AMF Economic Papers, Number 10

Analysis of Foreign Reserves in the Arab Countries, 1980-2002

Ali A. Bolbol and Ayten M. Fatheldin

Economic Policy Institute

Arab Monetary Fund

Abu Dhabi, January 2005

Table of Contents

Abstract **2**

I – Introduction **3**

II –International Reserves and Reserve Ratios **6**

III – Determinants of Optimal Reserves **11**

IV – Adjustment Coefficients and Optimal Reserves **17**

V – Conclusion **23**

Figures **25**

Tables **39**

Appendix **50**

References **52**

Analysis of Foreign Reserves in the

Arab Countries, 1980-2002

Abstract

The paper investigates questions relating to reserves adequacy, optimality, and adjustment for seventeen Arab countries during the period 1980-2002. In section II we analyze reserve adequacy from the vantage of three reserve ratios: reserves to imports, to capture current account sustainability; reserves to short-term debt, to assess debt sustainability; and reserves to broad money, to conjecture the extent of capital flight. The determinants of optimal reserves are discussed in section III, and we arrive at results that support the importance of both the transactions and precautionary motives for holding reserves. Section IV estimates adjustment coefficients for different groups of Arab countries, and also checks which Arab countries have their reserves depart the most from fundamentals. In this context, reform countries appear to have speedier adjustments, and Algeria stands out as the country with the largest excess in reserves. Section V concludes the paper with some policy recommendations.

JEL Classification: F31; E60

Key Words: Foreign Reserves; Reserves Adequacy and Optimality; Adjustment Coefficients; Arab Countries

I – Introduction

In 2003, real net international reserves in Algeria reached close to $32 billion but its unemployment rate was in excess of 25%[1]. Reserves of such magnitude when juxtaposed against the prevailing economic conditions raise the obvious question: why cannot reserves be put in the service of more productive activity? In more technical terms, why cannot reserves finance more investment and consumption or current account deficits? The answer to this question rests on two parts. The first part concerns whether reserve holdings match the economic fundamentals of the country. If they do not, and if they happen to be in excess – and this is where the second part kicks in – then how to use these reserves productively without enhancing the economic risks to the country. As it happens, economics has a pretty good way of dealing with the first part of the answer, but not the second.

Determining what level of reserves is optimal is not so straightforward, though. In a general sense, optimal reserves depend on a host of fundamental variables, some of them not amenable to measurement. The most salient include: stage of development, openness, efficiency of international financial markets, realism of exchange rate regimes, and policy objectives. To simplify matters, we can narrow down the motives behind holding of reserves to two: a transactions motive to cover

[1] This makes Algeria's foreign reserves equal to half its GDP. See AMF (2004).

payments imbalances that presumably grow with international transactions; and a precautionary motive to smooth unpredictable imbalances in international payments. The precautionary motive is of course the more critical, and it aims at avoiding the costs of adjustments. These may be due to the loss of output resulting from "stop-go" measures, and the misallocations caused by the shifting of resources which are unwarranted in the long run. Reserves also allow the country to "buy time" in order to adopt the appropriate policies if the deterioration in balances proves permanent. However, by removing the external constraints regarding countries' policy choices, reserves can lead to laxity in macroeconomic policies such as the prolonged defense of overvalued exchange rates. Add to this the quasi-fiscal costs involved in sterilization and, perhaps more important, the opportunity cost of holding reserves in the form of foregone domestic investments and/or external debt retirement, and these policy mistakes can turn out to be quite costly as well in the long run. The point is that substantial deviations from optimal reserves in either way are undesirable.

Such issues and the investigations to understand them are of significant importance to the Arab countries. Reserves in the Arab countries are mostly driven by current account balances (oil exports, labor remittances, and grants) and to a lesser extent capital account balances (concessional debt and foreign direct investment). These have had their roller coaster ride in the Arab world, increasing in the early 1980s, decreasing through

the mid 1990s, and recovering decently since then. So did, of course, foreign reserves. As a result, questions relating to Arab reserve adequacy, optimality, and adjustment are replete with practical resonance. Naturally, the Arab scene is not homogeneous, so along the way individual countries have had their own reserves experiences depending on their resource base, reform efforts, and political realities.

We intend to investigate these questions as they relate to the diversity of Arab reserves positions. The analysis in the paper encompasses seventeen Arab countries and its study period runs from 1980 to 2002[2]. In section II we analyze reserve adequacy from the vantage of three reserve ratios: reserves to imports, to capture current account sustainability; reserves to short-term debt, to assess debt sustainability; and reserves to broad money, to conjecture the extent of capital flight. The determinants of optimal reserves are discussed in section III, and we arrive at results that support the importance of both the transactions and precautionary motives fo holding reserves. Section IV estimates adjustment coefficients for different groups of Arab countries, and also checks which Arab countries have their reserves depart the most from fundamentals. In this context, reform countries appear to have speedier adjustments, and Algeria stands out as the country with the largest excess in reserves. Section V concludes the paper with some policy recommendations.

---

[2] The Arab countries included are Algeria, Bahrain, Egypt, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Qatar, Saudi Arabia, Sudan, Syria, Tunisia, the United Arab Emirates, and Yemen.

II –International Reserves and Reserve Ratios

It is perhaps best to start our descriptive measures by defining what constitutes foreign reserves. The measure widely used characterizes foreign financial assets that are controlled by the monetary authorities and are readily available for balance of payments financing (and whose value expressed in foreign units of account should be known with certainty). This implies four qualifying assets: official holdings of gold, SDRs, convertible foreign exchange, and the country's reserve position at the IMF – usually referred to as gross international reserves[3]. But because gold holdings have receded in importance since the collapse of the Bretton woods system in the early 1970s, the current focus – and rightly so – is on net international reserves. Table (1) presents the breakdown of gross and international reserves, real and nominal, for the world, and developed, developing, and Arab countries. Two interesting observations stand out from the table: first, real net international reserves for the Arab countries declined from about 30% of developing countries' reserves in 1980 to about 10% only in 1990; and although they have recovered since then, they remained at that ratio for the remainder of the period. Second, developing countries' reserves were only 40% of the world's total in 1980, but they surged to become more than 60% of the total by 2002, driven

[3] See IMF (2003) and Flood and Marion (2002). In practice, however, there are claims on reserves that can limit their availability for balance of payments purposes, such as derivative positions, collateral for loans, and investments with the government or domestic banks. In such cases, reserves need to be adjusted to reflect these drains.

mostly by the reserves of the emerging economies in Asia which equaled more than $1trillion in 2002[4].

Individually, and not surprisingly, the Arab countries followed a tapestry of patterns in the behavior of their real reserves. Table (2) and figure (1) show that Bahrain, Libya, and Saudi Arabia had consistently falling levels of reserves, while only the UAE had a consistently rising one. The rest of the Arab countries, though, had their reserve levels following a mostly inverted u-shaped pattern. Also, the most significant increases in reserves (by a factor larger than four) occurred for four countries: Egypt, Morocco, Sudan, and Syria. However, these four countries were among the countries which witnessed the largest fluctuations in their reserve levels, the others being Algeria, Lebanon, Yemen, and to a lesser extent Saudi Arabia. Consequently, fluctuations in the fortunes of Arab international reserves appear not to have spared many countries: it affected oil economies (Algeria, Yemen, and Saudi Arabia), reform countries (Egypt and Morocco), and diversified economies (Morocco and Syria), and undoubtedly war-torn economies (Lebanon and Sudan). As to the significance of gold holdings, only Lebanon continues to have a substantial stock, worth close to $2.5 billion; most of the other countries have dwindling gold stocks, not to mention that Mauritania, Sudan, and Yemen did not have any to begin with.

[4] Emerging Asian economies include China, Hong Kong (SAR), India, Indonesia, Korea, Malaysia, Philippines, Taiwan (Province of China), and Thailand.

The interesting thing to consider next is reserve ratios which indicate reserve adequacy and also assist in predicting economic crises. Initially, the most widely-watched ratio was reserves to imports, since foreign trade represented a principal item in the balance of payments, and a ratio covering three-four months of imports was considered adequate to support a country's current level of imports. But as openness and external vulnerability became no longer solely defined in terms of trade shocks, and with increasing capital mobility and access to international financial markets, reserve adequacy ratios had to reflect the significance of the capital item. This meant considering, in addition, a reserves to short-term debt ratio, which reflects a country's ability to meet its obligations over the coming year, and thus avoid rollover problems that stem from concerns about liquidity and deterioration in external financing. Thus a ratio equal to one (100%) was considered adequate to stave off vulnerabilities to external shocks and crises, as long as the current account is not out of line and the exchange rate is not seriously misaligned[5]. In fact, as to exchange rate misalignment, available evidence lends support to its importance in that the ratio is higher for countries with fixed and managed regimes than for countries operating a more freely-floating regime[6]. Lastly, a third important ratio to take into consideration is reserves to broad money, which assesses the potential demand for foreign

[5] See, among others, Rodrik and Velasco (1999).

[6] De Beaufort Wijnholds and Kapteyn (2001) found for a group of emerging economies that the unweighted average of the ratio for floating countries was 159% whereas the similar ratio for managed and fixed countries was 283%.

reserves from domestic sources, or the potential for capital flight from the domestic currency in the event of financial crises. This ratio should naturally be higher for countries with a fixed exchange rate regime, because of the monetary authorities' willingness to satisfy demand for reserves so as to maintain the exchange rate peg. As a result, it is recommended that this ratio fall between 5-10% for floating countries and between 10-20% for fixed and managed ones[7].

Table (2) and figure (2) present the relevant descriptive statistics and the paths relating to all three ratios for the Arab countries (the reserves measure used is net real international reserves; for expositional purposes, the ratio of reserves to total external debt was also included in figure (2)). As a group, the Arab countries seem to have adequate reserves based on the average critical values of the three ratios, with the situation noticeably improving in the latest period (1997-2002). Of course, the all-country picture hides a lot of variations among the averages for individual countries. Of particular importance is the low reserves to imports ratio for Morocco, Mauritania, Sudan, Syria and Tunisia; and its high variability for Algeria, Egypt, Sudan and Syria. What is interesting is that this low ratio relates to resource-based economies (Mauritania and Sudan) and diversified economies whose stability depends on the fortunes of the

[7] See ibid. In addition, Hviding et al (2004) also showed that holding adequate reserves does reduce exchange rate volatility. Of course, during financial crises, the reserves to broad money ratio for fixed exchange rate countries will stay the same as long as reductions in money are offset by reductions in reserves – in other words, as long as the currency peg can be defended in the event of flight from the currency.

agricultural sector (Morocco, Syria, and Tunisia). Also important is the low reserves to short-term debt ratio for Mauritania and Sudan, an argument that no doubt justifies their inclusion in the HIPIC initiative. And although this ratio passes the critical values for Egypt, Jordan, and Lebanon (between 200-300%), its high variability coupled with the fixed (plus overvalued) exchange rate regimes that these countries follow make this aspect of reserve adequacy partially lacking. Regarding the reserves to broad money ratio, it is particularly low for Sudan and highly variable for Algeria, Egypt, Morocco, Sudan, and Syria. In addition, despite the fact that Egypt, Jordan, Lebanon, and Morocco have values for this ratio that fall within the bounds of adequacy, again their vulnerability cannot be ruled out given the largely-open capital accounts and fixed exchange rate regimes that characterize their economies.

In sum, inadequacy in one or more of the *average* reserve ratios seem to have impacted a decent spectrum of Arab countries, with the notable exception of the Gulf Cooperation Council (GCC) countries[8]. The latter, as would be expected, score well on all the three reserve adequacy ratios. Overall, though, vulnerability of reserves on all three counts has been strongly eased, if not completely turned around, in the latest years of the study period for *almost all* countries.

[8] The GCC countries are Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates (UAE).

III – Determinants of Optimal Reserves

That a good number of Arab countries – not withstanding the latest period – could have been subject to inadequate reserves is by itself not an unusual finding. A more rigorous analysis of reserve adequacy calls for a careful identification of its crucial determinants. This is because such an undertaking would be instrumental in deciding what level of reserves is optimal for smoothing adjustments and for creating a buffer stock against crises.

Early models on optimal reserves were of the buffer-stock variety that identified three determinants of reserves: reserves volatility, cost of adjusting to external balance, and the opportunity cost of holding reserves[9]. There was no arguing with the first determinant, but the other two were controversial. The cost of adjustment was proxied by the propensity to import, in the sense that a high value of the latter would imply a smaller reduction in aggregate expenditures – or adjustment cost – to correct for a given imbalance, and hence a smaller need to hold reserves. However, it turned out that a higher propensity to import reflected greater openness and with it the need to hold more precautionary reserves[10]. As to the cost of holding reserves, it was usually measured by the spread between domestic government bond yields and short-term

[9] See especially Heller (1966) and Frenkel and Jovanovic (1981).

[10] See the evidence in Frenkel (1983).

interest rates on foreign reserves, but the evidence on this determinant met with almost a uniform lack of success. This was partly due to measurement problems, but mostly due to the fact that central banks are extremely *risk-averse* regarding reserve shortfalls[11].

Later analysis of the fundamental determinants of optimal reserves centered on three more variables: a scale variable, the type of exchange rate regime, and the role and accessibility of external debt. The scale variable reflected the transactions motive for holding reserves, on the premise that payments imbalances can be expected to grow in proportion to international transactions, and either income or population was used as a proxy. The type of exchange regime was a very interesting innovation, and it revealed that exchange rate flexibility can be a substitute for reserve holdings in adjusting to external balances. This finding was peculiar, however, in that it applied mostly to developed countries. And the reason that it did not fit developing countries is because these countries have in reality kept a pegged exchange rate regime, and the uncertainty resulting from being pegged to a floating currency may have necessitated higher

[11] See De Beaufort Wijnholds and Kapteyn (2001). Measurement problems arose from the fact that interest rates, especially in developing countries, were subject to controls and short-term interest on reserves did not reflect the latter's currency composition. Also, IMF (2003) noted that exchange rate depreciations should be added to the short-term interest made on foreign reserves. The exception to most of the evidence was Ben-Bassat and Gottlieb (1992), who found a significant negative effect for the cost of holding reserves by using the rate of profit in the business sector instead of government bond yields and by adjusting for the currency composition of reserves.

holdings of precautionary reserves[12]. As to the role of external debt, the relationship focused on whether external debt and reserves are substitutes or complements. The substitution view argued that external debt could serve a transactions role which diminishes the demand for reserves (analogous to the use of credit cards as a substitute for money). The complementarity view, however, rested on the notion that a country would want to accumulate both external debt and reserves: external debt allows the country to smooth consumption when income is volatile, whereas reserves allow it to do the same in the event of a default on external debt. Not surprisingly, the evidence concerning this variable was mixed, depending – among other things – on degrees of sovereign risk and access to international markets[13].

The last two crucial determinants reflect recent developments and concerns. The first relates to financial liberalization and the associated increase in capital mobility. But accounting for this determinant also had an indeterminate effect on reserves, since on the one hand capital mobility is a vehicle to finance at least part of external deficits by borrowing abroad, and on the other hand is a source of vulnerability in its own right[14]. Capital mobility, however, poses an interesting connection with exchange rates. To the extent that reserves accumulation is the result of

---

12 See Heller and Khan (1978) and Flood and Marion (2002).

13 See Eaton and Gersovitz (1980), Ben-Bassat and Gottlieb (1992), and Aizenman and Marion (2004).

14 See Eichengreen and Frenkel (1996) and IMF (2003).

capital inflows associated with fixed exchange rates and induced by a one-way bet on the currency given interest rate differentials, then vulnerability to crises is enhanced, not to mention the quasi-fiscal costs related to sterilization[15]. The reason stems from the hazards involved with the prolonged build-up of interest-sensitive capital flows and the increase in unhedged foreign currency exposure. This is, of course, in stark contrast to the more benign reserve accumulation associated with current account surpluses arising from undervalued exchange rates and/or export booms. The second crucial determinant captures the impact of good governance on reserve holdings. Specifically, it was found that corruption and political stability act as a tax on the effective economy-wide, social return on reserves, thereby reducing worthy reserve holdings below the level supported by efficiency considerations[16].

Given the above tour of the fundamentals behind optimal reserves, table (3) presents the regression results for the panel data covering the seventeen Arab countries over the 1980 -2002 period[17]. Three observations are worth noting in this regard. First, all regressions appearing in the table were based on country-fixed effects; second, a wide variety of models were estimated so as to pick those robust determinants

---

15 IMF (2003) estimated that reserve build-up equivalent to 10% of GDP could cost up to 1% of GDP in sterilization cost.

16 See Aizenman and Marion (2004).

17 Models containing government stability and corruption were estimated from 1984-2002 because of a lack of available data for these variables from 1980-1983.

whose effects are consistently significant; third, capital account vulnerability was not included, because of the dearth of capital inflows in the Arab countries – averaging no more than $10 billion annually during the period[18]. For details on the definition, measurement, and data sources for the variables, see the Appendix.

An examination of the various estimated models in table (3) produce the following robust results. The scale variables given by per capita income (PCI) and population are positive and significant, with the elasticity of PCI to reserves being largely less than one – a good indication of scale economies in the need and use of foreign reserves[19]. The same is true for the propensity to import (M/GDP) as an indicator for openness. Volatility, measured both in terms of reserves (RESVOL) and export receipts (XVOL), is also positive and significant, reinforcing the importance of fluctuations in the current (and trade) account as a principal determinant of precautionary reserves[20]. The impact of exchange rate regimes and changes offers an interesting result. In broad terms, most of the Arab countries still adopt de facto fixed-rate regimes: from 1980 till the mid 1990s, all Arab countries followed fixed regimes with the exception of

---

[18] See Bolbol and Fatheldin (2004). The exception among the Arab countries were sensitive capital inflows to Lebanon and to a lesser extent Egypt and Jordan.

[19] This is in contrast to the evidence for developing countries found in Edwards (1984) and Aizenman and Marion (2004) where the elasticity was estimated at larger than 1.5.

[20] This also contrasts with the result found in Aizenman and Marion (2004) where export volatility was insignificant.

Lebanon; and from the mid 1990s till the end of the period, the countries following floating or managed-float regimes were: Algeria, Mauritania, Sudan, Tunisia, and Yemen[21]. As a result, exchange rate volatility (ERVOL) per se was highly infrequent, and its impact on reserves was insignificant. But when exchange rates did change, those countries witnessing it were spared holding more reserves as can be seen from the significant and negative effect of the exchange rate dummy (ERDUM) on reserves.

As to the interest differential, or the cost of holding reserves, we resorted to a different measurement methodology. Since, at least during the first half of the study period, a sizeable number of Arab countries had interest rate controls, we substituted interest paid on external debt for government bond yields. The idea here is that with a higher interest spread (INT-TB), it becomes desirable for countries to pay down their debt from reserve holdings[22]. However, the result we arrived at was not robust enough, although when it was significant the estimated coefficient turned *positive*. This outcome is not so surprising if we supplement it with the result

[21] The GCC countries represent the hard-core fixed regimes; whereas most of the rest represent adjustable pegs, though very infrequent. Egypt, de facto, moved from a fixed to a managed-float regime in 2003.

[22] See Edwards (1985) for more on the use of this interest differential. Van Wijnbergen (1990), however, argued that reserves should not be used to pay down external debt because they have an insurance value in times of uncertain income streams for risk-averse countries. Detragiache (1996) criticized this view on the grounds that if the country were to resort to distortionary policies to pay its debt, then it is less welfare costly to use reserves for that purpose.

obtained for the relation between external debt (EXTD) and reserves. As we can see, this result is significantly negative, hence indicating that external debt is a substitute for reserves. It seems then that, since close to 84% of Arab external debt is long-term, Arab external debt acts as a buffer instead of reserves, but with the latter partly increasing to pay interest due[23]. Lastly, the governance indicators yielded largely expected results. The significant effect of government and political stability (GS) confirm their importance for increasing the usefulness of reserves for economic well-being, and the ensuing higher social return stimulates more reserve holdings. However, the corruption indicator (CORR) did not produce similarly robust results, perhaps because the Arab economy has reached a steady state level of corruption and its reserve management has, for good or bad, adjusted itself to it[24].

IV – Adjustment Coefficients and Optimal Reserves

Given optimal reserves determined by the fundamentals delineated in the previous section, two relevant questions could be raised in relation: first, at what speed of adjustment do reserves return to their optimal level once they are in disequilibria; second, what aspects of policy determine the speed of adjustment. A standard model to utilize in this context is the

[23] In 2002, total Arab external debt was $140.4 billion with short-term debt reaching $22.6 billion.

[24] For more analysis on the prevailing corruption in the Arab world, see World Bank (2003).

stock adjustment model, which depicts the dynamic behavior of international reserves in the short term as follows:

(1) $\Delta LnRES_{i\,t} = \alpha\,(LnRES^{*}_{i\,t} - LnRES_{i\,t-1})$

Equation (1) postulates that country *i* adjusts its actual reserves between two time periods ($\Delta LnRES_{i\,t}$) in proportion to the discrepancy between desired reserves in time *t* ($LnRES^{*}_{i\,t}$) and actual reserves in time *t-1* ($LnRES_{i\,t-1}$). Also, α is the speed of adjustment coefficient, and higher values for α indicate a faster correction in reserves away from their optimal equilibrium levels.

The basic problem, however, in using equation (1) is that estimating pooled data on dynamic equations produce biased OLS results because the error term would include country-specific elements[25]. A congenial and tested way to avoid this problem is to use country-specific fixed effects (or dummy variables). As a result, we adopted a two-stage estimation methodology[26]. First, just as in the previous section, the following long-run equation for optimal reserves was estimated:

(2) $LnRES^{*}_{i\,t} = a_1\,LnPCI_{i\,t} + a_2\,M/GDP_{i\,t} + a_3\,RESVOL_{i\,t} + a_4\,ERVOL_{i\,t} + a_5\,GS_{i\,t} + a_6\,CORR_{i\,t} + a_7\,Country\ Dummy_{i\,t} + \mu_{i\,t}$

[25] See Nerlove (1971) and Gujarati (1995) for the error term properties in pooled dynamic equations.

[26] See Edwards (1984) and Frenkel (1983) for more on this methodology.

Second, the fitted values for $LnRES^{*}_{i\ t}$ from equation (2) were then replaced in equation (1) to estimate the coefficient of adjustment α. To highlight the policy dimension effecting α, we divided the all-countries sample into two groups and over two time periods: the GCC and Reform (Egypt, Jordan, Morocco, and Tunisia) groups, and the 1984-1992 and 1993-2002 (reform period) time periods.

Tables (4) and (5) present the results pertaining to equations (1) and (2). There are several interesting observations that can be deduced from these results. The all-countries sample had a lower adjustment coefficient in the second period than in the first period, 0.57 compared to 0.43, no doubt reflecting the higher optimal reserves characterizing the second period due to higher per-capita income and increased openness – plus the diminishing access to favorable (official) external debt[27]. Not the reform sample, however, whose second period adjustment coefficient was 0.62 compared to 0.54 in the first period. The speedier adjustment in the second period is most likely a product of more flexible and sounder economies: resorting to devaluations if need be (Tunisia and occasionally Morocco), and experiencing less overall volatility in their reserves due to the stabilizing impact of foreign direct investment – not to mention the continuing

[27] During the second period Arab per-capita income increased by 1.2% annually against a reduction of 0.8% in the first period. Also, the ratio of official debt declined from about 80% to 68% between the two periods. See AMF (2003).

beneficial role of external debt (Egypt and Jordan)[28]. The same can be said for the GCC sample, which saw its adjustment coefficient increase from 0.39 to 0.59 during the two periods. This higher coefficient is largely a result of smaller fluctuations in the price of oil during the second period and, in consequence, lower reserve volatility; perhaps more important, it also benefited from diversification efforts away from oil towards gas, petrochemicals, and services.

In comparative terms, one could argue that during the second period the Arab countries as a group had a *lower* adjustment coefficient mainly because of higher optimal reserve levels; but for the GCC, and especially for the reform, groups the *higher* coefficient was mostly the result of better policy framework and structural features. As to the results relating to the entire period, the reform group had the highest speed of adjustment: 45% of the disequilibrium between actual and optimal reserves is closed in one year, against a ratio of 38% for the GCC group, and 27% for the all-countries group.

If optimal reserves increased for the Arab countries as a whole in the second period, especially during 1997-2002, which countries were responsible for the increase? And did any of these countries overshoot their levels – in other words, did some countries hold more reserves than

[28] Egypt, Jordan, Morocco, and Tunisia are among the highest recipients of FDI in the Arab countries. In the second period, their ratios of FDI to GDP were respectively 1.2, 1.8, 2.5 and 2; against an Arab average of 1.3. See Bolbol and Fatheldin (2004).

warranted by their fundamentals? A simple way to check for such excessive holding or "hoarding" of reserves is to calculate the standardized residuals for the all-countries regression in table (5). The averages for these residuals for the 1997-2002 period are reported in table (6), in addition to the averages of actual reserves during 1980-2002[29]. They reveal some very important points. Tunisia and all the GCC countries, except Kuwait, held slightly less than their optimal reserves – although Saudi Arabia could benefit from holding more. Jordan, Lebanon, Morocco, and, to a mush lesser extent, Egypt held more reserves than warranted by their fundamentals[30]. However, part of the excess holdings could be justified by their extra precaution arising from their fixed exchange rates and open capital accounts, especially after the echo lessons from the Asian crisis[31]. The same holds true for Mauritania and Sudan, although their extra concerns relate to their capacity to sustain imports. The countries that truly stand out as overshooting their optimal reserves are Algeria and Syria – and to a smaller extent Yemen, given its freely-floating exchange rate regime. For Algeria and Syria, their average standardized reserves for the latest period were even larger than their

[29] We also ran the regression for the 1984-1996 period, and then compared the forecasted values for the 1997-2002 period with the actual ones. The difference between these two values matched the values for the standardized residuals in table (6) quite considerably.

[30] Egypt's standardized reserves could have been much higher had it not been the only Arab country which consistently lost reserves during 1997-2002. Reserves fell from about $18 billion to $13 billion in an attempt to defend the pound.

[31] IMF (2003) found that the Asian economies held more reserves than necessary during the same period, driven mostly by current account surpluses.

average holdings of reserves during the entire study period[32]. And it is hard to defend the reasons behind the super precautions that these two countries (especially Algeria) are taking after one accounts for all the relevant economic – and perhaps political – fundamentals.

[32] This is more surprising given that both Algeria and Syria do not have open capital accounts and Algeria even follows a flexible exchange rate regime.

V – Conclusion

The paper has provided a comprehensive analysis of Arab foreign reserves during the 1980-2002 period. The following conclusions and policy implications emanate from the analysis:

1. The GCC, and to a considerable extent, Tunisia have the best reserves adequacy ratios. Given the presumed "deep pockets" of the GCC countries, this is a testimony to Tunisia's success in its reserves and economic management.

2. Given their exchange rate and capital account arrangements, Egypt, Jordan, Lebanon, and Morocco could be vulnerable based on the reserves to short-term debt and to broad money ratios. However, they have amassed considerable reserves as extra precautions in the last six years – as Egypt discovered to its dismay during 1998-2001. The same applies to Mauritania and Sudan in the context of their reserves to imports ratio.

3. Exchange rate flexibility could relieve pressures on foreign reserves. Hence, it is recommended that countries introduce some flexibility to their exchange rate; or at least peg them to (a basket of) currencies of their major trading partners so as to stabilize trade flows, especially

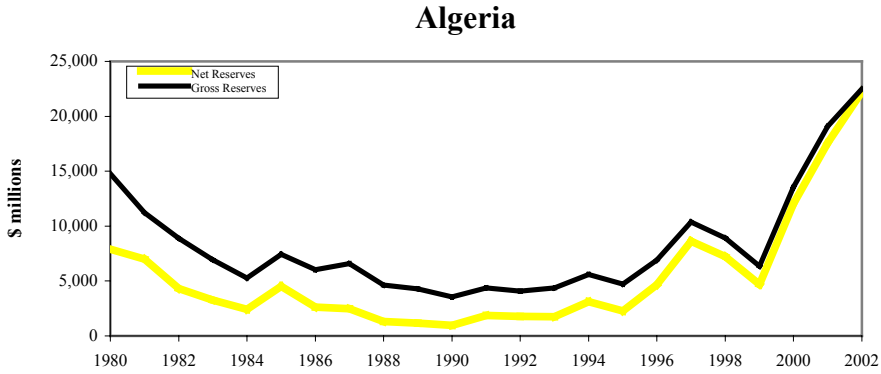
given the importance of the current account as a source of Arab reserves.

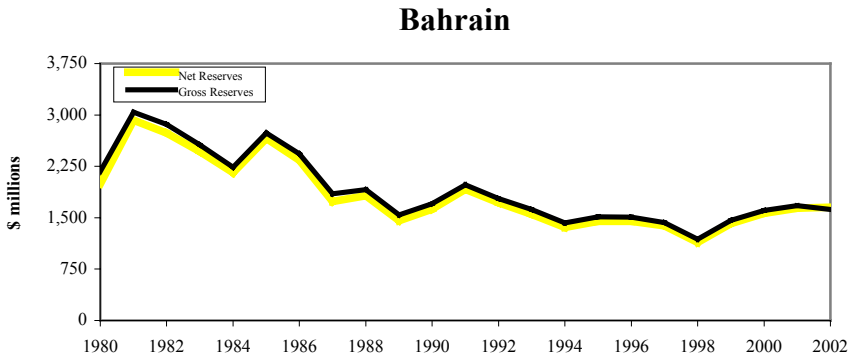
4. Higher per capita income and population, and the inevitable increase in openness due to globalization pressures, are bound to increase the demand for Arab reserves – the more so now that inflows of concessional debt are receding. As a result, Arab countries should activate more inflows through the capital account, primarily through the attraction of more foreign direct investment. In this regard, sound economic reforms is not only a good vehicle for that, but it also enhances the adjustment capability of the Arab economy to optimize its reserves levels.

5. Echoes from the Asian crisis, and perhaps undue emphasis on political concerns, have led some Arab countries to "hoard" excess reserves that depart quite extensively from fundamentals. These practices are better discouraged but, more important, the hard part is to melt down these excess foreign reserves in productive investment and useful consumption. This relates to issues that go beyond reserve management and touch at the heart of real economic – and political – reforms in the Arab world, and their treatment should therefore assume considerable urgency – not just for countries like Algeria and Syria that carry considerable excesses, but for all the Arab countries.

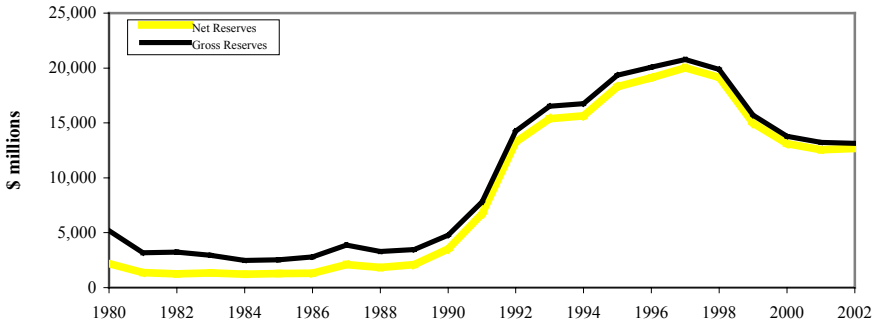
Figures

Figure (1): Arab Countries: International Real Reserves

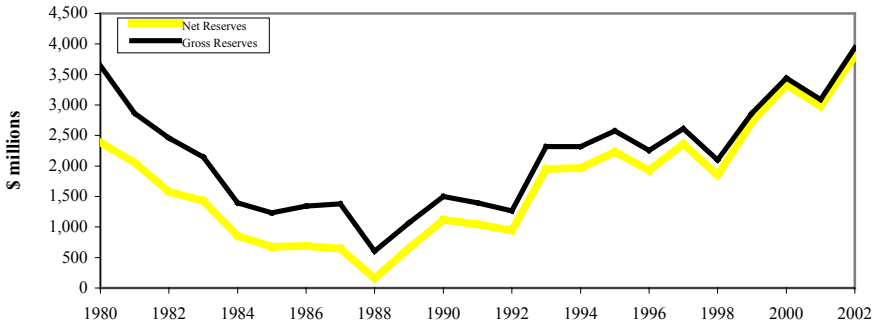




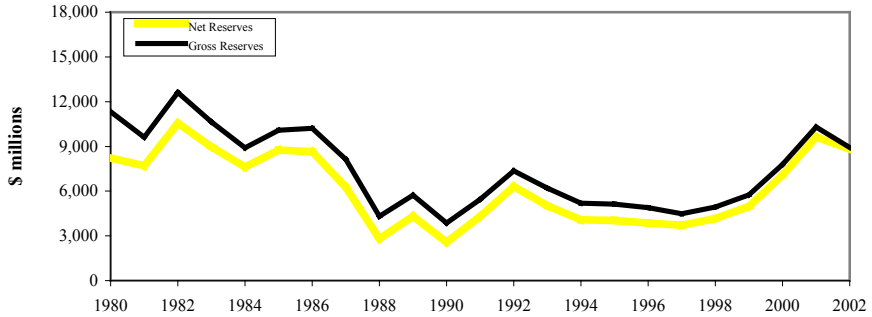
Egypt



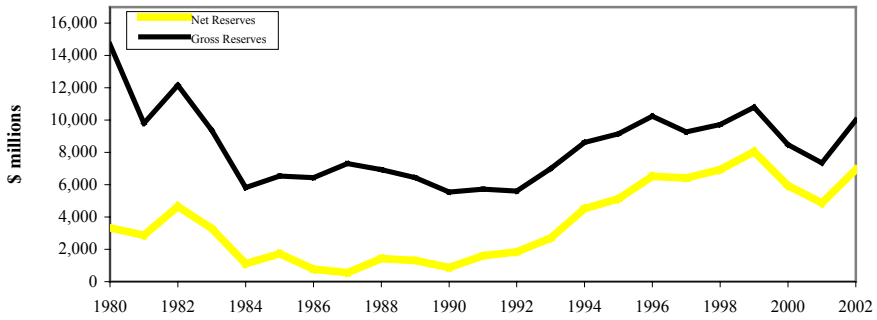
Jordan



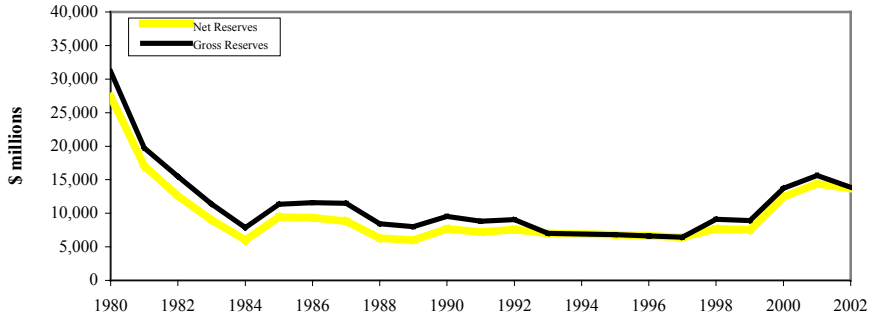
Kuwait



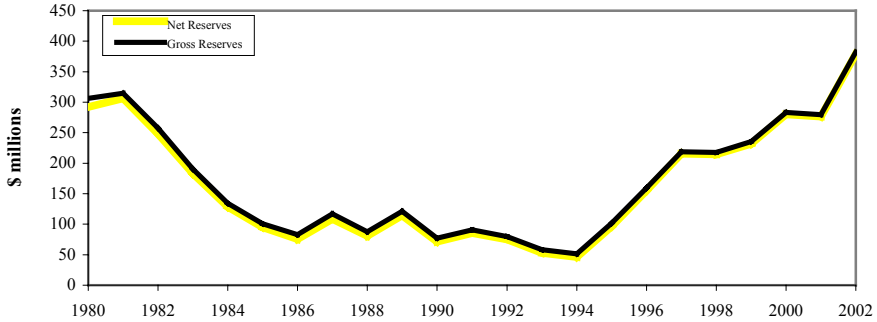
Lebanon



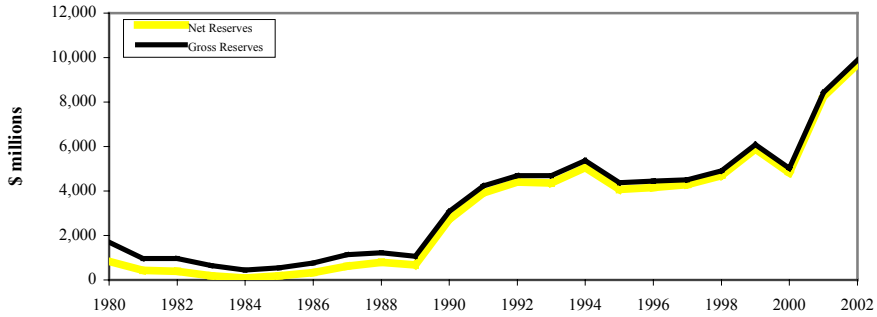
Libya



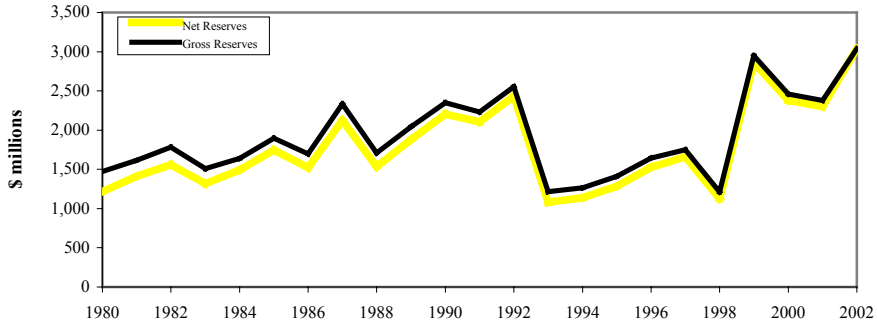
Mauritania



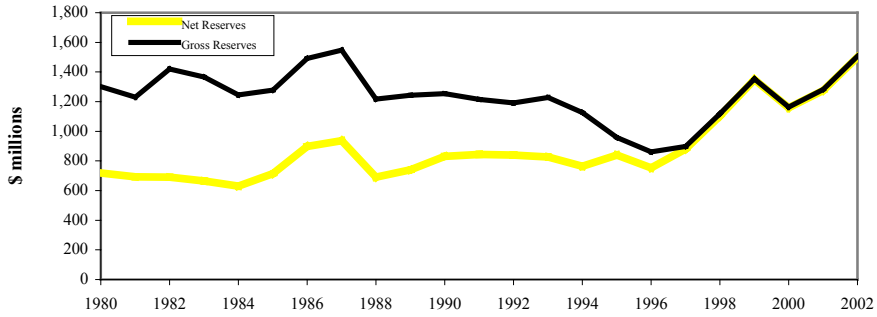
Morocco



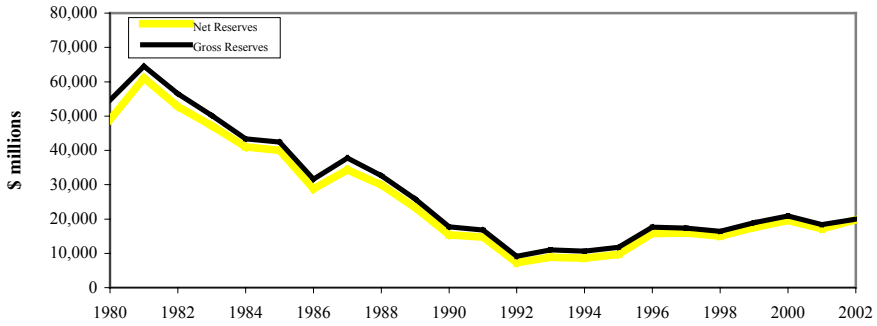
Oman



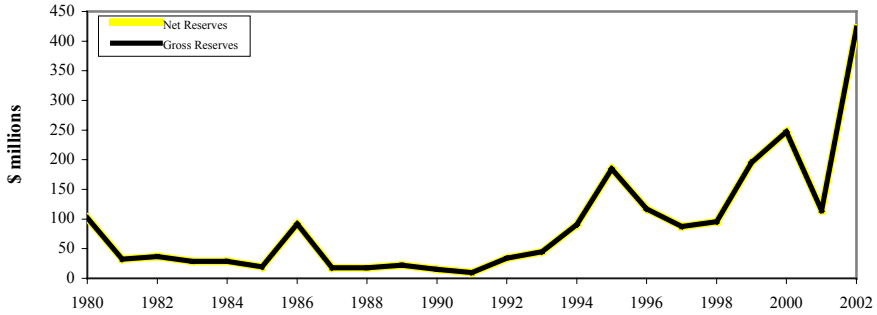
Qatar



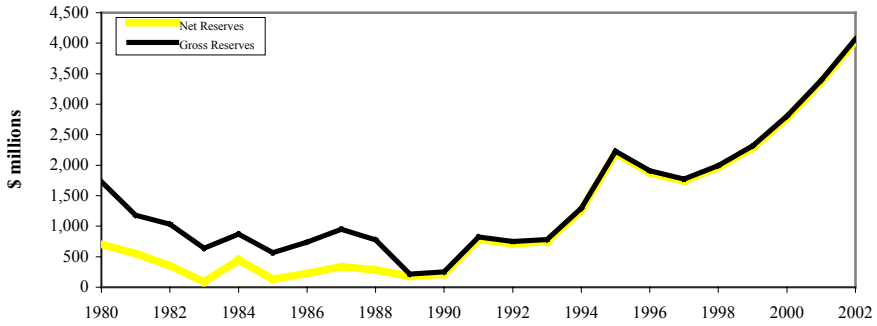
Saudi Arabia



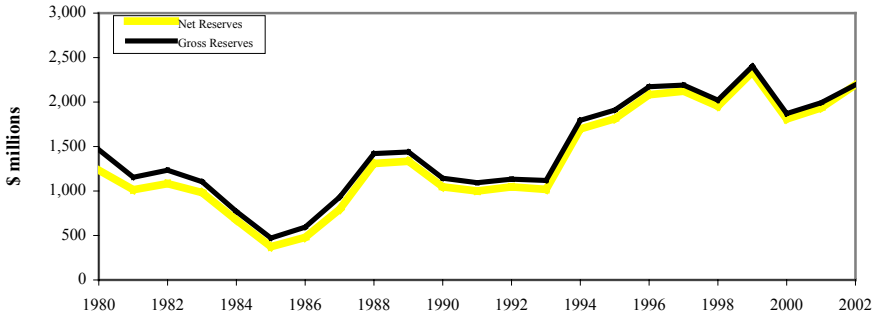
Sudan



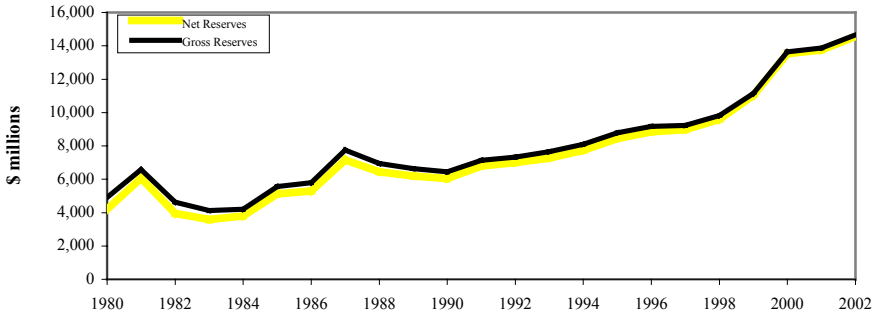
Syria



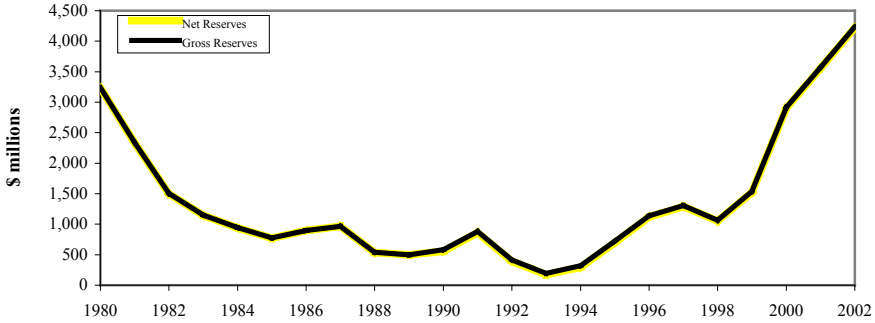
Tunisia



UAE



Yemen



All Arab Countries

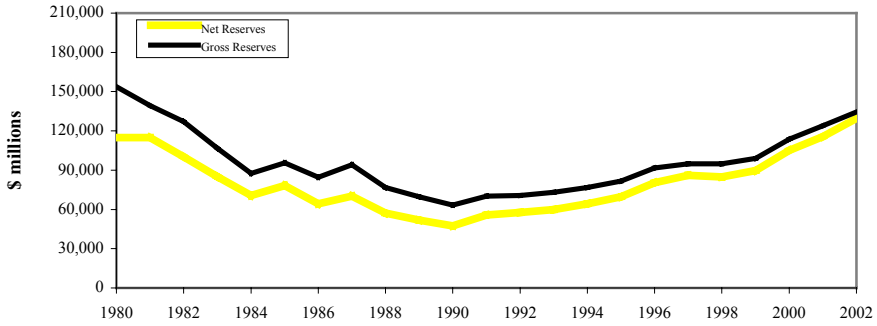
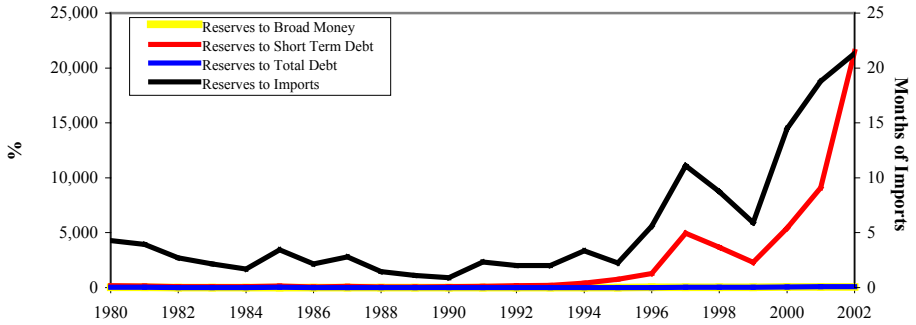
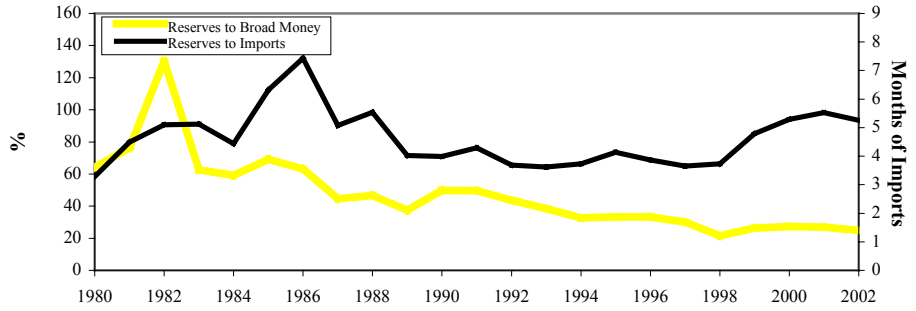


Figure (2): Arab Countries: Selected Reserve Indicators

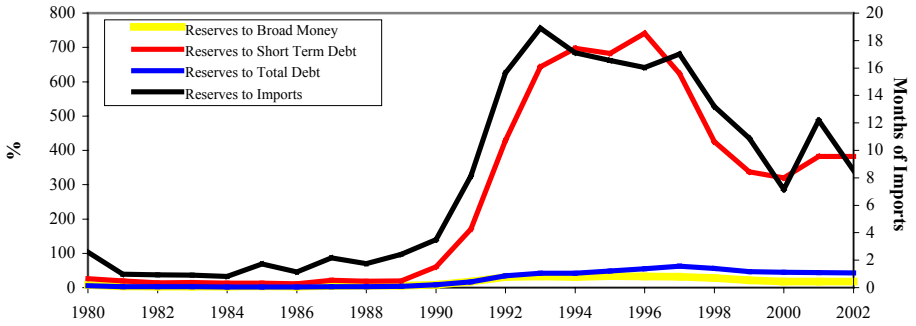
Algeria



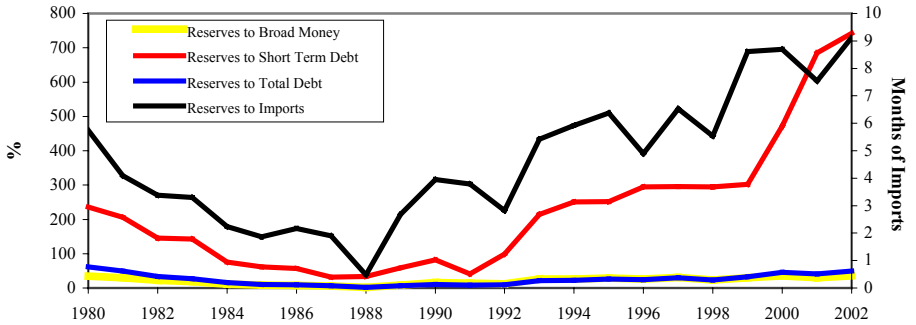
Bahrain



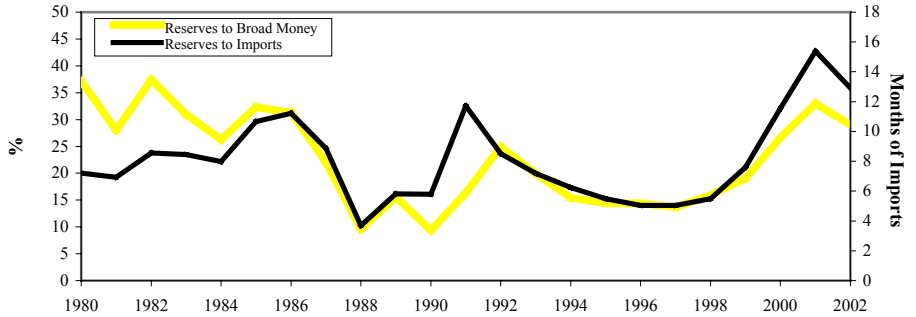
Egypt



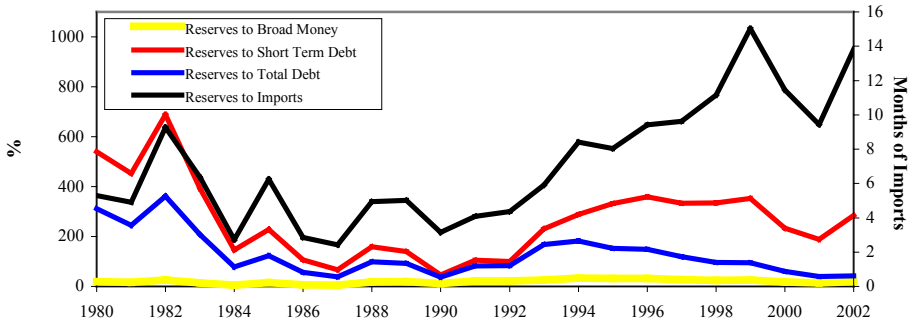
Jordan



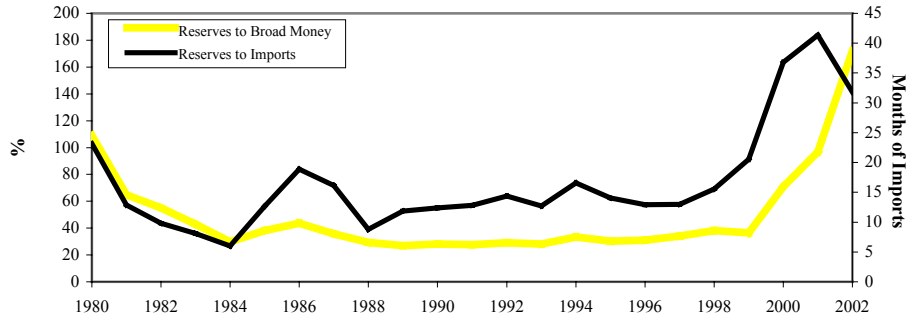
Kuwait



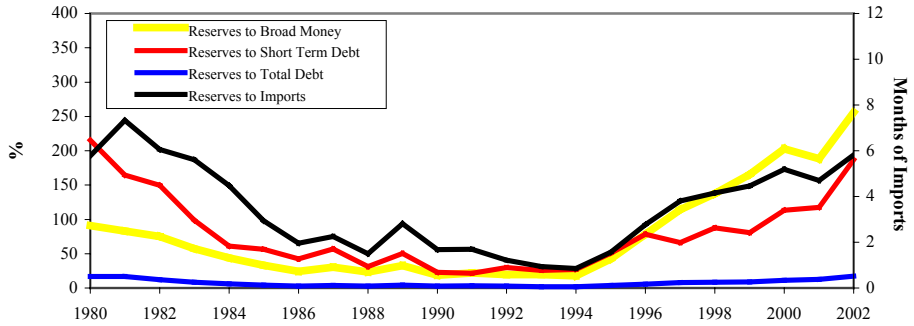
Lebanon



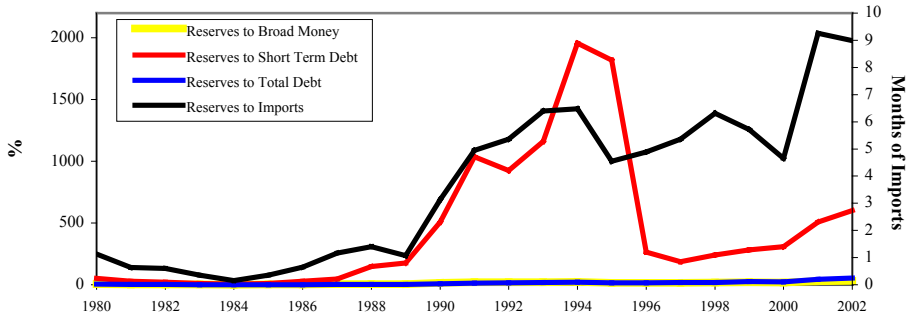
Libya



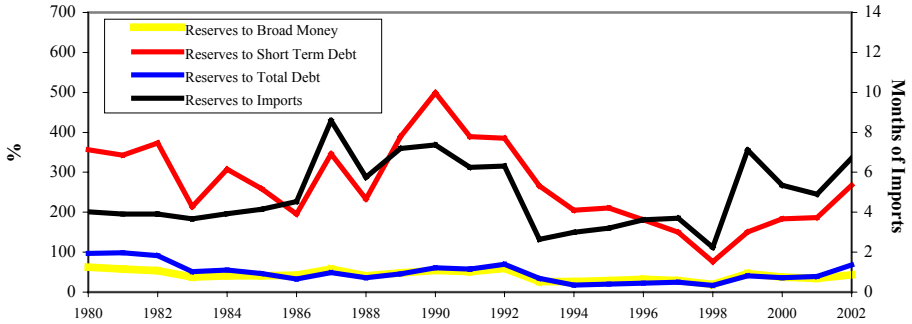
Mauritania



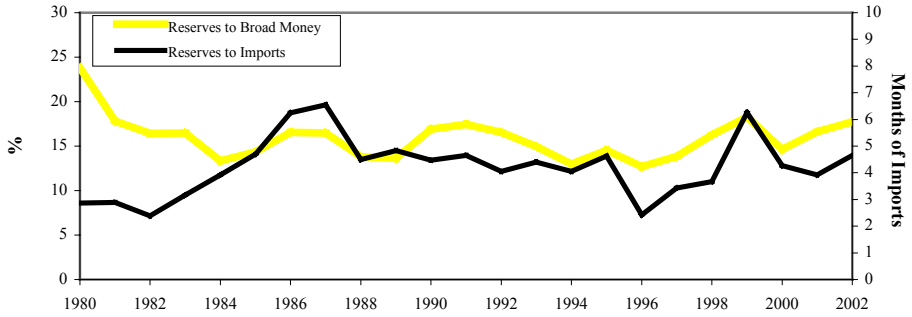
Morocco



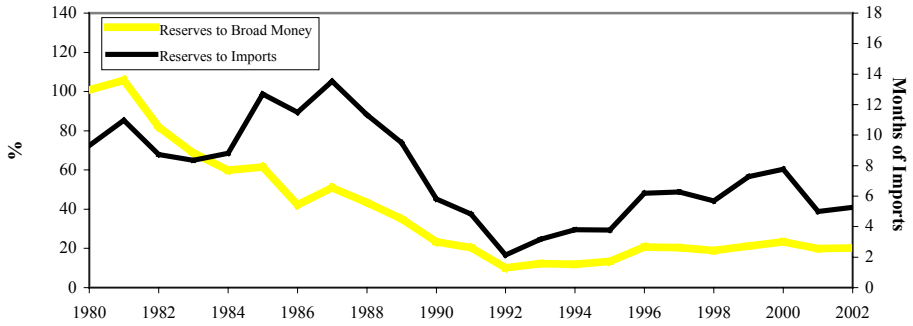
Oman



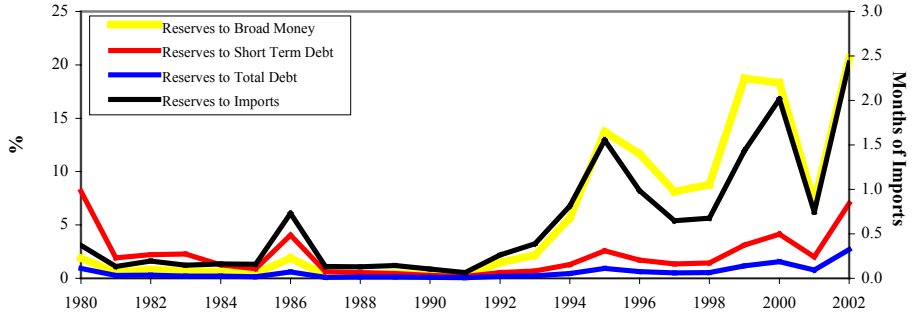
Qatar



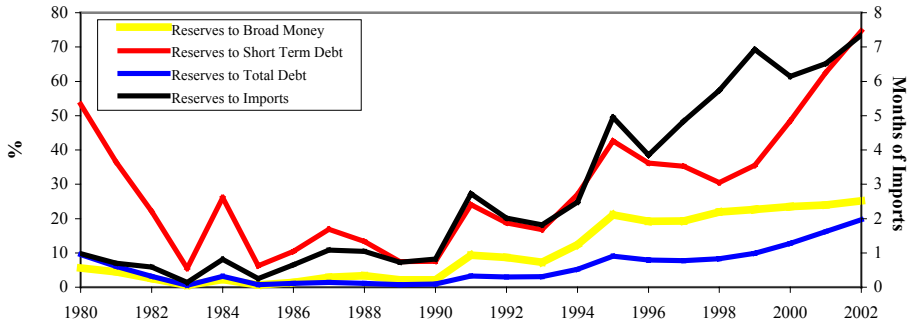
Saudi Arabia



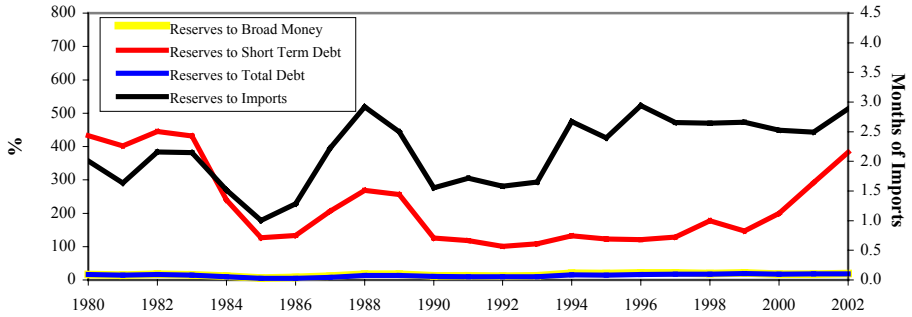
Sudan



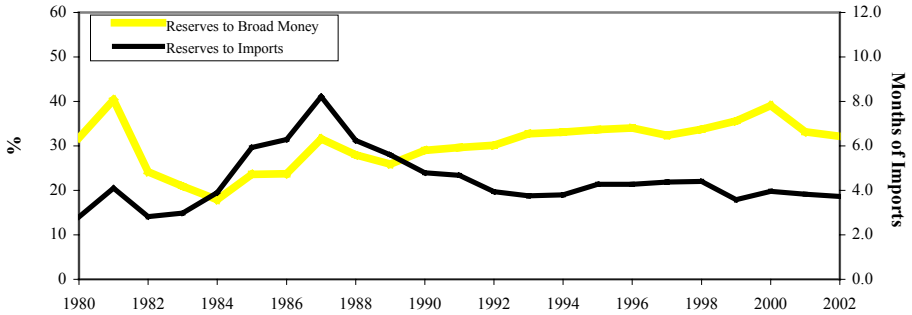
Syria



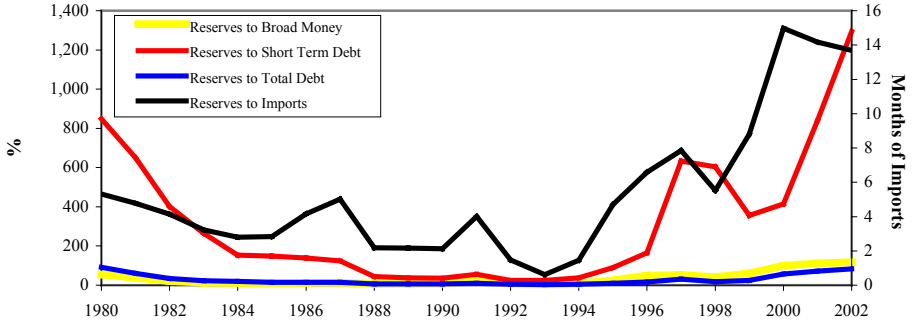
Tunisia



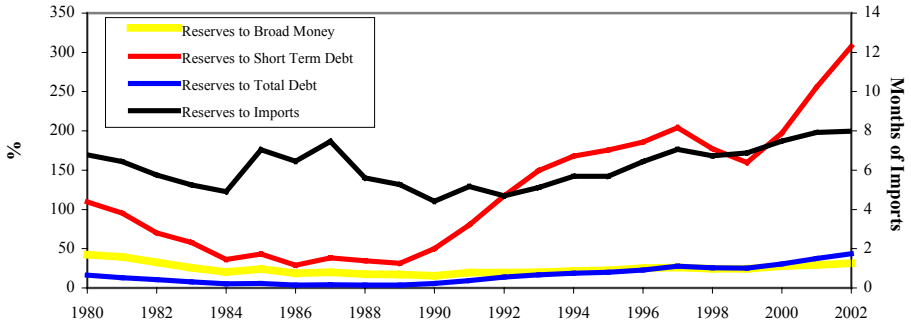
UAE



Yemen



All Arab Countries



Tables

Table (1): International Reserves[1]

	1980	1990	2002
Nominal Gross International Reserves			
World	452,261	978,752	2,557,318
Developed Countries	273,516	628,447	1,018,552
Developing Countries	178,744	350,305	1,538,767
Arab Countries	73,583	48,090	140,342
Nominal Net International Reserves			
World	409,614	931,988	2,513,057
Developed Countries	237,197	588,838	981,934
Developing Countries	172,416	343,148	1,531,122
Arab Countries	54,961	36,010	135,402
Real Gross International Reserves			
World	945,164	1,289,868	2,448,131
Developed Countries	571,611	828,212	975,064
Developing Countries	373,551	461,657	1,473,068
Arab Countries	153,779	63,376	134,350
Real Net International Reserves			
World	856,038	1,228,239	2,405,760
Developed Countries	495,710	776,012	940,010
Developing Countries	360,326	452,225	1,465,750
Arab Countries	114,861	47,457	129,621

1) Expressed in $ millions.

Source: IMF, *International Financial Statistics Yearbook* (2003).

Table (2): Descriptive Statistics

	Mean	Median	Min.	Max.	Std. Dev.
Algeria					
Net Real International Reserves [1]	5,468.3	3,251.0	955.1	22,245.4	5,391.1
Gross Real International Reserves [1]	8,278.4	6,577.5	3,562.9	22,500.5	4,987.8
Reserves to Broad Money [2]	18.4	8.1	1.8	72.1	21.2
Reserves to Short Term Debt [2]	2,221.4	162.3	46.0	21,516.2	4,804.1
Reserves to Total Debt [2]	19.6	11.5	2.6	101.9	24.9
Reserves to Imports [3]	5.4	2.8	0.9	21.3	5.7
Bahrain					
Net Real International Reserves [1]	1,832.8	1,652.1	1,140.1	2,925.0	490.5
Gross Real International Reserves [1]	1,906.8	1,703.5	1,185.7	3,037.9	511.9
Reserves to Broad Money [2]	47.5	43.7	21.6	130.3	24.0
Reserves to Short Term Debt [2]	..	..	..	..	..
Reserves to Total Debt [2]	..	..	..	..	..
Reserves to Imports [3]	4.6	4.4	3.3	7.4	1.0
Egypt					
Net Real International Reserves [1]	8,714.0	6,733.2	1,220.1	20,022.5	7,317.0
Gross Real International Reserves [1]	9,957.9	7,820.6	2,462.7	20,779.9	6,952.1
Reserves to Broad Money [2]	15.7	17.4	2.4	33.7	12.1
Reserves to Short Term Debt [2]	263.7	170.6	11.6	741.0	270.8
Reserves to Total Debt [2]	25.0	16.3	2.1	62.4	22.7
Reserves to Imports [3]	7.8	7.1	0.8	18.9	6.7
Jordan					
Net Real International Reserves [1]	1,710.8	1,849.1	159.5	3,806.2	955.9
Gross Real International Reserves [1]	2,165.6	2,255.7	603.3	3,941.3	893.4
Reserves to Broad Money [2]	20.9	22.9	1.5	35.6	10.5
Reserves to Short Term Debt [2]	220.5	205.7	32.1	741.8	193.5
Reserves to Total Debt [2]	24.5	23.0	1.9	61.2	16.3
Reserves to Imports [3]	4.7	4.1	0.5	9.1	2.4

1) Expressed in $ millions.
2) Expressed as a percentage.
3) Expressed in months.

Table (2) Continued

	Mean	Median	Min.	Max.	Std. Dev.
Kuwait					
Net Real International Reserves [1]	6,190.6	6,272.3	2,572.1	10,551.7	2,399.2
Gross Real International Reserves [1]	7,472.3	7,355.2	3,860.3	12,621.9	2,615.5
Reserves to Broad Money [2]	22.7	22.0	9.4	37.5	8.6
Reserves to Short Term Debt [2]	..	..	..	..	..
Reserves to Total Debt [2]	..	..	..	..	..
Reserves to Imports [3]	8.1	7.6	3.7	15.4	2.9
Lebanon					
Net Real International Reserves [1]	3,622.1	3,289.2	557.2	8,038.5	2,361.6
Gross Real International Reserves [1]	8,395.5	8,474.6	5,548.8	14,680.5	2,324.1
Reserves to Broad Money [2]	19.6	19.0	5.6	33.2	8.1
Reserves to Short Term Debt [2]	265.6	233.9	46.4	689.1	158.7
Reserves to Total Debt [2]	127.0	96.5	37.1	361.5	86.8
Reserves to Imports [3]	7.1	6.2	2.4	15.0	3.6
Libya					
Net Real International Reserves [1]	9,741.3	7,679.8	6,018.5	27,358.4	4,894.0
Gross Real International Reserves [1]	11,259.3	9,083.1	6,433.2	31,149.4	5,532.5
Reserves to Broad Money [2]	49.2	35.7	27.0	171.8	34.7
Reserves to Short Term Debt [2]	..	..	..	..	..
Reserves to Total Debt [2]	..	..	..	..	..
Reserves to Imports [3]	16.7	13.0	6.0	41.3	8.9
Mauritania					
Net Real International Reserves [1]	165.8	128.5	46.1	379.3	96.8
Gross Real International Reserves [1]	171.6	134.3	51.2	382.3	96.8
Reserves to Broad Money [2]	77.2	43.7	17.9	255.7	68.9
Reserves to Short Term Debt [2]	79.7	61.3	21.6	215.2	55.1
Reserves to Total Debt [2]	7.2	5.7	1.8	17.2	5.0
Reserves to Imports [3]	3.5	2.9	0.9	7.3	1.9

1) Expressed in $ millions.
2) Expressed as a percentage.
3) Expressed in months.

Table (2) Continued

	Mean	Median	Min.	Max.	Std. Dev.
Morocco					
Net Real International Reserves [1]	3,079.9	3,919.8	80.7	9,700.1	2,740.7
Gross Real International Reserves [1]	3,442.2	4,234.5	440.4	9,885.1	2,629.7
Reserves to Broad Money [2]	13.0	16.5	0.9	31.4	9.4
Reserves to Short Term Debt [2]	448.6	242.2	4.3	1,956.7	566.3
Reserves to Total Debt [2]	13.4	14.2	0.4	54.5	14.0
Reserves to Imports [3]	3.6	4.5	0.1	9.3	2.9
Oman					
Net Real International Reserves [1]	1,779.8	1,556.8	1,082.5	3,038.0	556.1
Gross Real International Reserves [1]	1,920.1	1,751.9	1,212.4	3,038.2	527.3
Reserves to Broad Money [2]	42.2	41.1	19.0	62.6	12.1
Reserves to Short Term Debt [2]	268.1	258.3	76.1	498.6	102.5
Reserves to Total Debt [2]	48.3	45.6	17.0	98.8	24.1
Reserves to Imports [3]	4.9	4.1	2.2	8.6	1.7
Qatar					
Net Real International Reserves [1]	884.3	831.7	629.7	1,499.9	235.4
Gross Real International Reserves [1]	1,239.0	1,243.1	862.1	1,547.0	175.1
Reserves to Broad Money [2]	15.9	16.4	12.7	23.8	2.4
Reserves to Short Term Debt [2]	..	..	..	..	..
Reserves to Total Debt [2]	..	..	..	..	..
Reserves to Imports [3]	4.2	4.3	2.4	6.5	1.1
Saudi Arabia					
Net Real International Reserves [1]	25,765.2	19,585.0	7,284.0	61,064.6	15,740.1
Gross Real International Reserves [1]	28,083.9	19,939.7	9,163.7	64,502.7	16,528.1
Reserves to Broad Money [2]	38.5	23.3	10.1	105.8	28.6
Reserves to Short Term Debt [2]	..	..	..	..	..
Reserves to Total Debt [2]	..	..	..	..	..
Reserves to Imports [3]	7.5	7.3	2.1	13.5	3.2

1) Expressed in $ millions.
2) Expressed as a percentage.
3) Expressed in months.

Table (2) Continued

	Mean	Median	Min.	Max.	Std. Dev.
Sudan					
Net Real International Reserves [1]	89.3	44.6	9.6	422.1	97.1
Gross Real International Reserves [1]	89.3	44.6	9.6	422.1	97.1
Reserves to Broad Money [2]	5.4	1.9	0.2	20.6	6.7
Reserves to Short Term Debt [2]	2.1	1.4	0.2	8.1	2.1
Reserves to Total Debt [2]	0.6	0.3	0.1	2.7	0.6
Reserves to Imports [3]	0.6	0.4	0.1	2.4	0.7
Syria					
Net Real International Reserves [1]	1,185.9	713.1	90.2	4,040.8	1,133.1
Gross Real International Reserves [1]	1,439.1	1,032.6	216.7	4,068.5	1,001.2
Reserves to Broad Money [2]	10.5	7.3	0.5	25.2	9.2
Reserves to Short Term Debt [2]	28.6	26.1	5.5	74.6	18.6
Reserves to Total Debt [2]	5.9	3.3	0.6	19.6	5.2
Reserves to Imports [3]	2.7	1.8	0.1	7.3	2.4
Tunisia					
Net Real International Reserves [1]	1,362.4	1,233.3	372.4	2,338.0	576.2
Gross Real International Reserves [1]	1,461.8	1,420.9	470.1	2,403.2	554.5
Reserves to Broad Money [2]	15.6	16.8	6.1	21.3	4.3
Reserves to Short Term Debt [2]	221.6	177.8	101.1	444.9	119.6
Reserves to Total Debt [2]	13.5	14.8	4.8	19.0	4.2
Reserves to Imports [3]	2.2	2.2	1.0	2.9	0.6
UAE					
Net Real International Reserves [1]	7,626.7	7,010.1	3,583.0	14,569.6	3,146.1
Gross Real International Reserves [1]	8,004.9	7,335.8	4,122.1	14,656.4	2,993.7
Reserves to Broad Money [2]	30.3	31.8	17.9	40.4	5.5
Reserves to Short Term Debt [2]	..	..	..	..	..
Reserves to Total Debt [2]	..	..	..	..	..
Reserves to Imports [3]	4.4	4.1	2.8	8.2	1.3

1) Expressed in $ millions.
2) Expressed as a percentage.
3) Expressed in months.

Table (2) Continued

	Mean	Median	Min.	Max.	Std. Dev.
Yemen					
Net Real International Reserves [1]	1,367.6	964.1	173.2	4,222.2	1,112.6
Gross Real International Reserves [1]	1,379.9	967.5	196.5	4,239.8	1,111.6
Reserves to Broad Money [2]	34.6	19.4	4.7	118.1	34.6
Reserves to Short Term Debt [2]	321.0	153.7	24.3	1,293.4	341.7
Reserves to Total Debt [2]	27.2	16.0	2.5	91.9	26.7
Reserves to Imports [3]	5.3	4.2	0.6	15.0	4.1
All Arab Countries					
Net Real International Reserves [1]	80,587.0	78,208.2	47,456.9	129,621.1	23,369.6
Gross Real International Reserves [1]	96,667.6	94,091.7	63,376.3	153,778.9	24,895.4
Reserves to Broad Money [2]	24.6	23.8	15.4	42.4	6.8
Reserves to Short Term Debt [2]	120.6	109.6	29.1	307.7	79.4
Reserves to Total Debt [2]	16.2	13.8	3.7	43.5	11.5
Reserves to Imports [3]	6.2	6.4	4.4	8.0	1.0

1) Expressed in $ millions.
2) Expressed as a percentage.
3) Expressed in months.

Source: Same as Table (1)

Table (3): Regression Results: Determinants of International Reserves[1]

Dependent Variable : Ln (RES)														
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14
Ln (PCI)	1.21	0.86	0.85	0.80	0.91	0.45	0.41	0.57	1.22	1.15	1.21	0.86	0.53	0.70
	(9.06) *	(6.58) *	(6.54) *	(4.40) *	(4.70) *	(2.39) **	(1.79) ***	(2.35) **	(9.47) *	(6.35) *	(6.52) *	(4.40) *	(2.09) **	(2.61) *
Ln (POP)	1.18	1.30	1.30	1.68	2.27	1.33	2.10	2.75	1.38	1.97	2.63	1.70	2.43	3.07
	(8.87) *	(9.47) *	(9.46) *	(5.03) *	(9.06) *	(4.20) *	(4.34) *	(6.42) *	(9.19) *	(6.19) *	(10.81) *	(5.17) *	(4.93) *	(6.82) *
M /GDP	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.01	0.01
	(7.61) *	(5.32) *	(5.27) *	(3.93) *	(3.81) *	(1.86) ***	(1.55)	(1.51)	(8.16) *	(5.95) *	(5.61) *	(4.29) *	(1.92) ***	(1.60)
RESVOL		0.28	0.28	0.31	0.25	0.33	0.25	0.21						
		(8.53) *	(8.51) *	(6.13) *	(4.71) *	(8.24) *	(4.22) *	(3.15) *						
XVOL									0.21	0.10	0.08	0.24	0.02	0.01
									(4.64) *	(1.52)	(1.26)	(4.41) *	(0.28)	(0.14)
ERVOL			0.00	0.00	0.00	0.00	0.00	0.00						
			(-1.30)	(-1.27)	(-1.58)	(-0.85)	(-1.15)	(-1.38)						
ERDUM									-0.10	-0.31	-0.30	-0.09	-0.21	-0.22
									(-1.08)	(-2.63) *	(-2.47) **	(-0.90)	(-2.09) **	(-1.96) ***
INT - TB				0.01			0.08			0.01			0.09	
				(0.23)			(2.98) *			(0.37)			(3.19) *	
Ln (EXTD)					-0.56			-0.36			-0.71			-0.55
					(-4.28) *			(-2.28) **			(-5.51) *			(-3.63) *
GS						0.07	0.05	0.05				0.06	0.05	0.06
						(3.18) *	(1.71) ***	(1.96) ***				(2.36) **	(1.55)	(2.07) **
CORR						0.12	0.06	0.04				0.08	0.06	0.02
						(2.33) **	(1.01)	(0.68)				(1.49)	(1.06)	(0.29)
N	391	391	391	243	253	311	193	203	391	243	253	311	193	203
Adj . R^2	83 .69	86 .25	86 .25	81 .58	83 .04	87 .83	86 .85	87 .79	84 .44	79 .39	81 .86	85 .72	85 .76	85 .93
F-Statistic	106 .33 *	123 .3 *	117 .5 *	67 .97 *	78 .11 *	98 .24 *	71 .46 *	73 .49 *	101 .8 *	59 .26 *	72 .088 *	81 .95 *	65 .25 *	69 .56 *

1) The White covariance estimator was used in order to provide estimates with heteroskedasticity consistent standard errors and covariance. Figures between parentheses are *t*-statistics
*, **, *** refer to 1%, 5% and 10% levels of significance, respectively.

Table (3) Continued[1]

Dependent Variable : Ln (RES)																										
	Model 15		Model 16		Model 17		Model 18		Model 19		Model 20		Model 21		Model 22		Model 23		Model 24		Model 25		Model 26		Model 27	
Ln (PCI)	0.91		0.90		0.88		0.96		0.49		0.43		0.59		0.91		0.87		0.96		0.50		0.43		0.59	
	(6.96)	*	(6.93)	*	(4.62)	*	(4.90)	*	(2.60)	*	(1.69)	***	(2.20)	**	(7.00)	*	(4.61)	*	(4.90)	*	(2.65)	*	(1.68)	***	(2.20)	**
Ln (POP)	1.40		1.41		1.63		2.20		1.49		2.12		2.76		1.41		1.62		2.20		1.49		2.08		2.70	
	(9.32)	*	(9.34)	*	(4.91)	*	(8.90)	*	(4.81)	*	(4.44)	*	(6.45)	*	(9.19)	*	(4.87)	*	(9.11)	*	(4.78)	*	(4.37)	*	(6.29)	*
M /GDP	0.01		0.01		0.01		0.01		0.01		0.01		0.01		0.01		0.01		0.01		0.01		0.01		0.01	
	(5.69)	*	(5.65)	*	(4.18)	*	(3.99)	*	(2.17)	**	(1.48)		(1.40)		(5.69)	*	(4.20)	*	(4.07)	*	(2.16)	**	(1.48)		(1.40)	
RESVOL	0.26		0.26		0.32		0.26		0.30		0.25		0.21		0.26		0.31		0.24		0.31		0.24		0.20	
	7.34	*	(7.29)	*	(6.39)	*	(4.87)	*	(7.09)	*	(4.26)	*	(3.18)	*	(7.28)	*	5.95	*	4.53	*	7.08	*	3.95	*	2.98	*
XVOL	0.11		0.12		0.124		0.10		0.11		0.03		0.02		0.11		0.14		0.11		0.10		0.03		0.02	
	2.40	**	2.46	**	1.867	***	1.50		1.98	**	0.33		0.30		2.33	**	(2.06)	**	(1.68)	***	(1.83)	***	(0.37)		(0.32)	
ERVOL			0.00		0.00		0.00		0.00		0.00		0.00													
			(-1.38)		(-1.27)		(-1.55)		(-0.98)		(-1.17)		(-1.37)													
ERDUM															0.04		-0.18		-0.19		0.05		-0.12		-0.14	
															0.51		(-1.66)	***	(-1.70)	***	(0.51)		(-1.22)		(-1.21)	
INT - TB					0.01						0.08						0.01						0.08			
					0.24						3.00	*					0.34						2.99	*		
Ln (EXTD)							-0.54						-0.35						-0.53						-0.34	
							(-4.00)	*					(-2.20)	**					(-4.06)	*					(-2.19)	**
GS									0.07		0.05		0.05								0.07		0.05		0.05	
									3.13	*	(1.64)		(1.90)	***							3.13	*	(1.65)	***	(1.91)	***
CORR									0.11		0.06		0.04								0.11		0.06		0.04	
									2.08	**	(0.99)		(0.68)								2.05	**	(0.96)		(0.69)	
N	391		391		243		253		311		193		203		391		243		253		311		193		203	
Adj . R^2	86.40		86.44		81.74		83.11		87.93		86.78		86.52		86.41		81.82		83.16		87.91		86.81		86.53	
F-Statistic	119.37	*	114.1	*	64.76	*	73.99	*	95.15	*	67.35	*	69.27	*	113.7	*	65.06	*	74.21	*	94.96	*	67.53	*	69.28	*

1) The White covariance estimator was used in order to provide estimates with heteroskedasticity consistent standard errors and covariance. Figures between parentheses are *t*-statistics
*, **, *** refer to 1%, 5% and 10% levels of significance, respectively.

Table (4): Regression Results: Determinants of International Reserves by Country Group[1]

Dependent Variable : Ln (RES)									
	Ln (PCI)	M /GDP	RESVOL	ERVOL	GS	CORR	N	Adj . R^2 (%)	F-Statistic
Entire Period									
All Countries	0.36 (1.86) ***	0.01 (1.42)	0.33 (8.02) *	0.00 (-0.74)	0.15 (9.38) *	0.11 (1.93) ***	311	87 .02	95 .50 *
Reform Countries	0.81 (1.57)	0.02 (2.51) **	0.52 (5.19) *	-0.39 (-0.42)	0.13 (3.50) *	0.29 (2.65) *	76	81 .96	38 .87 *
GCC Countries	0.56 (2.69) *	0.01 (4.10) *	0.03 (0.78)	20 .83 (2.77) *	-0.01 (-0.51)	-0.23 (-3.19) *	108	92 .60	123 .41 *
1984 - 1992									
All Countries	0.47 (1.84) ***	0.01 (2.41) **	0.27 (3.01) *	0.00 (1.18)	0.03 (0.91)	0.04 (0.39)	141	90 .57	62 .16 *
Reform Countries	1.70 (1.86) ***	0.03 (2.03) ***	0.42 (2.64) **	0.49 (0.37)	0.011 (0.14)	0.59 (1.93)	36	54 .07	5.58 *
GCC Countries	0.26 (0.82)	0.02 (1.32)	0.11 (0.80)	13 .54 (1.56)	-0.04 (-0.45)	0.04 (0.19)	48	91 .71	48 .26 *
1993 - 2002									
All Countries	0.17 (.75)	0.00 (0.38)	0.30 (5.24) *	0.01 (0.54)	0.15 (7.14) *	0.12 (1.61)	170	93 .64	114 .04 *
Reform Countries	0.31 (0.56)	0.01 (0.73)	0.42 (3.50) *	0.27 (0.44)	0.02 (0.67)	-0.01 (-0.13)	40	94 .72	78 .68 *
GCC Countries	0.75 (3.22) *	0.00 (0.75)	0.07 (1.20)	-15 .32 (-0.74)	0.06 (2.88) *	-0.18 (-1.93) ***	60	96 .46	146 .96 *

1) The White covariance estimator was used in order to provide estimates with heteroskedasticity consistent standard errors and covariance. Figures between parentheses are *t*-statistics
*, **, *** refer to 1%, 5% and 10% levels of significance, respectively.

Table (5): Regression Results: Coefficient of Adjustment[1]

Dependent Variable : Δ $lnRES_{i,t}$												
	Entire Period				1984 - 1992				1993 - 2002			
	$lnRES^{*}_{i,t} - lnRES_{i,t-1}$	N	Adj. R^2	F-Statistic	$lnRES^{*}_{i,t} - lnRES_{i,t-1}$	N	Adj. R^2	F-Statistic	$lnRES^{*}_{i,t} - lnRES_{i,t-1}$	N	Adj. R^2	F-Statistic
All Countries	0.27 (5.54) *	294	12.30	42.09 *	0.57 (5.82) *	124	26.24	44.72 *	0.43 (4.92) *	153	21.75	43.25 *
Reform Countries	0.45 (4.04) *	72	23.16	22.40 *	0.54 (3.92) *	32	25.34	11.52 *	0.62 (5.12) *	36	32.76	18.06 *
GCC Countries	0.38 (4.54) *	102	19.57	25.57 *	0.39 (3.06) *	42	13.68	7.48 *	0.59 (2.77) *	54	24.38	18.09 *

1) The White covariance estimator was used in order to provide estimates with heteroskedasticity consistent standard errors and covariance.
Figures between parentheses are *t*-statistics
*, **, *** refer to 1%, 5% and 10% levels of significance, respectively.

Table (6): Arab Countries: Average Standardized Residuals and Actual Reserves[1]

	Average Standardized Residuals (1997-2002)	Average Actual Reserves (1980-2002)
Algeria	7,106	5,468
Bahrain	-220	1,833
Egypt	411	8,714
Jordan	805	1,711
Kuwait	581	6,190
Lebanon	1,223	3,622
Libya	2,219	9,741
Mauritania	109	166
Morocco	1,758	3,080
Oman	-1,948	1,780
Qatar	-320	884
Saudi Arabia	-8,692	25,765
Sudan	76	89
Syria	1,126	1,186
Tunisia	-23	1,362
UAE	-1,074	7,627
Yemen	581	1,368

1) Expressed in $ millions.

Appendix

Definition of Variables

RES : *Real International Reserves* are defined as nominal reserves (net of gold) in US$ deflated by the US consumer price index.

PCI : *Real Income Per Capita*

POP : *Population*

M/GDP : *Ratio of Imports to GDP* is measured as the ratio of imports c.i.f. in US$ to GDP in US$.

RESVOL : *Reserve Volatility* is measured as the log of the standard error (over the previous 7 years) of the trend-adjusted annual changes in the stock of real reserves.

XVOL : *Export Volatility* is measured as the log of the standard error (over the previous 7 years) of the trend-adjusted annual exports, where exports are measured f.o.b. in real US$.

ERVOL : *Exchange Rate Volatility* is measured as the standard deviation of monthly changes in the nominal exchange rate over the previous 12 months.

ERDUM	:	The *Exchange Rate Dummy* is a dummy variable that takes the value of 1 if the nominal exchange rate appreciated/ depreciated by more than 1% in the preceding year, and takes the value of 0 otherwise.
INT – TB	:	The *Interest Differential* is measured as the interest rate on external debt minus the interest rate on 3–month US treasury bills.
EXTD	:	*External Debt* is measured as the nominal external debt in US$ deflated by the US consumer price index.
GS	:	The *Government Stability Index* ranges from 0 (most unstable) to 12 (most stable).
CORR	:	The *Corruption Index* ranges from 0 (most corrupt) to 6 (least corrupt).

Data Sources

All data were obtained from AMF, *Unified Economic Report* (2004), except for the following:

1. Data for interest rate on 3–month US treasury bills were obtained from IMF, *International Financial Statistics Yearbook* (2003).
2. Data for external debt and interest on external debt were obtained from World Bank, *Global Development Finance* (2004).
3. Data for the government stability and corruption indices were obtained from the *International Country Risk Guide* (2003).

References

1. Aizenman, J. and N. Marion. 2004. "International Reserve Holdings with Sovereign Risk and Costly Tax Collection", *Economic Journal*, Vol. 114, pp. 569-91.
2. Arab Monetary Fund (AMF). 2004. *Unified Economic Report*. Abu Dhabi: AMF.
3. Arab Monetary Fund (AMF). 2003. *Arab Countries: Economic Indicators*. Abu Dhabi: AMF.
4. Ben-Bassat, A. and D. Gottlieb. 1992. "The Effect of Opportunity Cost on International Reserve Holdings", *Review of Economics and Statistics*, Vol. 74, pp. 329-32.
5. Bolbol, A. and A. Fatheldin. 2004. "Foreign and Intra-Arab Capital Flows in the Arab Countries: 1990-2002", *unpublished manuscript*. Abu Dhabi: Arab Monetary Fund.
6. De Beaufort Wijnholds, J. and A. Kapteyn. 2001. "Reserve Adequacy in Emerging Market Economies", *IMF Working Paper WP/01/143*. Washington, D.C.: International Monetary Fund.
7. Detragiache, E. 1996. "Fiscal Adjustment and Official Reserves in Sovereign Debt Negotiations", *Economica*, Vol. 63, pp. 81-95.
8. Eaton, J. and M. Gersovitz. 1980. "LDC Participation in International Financial Markets", *Journal of Development Economics*, Vol. 7, pp.3-21.
9. Edwards, S. 1984. "The Demand for International Reserves and Monetary Equilibrium: Some Evidence from Developing Countries", *Review of Economics and Statistics*, Vol. 66, pp. 495-500.

10. Edwards, S. 1985. “On the Interest-Rate Elasticity of the Demand for International Reserves: Some Evidence from Developing Countries”, *Journal of International Money and Finance, Vol.* 4, pp.287-295.
11. Eichengreen, B. and J. Frenkel. 1996. “The SDR, Reserve Currencies, and the Future of the International Monetary System”, in *The Future of the SDR, in Light of Changes in the International Financial System*, Mussa, M., Boughton, J. and P. Isard (eds.). Washington, D.C.: International Monetary Fund.
12. Flood, R. and N. Marion. 2002. “Holding International Reserves in an Era of High Capital Mobility”, *IMF Working Paper WP/02/62*. Washington, D.C.: International Monetary Fund.
13. Frenkel, J. and B. Jovanovich. 1981. “Optimal International Reserves: A Stochastic Framework”, *Economic Journal*, Vol. 91, pp. 507-14.
14. Frenkel. J. 1983. “International Liquidity and Monetary Control”, in *International Money and Credit: The Policy Roles*, George von Furstenberg (ed.). Washington D.C.: International Monetary Fund.
15. Gujarati, D. 1995. *Basic Econometrics*. 3rd Edition. New York: McGraw-Hill.
16. Heller, R. 1966. “Optimal International Reserves”, *Economic Journal*, Vol. 76, pp.296-311.
17. Heller, R. and M. Khan. 1978. “The Demand for International Reserves Under Fixed and Floating Exchange Rates”, *IMF Staff Papers*, Vol. 25, pp. 623-49.

18. Hviding, K., Nowak, M. and L. Ricci. 2004. “Can Higher Reserves Help Reduce Exchange Rate Volatility?” *IMF Working Paper WP/04/189*. Washington, D.C.: International Monetary Fund.
19. International Monetary Fund (IMF). 2003. “Are Foreign Exchange Reserves in Asia Too High?”, *World Economic Outlook*. Washington, D.C.: IMF.
20. Nerlove, M. 1971. “Further Evidence on the Estimation of Dynamic Economic Relations From a Time Series of Cross-Sections”, *Econometrica*, Vol. 39, pp. 359-82.
21. Rodrik, D. and A. Velasco. 1999. “Short-Term Capital Flows”, *NBER Working Paper 7264*. Cambridge, MA: National Bureau of Economic Research.
22. Van Wijnbergen, S. 1990. “Cash/ Debt Buy-Backs and the Insurance Value of Reserves”, *Journal of International Economics*, Vol. 29, pp. 123-31.
23. World Bank. 2003. *Good Governance for Development in the Middle East and North Africa*. Washington, D.C.: World Bank.