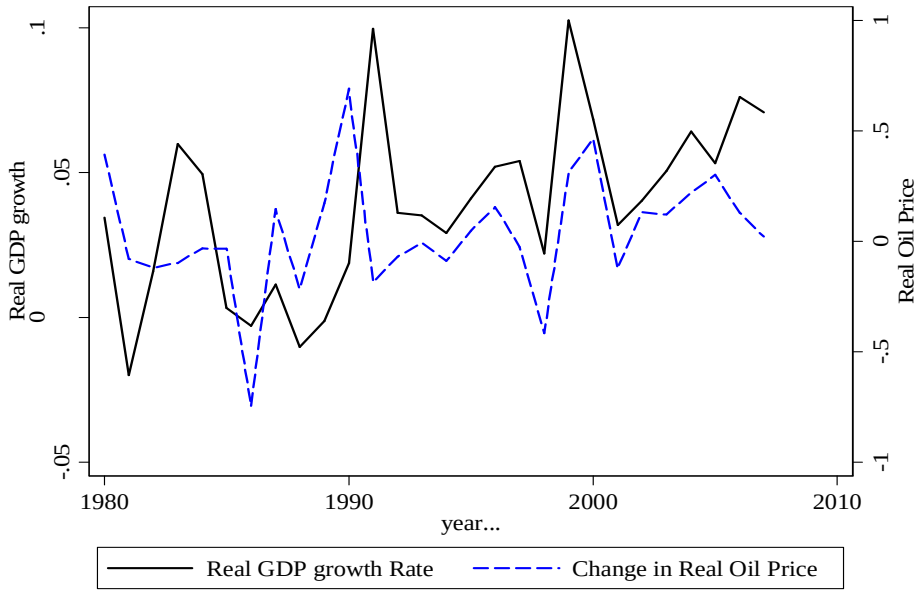
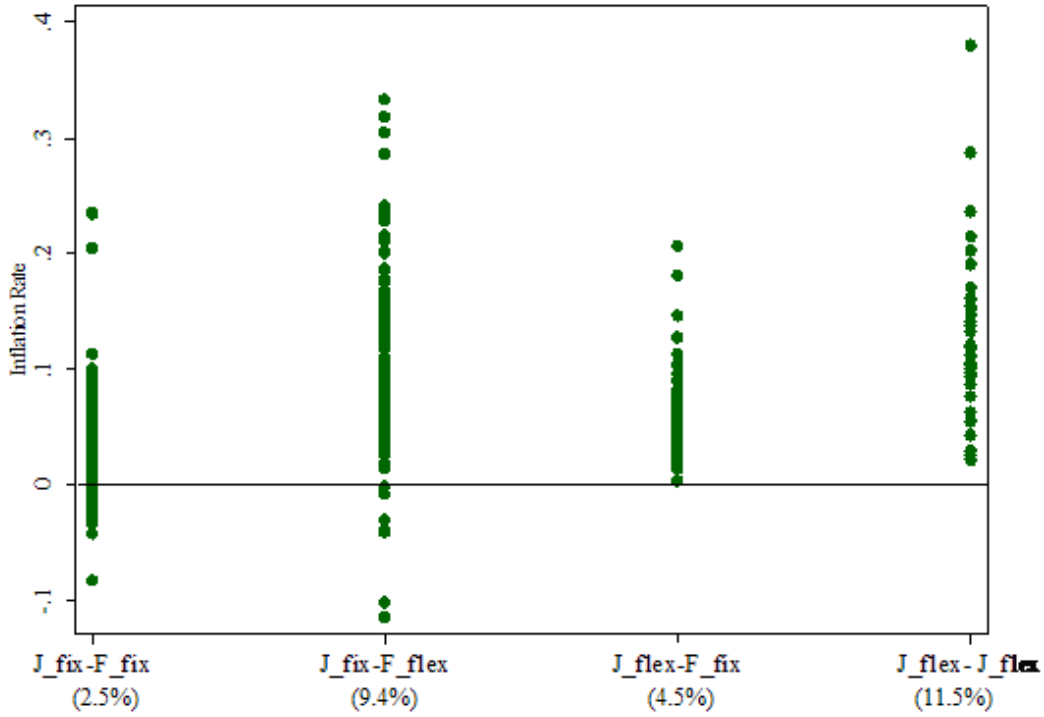


Figure 7

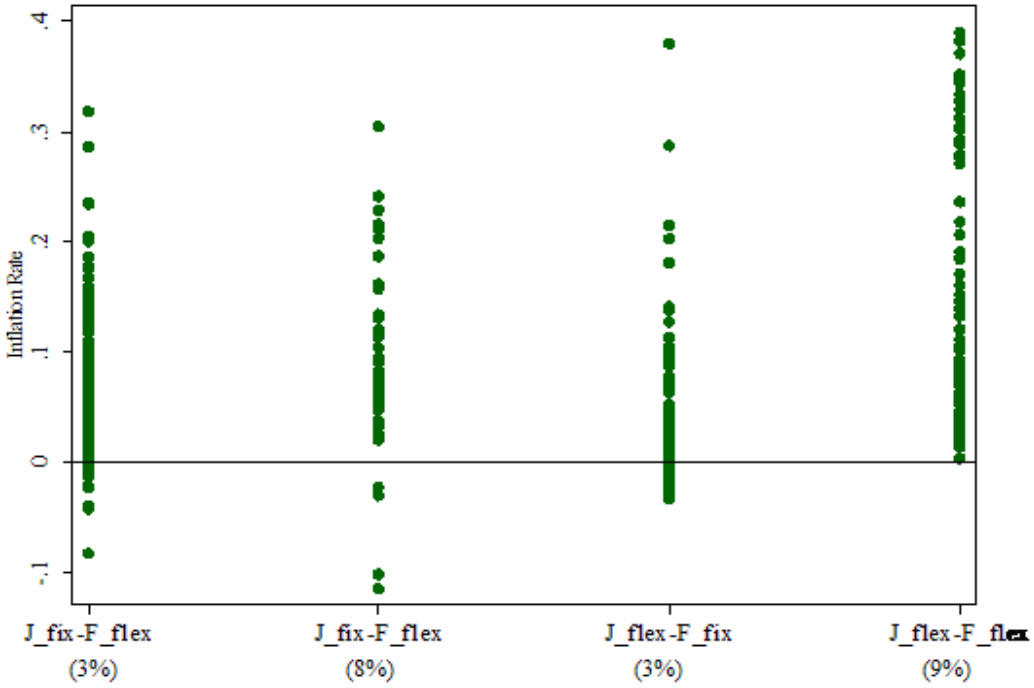
Country- year inflation observations across exchange rate regimes (IMF vs.RR, 1980-12007)



Note: median inflation rate is reported in parentheses

Figure (8)

Country- year inflation observations and median inflation rate across exchange rate regimes (IMF vs.LYS, 1980-12007)



Note: median inflation rate is reported in parentheses

Table (1) Various Exchange Rate Classification and Sources

IMF	**Fix:** Conventional Peg, Peg to Signal Currency, Peg to Composite of Currencies **Flexible:** Crawling Peg, Crawling Band, Limited Flexibility, Horizontal bands, Managed Float, Independent Float	International Financial Statistics, Exchange Arrangements and Exchange Rate Restrictions (IMF, annual publication). From 2003 to 2006 data taken from Classification of Exchange Rate Arrangements and Monetary Framework at http: //www.imf.org/ external/ np/ mfd/er /index
RR	**Fix:** Pre announced peg or currency board arrangementde, Pre announced horizontal band that is narrower than or equal to +/-2%, De Facto Peg, Pre announced crawling peg, Pre announced crawling band that is narrower than or equal to +/-2%, De factor crawling peg, De facto crawling band that is narrower than or equal to +/-2%. **Flexible:** Pre announced crawling band that is wider than or equal to +/-2%, De facto crawling band that is narrower than or equal to +/-5%, Managed Float, Freely Falling , Independent Float	Data is taken from Reinhart and Rogoff classification available at: http://www.puaf.umd.edu.faculty/papers/reinhart/reinhart
LYS	**Fix:** Fixe, Inconclusive **Flexible:** Dirty Crawling Peg, Float, Dirty **Float**	Data is taken from Levy Yeyati-Sturzenegger classification available at: http://FD_Database_new.xls de **profesores.utdt.edu/~ely/papers.html**

Table (2) Comparison of Inflation Rate in MENA Countries under Different Exchange rate Regimes (1980-2007)

	Fixed Exchange Rate Regimes				Flexible Exchange Rate Regimes	
	Conventional peg to signal currency	**Conventional peg to composite of currencies**	**Limited flexibility or peg within horizontal bands**	**Crawling peg or bands**	**Managed float**	**Independent float**
Gulf Countries						
BHR	2000- [1,5%]		1980-99 [1,17%]			
KWT	2003- [3%]		1980-2002 [3,12%]			
OMN	1980- 1,14%]					
QTR	2000- [5,8%]		1980-99 [3,3%]			
SAK	2000- [0,75%]		1980-99 [0,7%]			
UAE						
Maghreb Countries						
ADZ		1980-94 [14%]			1995- [6%]	
TUN		1980-88 [7,7%]		2003-05 [2,8%]	1989-98; 2001-02 & 2006- [4,7%]	
MOR		1990- [3,27%]			1980-89 [7,6%]	
LBY		1980- [4,6%]				
Other MENA Countries						
EGY	1980-90 [17%]		1999-2001 [2,7%]		1991-98 & 2002- [8,3%]	
IRN		1980-92 [19%]		2006- [21%]	1996-98 & 2003-05 [16%]	1993-95 [37%]
JOR	2000- [2,8%]	1980-87 & 1990-99 [5%]			1988-89 [16%]	
SYR	1980-06 [12%]					
LBN	1999- [2,22%]					1980-98 [20%]
TRQ	**1980-81**			1999-2000 [60%]	1982-98 [63%]	2001- [23%]
YMN*	**1990-97** [39%]				2006- [9,3%]	1998-05 [9%]

*For Yemen data for 1980s are missing and in this case average inflation is computed over the period 1990-2007

Table (3) Data Definition and Sources

Dependent Variable		**Source**
Inflation rate	Difference in log of CPI adjusted to reduce outlier	IFS/IMF
Independent Variables		
Real GDP	Difference in log of real GDP at constant 2000 prices in local currency units	IFS/IMF
Money supply	Difference in log of M1 in nominal local currency adjusted for outlier	IFS/IMF
Openness to trade	Exports plus imports of goods in current local currency and services to GDP	IFS/IMF
Oil price shock	Difference in log of nominal oil price (average spot oil-price of Brent, Taxes, and Dubai in US$) converted to local currency using nominal exchange rate with the US dollar, and then deflated with the respective country's CPI	IEA
Instrument List		
Natural logarithm of population size		WDI
Manufactured export to GDP		WDI
Debt service to GDP		WDI
Liquid liability to GDP		WDI
Net foreign asset to GDP		IFS/IMF
Net foreign reserve minus gold to import		IFS/IMF

Note: WB: World Bank; IMF: International Monetary Fund; IFS: International Financial Statistics; IAE: International Energy Agency

Table (4) Summary Statistics

Variables	Obs.	Mean	Median	Std.Dev.	Min	Max
Inflation Rate	465	.0757707	.0453815	.0952612	-.1149631	.6388962
Money Supply	465	.1070239	.1017358	.1087135	-.5168854	.737343
Real GDP	463	.0394014	.0438601	.1219862	-.8807067	1.35214
Openness to trade	455	.8100285	.7337911	.3901076	.1330336	2.674068
Oil price shock	465	.0392321	.0149218	.5003468	-1.016129	8.58059

Table (5) Pairwise correlation Matrix

	$\pi_{i,t-1}$	$ERR_{i,t}$	$M1_{i,t}$	$GDP_{i,t}$	$OPEN_{i,t}$	$Oil_{i,t}$	*Time-dum*
$\pi_{i,t-1}$	1.0000						
$ERR_{i,t}$	-0.3874	1.0000					
$M1_{i,t}$	0.5851	-0.3037	1.0000				
$GDP_{i,t}$	-0.1066	-0.0012	-0.0070	1.0000			
$OPEN_{i,t}$	-0.3214	0.2371	-0.1934	0.0848	1.0000		
$Oil_{i,t}$	-0.1157	0.0147	0.1021	0.0919	-0.0093	1.0000	
Time-dum	0.2293	0.0373	-0.1042	-0.0991	-0.0713	-0.1006	1.0000

Table (6.1) Results obtained with IMF *de jure* Classification

	OLS		***FE***		***FGLS***		***IV-GMM ****	
	Coef.	*P>|t|*	*Coef.*	*P>|t|*	*Coef.*	*P>|t|*	*Coef.*	*P>|t|*
$\pi_{i,t-1}$	.7560911 [16.76]	0.000	.6702077 [21.60]	0.000	.7910758 [32.91]	0.000	.6425689 [13.40]	0.000
$ERR_{i,t}$	-.0082021 [-1.60]	0.113	-.0004296 [-0.07]	0.941	-.0034401 [-1.01]	0.311	.0248534 [1.25]	0.210
$M1_{i,t}$	.1355301 [4.23]	0.000	.1262016 [5.67]	0.000	.0793652 [5.46]	0.000	.0933535 [3.20]	0.001
$GDP_{i,t}$	.0160666 [-0.79]	0.348	-.0200603 [-1.32]	0.186	-.0296009 [-2.73]	0.006	-.003084 [-0.22	0.824
$OPEN_{i,t}$	.0160666 [0.94]	0.348	.0200985 [1.62]	0.106	.0321734 [4.31]	0.000	.0402108 [3.24]	0.001
$Oil_{i,t}$	-.0130194 [-1.86]	0.063	-.0136034 [-2.16]	0.031	-.0093456 [-1.97]	0.049	-.0204472 [-3.45]	0.001
Time-dum	.0193119 [4.31]	0.000	.0223289	0.000	.009228 [3.50]	0.000	.0187759 [4.74]	0.000
N. obs	446		446		446		420	

Notes: t-values in parentheses.
, **, * indicate significance at the 10,5 and 1% significance levels respectively*

(*): The predicted probability obtained from logit regression on a set of regressors: lagged openness to trade, liquid liability to GDP, log of real GDP, net foreign asset to GDP. All instruments were test for orthogonality.

The diagnostic tests show no evidence of under of overidentification. The Anderson canon. corr. LR (underidentification) statistic = 45.127Chi-sq(1) P-val = 0.0000
The Cragg-Donald F statistic is 46.921well above the range where it would imply any significant bias.

Table (6.2) Results obtained with RR *de facto* Classification

	OLS		***FE***		***FGLS***		***IV-GMM ****	
	Coef.	*P>|t|*	*Coef.*	*P>|t|*	*Coef.*	*P>|t|*	*Coef.*	*P>|t|*
$\pi_{i,t-1}$	.7182504 [14.30]	0.000	.6393632 [19.96]	0.000	.7402373 [27.74]	0.000	.5841064 [10.02]	0.000
$ERR_{i,t}$	-.0180459 [-3.05]	0.002	-.0251773 [-3.30]	0.001	-.0179214 [-4.17]	0.000	-.0527013 [-1.76]	0.079
$M1_{i,t}$	.1399653 [4.34]	0.000	.1269316 [5.79]	0.000	.0819547 [5.74]	0.000	.095873 [3,44]	0.001
$GDP_{i,t}$	-.0167154 [-0.92]	0.356	-.0216909 [-1.45]	0.148	-.0296024 [-2.68]	0.007	-.0145992 [-1.04]	0.300
$OPEN_{i,t}$	.0160033 [1.01]	0.315	.0202209 [1.65]	0.099	.0323986 [4.28]	0.000	.0283826 [2.42]	0.016
$Oil_{i,t}$	-.0139237 [-2.11]	0.036	-.0137931 [-2.22]	0.027	-.0093852 [-2.06]	0.039	-.0185847 [-3.10]	0.002
Time-dum	.0186006 [4.30]	0.000	.0206956 [5.19]	0.000	.0088261 [3.54]	0.000	.0148775 [3.58]	0.000
N. obs	446		446		446		431	

Notes: t-values in parentheses.
, **, * indicate significance at the 10,5 and 1% significance levels respectively*

(*): The predicted probability obtained from logit regression on a set of regressors: lagged foreign reserve minus gold to import, debt services to GDP and the size of population.

The diagnostic tests show no evidence of under of overidentification. The Anderson canon. corr. LR (underidentification) statistic = 22.547 Chi-sq(1) P-val = 0.0000
The Cragg-Donald F statistic is 22.780 well above the range where it would imply any significant bias.

Table (6.3) Results obtained with LYS *de facto* Classification

	OLS		***FE***		***FGLS***		***IV-GMM ****	
	Coef.	*P>|t|*	*Coef.*	*P>|t|*	*Coef.*	*P>|t|*	*Coef.*	*P>|t|*
$\pi_{i,t-1}$	.7602591 [16.26]	0.000	.6686172 [21.45]	0.000	.7906903 [32.70]	0.000	.6461029 [9.70]	0.000
$ERR_{i,t}$	-.0057682 [-1.02]	0.308	-.0030942 [-0.53]	0.598	-.0037463 [-1.24]	0.216	-.0510688 [-1.98]	0.051
$M1_{i,t}$	.1394084 [4.24]	0.000	.1265944 [5.71]	0.000	.0808322 [5.55]	0.000	.096809 [3,32]	0.001
$GDP_{i,t}$	-.0157953 [-0.84]	0.401	-.0207344 [-1.36]	0.173	-.0295048 [-2.68]	0.007	-.0375907 [-2.82]	0.005
$OPEN_{i,t}$	.0148424 [0.87]	0.387	.0199862 [1.61]	0.108	.0320149 [4.22]	0.000	.0392779 [3.45]	0.001
$Oil_{i,t}$	-.0142291 [-1.99]	0.047	-.0143385 [-2.22]	0.027	-.0094316 [-1.99]	0.047	-.0298805 [-3.37]	0.001
Time-dum	.0181618 [4.00]	0.000	.0219381 [5.38]	0.000	.0088968 [3.40]	0.001	.0104326 [2,16]	0.030
N. obs	446		446		446		422	

Notes: t-values in parentheses.
, **, * indicate significance at the 10,5 and 1% significance levels respectively*

(*): The predicted probability obtained from logit regression on a set of regressors:. net foreign asset to gdp, manufactured exports to gdp and the size of population

The diagnostic tests show no evidence of under of overidentification. The Anderson canon. corr. LR (underidentification) statistic = 24.66Chi-sq(1) P-val = 0.0000
The Cragg-Donald F statistic is 25.013well above the range where it would imply any significant bias.

Table (9) Results obtained with Words versus Deeds Classification

	IMF vs. RR						***IMF vs. LYS***					
	OLS		***FE***		***FGLS***		***OLS***		***FE***		***FGLS***	
	Coef.	*P>|t|*	*Coef.*	*P>|t|*	*Coef.*	*P>|t|*	*Coef.*	*P>|t|*	*Coef.*	*P>|t|*	*Coef.*	*P>|t|*
$\pi_{i,t-1}$	0.730122		0.646308		0.726199		0.8085103		0.7134808		0.8127657	
	[18.27]	0.000	[19.02]	0.000	[25.67]	0.000	[26.88]	0.000	[22.26]	0.000	[33.05]	0.000
J_fix-F_fix	-0.01832		0.000108		-0.018485		-0.0065925		-0.0001566		-0.00217	
	[-2.68]	0.008	[0.01]	0.991	[-2.50]	0.012	[-1.18]	0.239	[-0.03]	0.98	[-0.58]	0.561
J_fix-F_flex	-0.00563		0.008257		-0.002971		-0.0105972		-0.0028145		-0.0045386	
	[-0.73]	0.468	[1.07]	0.283	[-0.39]	0.698	[-0.74]	-1.45	[-0.42]	0.676	[-0.9]	0.367
J_float-F_fix	-0.01858		-0.008257		-0.01651		-0.0142708		-0.0125798		-0.0094038	
	[-2.5]	0.013	[-0.94]	0.347	[-2.2]	0.028	[-2.43]	0.016	[-1.85]	0.065	[-2.46]	0.014
$M1_{i,t}$	0.082131		0.065821		0.067972		0.0867999		0.0694887		0.0702439	
	[4.14]	0.000	[3.55]	0.000	[5.19]	0.000	[3.72]	0.000	[3.48]	0.001	[5.30]	0.000
$GDP_{i,t}$	-0.03061		-0.028163		-0.035004		-0.0302402		-0.0298156		-0.0334638	
	[-2.26]	0.025	[-1.32]	0.029	[-3.70]	0.006	[-1.88]	0.061	[-2.11]	0.035	[-3.36]	0.001
$OPEN_{i,t}$	0.036564		0.035333		0.034965		0.0275095		0.0280128		0.0331314	
	[3.74]	0.000	[3.40]	0.001	[5.53]	0.000	[2.01]	0.045	[2.46]	0.014	[4.91]	0.000
$Oil_{i,t}$	-0.01894		-0.017732		-0.008673		-0.0174149		-0.0172438		-0.0093037	
	[-3.14]	0.000	[-3.54]	0.000	[-1.98]	0.048	[-2.83]	0.005	[-3.08]	0.000	[-2.06]	0.039
Time-dum	0.011583		0.012945		0.007039		0.0147584		0.0178144		0.0098023	
	[3.64]	0.000	3.93	0	[2.95]	0.003	[3.68]	0.000	[4.94]	0.000	[3.93]	0.000
N. obs	413		413		413		437		437		437	

*Notes: t-values in parentheses. *, **, *** indicate significance at the 10,5 and 1% significance levels respectively*