

* دوخم، الحنيط
 * قبلان المجالي،
 * سعود الطيب
 * حسين العثمان
 * أمجد جرار

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Discriminating Poor from Non poor Households in the Remote Communities of the Southern Part of Jordan

**Dukhi Al-Hunaiti
 Qablan Al-Majali
 Saud Al-Tayeb
 Husein Al-Othman
 Amjad Jarrar**

Abstract

The aim of this study is to discriminate poor households from non poor households in the remote communities of the southern part of Jordan. To achieve this goal, a random sample of (203) households (from 660 households in 11 communities) was selected and three personal interview questionnaires were used to collect the data. Moreover, discriminant analysis was applied to analyze the data. The results of statistical analyses have revealed that the absolute poor households were discriminated by the following variables: unemployment average, household's ownership, expenditure on gifts, sex ratio, agricultural loaned ownership, age, means of mail, video cassette ownership. In addition, the statistical analyses have revealed that the absolute poor households were discriminated by the following variables: number of electric machine in house, percentage of unemployed people, video cassette ownership, percentage of hand capelin in the household, and sex ratio

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(Discriminate Coefficients)

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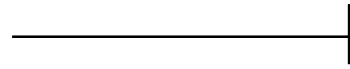
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Wilks' Lambda	Sig. of F to Remove	Tolerance		
0.039	317.730	0.010	(2= 1=)	1
0.017	132.419	0.008	()	2
0.013	104.140	0.014	)	3
0.044	359.584	0.002	(	4
0.026	209.470	0.002		5
0.009	71.017	0.062		6
0.009	71.291	0.063	()	7
0.005	30.351	0.142		8
0.002	6.595	0.485	()	9
0.003	13.484	0.209		10
0.002	7.262	0.309	()	11
عدد المتغيرات المهمة في التمييز 11				

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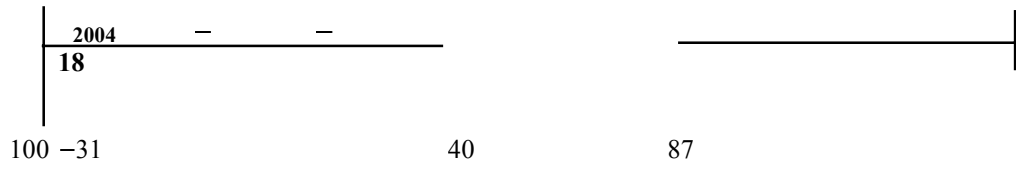
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(0.05 = α)

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Canonical Correlation	of Variance %	Eigenvalue	
100.0	100.0	1047.43	1
First 1 canonical discriminate functions were used in the analysis.			

Standardized Discriminate Coefficient

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100

(0.00 = α)

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Standardized

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:(4)

Standardized Canonical Discriminate Function Coefficient

Function		
9.943	(2= 1=)	1
0.966-	()	2
1.242	()	3
3.824-		4
11.001-	()	5
8.057	()	6
3.768	()	7
2.362		8
1.734-		9
21.083		10
25.103-		11

(133.83) (5)

(-7.044)

Functions at Group Centroid

:(5)

133.832	
7.044-	
Unstandardized canonical discriminate functions evaluated at group means	

100

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86.93 () χ^2

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Sig.	df	Chi-square	Wilks' Lambda	(Test of Function)
0.00	11	86.93	0.00	1

Unstandardized Discriminate Coefficient

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:(7)

43.340	(2= 1=)	1
4.209-	()	2
2.745	()	3
0.079-		4
29.365-	()	5
0.049	()	6
3.245	()	7
0.213		8
2.019-		9
83.586		10
26.282-		11
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(Partial F Ratio)

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Wilks' Lambda	Sig. of F to Remove	Tolerance		
0.154	3538.043	0.002	()	1
0.129	2959.112	0.002		2
0.037	845.060	0.006	()	3
0.022	492.573	0.008	()	4
0.004	97.025	0.039		5
0.001	12.566	0.199	()	6
عدد المتغيرات المهمة في التمييز 6				

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Canonical Correlation	of Variance%	Eigenvalue	
100.0	100.0	4603.42	1
First 1 canonical discriminate functions were used in the analysis.			

Standardized Discriminate Coefficient

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Standardized

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Standardized Canonical Discriminate Function Coefficient

(Function)		
12.939-	()	1
11.462	()	2
1.898-	()	3
4.925		4
24.941		5
22.269	()	6

(-73.285) (11)

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X² (0.00) () λ

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Sig.	df	Chi-square	Wilks' Lambda	إختبار النموذج (Test of Function)
0.00	6	59.04	0.00	1

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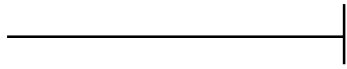
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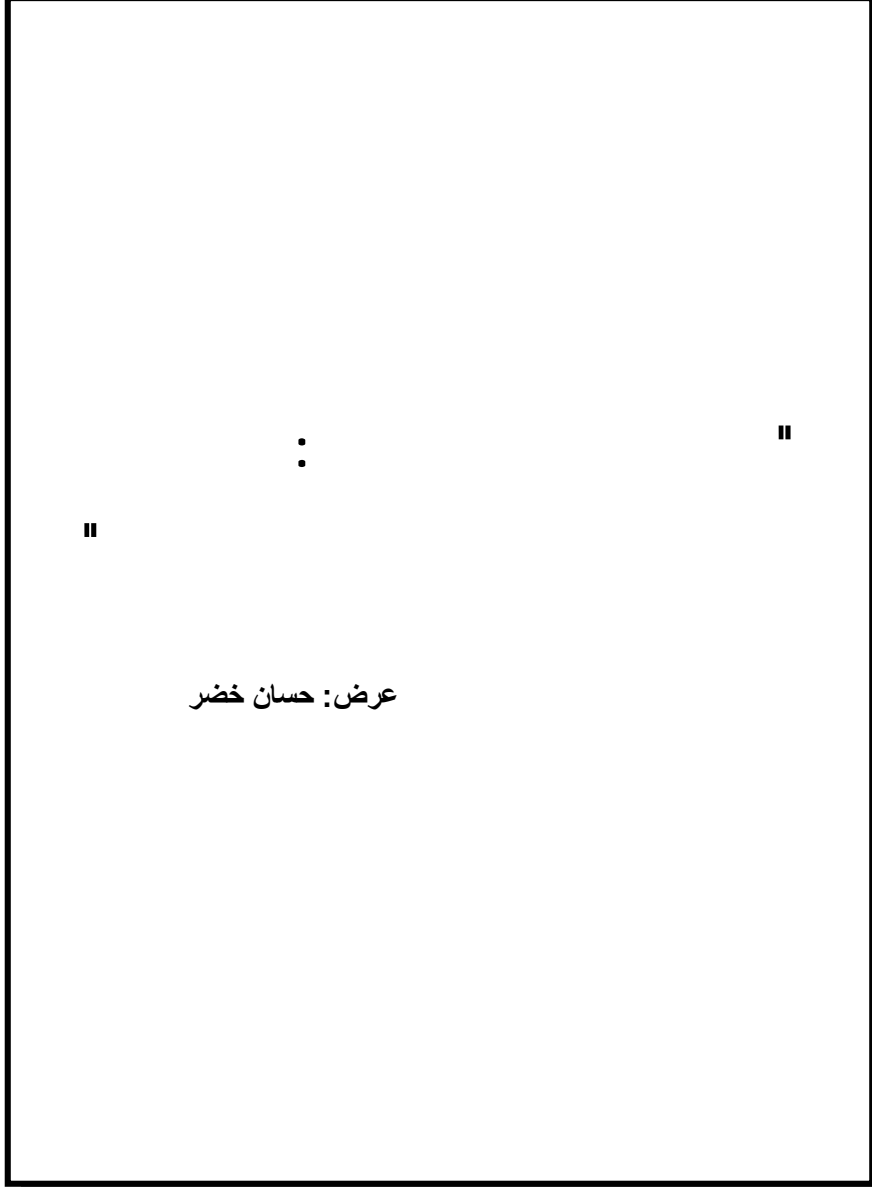
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سابعاً: تشجيع التعاون بين الفقهاء والاقتصاديين، بغرض فهم واستنباط الأحكام الشرعية الخاصة بالمعاملات الاقتصادية الحديثة وتطوير الفقه الاقتصادي الإسلامي.



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By: Oswaldo de Rivero
The Myth of Development: The Non-Viable Economies
"of the 21th Century"
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**Why Economic Growth Has Been Weak
in Arab Countries: The Role of
Exogenous Shocks, Economic Policy
Failure and Institutional Deficiencies**

Peter Nunnenkamp

Why Economic Growth Has Been Weak in Arab Countries: The Role of Exogenous Shocks, Economic Policy Failure and Institutional Deficiencies

Peter Nunnenkamp*

Abstract

Few Arab countries have succeeded since the early 1990s to narrow the income gap to advanced industrial countries. The growth performance of most Arab countries has been weak by developing country standards, too. We discuss three factors that may help explain the generally poor, though highly diverse growth record in the region: exogenous shocks, policy failure and institutional deficiencies. We find that although country-specific shocks played a role, influences beyond the immediate control of Arab policymakers contribute surprisingly little to the explanation of Arab growth patterns. Economic policy failure in Arab countries appears to be a more important reason for poor growth. The region has partly fallen into line with the Washington Consensus. With few exceptions, however, Arab countries lag behind other developing countries when it comes to trimming the interventionist role of the state and integrating themselves into the global division of labor through trade and FDI. Overall, reforms did not go far enough and remained fragmentary even in Arab countries with a relatively favorable growth performance since the early 1990s. It has to be taken into account; however, that policy-related variables and economic growth depend on more deeply rooted institutional factors shaping the incentive structure of economic agents. Institutional development varies greatly between Arab countries, but, generally, is less advanced than the level of per-capita income would suggest. While the discovery of oil may result in higher growth for some time, the experience of several oil exporters in the region supports the proposition that the abundance of oil encourages rent-seeking and exerts a negative impact on economic growth via its deleterious impact on institutional development. The experience of countries like Mexico, having managed the transformation from an oil-dependent to a highly diversified economy with more advanced institutions, may show the way for Arab countries.

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بيتر نيوننكامب

* Research Director, Kiel Institute for World Economics, Germany, E-mail: nuunnenkamp@ifw.uni-kiel.de

Introduction

Most developing countries have failed to catch up economically with advanced industrial countries in the process of globalization (Nunnenkamp, 2003a). Arab countries are no exception in this regard. Recent reports suggest that Arab countries have even underperformed by the standards of other developing countries. According to the World Bank (2003b), “the results on the ground, and especially growth, remained disappointing”. Abed (2003) notes that growth of per-capita income has faltered in the Middle East and North Africa (MENA), compared with the rest of the developing world. Furthermore, according to various experts, the major responsibility for the poor economic growth performance rests with the Arab countries themselves. Frequently mentioned domestic policy failures include the strong and interventionist role of the state, poor integration into international trade and insufficient attractiveness to foreign direct investment (FDI).

This paper aims to assess the empirical relevance of these claims. Apart from economic policy failure, exogenous factors and institutional deficiencies are analyzed to determine the barriers to higher economic growth of Arab countries. The subsequent analysis covers 18 Arab countries, namely the 15 members of the Arab Planning Institute (API) plus Algeria, Morocco and Saudi Arabia.⁽¹⁾ Throughout the paper, a large group of other developing countries in Africa, Asia and Latin America, serves as the point of reference, in order to assess the *relative* position of Arab countries.

Relative Growth Performance

The evidence presented herewith supports the view that the economic performance of most Arab countries has been “disappointing” (Hoekman and Messerlin, 2002). Economic growth is measured by relating the per-capita income (in PPP terms – see Annex) of sample countries to the per-capita income of the United States (representing the group of advanced industrial countries) and by comparing this relative income measure between the years 1992 and 2001.

$$GNIUS^i = \frac{GNI01^i}{GNI01^{US}} \cdot \frac{GNI92^i}{GNI92^{US}}$$

with i =sample countries.

Accordingly, $GNIUS = 1$ represents the dividing line between developing countries which caught up with the United States ($GNIUS > 1$) and those which fell further back ($GNIUS < 1$).

The growth performance of Arab countries is assessed for the relatively short period of 1992–2001. The rationale for this short period is to avoid biased results due to exceptional factors in the 1980s and at the beginning of the 1990s. The 1980s was excluded because of the peak and subsequent drop of oil prices.⁽²⁾ Furthermore, countries such as Jordan and Lebanon suffered political and economic instability in the late 1980s, resulting in exchange-rate volatility and sharply declining per-capita incomes. Distortions may also result from the first Gulf War in 1991.

The choice of the observation period hardly affects the overall picture on the growth performance of Arab countries. In an earlier paper, it was observed that the income gap as compared to that of the United States widened in 1980–2000 for almost all Arab countries, with Egypt, Tunisia and Sudan having performed best (Nunnenkamp, 2003b). Figure 1 portrays a similar pattern for 1992–2001. Only four out of 15 Arab countries succeeded in narrowing, at least somewhat, the income gap with the United States (the three aforementioned countries plus Yemen).⁽³⁾ For the majority of the Arab countries, growth performance proved to be weak not only relative to the United States, but also relative to the control group of other developing countries.

Four oil-rich Arab countries figure at the bottom of Figure 1, revealing a particularly poor growth performance.⁽⁴⁾ Nevertheless, the growth patterns of Arab countries defy easy generalizations. Resource-poor Jordan ranks next to oil-rich Oman. Starting from a similar initial income of 10% of US income in 1992, Egypt clearly outperformed Syria. Bahrain fared considerably better than most other oil-dependent countries. Likewise, economic growth differed remarkably between neighboring countries such as Tunisia and Algeria, or Lebanon and Syria.

⁽¹⁾ API members are: Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Oman, Qatar, Sudan, Syria, Tunisia, United Arab Emirates and Yemen. Due to data constraints, however, the number of observations varies in the different steps of the analysis

⁽²⁾ The average crude price almost tripled in 1978–1980, and fell back to about its 1978-level in 1986 (IMF, 2002).

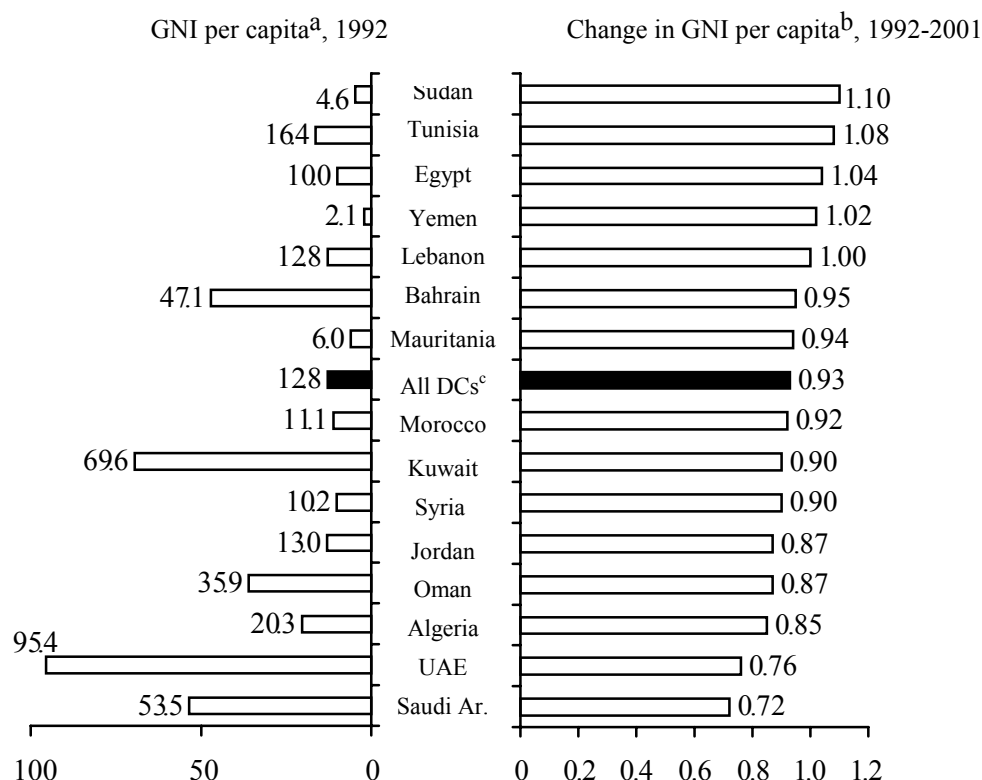
⁽³⁾ The relevant data are missing for Iraq, Libya and Qatar.

⁽⁴⁾ According to the MENA Development Report, per-capita income increased considerably in the United Arab Emirates since 1989 (World Bank 2003b). The data reported there are in stark contrast to the data drawn from the World Development Indicators (World Bank, 2003a).

Subsequent discussion addresses various propositions that may account for the generally poor growth performance of Arab countries, and the considerable diversity of growth patterns within this group.

How Relevant Are Exogenous Factors?

Before turning to what appears to be the predominant view in the literature, namely that Arab countries themselves are to blame for poor growth, some factors are highlighted which may be considered exogenous in the sense that they escape the immediate control of Arab policymakers.⁽⁵⁾ Possible candidates are: geographical distance from world economic centers, terms-of-trade shocks, and forced compliance with policy conditionality, along the lines of the so-called Washington Consensus, attached to IMF and World Bank loans.



^aIn % of gross national income (GNI) per capita (PPP) in the United States.

^bRelative to GNI per capita (PPP) in the United States; see text for details; UAE: 1992-1998; Oman: 1992-2000.

^cMedian.

Source: World Bank (2003a).

Figure 1. Economic development of Arab countries.

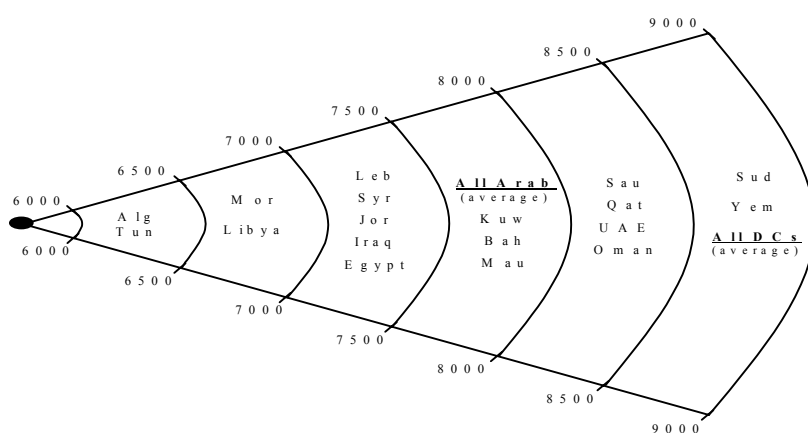
The hypothesis that distance from economic centers hinders growth at the periphery is firmly rooted in development economics. While earlier critics of the international economic system portrayed center-periphery relations in terms of intentional exploitation, more conventional economic analyses regard distance as a structural impediment to economic development at the periphery. According to the so-called gravity models, it is more difficult for remote economies to benefit from international trade and FDI. This is because economic transactions between the center and remote economies involve higher costs related to information, communication, monitoring and transportation (e.g., Fujita *et al.*, 1999).

With few exceptions, however, Arab countries are not handicapped by large distance to world economic centers. Figure 2 shows the average distance in kilometers between the capitals of Arab countries on the one hand, and the capitals of Germany (as a proxy for the EU), Japan, and the United States, on the other hand. By this measure, Arab countries are located closer to world economic centers with an average distance of 7540 kilometers, than all developing

⁽⁵⁾ For a more detailed account of exogenous factors, see Nunnenkamp (2004a).

countries taken together (8810 kilometers). Moreover, the growth differences between Arab countries are in some conflict with the notion of distance-related barriers to economic development. Sudan and Yemen are shown in Figure 1 to have narrowed the income gap compared to advanced industrial countries, even though they are located furthest away from world economic centers. Economic catching up of Tunisia might have been helped by its relatively favorable location, but the same advantage did not prevent Algeria from falling back considerably. Across all Arab countries, the correlation between measure of distance and per-capita income growth in 1992–2001 turned out to be totally insignificant.

Similar to the concept of distance, terms-of-trade shocks do not provide a convincing explanation of the disappointing growth performance of Arab countries. This is not to ignore that several empirical studies support the view that declining (net barter) terms of trade are still an issue for developing countries. For example, the findings of Sapsford and Chen (1999) as well as Lutz (1999), in one way or another, point to the continuous relevance of the famous Prebisch/Singer hypothesis, according to which the terms of trade of developing countries whose exports traditionally consist mainly of primary commodities characterized by low income elasticity, are bound to deteriorate in the longer run.



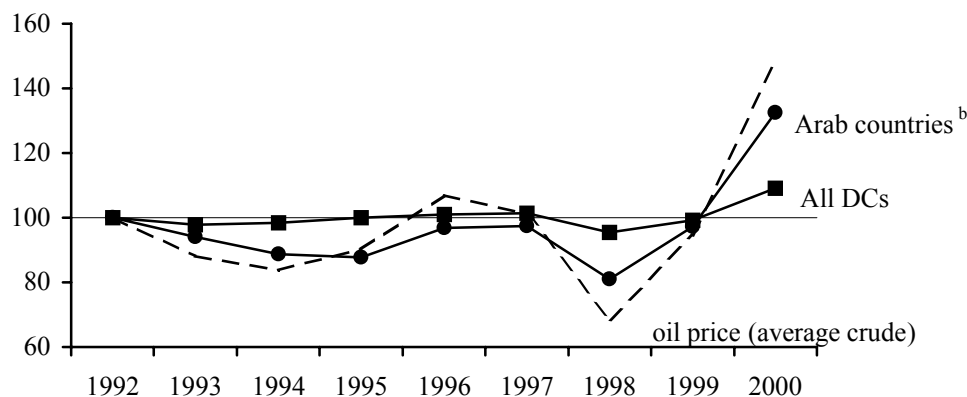
.N.B. Average distance to Germany representing the EU, Japan and the United States in kilometers

Source: <http://www.malester.edu/research/economics/page/haveman/trade.resources/data/gravity/dist.txt>; <http://www.indo.com/distance/index.html> (both accessed in January 2004).

Figure 2. Distance from world economic centers of Arab countries compared to all developing countries.

The terms of trade of various Arab countries obviously depend on the development of oil prices in the first place. Figure 3 reveals the strong correlation between oil prices and the terms of trade if Arab countries were considered as a group. It also shows that Arab countries have been subject to much more volatile terms of trade since the early 1990s than other developing countries. Terms-of-trade volatility is considered by Sala-i-Martin and Subramanian (2003) to be one of the mechanisms through which economic growth of oil-rich countries may be impaired.⁽⁶⁾ In the cross-country regressions of these authors, higher volatility tends to be correlated negatively with growth, but the coefficient is not consistently significant. In any case, for analytical as well as empirical reasons, terms of trade do not provide an exogenous reason for the weak growth of Arab countries reported above. The typical assumption that small countries are price-takers in international markets thus implying that the terms of trade are beyond their control, does not hold for oil-exporting countries. Several Arab countries are members of OPEC whose output decisions, at least occasionally, affect oil prices significantly.

⁽⁶⁾ Sala-i-Martin and Subramanian (2003) do not find any direct impact from natural resources such as oil to economic growth. Two other indirect mechanisms are discussed by these authors, namely the impact through overvalued real exchange rates (Dutch disease) and institutional deficiencies. Overvaluation turns out to be insignificant in the cross-country regressions. However, resource abundance in oil and minerals is shown to have a negative effect on growth by impairing institutional quality.



^(a)1992=100; group averages of net barter terms of trade.

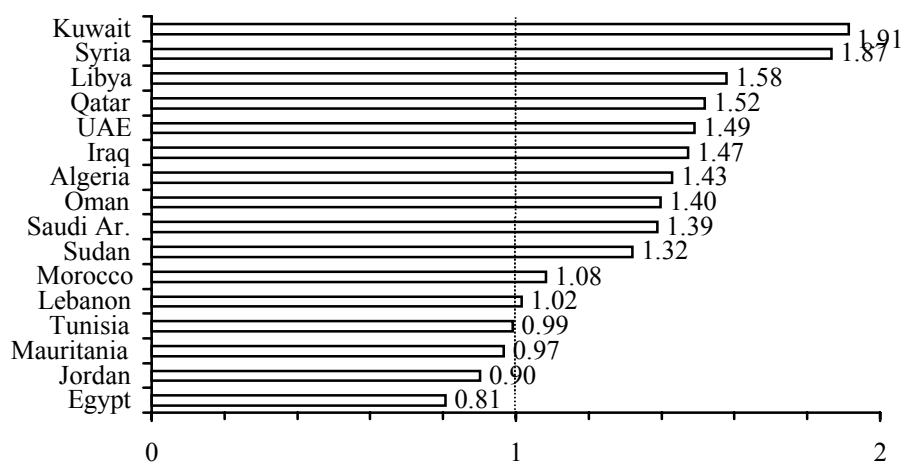
^(b)API members plus Algeria, Morocco and Saudi Arabia.

Source: World Bank (2003a); IMF (2002).

Figure 3. Terms of trade: Arab countries compared to all developing countries, 1992–2000.

Empirically speaking, all Arab countries taken together, suffered terms-of-trade losses in 1993–1995 and in 1998. Subsequently however, rising oil prices resulted in terms-of-trade gains. Comparing 2000 (the latest year for which World Bank data are available) and 1992, Figure 4 indicates terms-of-trade gains for 12 out of 16 Arab countries. More surprisingly perhaps, two of the four exceptions, namely Egypt and Tunisia, performed relatively well in terms of growth (Figure 1). As a result, the change in the terms of trade, according to Figure 4, is negatively, though not significantly, correlated with the growth performance in 1992–2001 across Arab countries. It is only for Jordan and to a lesser extent, Mauritania, that terms-of-trade losses offer a reasonable explanation for falling further back economically.

In contrast to the more traditional arguments related to distance and terms of trade, one other factor beyond the control of developing countries has received much attention only recently. Globalization critics attribute widening income gaps between advanced industrial countries and developing economies to counterproductive policy recipes of the so-called Washington Consensus.⁽⁷⁾ Prominent economists such as Easterly (2001) and Stiglitz (2002) have highlighted the flaws of policy conditionality that developing countries had to accept in the context of conventional stabilization and structural adjustment programs, designed and funded by Washington-based institutions, notably the IMF. By contrast, international financial institutions maintain that economic policy prescriptions were essentially correct and effective, and tend to blame the loan recipients for not having followed external advice or having implemented policy reforms at best partially.



N.B. Net barter terms of trade in 2000 divided by net barter terms of trade in 1992. Vertical line divides terms-of-trade gains (>1) from terms-of-trade losses (<1).

⁽⁷⁾ For a summary, see Williamson (1990) who also coined this term.

Source: World Bank (2003a).

Figure 4. Terms of trade of Arab countries: 2000 compared to 1992.

It has been argued elsewhere that both claims obscure the multi-faceted experience of developing countries (Nunnenkamp, 2003a; 2003b). Major elements of the Washington Consensus, including macroeconomic stabilization efforts as well as liberalization measures, proved less effective in promoting economic growth than hoped for by international financial institutions. However, none of the correlations between policy-related variables and the growth performance of developing countries supports the view that conventional policy prescriptions were detrimental to growth. At the same time, various developing countries may have refrained from fully implementing the Washington Consensus. However, most of them have clearly moved into this direction, by stabilizing their economies, liberalizing foreign trade and opening up to FDI.

Arab countries resemble other developing countries in that they have partly fallen into line with the Washington Consensus. The subsequent section will provide a detailed account of how Arab countries have adjusted their policies to the conventional wisdom of external advisers. In the present context, it is important to note that international financial institutions are hardly to blame for imposing ineffective, or even counterproductive, policy conditionality on Arab countries. The leverage of the IMF and the World Bank has remained fairly limited in most of these countries. Few Arab countries have drawn extensively on IMF and World Bank financing and therefore, subject to strict conditionality:

- Just four of the 18 countries have received IMF financing since 1993, i.e. Algeria, Jordan, Mauritania, and Yemen (IMF, 2002). IMF loans outstanding to Arab countries in mid-2002 accounted for 15% of the combined IMF quota of the 18 Arab countries, compared to 81% for all developing countries.⁽⁸⁾
- A few more Arab countries received financing from the World Bank Group.⁽⁹⁾ Besides the four countries listed above, Egypt, Morocco, Sudan, and Tunisia reported considerable World Bank loans outstanding in 2001 (World Bank, 2003a). Yet, all Arab countries taken together, accounted for only 5.5% of outstanding World Bank loans extended to all developing countries.⁽¹⁰⁾

Apart from a few Arab countries having fallen under the sway of international financial institutions, countries that did rely on IMF and World Bank financing do not appear to have suffered from conditionality. On the contrary, all five top growth performers in Figure 1 belonged to the clients of international financial institutions, measured by their outstanding debt to the IMF and the World Bank in 2001/02. Three of the five Arab countries which fell back most significantly did not draw on IMF and World Bank financing (Algeria and Jordan representing the exceptions).

In summary, it appears that exogenous factors contribute surprisingly little to the explanation of the weak growth performance of Arab countries. This is not to ignore that the previous analysis does not capture country-specific exogenous shocks such as the negative impact of the Iraq embargo on neighboring Jordan. On the whole, however, domestic factors, seem to be more important for the region's growth performance.

Insufficient Policy Reforms

Policy-related variables are highlighted to determine what Arab countries have already achieved in terms of policy reforms and where important bottlenecks to growth remain. Table 1 lists several variables reflecting the request of international financial institutions for macroeconomic stabilization, factor accumulation, trade liberalization and openness to FDI.¹¹ Macroeconomic stabilization efforts are captured by two variables: (a) annual average rates of inflation; and (b) government consumption expenditure in percent of GDP. Investment in physical and human capital is proxied by gross fixed capital formation in percent of GDP and average years of schooling, respectively. Trade-policy-related variables include the share of imports and exports in GDP as well as import tariff revenues in percent of import value.⁽¹²⁾ Finally, openness to FDI is measured by FDI inflows and inward FDI stocks, both related to the host country's GDP.

⁽⁸⁾ Excluding the high quota of Saudi Arabia, the percentage for Arab countries rises to 27%.

⁽⁹⁾ Comprising the International Bank for Reconstruction and Development and the International Development Association (IDA).

⁽¹⁰⁾ Their share in GDP of all developing countries was about twice as high.

⁽¹¹⁾ For detailed definitions of variables and statistical sources, see the Annex.

⁽¹²⁾ In Table 1, import tariff revenues are considered, rather than average tariff rates, as the *World Development Indicators* of the World Bank present comprehensive time series data only for the former variable.

Table 1. Policy-related Variables:^(a) Median for Arab Countries, Compared to Other Developing Countries

	Arab countries ^(b)		Other DCs	
	1980–1983 ^(c)	1998–2001 ^(c)	1980–1983 ^(c)	1998–2001 ^(c)
Inflation	8.5	1.6	12.8	5.5
Government consumption	17.8	17.3	14.6	13.2
Gross fixed capital formation	26.3	19.0	22.0	20.7
Years of schooling ^(d)	2.9	5.5	3.4	5.1
Imports	41.5	33.0	35.0	39.3
Import tariff revenues	13.6	9.7 ^(e)	12.1	8.8 ^(e)
Exports	38.8	36.6	23.2	30.7
FDI inflows	1.0	1.2	0.5	2.7
Inward FDI stocks ^(f)	1.0	12.9	4.9	30.0

^(a)For definition of variables and statistical sources, see Annex.

^(b)Due to data constraints, the number of observations varies from eight in the case of import tariff revenues to 18 in the case of FDI stocks. The average number of observations is 11.

^(c)Annual averages, unless stated otherwise.

^(d)1980 and 2000, respectively.

^(e)1997–2000.

^(f)1980 and 2002, respectively.

Source: World Bank (2003a); Barro and Lee (2002); UNCTAD (2003).

What is the unit of measurement of this table - %?

The question may be asked as to how these variables developed over time. If most countries had refused to implement the Washington Consensus, economic stability indicators could have deteriorated; investment in physical and human capital could have declined; and countries probably would not have opened up to trade and FDI. However, evidence suggests that the economic policies pursued by Arab countries were in accordance with the Washington Consensus, at least in some respects:

- Compared to the median for other developing countries, inflation in Arab countries was already fairly low in the early 1980s. Inflation was further reduced to a very low median in recent years.⁽¹³⁾
- In contrast, government consumption, as a share of GDP, was higher in Arab countries than in other developing countries. Moreover, Arab countries curtailed government consumption only slightly. This tends to support the critique of Hoekman and Messerlin (2002) that “most of the governments in the Middle East and North Africa have made scant headway in reducing the interventionist role of the state in the economy.”⁽¹⁴⁾
- The evidence on factor accumulation is mixed. The share of gross fixed capital formation in GDP declined considerably in Arab countries. On the other hand, human capital formation, proxied by average years of schooling, improved more pronouncedly for Arab countries than for other developing countries. Nevertheless, Hoekman and Messerlin (2002) reckon that education in the MENA region lags behind the rest of the world. Eken, *et al.* (2003) point out that education systems in some MENA countries remain ineffective, with high dropout and repetition rates offsetting high enrollment rates, even though government spending on education is relatively high.⁽¹⁵⁾
- Trade-related indicators are in line with the reasoning of Hoekman and Zarrouk (2000): “Virtually all Arab countries ... have undertaken major steps to implement tariff and fiscal reforms and to dismantle quantitative import restrictions. Notwithstanding these efforts, the pace of integration into the world economy achieved by the region has been slow” (see also Abed 2003). Import tariff revenues dropped below 10% of import value for Arab countries as well as other developing countries. Recent WTO data on average applied import tariffs,

⁽¹³⁾ Significant improvements in macroeconomic policies in the MENA region are stressed by Hoekman and Messerlin (2002).

⁽¹⁴⁾ For similar statements, see World Bank (2003b), Abed (2003) and Bennett (2003). Gardner (2003) argues that a large share of government employment impaired labor productivity growth in several Arab countries.

⁽¹⁵⁾ See also Gardner (2003) on low returns on MENA countries' investment in education.

underscore that tariff barriers are only slightly higher in Arab countries than in other developing countries.⁽¹⁶⁾ Nevertheless, Arab countries differ remarkably from other developing countries in that the import share in GDP, and to a lesser extent also the export share, declined. This may be, at least partly, because of high transaction costs associated with international trade, resulting from inefficiencies in customs clearance procedures, administrative red tape, and deficient transportation and telecommunication services in many Arab countries (World Bank, 2003b).⁽¹⁷⁾

- The ratio of inward FDI stocks to GDP soared in both country groups, which is consistent with the worldwide trend towards the liberalization of FDI regulations reported by UNCTAD (2002). However, the median of this ratio for Arab countries remained substantially below the median for other developing countries. This is consistent with the observation of Nabli and De Kleine (2000), who found FDI flows to Arab countries to be relatively small and concentrated in a limited number of sectors.⁽¹⁸⁾

Taken together, evidence points to partial reforms along the lines of the Washington Consensus in Arab countries especially the failure to develop closer links with the global economy through FDI as well as through trade in services and goods other than oil may have prevented a more positive growth impact of reforms (Hoekman and Messerlin, 2002). At the same time, the group averages reported so far, disguise considerable differences within the group of Arab countries.

Table 2 ranks Arab countries for which the relevant data are available, according to macroeconomic conditions, factor accumulation and integration into world markets. The ranking underscores that Arab countries, with few exceptions, lag behind other developing countries in terms of: (a) reducing the role of the state, and (b) integrating themselves into the global division of labor through exports and FDI.⁽¹⁹⁾ Furthermore, the country-specific evidence is consistent with the view that policy reforms remained fragmentary almost everywhere. Even the top growth performers among Arab countries are below the median for other developing countries in some respects as shown in Table 2.

Table 2. Ranking of Arab Countries According to Policy-Related Variables

	Inflation, 1998-2001	Government consumption, 1998-2001	Gross fixed capital formation, 1998-2001	Years of schooling, 2000	Import tariffs, latest year	Change of export share in GDP, 1998-2001 vis-à-vis 1980-1983	FDI inflows, 1998-2001	FDI stocks, 2002
Better than median ^(b)	Saudi Arabia (-0.8)	Sudan (5.1)	Tunisia (25.7)	Jordan (6.9)	Kuwait (3.6)	Syria (20.0)	Jordan (4.1)	Bahrain (72.9)
	Bahrain (-0.8)	Egypt (10.5)	Algeria (24.3)	Kuwait (6.2)	Qatar (4.2)	Morocco (10.4)	Sudan (3.7)	Tunisia (66.4)
	Syria (-0.7)	Jordan (10.8)	Jordan (24.0)	Bahrain (6.1)	Sudan (5.4)	Tunisia (6.0)	Morocco (2.9)	
	Morocco (1.5)		Morocco (23.5)	Syria (5.8)	Lebanon (5.4)		Tunisia (2.8)	
	Jordan (1.5)		Mauritania (23.4)	Egypt (5.5)	Oman (5.7)			
	Kuwait (1.7)			Algeria (5.4)	Bahrain (7.8)			
	Qatar (2.0)				Mauritania (10.9)			
	Algeria (3.0)							
	Egypt (3.1)							
Worse than median ^(b)	Sudan (16.6)	Tunisia (15.7)	Syria (20.4)	Tunisia (5.0)	Saudi Arabia (12.0)	Jordan (4.2)	Lebanon ^(c) (1.4)	Morocco (26.9)
		Mauritania (15.7)	Saudi Arabia (19.0)	Iraq (4.0)	Yemen (12.8)	Sudan (0.7)	Algeria (1.3)	Jordan (26.0)
		Algeria (16.1)	Egypt (18.3)	Sudan (2.1)	Jordan (14.7)	Algeria (0.7)	Syria (1.2)	Egypt (24.1)
		Morocco (18.6)	Bahrain (13.6)		Libya (17.0)	Mauritania (-3.2)	Egypt (1.1)	Sudan (19.4)
		Bahrain (19.4)	Sudan (13.0)		Algeria (19.2)	Egypt (-12.6)	Mauritania (1.0)	Qatar (14.7)
		Libya (23.0)	Kuwait (12.5)		Syria (19.6)	Kuwait (-13.6)	Oman (0.4)	Saudi Arabia (13.4)
		Jordan (24.1)	Libya (11.7)		Egypt (19.9)	Saudi Arabia (-22.8)	Kuwait (0.1)	Yemen (13.3)
		Saudi Arabia (26.7)			Morocco (33.7)	Libya (-28.5)	Yemen (-2.6)	Oman (12.6)
		Kuwait (27.0)			Tunisia (33.9)	Bahrain (-41.6)		Mauritania (11.3)
								Algeria (10.5)
								Syria (9.6)
								Lebanon (9.4)
								UAE (2.0)
								Kuwait (1.1)
								Iraq (neg.)
								Libya (neg.)

⁽¹⁶⁾ The median of import tariffs applied by 16 Arab countries amounts to 12.4%, compared to 10.9% for other developing countries (WTO, 2003: Appendix Table II.B.4). Yet, Hoekman and Messerlin (2002) argue that many countries in the MENA region maintain relatively high trade barriers in the form of tariffs.

⁽¹⁷⁾ For recent survey results on barriers to trade and investment in the MENA region, see Zarrouk (2002). According to Abed (2003), "for the MENA region as a whole, overall trade restrictiveness (as measured by an index developed by the IMF) is double the developing country average."

⁽¹⁸⁾ Likewise, Hoekman and Messerlin (2002) as well as Abed (2003) point to the limited magnitude of FDI flows to the MENA region.

⁽¹⁹⁾ In an earlier paper, the author argues that insufficient human capital formation is most likely to have hindered economic growth in various Arab countries (Nunnenkamp, 2003b). This may still be true, even though average years of schooling increased considerably in several Arab countries since 1980. This conventional proxy of human capital formation captures neither the quality of schooling nor the importance of vocational training.

^(a)For Arab countries not listed, the relevant data are not available. For definition of variables and statistical sources, see Annex.

^(b)The median serving as the dividing line is for the sample of all other developing countries.

^(c)1997–2000

Source: World Bank (2003a); Barro and Lee (2002); WTO (2003); UNCTAD (2003).

- Sudan's growth performance may have been supported by its favorable ranking in terms of government consumption, import tariffs and FDI inflows. However, considering Sudan's poor record in other dimensions, notably its weak factor accumulation, it is highly questionable whether the growth path is sustainable once the stimulus of recent oil discoveries fades. In the period under consideration, weak incentives for the accumulation of physical and human capital may be attributed for the long-lasting civil war in Sudan.
- Egypt succeeded in reducing its inflation and government spending, and more than doubled average years of schooling since 1980. On the other hand, the country ranks poorly, even by Arab standards, with regard to import protection and export performance. Furthermore, economic growth in Egypt may prove difficult to sustain, considering that the country's position with regard to gross fixed capital formation and FDI inflows deteriorated significantly in recent years (Nunnenkamp, 2003b).
- Tunisia is in a favorable position in several dimensions, but applies the highest import tariffs among Arab countries.⁽²⁰⁾

The particularly poor growth performance of some Arab countries may reasonably be attributed to policy-related bottlenecks. Saudi Arabia represents a case in point. Reform efforts began only in 1999, and progressed slowly (World Bank, 2003). Except on inflation, Saudi Arabia consistently ranks below the median for other developing countries in Table 2. Yet, the relation between policy-related variables and economic growth remains elusive. For example, Jordan and Algeria suffered similar income losses according to Figure 1, although Jordan is considered an "early, intensive, and steady reformer" by the World Bank (2003b) and performed better than Algeria in almost all dimensions as shown in Table 2. There may be various reasons why policy reforms turned out to be less effective than hoped for by Arab policymakers (as well as the proponents of the Washington Consensus, in general). As noted before, country-specific shocks, either positive (e.g., oil discoveries in Sudan) or negative (e.g., the embargo against neighboring Iraq in Jordan), have played a role. But the correlation of policy-related variables with economic growth may also be blurred by the fragmentary nature of reforms.

The latter proposition is often referred to by international financial institutions. The World Bank (2003b) argues that "halfhearted attempts at trade reform in the absence of deeper domestic investment climate reforms fail to create much positive impact", and concludes that the MENA region needs to deepen and accelerate reforms. In a similar vein, Abed (2003) considers reforms that "did not achieve a necessary critical mass or did not go deep enough" to be responsible for the limited growth impact. The problem with this proposition is that it cannot be tested in the context of Arab countries, none of which has fully implemented the Washington Consensus. It is in some conflict with this proposition, however, that the correlation with economic growth differs considerably between the policy-related variables discussed before when a large sample of developing countries, including the group of Arab countries, is considered (Nunnenkamp, 2003b). For example, domestic factor accumulation was strongly correlated with growth, whereas the relation between FDI and growth turned out to be highly ambiguous. The latter finding puts into question the current euphoria about FDI as a stimulus to growth.⁽²¹⁾ Furthermore, the relation between openness to trade and FDI on the one hand, and growth on the other hand, weakens considerably if the calculation were based on a subsample of developing countries with relatively low per-capita income (Nunnenkamp, 2003a). Several Arab countries belong to this group, e.g., Mauritania, Sudan and Yemen. Domestic factor accumulation appears to be more important than opening up to FDI in countries with low per-capita income. Even in more advanced countries, certain types of FDI are unlikely to deliver significant growth effects. FDI aiming at the exploitation of natural resources in oil-exporting Arab countries provides a case in point. This type of FDI often results in foreign-dominated enclaves so that host economies hardly benefit from growth-enhancing spillovers.

All these suggest that the effectiveness of particular economic policy reforms depends on country-specific conditions. This does not invalidate, but qualifies the World Bank's call for a broader reform agenda and the generalized assertion that much faster growth would be available if Arab countries went "beyond the shallow at-the-border trade policy reforms" and tackled "deep-seated barriers to trade and investment" (World Bank, 2003b).

⁽²⁰⁾ Tunisia reveals the limitations of the proxy of human capital formation. Average years of schooling are shown in Table 2 to be substantially lower in Tunisia than in Jordan. According to survey results presented by the World Economic Forum (2003), however, the quality of public schools and the quality of math and science education are rated to be clearly superior in Tunisia.

⁽²¹⁾ For literature review and new findings on the link between FDI and economic growth in developing countries, see Nunnenkamp (2004b).

Institutional Deficiencies

Recent research invites another explanation for the ambiguous relation between conventional policy reforms and economic growth. Easterly and Levine (2002) advocate that “bad policies are only symptoms of longer-run institutional factors, and correcting the policies without correcting the institutions will bring little long-run benefit.” Likewise, Acemoglu (2003) stresses the role of institutions as a *fundamental* cause of divergent economic fortunes, whereas policy-related variables such as investments and education are considered only *proximate* causes. According to Rodrik and Subramanian (2003), the primacy of institutions implies that “conditionality on policies [as required by the IMF and the World Bank] is often ineffective.”

In order to identify institutional deficiencies that may have hindered economic growth in Arab countries, the widely used data presented by Kaufmann, *et al.* (2002) may be referred to. This source comprises six indicators, all of which range from -2.5 to 2.5 (with higher values indicating better institutions): voice and accountability, political stability, government effectiveness, regulatory quality, rule of law, and control of corruption. These factors are supposed to shape the incentive structure of economic agents. Hence, they are likely to affect policymaking, factor accumulation and, eventually, economic growth.

Nunnenkamp (2003b) shows that it would be unreasonable indeed to assume that policy-related variables are truly exogenous growth determinants. Some of these variables are significantly correlated with institutional factors for a large sample of developing countries. Measuring institutional development with the average of the six indicators listed above, better institutions are associated, for example, with higher investment in physical and human capital as well as more open trade and FDI policies. The rule of law, i.e., the protection of persons and property, the availability of independent judges and effective contract enforcement, appears to be most important for physical capital formation. Average number of years of schooling is correlated most strongly with effective control of corruption and the rule of law. If corruption is pervasive, opening up to trade and attracting FDI inflows seem less likely. In addition, institutional development turns out to be crucially important for developing countries to catch up economically to advanced industrial countries. The growth performance improves most significantly when developing countries adhere to the rule of law. Other institutional factors that are shown to be relevant for growth include the control of corruption and government effectiveness.

At a cursory look, the institutional underpinnings for sustainable economic growth appear to be relatively favorable in Arab countries. Table 3 shows that the median of the overall measure of institutional development is less negative (i.e., more favorable) for Arab countries than for the control group of other developing countries. A similar picture emerges for all individual indicators, except voice and accountability.⁽²²⁾ Arab countries compare most favorably with other developing countries with respect to the rule of law, whereas the median of regulatory quality and control of corruption is only slightly above developing country standards. However, the comparison with the control group of other developing countries in Table 3 obscures that: (a) institutional development varies tremendously between Arab countries; and (b) institutional development lags behind economic development in most Arab countries.

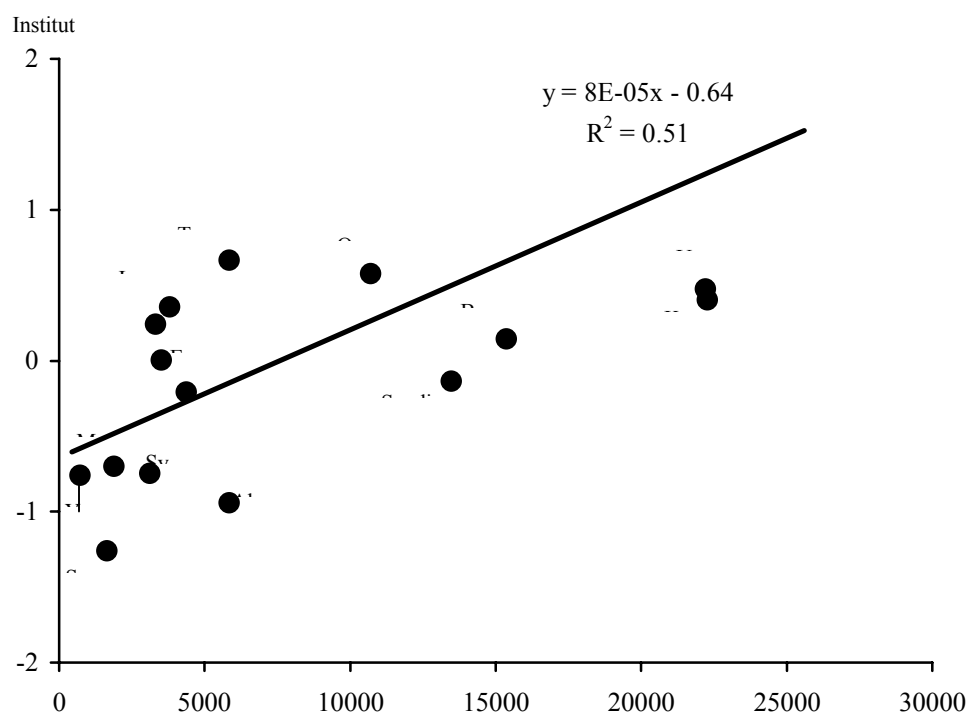
The large variation of institutional development is reflected in that all indicator values for the three Arab countries which rank most unfavorably (bottom three in Table 3) are worse than -1 . On the other hand, the indicator values for the three best-rated Arab countries (top three) are clearly positive, except for voice and accountability. In other words, institutional development in the Arab group ranges over much of the spectrum of the index of Kaufmann, *et al.* (2002). Apart from Iraq representing the taillight in almost all institutional dimensions, it is for Sudan that institutional deficiencies are shown to be most severe in Table 3. The composition of the top three varies more across institutional dimensions than the composition of the bottom three. Overall, institutional development is reported to be most advanced in Tunisia, Qatar and Oman.⁽²³⁾

Tunisia clearly stands out when institutional development is controlled for per-capita income. The regression line in Figure 5 represents the normal pattern of institutional development across a large number of developing countries, considering that a higher per-capita income is typically associated with better institutions. The observation that institutions in Tunisia are significantly more advanced than the normal pattern would suggest, helps explain this country's favorable growth performance. A similar argument may be made about Egypt, albeit to a lesser extent. By

⁽²²⁾ This exception is consistent with the finding in the Arab Human Development Report that the region performs poorly when it comes to civil and political freedoms (UNDP, 2002).

⁽²³⁾ Note that Tunisia does not belong to the top three when the assessment of overall institutional development is based on data for 1997/98, instead of 2000/01. Tunisia's institutional progress in recent years was most pronounced with regard to control of corruption and government effectiveness (Kaufmann, *et al.*, 2002).

contrast, institutional development in Sudan is clearly sub-standard, even when this country's low per-capita income is taken into account.



^(a)Normal pattern identified by regressing institutional development against per-capita income for all developing countries (131).

^(b)Average of six institutional indicators; data for 2000/01.

^(c)Gross national income (GNI) per capita (PPP) in 2000 (UAE:1998).

Source: Kaufmann, *et al.* (2002); World Bank (2003a).

Figure 5. Position of Arab countries in the normal pattern of institutional development.

Figure 5 also reveals that almost all Arab countries whose per-capita income, relative to the per-capita of the United States, declined by at least 10% in 1992–2001, a fall below the normal pattern of institutional development. Especially for Algeria, Saudi Arabia and the United Arab Emirates, which fell back most severely since 1992, the evidence suggests that economic growth was hindered by insufficient institutional development. The experience of these three oil-exporting countries is consistent with the finding of Sala-i-Martin and Subramanian (2003) that the so-called natural resource curse is largely because some natural resources, including oil, encourage rent-seeking and exert a negative impact on economic growth via their deleterious impact on institutional development.⁽²⁴⁾ This is not to ignore that relatively advanced institutions failed to compensate for country-specific exogenous shocks as in Jordan.

Finally, one may get some clues as to the sustainability of growth by plotting institutional development against the growth performance of a large number of developing countries, and identifying the position of Arab countries in this relationship. As demonstrated in Figure 6, better institutions went along with higher economic growth in 1992–2001 across all developing countries. Against this backdrop, about half of the Arab group has performed worse than their institutional development would have suggested. For the United Arab Emirates and to a lesser extent, also for Oman, the large deviation from the normal pattern may be at least partly because their growth performance had to be based on a shorter period of observation (see Figure 1). The unfavorable position of Saudi Arabia is in line with this country's poor ranking with respect to economic policy-related variables and its characterization as a late reformer. Jordan and Morocco, which are more advanced institutionally and belong to the group of early reformers (World Bank 2003b), tend to have better growth prospects in the absence of negative exogenous shocks in the future.

⁽²⁴⁾ Note that almost all oil-exporting Arab countries have considerably less advanced institutions than their per-capita income would suggest. See also World Bank (2003b) and Eifert, *et al.* (2003) on oil-related rents and the ensuing reorientation of economic incentives towards competition for access to oil revenues and away from productive activities.

Table 3. Institutional Development: Arab Countries and Other Developing Countries

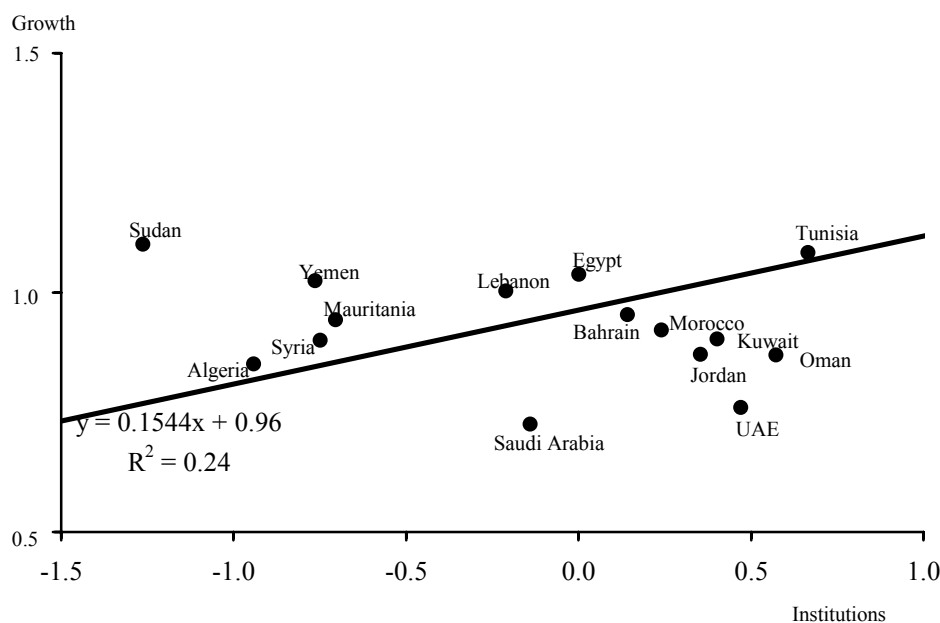
	Arab countries (18)			Other developing countries (Median)
	Median	Top3 ^(b)	Bottom 3 ^(b)	
Voice and accountability	-0.62	J, K, Mo (-0.02)	I, Su, Sy (-1.62)	-0.14
Political stability	0.04	Q, U, O (1.16)	Su, I, A (-1.62)	-0.21
Government effectiveness	0.05	T, O, Q (0.99)	I, Su, Li (-1.29)	-0.35
Regulatory quality	0.01	T, B, J (0.78)	I, Li, A (-1.74)	-0.02
Rule of law	0.20	U, K, O (1.09)	I, Y, Su (-1.27)	-0.40
Control of corruption	-0.26	T, K, Q (0.67)	Su, I, Ma(-1.12)	-0.43
Average of six indicators	-0.07	T, Q, O (0.61)	I, Su, Li (-1.35)	-0.34

^(a)Indicator values range from -2.5 to 2.5, with higher values corresponding to better institutional development.

^(b)In descending order; average indicator value in parentheses. Abbreviations as follows: A = Algeria, B = Bahrain; I = Iraq, J = Jordan, K = Kuwait, Li = Libya, Ma = Mauritania, Mo = Morocco, O = Oman, Q = Qatar, Su = Sudan, Sy = Syria, T = Tunisia, U = United Arab Emirates. Y = Yemen.

Source: Kaufmann, et al. (2002).

The countries above the regression line in Figure 6 have “overperformed” in the light of their institutional development. This adds to concerns about the sustainability of growth in Yemen and, even more so, in Sudan. Among the top growth performers in 1992–2001, it is only for Tunisia that relatively advanced institutions, together with the country’s favorable ranking with regard to various economic policy-related variables, tend to support sustainable growth. Egypt and Lebanon are in an intermediate position.



^(a)Economic growth in 1992-2001; institutional development measured by the average of six institutional indicators. For detailed definition of variables, see Annex.

^(b)Regression based on evidence for a large sample of 129 developing countries, including Arab countries.

Source: World Bank (2003a); Kaufmann, et al. (2002).

Figure 6. Institutional development and economic growth: The position of Arab countries among all developing countries.

Summary and Conclusions

Few Arab countries have succeeded since the early 1990s to narrow the income gap with advanced industrial countries. Also, the growth performance of most Arab countries has been weak by developing country standards. Three factors may help explain the generally poor, though highly diverse growth record in the region, to wit: (a) exogenous shocks; (b) policy failure; and (c) institutional deficiencies.

Country-specific shocks played a role, notably for relatively high growth in Sudan and the poor performance of Jordan. On the whole, however, influences beyond the immediate control of Arab policymakers contribute surprisingly little to the explanation of Arab growth patterns. Countries in this region are not handicapped by a large distance to world economic centers. The relation between terms-of-trade developments and economic growth is found to be extremely weak. As a matter of fact, Egypt and Tunisia belonged to the best growth performers even if they suffered terms-of-trade losses in contrast to most other Arab countries. Moreover, the IMF and the World Bank are hardly to blame for imposing ineffective, or even counterproductive, policy conditionality on Arab countries, if only because the leverage of international financial institutions remained limited in the region.

Economic policy failure in Arab countries appears to be an important reason for poor growth. The region has partly fallen into line with the Washington Consensus. With few exceptions, however, Arab countries lag behind other developing countries when it comes to trimming the interventionist role of the state and integrating themselves into the global division of labor through trade and FDI. Delayed, and at best, partial reforms, as in Saudi Arabia, help explain why this country represents the taillight in terms of growth.

The relation between macroeconomic conditions, factor accumulation, trade and FDI liberalization on the one hand, and economic growth on the other hand, remains elusive. Arguably, this is because reforms did not go far enough and remained fragmentary even in Arab countries with a relatively favorable growth performance since the early 1990s. Also, it may not be ruled out that some elements of the Washington Consensus were less effective than widely expected, in promoting growth. For example, developing country experience suggests that positive growth effects of FDI cannot be taken for granted. The enclave character of FDI in some Arab countries is rather unlikely to spur per-capita income growth.

These findings have important implications for economic policymakers in Arab countries. The World Bank (2003b) may be right to argue that “the region now needs to deepen and accelerate its reforms”. Rather than applying standard recipes to all Arab countries, however, country-specific conditions deserve closer attention when designing economic policy reforms. In Arab countries with low per-capita income, domestic resource mobilization appears to be more important than attracting FDI. Even in more advanced countries such as Egypt and Tunisia, continued efforts towards human capital formation seem the key to sustainable growth.

Moreover, it has to be taken into account that policy-related variables and economic growth depend on more deeply rooted institutional factors shaping the incentive structure of economic agents. Institutional development varies greatly between Arab countries, and generally, is less advanced than the level of per-capita income would suggest. While the discovery of oil may result in higher growth for some time, as in Sudan, the experience of several oil exporters in the region supports the proposition that the abundance of oil encourages rent-seeking and exerts a negative impact on economic growth via its deleterious impact on institutional development.

The finding that institutional deficiencies hindered growth in the past implies that economic policy reforms along the lines of the Washington Consensus, are not sufficient to improve the future growth performance of Arab countries. At present, it is only for Tunisia that relatively advanced institutions, together with the country's reputation as an “early, intensive and steady reformer” (World Bank 2003b), tend to sustain the process of economic catching up. The call for institutional reforms mainly applies to resource-rich countries such as Algeria, Saudi Arabia and Sudan, notwithstanding their different growth performance in the past. It seems to be exactly here that institutional deficiencies are most difficult to tackle. Yet, the natural resource curse can be overcome. The experience of countries like Mexico, having managed the transformation from an oil-dependent to a highly diversified economy with more advanced institutions, may show the way for Arab countries.

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Annex

Definition of Variables and Data Sources

Variables	Definition/Source
Distance	Average distance in kilometers to the capitals of Germany, Japan and the United States; via Internet: < http://www.macalester.edu/research/economics/PAGE/HAVEMAN/Trade.Resources/Data/Gravity/dist.txt > < http://www.indo.com/distance/index.html >
Economic growth (GNIUS)	Per-capita income (PPP) of country i (relative to per-capita income of the United States) in 2001, divided by per-capita income (PPP) of country i (relative to per-capita income of the United States) in 1992; World Bank (2003a)
Exports	Exports of country i in % of its GDP, 1998–2001; World Bank (2003a)
FDI inflows	Inflow of FDI in % of the host country's GDP, 1998–2001; World Bank (2003a)
Government consumption	Government consumption expenditure in % of the country's GDP, 1998–2001; World Bank (2003a)
Gross fixed capital formation	Gross fixed capital formation in % of the country's GDP, 1998–2001; World Bank (2003a)
Imports	Imports of country i in % of its GDP, 1998–2001; World Bank (2003a)
Import tariffs	Simple average of MFN statutory applied tariffs for all products, latest year; WTO (2003)
Import tariff revenues	Import tariff revenues in % of import value, 1997–2000; World Bank (2003a)
Inflation	Annual average change in consumer prices in %, 1998–2001; World Bank (2003a)
Institutional development	Average of six indicators on institutional development in 2000/01: <ul style="list-style-type: none"> • voice and accountability • political stability and absence of violence • government effectiveness • regulatory quality • rule of law • control of corruption; indicators range from –2.5 to 2.5, with higher values indicating better institutional development; Kaufmann et al. (2002)
Inward FDI stocks	Stock of inward FDI in % of the host country's GDP, 2002; UNCTAD (2003)
Per-capita income	Gross national income per capita in PPP terms, in current international US\$, 1992; World Bank (2003a)
Terms of trade	Export prices divided by import prices, 1992–2000 (1992 = 100); World Bank (2003a)
Years of schooling	Average years of schooling of the population aged 15 and over; Barro and Lee (2002)

Financial Reforms and Financial Development in Arab Countries

**Jean-Claude Berthélemy
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Abstract

This paper examines the development of financial sectors in Arab countries initiated in the 1980s after more than a decade of reforms. Overall, in spite of reforms, progresses have been limited in the countries surveyed. One theoretical explanation of this observation is that there are multiple equilibriums in financial development. After many years of financial repression, Arab countries which have started liberalizing their financial sectors, were initially trapped in a low-level equilibrium, and this may explain why progress so far obtained, have been minimal. A critical mass of change was needed to escape the financial underdevelopment equilibrium. This critical mass of change implies deep structural changes in the financial sector, including in particular, the de-controlling and privatization of the banking activity. However, such financial liberalization could not be successfully implemented without improvement in the institutional setting, through improved financial infrastructure and legal framework. In addition, for lack of deep or fast enough strengthening of the prudential requirements and supervision, authorities have been confronted with a trade-off between financial liberalization and financial stability, and therefore, as a consequence, delayed and mitigated liberalization measures.

جون كلود بيرثلمي
نوال بن طاهر

Introduction

Financial sector development is a key factor in economic progress. This is also a sector where governments have frequently intervened, with mixed results. After financial repression policies usually implemented until the 1980s, which prevented financial development in many developing countries, including most Arab countries, governments have started liberalizing their financial sectors. One would have expected that this reversal of previous failed policies would have led to significant improvement in financial sector performance. However, although it has been quite easy to hamper financial development, promoting it has proven to be difficult. This is to a large extent related to institutional issues.

This paper provides an overall assessment of the current situation of financial sectors in Arab countries and also proposes a more in-depth analysis of financial development conditions in the light of the discussion of institutional aspects of the banking sector reforms in four specific countries: Egypt, Jordan, Morocco and Tunisia. Examining such country experiences is essential to uncover the institutional bottlenecks which may explain why it is so difficult to build dynamic financial systems after financial liberalization.

Two alternative approaches with financial liberalization have been advocated in the economic literature and implemented by governments and central banks in developing countries: gradualism vs. shock therapy (Grais and Kantur, 2003). Gradualist policies have involved step-by-step liberalization of interest rates and removal of state control on banks' and other financial intermediaries' activities. Shock therapy means, like in the Southern Cone of Latin America in the 1970s or in some transition economies more recently, a much quicker reform process, within a speedy liberalization and opening of money and financial markets, as well as privatization of financial institutions.

Both options have merits and weaknesses. Experiences with shock therapy have shown that it may disrupt financial market stability. However, gradualism may prevent the achievement of a critical mass of change in the financial sector. The bottom line of the argument is that too timid and gradualist approaches to financial liberalization are bound to fail because of path dependency. On the other hand, shock therapy leads to financial crises if an appropriate institutional framework – in particular, regarding prudential regulation and supervision – has not been put in place beforehand.

Financial development requires a critical mass of change because financially repressed economies are locked in a sort of poverty trap, where financial underdevelopment and poor economic performances reinforce each other. There is a two-way interaction between economic development and financial depth, leading to multiple equilibriums (Berthélemy and Varoudakis, 1996), which is further discussed below.

Arab countries have generally chosen gradualism over shock therapy. Today, after more than a decade of financial reforms, a number of these economies are still typically in a low equilibrium, with inadequate financial services, contributing to poor economic performance. To get out of this trap, it is necessary to implement stronger reforms and policy initiatives, rather than merely to eliminate the most obvious flaws of the previously applied financial repression policies.

The Financial Poverty Trap

A well-functioning financial sector stimulates savings and improves capital allocation. Nevertheless, it is equally true that in a poor economic environment, financial intermediaries cannot develop profitable services, for lack of large enough amounts of savings to intermediate as well as of demand of capital. Consequently, the finance and growth nexus typically poses a chicken and egg dilemma.

A consequence of this bi-directional interaction between financial depth and economic progress is that it creates cumulative processes which in turn, can lead to multiple equilibriums. Slow economic progress hampers financial development which subsequently reduces potential growth, and leads to a low-level equilibrium. Conversely, economic development and financial deepening reinforce each other, in a high-level equilibrium.

Theoretically speaking, as shown by Berthélemy and Varoudakis (1996), the existence of multiple equilibriums is likely. The intuition behind this theoretical result may be illustrated in Figure 1, where typical relationships between financial depth and economic performance are represented. Intuitively, it may be assumed that economic performance

is linked to financial depth through a logistic function, with asymptotic branches both for low levels and for high levels of financial development. Economic growth has lower and upper bounds, even when financial depth is extremely weak or extremely strong. The same kind of assumption may be made regarding financial depth as a function of economic performance. These two assumptions typically lead to the existence of multiple crossings between the two curves.

The grey curves in Figure 1 represent financial depth as a function of economic growth, while the black curve represents the reverse dependence of economic growth on financial depth. Points A and C correspond typically to stable equilibria, and point B is an unstable equilibrium. As a consequence, it may be assumed that economies will converge either toward point A (the low-level equilibrium, or poverty trap) or toward point C (the high-level equilibrium).

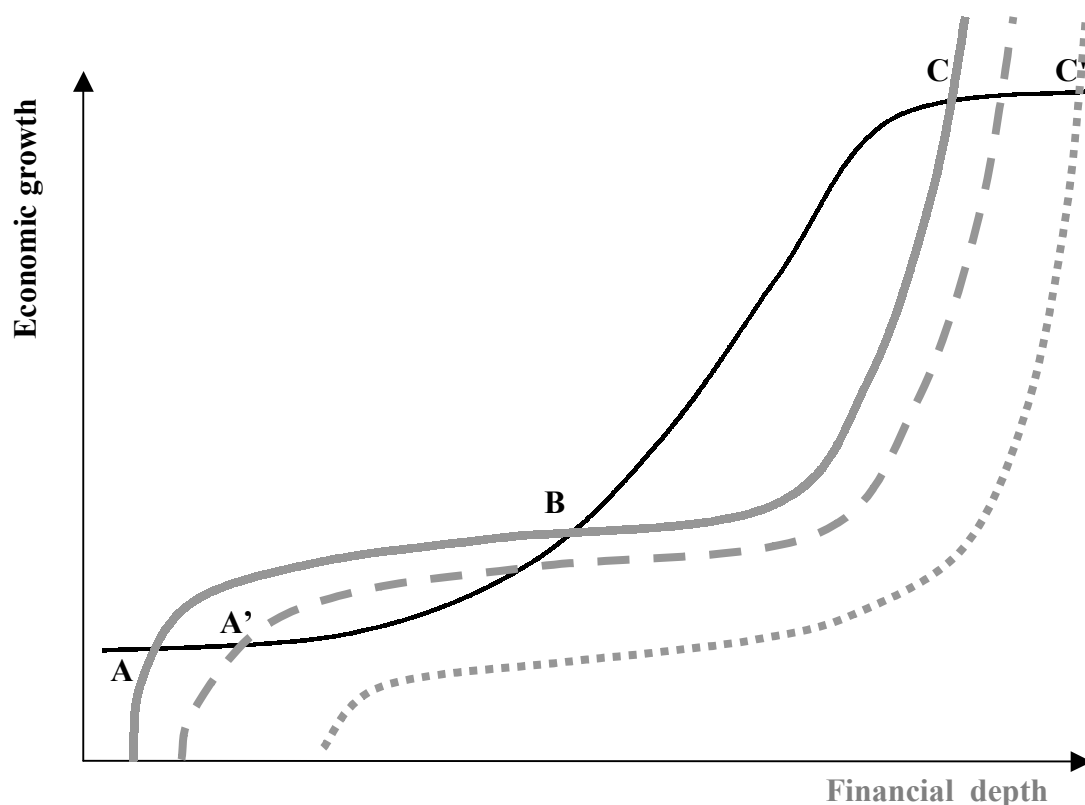


Figure 1. Multiple equilibriums.

The consequences of this theory for the analysis of financial reforms are obvious. Typically, financial repression policies hamper financial activity, and lead to the poverty trap equilibrium. It is even possible that there remains only one (low-level) equilibrium. Such adverse effects will have long-lasting consequences. If the economy has been initially driven to the poverty trap, a mere reversal of initial financial repression policies will probably be insufficient to bring back the economy to the high-level equilibrium.

After a financial repression policy, illustrated by the low-level equilibrium A in Figure 1, if marginal liberalization reforms are implemented, this leads only to a shift from A to A', which does not change much economic performances. What is needed is a critical change, so that the poverty-trap equilibrium disappears, and the economy switches to the high equilibrium C''.

The existence of multiple equilibriums may be empirically investigated through tests designed to detect convergence clubs. Countries with poor financial development (typically financially repressed developing economies) tend to cluster in a slow growth–low income group, while countries with more developed financial intermediation systems (typically Asian emerging market economies and OECD countries) will converge together at much higher levels. This approach may of course be generalized to other potential sources of multiple equilibriums. For instance, Berthélemy and Varoudakis (1996) have identified not only two but four convergence clubs, defined both by financial

depth and by educational development (see also Berthélemy, 2002). Such results suggest that although a critical mass of change in the financial sector would presumably be insufficient to promote financial development and hence facilitate the growth process, it is not a sufficient condition for economic development. This is because other adverse initial conditions, possibly linked to other multiple equilibrium occurrences, may continue to prevail.

In a more refined approach, Berthélemy and Varoudakis (1997) identified two threshold points related to financial development instead of only one, defined by: (a) the savings collection role of the financial system, which requires only a rudimentary financial industry; and (b) its capacity to improve total factor productivity, which depends on the existence of a more sophisticated financial system, capable of efficiently allocating the intermediated capital. According to data used by Berthélemy and Varoudakis (*op. cit.*), which covered six five-year periods over the years 1960 to 1990, three Arab countries namely — Morocco, Syria and Tunisia — were located on the borderline between the upper-level and the intermediate-level convergence clubs, while three others — Algeria, Egypt and Jordan — had a financial depth indicator putting them in the upper-level convergence club.

The ranking of Algeria and Egypt in the upper-level convergence club, as well as the position of Syria close to the borderline between the two convergence clubs, deserves some discussion. The test implemented by Berthélemy and Varoudakis (*op. cit.*) was based on a crude measurement of financial depth, the ratio of liquid liabilities to GDP. However, there are a number of other dimensions in financial development, which need more systematic exploration. The issue is not only the amount of capital that is intermediated, but also the experience and efficiency of financial intermediaries, their capability of offering adequate and diversified financial services, the existence of well-functioning legal and informational infrastructures that underlie the development of a credit market, and the ability of financial intermediaries and supervision authorities to prevent financial fragility and systemic crises. In the pre-reform period, the liquidity ratio was presumably, a meaningless indicator of the true financial depth in countries where money and credit were tightly controlled or directly decided by the government, e.g. Algeria, Egypt and Syria.

Among the six countries considered above, two have not really implemented significant financial reforms (Algeria and Syria), but the four others (Egypt, Jordan, Morocco and Tunisia) have started reforming their financial sectors relatively early. Therefore, it is time to draw lessons from these reforms.

Aggregate and Micro-Level Indicators of Financial Development in Arab Countries

Until the end of the 1980s, most Arab countries had repressed their financial systems through interest rates controls, state-ownership of banks, directed credit, and protection from foreign competition. Since the mid-1980s, however, significant reforms have been implemented (Chalk *et al.*, 1996; Creane *et al.*, 2003).

Liberalization policies have removed some of the constraints on banking intermediation imposed by previous policies. Most often, interest rate controls and constraints previously enforced by governments and Central Banks over bank operations, have been dismantled or softened. Also, some banks have been privatized, and some constraints on foreign participation in the financial sector have been removed. Although only a qualitative and country-specific assessment can tell whether such reforms have been significant, simple data analysis does provide useful preliminary answers to this question.

This is illustrated in Table 1, where the ratio of domestic credit to private sector is reported. In this table, Arab countries are ranked in three classes, based on an evaluation of financial development levels recently implemented by the IMF (see Creane *et al.*, 2003). The IMF evaluation is based on a large dataset of 36 indicators.⁽¹⁾ The information used to build these indicators cover quantitative and qualitative information on the monetary sector, the banking sector size, structure and efficiency, the quality of banking regulation and supervision, the development of non-bank financial intermediation, financial openness, and the institutional environment. Given that some of their indicators are based on unpublished evaluation by IMF staff, the authors have not attempted to reproduce their exercise. The ranking it provides is, however, reasonable. GCC countries as well as Jordan and Lebanon, which are known for their financial sector dynamism, are found in the first group. The second group lists countries which have started liberalizing their financial sector, but where this reform process is unfinished. Non-reforming countries are found in the last group. To some

⁽¹⁾ In their paper, Creane *et al.* do not mention Tunisia. However, given that, based on the authors' later analysis, it is found that Tunisia has a level of financial development comparable to Morocco, and hence placed in the second group. Neither do Creane *et al.* consider the Comoros, because it is not part of the IMF MENA region, but given its very rudimentary financial sector, it has been included in the third group.

extent, the fact that all GCC countries are put in the first group, although some of them would actually need financial reforms, confirms that financial development depends on the wealth of the economy.

Table 1 also shows comparative data for Asian emerging market economies, many of which have also implemented financial reforms, but with much more success than Arab countries. All such Asian emerging market economies compare favorably with Arab countries, even those Arab countries which are put by the IMF in the group of highly financially developed countries. According to the indicators reported in Table 1, they are much closer to OECD high-income countries than to Arab countries. The only relative exception is the Philippines, which is known for being the less developed of the Asian emerging economies. It is also worth noting that this ratio has first declined at the start of the reforms in several countries (notably Algeria, Egypt and Tunisia), where bank assets were previously inflated by government directed credits. This is particularly the case in Algeria, which used to have a centrally planned economy, resulting in a significant monetary overhang (see Jbili, Enders and Treichel, 1997). Since then, the domestic credit ratio has particularly progressed in Egypt, Morocco and Oman, with a growth higher than 50%, suggesting the possible existence of a critical change in the banking sector of these countries over the past 10 to 15 years. However, none has reached a ratio close to those observed on the average in Asian emerging market economies or in high-income OECD countries.⁽²⁾ Therefore so far, there is not enough evidence that the above-mentioned countries have achieved enough structural change in their financial systems to promote a sustained banking sector development.

One may argue that longer time is necessary to converge to a financial development stage comparable to the advanced countries' level. However, if a critical mass of change had been achieved in the above-mentioned reforming countries, this would have, at least, accelerated the speed of convergence of their financial depth towards the OECD level.⁽³⁾ Overall, this has not been the case. Only one country, Egypt, had a speed of convergence of its financial depth indicator higher than 2% over the past ten years. Even in this case, financial depth has decelerated since 1998, while it is still at a rather low level in comparison with the OECD average country. Moreover, in Egypt, the significance of monetary aggregate evolutions is dubious. Domestic-currency denominated liquidity has increased partly as a result of a reduction in the dollarization of the economy. Also, the ratio of bank credit to GDP has mechanically increased as a result of the depreciation of the Egyptian pound (20% of loans are in foreign currency).

The size of banking activity provides, however, only very partial information on the banking sector efficiency. Another indicator that may be considered is the interest rate spread charged by banks, given that most Arab countries have liberalized their interest rates since the end of the 1980s. This is true in particular of Algeria, Egypt, Jordan, Morocco, and Tunisia. Figures reported in Table 2 suggest that spreads are at rather high levels.

⁽²⁾ There is of course some diversity within the OECD, and most new members of the OECD and Turkey, which are not high-income countries, have ratios comparable to those of Arab countries. Throughout the rest of this paper, the OECD averages refer to high-income OECD members.

⁽³⁾ The speed of convergence is defined here with reference to convergence towards the level observed on the average in OECD countries 10 years ago. It is computed on an annualized basis. Results are not sensitive to the precise definition of this target.

Table 1. Ratio of Domestic Credit to Private Sector to GDP (%)

	1985	1990	1995	2000	2001	2002
<i>High financial development</i>	..	..	<i>52</i>	<i>52</i>	<i>56</i>	<i>59</i>
Bahrain	44	30	57	57	60	65
Jordan	66	72	74	76	75	74
Kuwait	81	..	39	53	66	74
Lebanon	..	79	58	92	91	91
Oman	20	23	29	37	39	39
Qatar	29	37	35	27	28	30
Saudi Arabia	62	55	56	52	56	58
United Arab Emirates	34	37	49	46	51	56
<i>Medium financial development</i>	..	..	<i>34</i>	<i>46</i>	<i>46</i>	..
Algeria	60	44	5	6	7	..
Djibouti	57	52	48	32	26	24
Egypt, Arab Rep.	36	31	37	59	62	61
Mauritania	32	43	23	27	28	32
Morocco	32	34	48	59	54	54
Tunisia	67	..	69	66	68	69
<i>Low financial development</i>	..	<i>18</i>	<i>21</i>	<i>14</i>	<i>14</i>	<i>10</i>
Comoros	10	15	14	12	10	9
Libya	25	31	33	24	25	18
Sudan	10	5	3	2	3	5
Syrian Arab Republic	8	7	11	8	8	8
Yemen, Rep.	..	6	5	5	6	6
<i>Asian emerging market economies</i>	..	..	<i>96</i>	<i>111</i>	<i>115</i>	<i>116</i>
Hong Kong, China	..	164	153	156	155	150
Korea, Rep.	59	66	65	101	107	116
Malaysia	87	..	124	140	149	146
Philippines	27	22	45	44	40	36
Singapore	106	97	106	111	130	115
Thailand	58	83	140	108	97	103
<i>High income: OECD</i>	<i>88</i>	<i>108</i>	<i>119</i>	<i>138</i>	<i>137</i>	<i>134</i>

Source: World Bank. 2004. World Development Indicators.
N.B. Countries without available data are not shown.

In countries such as Libya and Syria in the third group, interest rates are still controlled, and therefore not very informative of the actual cost of banking intermediation. In Algeria and Egypt, although interest rates have been liberalized, there is still a majority of state-owned banks, which still apply, notably for social reasons, distorted deposit and lending rate policies, thereby reducing their interest margins. In other countries where this information is available, interest rate spreads are still rather high by international standards, including in the first group of countries. In comparison, over the whole period under review (with the exception of the year 2002), the median Asian emerging market economy has enjoyed a spread below 4%, at levels similar to those observed in the OECD area.

Another aspect of the financial development concerns the emergence of capital markets. This aspect is perhaps less critical, given that capital markets usually develop only at a rather advanced stage of development of the financial system. Moreover, it should be kept in mind that bank-based financial systems, where equity markets play a relatively minor role, can still be fairly developed, such as in Germany. However, even in countries where equity market has existed for a long time (e.g. Egypt, Jordan, Kuwait, Lebanon and Morocco), the capital market has been rather limited until now (see Table 3).

Reforms implemented in recent years have gone in the right direction, within particular stock market liberalizations in Egypt, Morocco and Tunisia in the mid 1990s. However, only Egypt has a relatively large stock market, with more than 1100 companies listed. Also, ratios of market capitalization to GDP are typically low, as compared with Asian emerging market economies, with the only exception of Bahrain and Jordan, as illustrated in

Table 3. Privatizations (particularly in Egypt, Morocco and Tunisia) have led to some increase in market capitalization, but not enough to sustain a dynamic development of the stock markets, given the timid stance of privatization programs implemented in Arab countries.

One reason why market capitalization attains only modest levels in Arab countries is that usually, the owners of small and medium size enterprises are reluctant to issue shares on the equity market. Moreover, when such companies are listed, most of the shares remain family-owned, thereby reducing to a large extent the turnover in the market. This may also partly explain why data on capital market turnover show that the existing capital markets in Arab countries have a very small trading activity, as compared with capital market in developed countries. Generally, the turnover is below 20% (with the only exceptions of Saudi Arabia). On the other hand, the average turnover in Asian emerging market economies, as well as in OECD capital markets, is above 100% (see Table 4).

Although they provide a useful picture of the progress in financial intermediation activity achieved in Arab countries, the previous indicators do not demonstrate whether the financial sector supplies adequate sources of financing to private businesses. To answer this critical question, the focus is now shifted to microeconomic information, which is necessary. This information is available in the World Business Environment Survey (World Bank, 2000) for three economies in the region, namely Egypt, the Gaza Strip and Tunisia. We consider here the available information for Egypt and Tunisia.

Table 2. Interest Rate Spreads (percentage points)

	1985	1990	1995	2000	2001	2002
<i>High financial development</i>						
Bahrain	..	1.0	6.1	5.9	8.1	7.2
Jordan	..	2.2	3.0	4.8	5.1	5.8
Kuwait	1.5	0.0	1.8	3.0	3.4	3.3
Lebanon	4.0	23.1	8.4	6.9	6.3	5.5
Oman	1.2	1.4	2.8	2.4	4.7	5.7
Qatar	3.5	3.5	..	..	..	..
<i>Medium financial development</i>						
Algeria	..	..	3.0	2.5	3.3	3.3
Djibouti	..	..	..	..	8.7	10.1
Egypt, Arab Rep.	4.0	7.0	5.6	3.8	3.8	4.5
Mauritania	4.8	5.0	..	..	..	..
Morocco	-0.3	0.5	0.0	8.2	8.2	8.6
Tunisia	4.3	..	..	..	..	..
<i>Low financial development</i>						
Comoros	7.5	..	..	..	..	..
Libya	1.5	1.5	0.0	4.0	4.0	4.0
Syrian Arab Republic	5.0	5.0	5.0	5.0	5.0	5.0
Yemen, Rep.	..	..	..	5.5	4.5	4.7
<i>Asian emerging market economies</i>						
Hong Kong, China	..	3.3	3.1	4.7	2.7	4.7
Korea, Rep.	0.0	0.0	0.2	0.6	1.9	1.8
Malaysia	2.7	1.3	1.7	3.4	3.3	3.2
Philippines	9.7	4.6	6.3	2.6	3.7	4.5
Singapore	2.9	2.7	2.9	4.1	4.1	4.5
Thailand	3.1	2.2	1.7	4.5	4.7	4.9
<i>OECD high income median country</i>	4.1	4.6	4.0	4.0	4.3	3.7

Source: World Bank. 2004. World Development Indicators. N.B. Countries without available data are not shown.

Table 3. Ratio of Market Capitalization of Listed Companies to GDP (%)

	1985	1990	1995	2000	2001	2002
<i>High financial development</i>	19	21	24	24
Bahrain	87	88	89
Jordan	..	50	69	58	71	76
Kuwait	54	56	..	..
Lebanon	4	10	7	8
Oman	16	17	17	20
Qatar	29	..	..
Saudi Arabia	29	36	40	40
United Arab Emirates	8	11	..
<i>Medium financial development</i>	..	4	16	28	23	25
Egypt, Arab Rep.	..	4	13	29	25	29
Mauritania	113	..
Morocco	..	4	18	33	27	24
Tunisia	..	4	22	15	12	10
<i>Asian emerging market economies</i>	..	57	101	114	109	100
Hong Kong, China	..	111	214	377	311	287
Korea, Rep.	..	44	37	37	54	52
Malaysia	..	110	251	130	135	131
Philippines	..	13	79	68	30	50
Singapore	..	93	176	167	138	117
Thailand	..	28	85	24	31	36
<i>OECD high income countries</i>	..	51	67	118	103	82

Source: World Bank. 2004. World Development Indicators. N.B. Countries without available data are not shown.

Table 4. Turnover Ratio in Stock Markets (%)

	1985	1990	1995	2000	2001	2002
<i>High financial development</i>						
Bahrain	4	3	3
Jordan	..	20	11	8	17	15
Kuwait	53	21	..	..
Lebanon	7	4	5
Oman	..	12	11	14	15	13
Qatar	5	..	..
Saudi Arabia	16	27	32	30
United Arab Emirates	4	3
<i>Medium financial development</i>						
Egypt, Arab Rep.	11	35	14	16
Morocco	46	9	10	11
Tunisia	..	3	..	23	13	14
<i>Asian emerging market economies</i>	..		48	82	114	105
Hong Kong, China	..	43	37	61	35	43
Korea, Rep.	..	61	98	233	380	303
Malaysia	..	25	36	45	18	17
Philippines	..	14	26	16	7	15
Singapore	42	52	47	39
Thailand	..	93	41	53	109	98
<i>OECD high income countries</i>	..	55	83	131	139	148

Source: World Bank. 2004. World Development. N.B. Countries without available data are not shown.

In Egypt, the business environment of surveyed firms is still characterized by significant financing obstacles. The vast majority of these firms face major (9% of surveyed firms) or moderate (77%) financing obstacles, while only 2% face no obstacle, and 13% minor obstacles. Financing obstacles are encountered by large and small companies equally.

Conversely, in Tunisia, the vast majority of surveyed firms face no financing obstacle (33%) or minor obstacles (55%) and none of them face major obstacles. These ratios compare favorably with the average ratios observed in OECD countries, where 36% of surveyed firms do not face financing obstacle, and 25% face minor obstacles. These positive results are however lessened by the fact that, in Tunisia, only some large- and medium-sized enterprises face no financing obstacle, while small-sized companies, which play a major role in the economy, face such obstacles much more frequently.

A closer look at the principal financial issues encountered by enterprises in Egypt and Tunisia, provides revealing information on the main challenges that Arab countries still need to address regarding their financial sectors. In both countries, the issue most frequently mentioned by surveyed firms, is the cost of interest rates, as shown in Table 5. This suggests that reduced interest margins through reduced intermediation costs and/or increased competition among banks that would erode monopolistic rents, are absolutely necessary improvements in the credit markets of Egypt and Tunisia.

Heavy paperwork is also mentioned frequently suggesting that lending activity is still characterized by heavy regulations and that some further lessening of such regulations is needed. It is also characterized by significant involvement of public sector banks, which may explain the perception by borrowers of a heavy bureaucratic attitude of the lenders.

Table 5. Frequency of Problematic Financing Issues in the Business Environment

Egypt	%	Tunisia	%
High interest rates	74	High interest rates	54
Paperwork	71	Inadequate credit information on customers	51
Lack access to export finance	52	Paperwork	28
Need special connections with banks	48	Lack access to equity partners	27
Inadequate credit information on customers	47	Need special connections with banks	23
Collateral requirements	46	Collateral requirements	23
Lack access to lease finance	46	Lack access to foreign banks	19
Corruption of bank officials	44	Lack access to export finance	11
Banks lack money to lend	41	Lack access to lease finance	8
Lack access to foreign banks	39	Banks lack money to lend	5
Lack access to equity partners	39	Corruption of bank officials	3

Source: World Bank. 2000. World Business Environment Survey

N.B. Ratios reported are the percentages of surveyed firms for which the obstacle is major or moderate.

Another problem quoted rather frequently in both countries concerns the inadequacy of the available credit information on customers. It may be assumed that this issue is of course also critical for banks and other creditors, which may explain why a significant number of companies, particularly small businesses in the case of Tunisia, do not find adequate funding in the domestic financial market. This is to some extent confirmed by the fact, that a significant number of surveyed companies mention financing difficulties due to their lack of connections with banks and due to collateral requirements.

Finally, in Egypt, the lack of access to export finance is also mentioned relatively frequently by surveyed enterprises. This is consistent with the presence of significant rigidities in the Egyptian foreign exchange market, notably before the floating of the pound decided in January 2003.

There are obviously differences among Arab countries, as already illustrated by the differences between Egypt and Tunisia. Observations of these two countries should not be generalized for other countries. Nevertheless, these data are indicative of some major weaknesses of Arab country financial sectors to wit: high interest costs, heavy bureaucracy, uneasy relationships between lenders and borrowers and inadequate information systems.

Challenges Ahead

Deeper change in financial sectors is necessary if reforming Arab countries were to achieve more significant progress in their financial intermediation system in the years to come. Pro-market reforms should be strengthened in two main areas: (a) the reduction of remaining restrictive regulations in the financial sectors; and (b) the promoting of competition among the different financial intermediaries. Moreover, recent experiences with financial liberalization policies suggest that such policies need also to be supplemented with the provision of an adequate institutional and regulatory environment and the promotion of necessary financial market infrastructures. When this framework is absent, not only shock therapy policies may weaken the financial system, but also an efficient credit market cannot develop.

Regulatory Framework

According to Grais and Kantur (2003), restrictive regulations have been eased in a majority of Middle East and North African countries. However, these economies are still characterized by relatively restrictive controls and regulations in their banking and finance activities.

According to the Heritage Foundation (2004), which provides a qualitative index of restrictiveness of regulations in banking and finance, restrictiveness is high or very high in eight countries, i.e. Algeria, Egypt, Iraq, Saudi Arabia, Sudan, Syria and Yemen. This proportion is even higher than in the second half of the 1990 decade, when only six Arab countries had highly or very highly restrictive regulations. Table 6 shows that generally speaking, regulation restrictiveness in the banking and financial sector has not decreased in recent years, quite the contrary. Table 6 shows further that only three countries – Bahrain, Jordan and Mauritania – face low or very low restrictions.

In comparison, currently close to 70% of OECD countries have low or very low restrictions in their banking regulations. None has high or very high restrictions. Moreover, a large majority of OECD countries have reduced their regulation restrictiveness, contrary to the Arab countries. Also, all Asian emerging market economies have low or moderate restrictions, with the exception of Malaysia. Notwithstanding the reforms already implemented, this suggests that there exists significant room for further liberalization of banking sectors in Arab countries.

Table 6. Restrictiveness of Regulations in Banking and Finance Sector

		2003		
		Low or very low	Moderate	High or very high
Initially (mid to end 1990s)	Low or very low	Bahrain	Morocco Oman Tunisia	Algeria Libya Sudan Syria
	Moderate	Jordan	Djibouti Qatar	Iraq Saudi Arabia
	High or very high	Mauritania	Kuwait Lebanon UAE	Egypt Yemen

Source: Heritage Foundation. 2004. Index of Economic Freedom.

Liberalization and de-control of the banking sector do not imply the absence of regulations. Such financial reforms must be accompanied by the building of a strengthened prudential regulatory and supervisory framework. Otherwise, financial liberalization may only lead to financial fragility and crises. This is all the more important as banks have often inherited from the pre-reform period, heavy non-performing loans portfolios. A complete and speedy liberalization of the banking sectors would have been unadvisable unless prior measures are taken to clean portfolios and recapitalize banks, and to establish proper prudential regulations and monitoring of depository institutions.

Some progress has been gradually achieved by Arab countries since the early 1990s, sometimes in response to major bank crises. A few examples are the bankruptcy of the Petra Bank in Jordan in 1990 and the consequences of the collapse of the Bank of Credit and Commerce International in 1991, notably in Egypt and the UAE. However, partial available data on non-performing loans point to a significant financial fragility in a number of countries, as will be documented in the cases of Egypt, Jordan, Morocco and Tunisia.

Competition

As mentioned previously, banking intermediation is relatively costly in Arab countries. This is partly due to insufficient competition in the banking industry, insofar as monopolistic behaviors result in high intermediation margins. Bank competition may also improve firms' access to credit. The assumption of a positive relation between bank concentration and financing obstacles, which is consistent with the standard structure-performance hypothesis, is supported by empirical evidence provided recently by Beck *et al.* (2003). Using data from the World Business Environment Survey (2000), these authors find that firms face more financing obstacles in countries with high bank concentration.

Insufficient competition in the financial sector may constitute a handicap for Arab countries. Standard indicators suggest that the degree of concentration in the banking sector is high in Arab countries, where the share of the five largest banks in total bank assets varies generally between 65 and 80% (Table 7). These levels of concentration are significantly higher than in Asian emerging market economies, where the median country has a 5-bank concentration ratio equal to 47. The average concentration observed in OECD countries is equal to 48%. The only Arab country showing a lower concentration is Lebanon, where the bank concentration ratio is equal to 40%.

Recent research results on banking sector competition produced by Gelos and Roldós (2002) and by Claessens and Laeven (2003) suggest however, that standard concentration indicators do not measure accurately the degree of competition in the banking industry. They propose to use measures based on the Panzar and Rosse (1987) methodology, which relies on econometric estimates of the elasticity of total revenues of banks with respect to their input prices. This methodology cannot be applied to Arab countries, for lack of availability of the necessary micro-economic data, but results proposed by Claessens and Laeven (*op. cit*) suggest that competition in the banking sector is heavily influenced by barriers to entry, in particular those opposed to foreign banks.

In this account, Arab countries have implemented so far, very diverse policies. Jordan has a widely opened banking sector, with 68% of bank assets in banks that are 50% or more foreign-owned. Part of the high share of foreign banks' assets is due to the preference of migrants for deposits in foreign-owned banks. However, this does not explain all of it. Migration is a widespread phenomenon in Arab countries. Although smaller, the share of bank assets owned by foreign-controlled banks is also significant in Bahrain (28%), Lebanon (27%), Morocco (19%) and Tunisia (19%). All these countries have foreign ownership in the banking sector higher than in Asian emerging market economies, with the exception of Singapore (and possibly Hong Kong). On the other hand, in Egypt, foreign-controlled banks own only 4% of bank assets. In Egypt and in other countries with high or very high restrictions in banking regulations, (e.g. Algeria), a higher degree of openness to foreign banks could be beneficial to the economy. As shown by the experience of Saudi Arabia, this may be implemented through cooperation between local and foreign banks, without necessarily fully opening the market to foreign-controlled banks.

Another indicator of the degree of competition in the banking industry is the proportion of bank assets owned by private banks, or by banks with a majority of private shareholders. Again Bahrain, Jordan, Lebanon, Morocco and Tunisia enjoy, based on this indicator, a significant degree of competition, with more than two-third of bank assets owned by private-controlled banks. On the other hand, this ratio is only equal to one-third in Egypt. In comparison, in emerging market economies, the share of private-controlled banks is always high, with a minimum of 70%. Examples are Korea and Thailand where some banks have been nationalized after the 1997-98 financial crisis.

Table 7. Indicator of Competition in the Banking System

	5-bank concentration ratio (%)	Percentage of banking system's assets in banks that are 50% or more private-owned	Percentage of banking system's assets in banks that are 50% or more foreign-owned
<i>High financial development</i>			
Bahrain	71	96	28
Jordan	68	100	68
Lebanon	40	100	27
Oman	77	100	11
Qatar	76	57	15
Saudi Arabia	69	100	0
<i>Medium financial development</i>			
Egypt	65	33	4
Morocco	75	76	19
Tunisia	66	68	19
<i>Asian emerging market economies</i>			
Hong Kong, China	..	..	..
Korea, Rep.	48	70	0
Malaysia	30	100	18
Philippines	46	88	13
Singapore	..	100	50
Thailand	75	69	7
<i>Median OECD high income country</i>	65	97	7

Source: World Bank's Bank Supervision And Regulation Database, 2003; and authors' computation from data of the Association Professionnelle Tunisienne des Banques, Rapport Annuel 2002.

Finally, competition may be enforced with the development of a diversified financial sector, albeit currently, traditional bank loans are still the principal sources of financing. In this account, considerable work needs to be done in most Arab countries particularly concerning the development of instruments such as lease finance, and capital market segments such as secondary markets for government debt paper and bond markets. This may need not only private initiative, but also the development of proper regulations.

Legal Framework

Recent research papers (e.g. La Porta *et al.*, 1998) show that adequate protection of creditor rights is necessary for the development of credit markets. This depends both on the design of laws and regulations, particularly well-designed collateral and bankruptcy laws, and on the actual implementation of such legislations. According to La Porta *et al (op. cit)*, countries with civil law instead of common law, to which belong Arab countries, are handicapped by insufficient protection of creditors.

As shown in Table 8, theoretically speaking, creditor rights are sometimes well protected better protected in Arab countries than in the median OECD country⁽⁴⁾ This is the case of Algeria, Mauritania and Syria. However, in other cases (Egypt, Jordan, Lebanon and Tunisia), they are worse protected. These observations may lead to the conclusion that the nature of the legal system does not seem to play a systematically adverse role in Arab countries. However, such observations are relevant only if legislations are actually enforced, or at least if they are equally enforced in the different countries. The "rule of law" indicator available in the governance dataset assembled at the World Bank by Kaufmann *et al.* (2003) shows doubtlessly that agents in Arab countries have significantly less confidence in the rules of society than agents in emerging market economies or in OECD countries.⁽⁵⁾ This is true in particular of Algeria and Syria, which means that their supposedly high level of protection of creditor rights is to a large extent meaningless.

These observations imply that although in several Arab countries, improving the legislation on creditor rights would be advisable, the major challenge faced by the region goes beyond mere financial sector legislations. The greater concern is more generally the necessity to improve governance.

Similarly, only few Arab countries have set up depositor insurance schemes, which mean that they rely, in case of bank crises, on *ad hoc* measures including mandating rescue finance by other banks. Such institutional arrangements, in a context where prudential supervision is weak, may give the wrong incentives to banks and typically increase moral hazard problems.

⁽⁴⁾ The Creditor Rights Index is based on the methodology of La Porta *et al.* (1998). The indicator measures four powers of secured lenders in liquidation and reorganization: (a) whether there are restrictions, such as creditor consent, when a debtor files for reorganization; (b) whether secured creditors are able to seize their collateral after the decision for reorganization is approved; (c) whether secured creditors are paid first; and (d) whether an administrator is responsible for management of the business during the resolution of reorganization.

⁽⁵⁾ The "Rule of Law" indicator summarises several indicators which measure the extent to which agents have confidence in and abide by the rules of society. These include perceptions of the incidence of crime, the effectiveness and predictability of the judiciary, and the enforceability of contracts. See Kaufmann *et al.* (2003) for further details.

Table 8. Legal Framework and Financial Infrastructure Indicators

	Creditor Rights Index	Rule of Law indicator	Quality of public credit registry information
Jordan	1	0.3	67
Lebanon	1	-0.3	..
Saudi Arabia	2	0.4	50
UAE	2	0.9	58
<i>Medium financial development</i>			
Algeria	3	-0.5	..
Egypt	1	0.1	50
Mauritania	3	-0.3	..
Morocco	2	0.1	17
Tunisia	0	0.3	36
<i>Low financial development</i>			
Comoros	..	-0.8	..
Somalia	..	-2.1	..
Sudan	..	-1.4	..
Syria	3	-0.4	..
<i>Asian emerging market economies</i>			
Hong Kong, China	4	1.5	..
Korea, Rep.	3	0.3	..
Malaysia	2	0.4	44
Philippines	1	-0.5	..
Singapore	3	2.3	..
Thailand	3	-0.2	..
<i>Median OECD Europe</i>	2	1.6	78

Source: World Bank. 2003. Governance Dataset; and World Bank. 2004. Doing Business Database N.B. The creditor right index is an integer index ranging from 0 to 4; the rule of law indicator is an index ranging from -2.5 to +2.5; the index of quality of public registry ranges from 0 to 100.

Financial Infrastructure

Another usual constraint to the development of credit markets is the absence of adequate and accurate information on the individual debtors' financial situation. The lack of such information is also responsible, to some extent, for poor risk management and the occurrence of high levels of non-performing loans. One way to solve the information asymmetry problem faced by lenders is to organize information sharing among them. This kind of institutional arrangement may be particularly helpful to improve credit access of small businesses. Such information exchange also reduces the informational rents that banks could otherwise extract from their customers (Jappelli and Pagano, 1999). In well developed financial systems, such information is provided by specialized agents, which may be public or private. In many of the most advanced countries, as well as in all Asian emerging market economies, private information services have emerged endogenously, through the creation of private credit bureaus. In some of these countries, there are both public and private credit registries (e.g. Germany and Malaysia) or, in a few instances (France, Slovak Republic), only a public credit registry.

Only countries with a rather large financial market can sustain an economically viable private financial information activity. In other countries, government intervention is probably necessary to initiate such an activity, which is of a public good nature. As shown by Jappelli and Pagano (*op. cit*), in either case, the availability of such services has a positive influence on the development of the credit market.

In Arab countries, there are no private credit bureaus, but public credit registries are available in Egypt, Jordan, Morocco, Saudi Arabia, Tunisia and the UAE. Such institutions are however, lacking in a number of other countries, including Algeria, Lebanon, Mauritania and Syria.

The impact of such services on the development of firms' access to credit may, however, depend critically on the quality of the information collected, which becomes totally useless if not fully reliable. On this account, Arab countries have poor performances. On the basis of the information available in the World Bank (Doing Business Database, 2004), the quality of information collected by the public credit registries may be considered as particularly poor in Morocco and Tunisia.⁽⁶⁾ This suggests that, notably in Morocco and Tunisia, which otherwise, have achieved some progress in their financial sector reforms, more needs to be done in this area to promote a significant development of credit markets. In other Arab countries, only Jordan enjoys a quality of information provided by its public credit registry comparable to the quality standard available in more advanced economies.

Improving the quality of financial information would also require more general improvement in the business environment. In particular, improvements in this area would necessitate the enforcement of robust accounting and auditing systems, and better corporate governance.

Lessons Learned from Financial Liberalization in Egypt, Tunisia, Morocco and Jordan

Egypt

In Egypt, reforms started in 1991, with three principal objectives: (a) reducing inflation pressure created by monetary financing of the public deficit; (b) promoting private sector financing; and (c) restructuring the banking sector. This reform agenda was triggered by macroeconomic instability, insufficient results of the *Infitah*⁽⁷⁾ open-door policy implemented in the 1980s and fragility of the financial sector, as exemplified by the consequences of the BCCI (Bank of Credit and Commerce International) bankruptcy.

A significant and rather rapid reform has been the liberalization of interest rates. Bank interest rates were fully liberalized in 1991. Real interest rates increased significantly, partly as a result of this measure and of reduced inflation. The prime rate which was below the inflation rate at the end of the 1980s, surged to 5.7% above inflation in 1992. Since then, with the exception of 1995 marked by an inflation peak, the difference between the prime rate and the inflation rate has continuously increased, to reach 11.1% in 2002. Although the initial upsurge of the interest rate was an inevitable and desirable consequence of the liberalization, its further rise indicated clear shortcomings in the financial liberalization policy, which did not succeed in improving the efficiency of financial intermediation.

As a consequence, nominal interest rates remained relatively high with positive real differential between interest rates on the Egyptian pound and the US dollar. This differential attracted capital inflows until 1997. The Central Bank intervened to buy excess foreign currency to avoid nominal appreciation. The associated sterilization measures, through the issuance of Treasury bills, were the most active monetary policy between the period 1991-1997.

The foreign exchange rate has been kept long under control. At the beginning of the reforms, there was a major issue regarding the foreign exchange market, leading to a significant dollarization of the economy, which was at the level of 51% in 1991. The foreign exchange market has been unified in 1991, and the pound was pegged to the US dollar in a managed floating system, stabilizing the exchange rate. This measure helped reduce the dollarization to 29% in 1992. However, the foreign exchange market was not liberalized, leaving on its wake a foreign exchange shortage, particularly affecting commercial banks. In January 2003, in response to continuing foreign currency shortage and a new rise in dollarization, the managed floating system was abandoned, supposedly in favor of a flexible exchange rate system, which led to a significant depreciation of the currency. However, the exchange rate has been kept under control

⁽⁶⁾ The Public Credit Registry quality of information index summarises scores on question regarding the process of data collection and verification. These concern the existence of legal penalties for reporting inaccuracies, the ability of consumers to inspect data, the legal requirement to respond to borrower complaints, the delay of submission of data, the actual submission of data on time by most financial institutions, the time allowed to correct reported errors, the delay of availability of data for distribution and the duration of existence of the registry. The maximum score is 100.

⁽⁷⁾ *Infitah* means open door. It refers to President Sadat's policy after the October 1973 War of relaxing government controls on the economy so as to encourage the private sector and stimulate the inflow of foreign funds.

in an attempt to avoid disruptive consequences of depreciation on inflation and public finances, and insufficient foreign currency supply is still weakening the efficiency of the economy and of the financial sector.

This experience of Egypt among the four countries studied is unique, in the sense that, even though the foreign exchange market is not fully liberalized in Morocco and Tunisia, it has been kept close enough to equilibrium to avoid adverse consequences of foreign currency shortages on the real and the financial sectors, as well as dollarization.

Together with interest rate liberalization, the reform process has also concerned the credit ceilings previously used as a monetary policy instrument. Such measures, which were enforced on all banking credit, were removed in 1992 for the private sector and 1993 for the public sector.

Credit direction, which usually goes along with credit ceilings, and is characterized by the implementation of preferential treatment measures granted to the public sector and other priority sectors, has been also subject to some reforms. The Central Bank has suppressed in the early 1990s several regulations, such as administrative credit allocation, or the ban on business relations between a private bank and a state-owned company in the absence of a prior authorization by a state sector bank, which inhibited competition by private banks. These restrictions have been, however, replaced by the creation of credit ceilings on specific categories of loans, and public banks still have to comply with government objectives in setting their credit policies. Therefore, credit direction has not been fully abandoned.

At the beginning of the reforms, the banking sector was highly segmented. It was comprised of onshore banks and offshore commercial banks, business and investment banks, and specialized banks. The onshore commercial bank sub-sector was made of four state-owned banks and some 20 private banks, but state banks were predominant in size. Offshore banks specializing in foreign currency transactions, which emerged during the open-door policy period, were partly private and joint-venture banks, but were essentially controlled by the public sector commercial banks. Overall, the state controlled most of the banking sector through its public sector institutions. The four public sector commercial banks totaled 90% of bank assets, and moreover, were involved in the shareholding and management of private banks.

In the first phase of the reforms, there were several restructuring and liquidation operations. Fourteen branches of the National Development Bank were merged. The Bank of Commerce and Credit of Egypt (a subsidiary of BCCI) and Banque Misr were merged following the BCCI bankruptcy. However, the banking sector remained essentially state-controlled.

In the second phase of the reforms, the Egyptian government attempted a partial privatization. A public sector commercial bank was supposed to be privatized, together with offshore banks, where public sector bank had majority shareholding. However, no public sector commercial bank has yet been considered for privatization, and stakes held by the public sector in several offshore banks have been only partially and incompletely sold out.

Given this timid restructuring process, the sector has remained highly concentrated and segmented, and state-controlled. Competition is further weakened by significant entry barriers imposed by the Central Bank (El-Shazly, 2000).

The banking sector has also remained fragile, partly due to the poor quality of the portfolio of public sector banks. This is all the more a source of concern as there is no formal system of protection of deposits. After the BCCI bankruptcy, the government intervened on an *ad hoc* basis to protect depositors, forcing other banks to participate in a rescue package. In 1992, it approved a new legislation to create a deposit insurance fund, but this fund has actually never been created.

The systemic fragility had convinced the Central Bank to maintain or introduce rather severe prudential regulations regarding reserves, capital and liquidity requirements.

The reserve requirement ratio has been reduced in 1990 from 30 to 15% for local currency deposits, and in 1993 from 15 to 10% for foreign currency deposits. These reserves bear no interest, and therefore imply a significant implicit tax on banking activity, given the unusually high level of reserve requirements. On the other hand, the liquidity ratio regulation is rather loose. Liquidity requirements were further reduced in 1990, from 30 to 20% (25% for foreign currency).

The Central Bank has introduced a capital adequacy ratio along the lines of the Basle core principles (capital should account for at least 8% of the risk weighted assets), with gradual enforcement till December 1993. Public sector

banks were recapitalized, through government bonds financing, to comply with this capital adequacy ratio. The required capital adequacy ratio was increased to 10% in 1996, in an attempt to improve the stability of the financial system.

The Central Bank has also been enforcing since April 1993, a regulation regarding credit concentration (with only gradual enforcement initially). Credit to a single customer, public or private, should stay below 30% of a bank capital (as defined by the Basle Committee). This regulation was applied initially to commercial banks, but it has been extended to business and investment banks, which since September 1995, could not have a participation in the capital of a company exceeding 40% of the paid-up capital.

Finally, loan classification and provisioning of non performing loans (NPL) were introduced in September 1991. The regulation defines three categories of NPLs: (a) Substandard debt (with a delay of debt servicing between 3 and 6 months); (b) Doubtful debt (with a delay of servicing between 6 and 12 months); and (c) Bad debt with a delay of servicing over one year. Compulsory provisioning on this NPLs are respectively 20, 50 and 100%. Cases of fraud and liquidity problems faced by the banking sector in recent years suggest however, that this regulatory system needs to be enhanced. Moreover, there is a lack of adequate tax incentive for taking loan-loss provisions. Although such data are not published regularly, it seems that NPLs are not only at high levels, but are also growing. According to estimates released by the Central Bank, NPLs accounted for 14% of total credit exposure in 2001, but other independent estimates put this ratio at 20-30%. This issue is to be related to insufficient monitoring of individual banks, and lack of market transparency.

All in all, the banking sector reforms in Egypt have, so far, introduced some progress in the regulatory environment. However, the sector restructuring has been incomplete, with a remaining heavy weight of the public sector, which hinders efficiency and competition within the banking sector, with consequently, a relatively modest improvement in the price and quality of services offered by the sector. Also, supervision by the Central Bank has shortcomings, resulting in a significant fragility of the banking sector, as suggested by NPLs estimates. In addition, a peculiarity of Egypt is the fact that the management of the foreign exchange market by the Central Bank has led continuously to foreign currency shortages and dollarization, which have directly and negatively affected the banking sector.

Tunisia

Tunisia started reforming its financial sector relatively early, in 1987, in the context of its overall structural adjustment policy. However, reforms were implemented only very gradually, with some of the major reform measures concerning bank prudential supervision particularly, taken only as late as 2001.

Interest rates were controlled until January 1987. At that time, debtor interest rates were partially liberalized, within a margin of 3 percentage point of difference with the money market rate. Debtor rates for non-priority sectors were fully liberalized in June 1994, together with bank margins. Debtor rates on loans granted to priority sectors (agriculture, exportation and small and medium size enterprises) were liberalized only in November 1996. Most creditor rates were liberalized in January 1987 as well, with the exception of sight deposits, the remuneration of which is subject to a ceiling of 2 percentage points since 1990, and earnings on special savings accounts, which is indexed on the money market rate. This liberalization process, over a 10-year period, has been one of the slowest in the region.

As in other countries, modern monetary policy instrument were introduced together with interest rate liberalization, with the suppression of credit ceiling and creation of the money market in 1987. Subsequently, new debt instruments in the money market (Certificate of Deposits and Treasury Bills) were introduced in 1991. As a logical consequence, credit direction was also gradually abandoned, but at a slow pace. Mandatory holdings were suppressed only in 1996. Until this date, banks were still required to hold at least the equivalent of 10% of their deposits on loans to priority sectors.

The financial sector is concentrated and is characterized by low competition, as suggested by its current high profitability, achieved in spite of high levels of non-performing loans. The state still plays a major role in the sector, insofar as it controls three of the largest commercial banks (among a total number of 14 commercial banks) and it directly or indirectly controls more than half of the banking system's assets. In addition, the state is involved, together with other Arab governments, in the development bank sector, albeit this sector does not play a significant role in the financial sector, given that development banks today hold only 4% of total financial assets. Furthermore, the distinction between commercial and development banks was suppressed in 2001. The state also controls financial institutions outside the supervision of the Central Bank such as the CCP (Centre de Chèques Postaux) and the CENT (Caisse d'Épargne Nationale Tunisienne), which together, account for close to 8% of total financial assets, as well as pension

funds. On the positive side, the range of financial services has expanded in recent years with the creation of several non-bank financial institutions in the sectors of leasing and factoring. There are also two merchant banks, and a limited offshore banking activity.

There has been some recent restructuring in the public banking sector. This led in December 2000 to the merger of two former development banks, BNDT (Banque Nationale de Développement Touristique) and BDET (Banque de Développement Economique de Tunisie) with the STB (Société Tunisienne de Banque), one of the major state-controlled commercial banks. There were also two privatizations of medium-sized banks, accounting each for around 7.5% of total commercial bank assets, i.e. the BS (Banque du Sud) in 1997 and UIB (Union Internationale de Banque), in which the French bank Société Générale has acquired a majority shareholding in November 2002.

The main fragility in the Tunisian financial sector lies in its public-controlled segment. It is likely that the state would intervene to protect depositors in case of difficulties, but there is no deposit insurance system. The Central Bank has authority to appeal to "market solidarity" in the event of a banking crisis. However, such procedure may be difficult to enforce, and may prove costly to the state budget, given its heavy involvement in the weakest segments of the financial sector.

On paper, a complete modern regulatory framework has been put in place by the Central Bank since 1991. However, the regulations remained rather weak and insufficient for quite some time. To some extent, the relatively slow process of reform of the banking sector and the lasting dominant role of the state, have been due to the lack of sufficient progress in bank supervision until recent years.

Firstly, reserve requirements are quite minimal. Today, commercial banks are only requested to keep the equivalent of 2% of their sight deposits and 1% of their term deposits and Certificates of Deposits in non-bearing interest reserves with the Central Bank. In addition, liquidity requirements have been put in place only recently, i.e. in February 2001, by the Central Bank. They are defined by a 100% liquidity ratio (ratio of achievable assets to current liabilities).

Secondly, the Central Bank was unable, until recently, to enforce a capital adequacy ratio requirement comparable to international standards defined by the Basle core principles. This is for the simple reason that bank balance sheets were not sound enough to sustain such requirements. Initially, the banking system inherited large amounts of non performing loans from the pre-reform period of directed credit policies. In 1993, the ratio of gross NPLs on total assets of commercial banks was equal to 34% with 82% of these NPLs owned by state-controlled banks. Although these ratios slightly declined in the following years, they remained at an unmanageable level, all the more that the level of provisioning of these NPLs was minimal, due to shortcomings in the regulation on NPLs provisioning. These NPLs were particularly high in the development bank sector until the merger of BDET, BNDT and STB.

Only in 1997 did the government take comprehensive measures to tackle this issue, including the creation of private asset management companies, a government guarantee granted on NPLs owed by active public enterprises, and substitution of NPLs owed by privatized or liquidated enterprises with 25-year government bonds bearing no interest. Primarily due to this treatment of a major part of NPLs, in December 1999, the Central Bank was able to align its regulation on international standards, through increasing the required capital adequacy ratio from 5% (according to the 1991 regulation) to 8%.

The Central Bank has also been enforcing since 1991, a regulation regarding credit concentration, which was however not very severe until December 1999. From 1991 to 1999, credits to a single customer were supposed to stay below 40% of a bank's net capital. This ratio was reduced to 25% in 1999, a level more comparable to international standards. In addition, the total debt of the biggest clients of a bank (defined as clients with debt above 5% of the bank's net capital) should not exceed 10 times that bank's net capital. In spite of this regulation, presently, it seems that bank exposure to large individual debtors is alarming. According to unofficial and controversial information circulated in the press in early 2004, some 127 individual customers could have a total debt equivalent to 5.3 billion dollars (27% of total domestic credit).

Finally, the Central Bank has introduced loan classification and provisioning of non performing loans in 1991. The regulation defines three categories of NPLs consistent with international standards: (a) Substandard debt with a delay of debt servicing between 3 and 6 months; (b) Doubtful debt with a delay of servicing between 6 and 12 months; and (c) Bad debt with a delay of servicing over one year. In 2001, NPLs of commercial banks were as high as 19.5% of total gross claims, but were much higher in state-controlled banks (close to 25%) than in private banks (close to 11%). Mandatory provisioning of NPLs is on paper, consistent with international standards, with respectively 20, 50 and 100%. However, the regulation does not require that loans backed by real estate collaterals be provisioned. As a

consequence, provisioning is low, because of the large size of debt backed by such collaterals. In 2001, net NPLs accounted for 12.3% of total net claims. The main risk exposure, and NPLs, of the Tunisian banking sector is on the tourism sector, which has heavily borrowed funds to build hotels and resorts. Due to cumbersome judicial procedures, recovering such assets is a very long and uncertain process for banks. This phenomenon may imply that the current regulation does not provide for enough provisioning of NPLs. In addition, tax rules limit deductible provisions, and therefore, do not create adequate provisioning incentive.

All in all, the Tunisian financial sector, although today highly profitable, is exposed to major risks, due to long delayed reforms of its regulatory framework. If this does not imply any major risk for private banks, the state-controlled financial sector is considered as vulnerable. Its recapitalization needs could represent a significant cost for the state budget, as concluded by the IMF and World Bank in their Financial System Stability Assessment completed in 2002. This low-performing public financial sector certainly hinders the capacity of the banking sector to develop dynamically, given its size and the systemic risk it inevitably creates. Moreover, its poor financial situation has played a major role in delaying the implementation of a solid regulatory framework.

Morocco

Morocco's structural adjustment program was one of the earliest in the region, starting as early as 1983. However, the Moroccan financial sector stayed highly regulated and controlled by the public authorities for a long time, and the financial reforms were implemented only in the 1990s. Moreover, the state still plays a significant role in the financial system, and the weak functioning of the public institutions remains a major shortcoming in the Moroccan financial system, although at a lower level than in Egypt and Tunisia.

Like in other countries, financial liberalization started with a deregulation of interest rates. The deregulation process has been somewhat faster than in Tunisia, but slower than in Egypt. It took more than a five-year period, from July 1990 to February 1996. Creditor interest rates were liberalized first, in July 1990. Medium-term and short-term debtor rates were partially liberalized in October 1990 and January 1991 respectively, but they were still subject to a ceiling based on a reference rate determined by the Central Bank. In spite of this ceiling, debtor rates surged to 14.5% in the first half of 1991 and 15.8% in the first half of 1993. Further measures constrained the debtor rate below 12% in March 1994 for short-term and medium-term loans and 13% for long-term loans. At the same time, some preferential rates were maintained. This policy weakened the credibility of the financial liberalization policy, and prevented banks from properly managing their risk portfolios. It was dismantled only in February 1996, when interest rates have been almost fully liberalized, although limited controls on some deposit rates remain in force.

Before the reforms, the monetary policy was characterized by credit ceilings, which were used by the Central Bank, together with reserve requirements, to control the volume of credit. This system implied rigidities in the credit system, detrimental to economic activity. From 1991, this policy has been reformed, and the Central Bank, as in other reforming countries, has turned to open market instruments, together with changes in reserve requirements, to control the liquidity expansion. Until the reforms, as in Egypt and Tunisia, the Moroccan Central Bank also applied a directed credit policy. Banks were required to lend to the Treasury as well as to priority sectors. From July 1991, the Central Bank has started reluctantly, to reduce these distortions. However, Morocco has been slower than the other countries in this move. Until June 1998, banks were still required to hold a minimum proportion of their short-term liabilities in Treasury securities bearing interest rates below the market rate. Such requirement, which concerned 35% of bank portfolio in 1990, was phased out only slowly (it was still at the level of 20% until September 1996).

Most, but not all, other mandatory holdings were eliminated in April 1994. Banks still have to hold a minimum of 2% of their liabilities in CNCA (Caisse Nationale de Crédit Agricole) notes. In addition, the Central Bank still requires that funds lent to banks through repurchase agreements be met for 50% by loans to exporters, SMEs and new businesses, and for the other 50% by Treasury Bills.

The banking sector was initially highly concentrated, and has remained so. There are 14 commercial banks and four specialized banks, together with some offshore banks in Tangiers. The state involvement in this banking sector is significant. It has a strong participation in the CPM (Crédit Populaire du Maroc), which accounts for some 29% of the deposits in the banking system, as well as in three other commercial banks. Moreover, it controls the four specialized banks, which account for around one third of the lending market, and operate outside the regulatory framework of the banking sector, although they have a role similar to commercial banks. The role of the state in the banking sector has been only reduced by the privatization of the BMCE (Banque Marocaine du Commerce Extérieur) in 1995. All in all, government-controlled institutions still held around 43% of all banking system assets at the end of December 2001. Moreover, most important non-bank financial institutions are parastatals such as the CDG (Caisse des Dépôts et de

Gestion), an institution with dominant position in the management of institutional savings, or the Post Office, which offers financial services through its network but is not subject to banking regulations. Given its concentration and the role still played by the state, the financial sector is still characterized today by limited competition and transparency.

Due to moderate competition and relatively comfortable interest margins, the commercial banking sector is profitable, and consequently relatively robust, according to the Financial System Stability Assessment performed by the IMF and the World Bank (International Monetary Fund and the World Bank, 2003). However, stress tests conducted for this assessment have shown that several major commercial banks, principally foreign-owned, were exposed to significant fragility *vis-à-vis* credit risks. On the other hand, the large public-owned specialized banks are already in a very difficult financial situation, due to their accumulated losses and non-performing loans.

To protect depositors against risk of bank failures, a deposit insurance fund has been created by the Bank Law in July 1993. According to the law, this mechanism may be supplemented by *ad hoc* financial interventions organized by the Central Bank, which may ask other financial institutions to participate in a rescue operation when one of them faces difficulties, like in Egypt and Tunisia, with the same adverse consequences in terms of incentives and of risk for the government budget.

The Central Bank introduced reserve requirements in the pre-reform period in 1966. It has since then used mandatory reserves as a monetary policy instrument, with in particular a rise in mandatory reserves up to 25% in October 1992, to reduce them back to 10% in 1993. Liquidity ratios were introduced in 1982, and have stayed at 60% since then.

The Central Bank has introduced only very late a capital adequacy ratio along the lines of the Basle core principles. Although the 1993 Bank Law provided for such a regulation, it has been put definitively in place by decree only in January 1997. However, once implemented, the capital adequacy ratio required by the authorities has been, in fact, relatively restrictive. Firstly, the risk weighting factors are relatively strict. Secondly, until January 2001, the capital considered in this ratio took account of only the own funds and assets (tier-one capital), while the Basle capital adequacy ratio definition takes also into account tier-two capital (such as subordinated debt). Nevertheless, commercial banks have always had statutory capital much higher than the amount required to cover their risk-weighted assets. Their capital adequacy ratio was on the average above 15% in 2001 and 2002. The main issue in the Moroccan banking sector lies with the specialized banks sector, particularly BNDE (Banque Nationale de Développement Economique), CNCA and CIH (Crédit Immobilier et Hôtelier), which have been exempted on an *ad hoc* basis from the solvency regulation, and have in fact statutory capital much lower than their risk-weighted assets. Apart from creating a competitive distortion, this situation puts at risk the whole public financial sector, and requires urgent corrective measures.

Regarding credit concentration, the Moroccan regulation initiated in 1977, has been rather restrictive. Until 2000, credit to a single customer (weighted by its risk factor) could not exceed 10% of a bank net capital. This risk concentration ratio has been increased to 20% in October 2000, which is still restrictive by international standards.

Loan classification and provisioning of non performing loans have been introduced in December 1995 and modified in December 2002. Overall, they provide for an adequate representation of asset quality. NPLs are classified in three categories, defined principally by the delay of servicing, but also by the financial situation of the debtor: (a) Pre-doubtful debt with a length of arrear between 3 and 6 months; (b) Doubtful debt with a length of arrear between 6 and 12 months; and (c) unrecoverable debt with a length of arrear above 1 year. Provisioning rates for these NPLs are respectively 20, 50 and 100%, after deduction of agios and collaterals. At present, NPLs of commercial banks are reasonably low and well provisioned. Their gross NPLs amounted to 11% of their total assets, and their net NPLs 2% in September 2002. However, NPLs of specialized banks are very high, 36% of their assets (in gross terms) in September 2002 and are inadequately provisioned. The NPL problem is aggravated, like in Tunisia, by a weak functioning of the judicial system, which implies long delays in the recovery of claims through the courts.

All in all, the Moroccan performances in banking sector reforms have been similar to those of Tunisia, with a significant not-too-efficient public sector. However, implementation of a modern regulatory framework has been apparently somewhat easier, due to a better viability of public sector commercial banks, which have relatively smaller and better provisioned non performing loans.

Jordan

In Jordan, the banking sector, which is essentially private and open to foreign competition, had been booming in the 1980s, fuelled by growing worker remittances in the wake of the second oil shock. The number of financial

institutions increased dramatically, in an essentially unregulated framework, introducing stiff competition in the sector. As a consequence, banks took unbearable liquidity and foreign exchange risk exposure, and NPLs mounted at high levels. This led to a banking crisis in 1989, triggered by a 21% depreciation of the Jordanian Dinar (JD), which led to the formation of a speculative foreign exchange black market. There was also corruption and managerial failure in several institutions. The Central Bank attempted to rescue ailing banks through the injection of the equivalent of 10% of GDP in overdraft facilities. However, this did not prevent the bankruptcy of three major banks (Petra Bank, Syria Jordan Bank and Jordan Gulf Bank), together with emerging difficulties in six other financial institutions. In response to this crisis situation, the Central Bank launched a major reform of the financial sector.

Creditor interest rates were liberalized without delay, in 1989, and debtor rates a year after, apart from relatively minor subsidized credit schemes. This, however, did not lead to any increase in real interest rates during the first years of the reforms. Quite the contrary, real interest rates declined, due to the inflation in 1989 and 1990 created by the large quantity of money injected by the Central Bank in the economy. Inflation and real interest rates went back to normal levels in 1992.

The main thrust of the reforms has been initially an attempt at restructuring the banking sector. Four bankrupt banks were liquidated in 1990 and 1991: Al Batra Bank, Syria Jordan Bank, National Islamic Bank and Jordan Credit Bank. Moreover, a number of other institutions were restructured and merged. However, this restructuring process was uneasy, due in particular, to the family ownership of banks.

In spite of these liquidations and restructurings, Jordan is still considered as over-banked. It has 21 banks and 479 bank branches for a total population of 5.3 million, which is two to three times the average banking coverage of Egypt, Morocco and Tunisia. This large bank coverage is favorable to competition in the banking industry. Moreover, competition is reinforced by the facts that there is no state-owned bank and that foreign controlled banks play a major role in the sector, with foreign participation accounting for around 40% of bank ownership. As a consequence, by regional standards, the Jordan banking sector may be considered as relatively competitive (Khamis, 2003), although being highly concentrated, given that the Arab Bank Plc. accounts alone for 60% of all assets (and the three largest banks for 90%). This competition is reflected in the interest margin of no more than 5% in the banking sector (Mahdi, 2001), which does not leave significant profit after payment of administrative costs, legal reserves costs (equivalent to more than 1 percentage point of interest) and income tax (Hashemite Kingdom of Jordan, Ministry of Planning, 2000). Nevertheless, it should be noted that entry costs have been increased by the Central Bank, since the minimum capital requirement, which was before the reforms of only JD5 million has been increased in several steps to JD20 million (around US\$30 million). Such entry barriers have not barred, however, the recent licensing of two new foreign banks, the National Bank of Kuwait and the Banque d'Affaire du Liban et d'Outre-Mer.

To prevent financial fragility, several measures were taken over time to improve the regulatory framework of the banking sector. Such reform measures culminated in the introduction in 2000 of a new Bank Law (amended in 2003), strengthening the supervisory power of the Central Bank, and the creation of a Deposit Insurance Corporation, in 2000 as well.

Reserve requirements, which were equal to 9% of deposits in 1988, were increased by the Central Bank to 15% in the early 1990s. However, such reserve requirements have been reduced since then in several steps, to levels similar to the pre-reform period (10% in 2000). These reserves bear no interest. The Central Bank also introduced in 1992 a liquidity ratio of 30%, which was increased to 53% in 1996.

Prudential regulations were strengthened from the early 1990s in response to the systemic fragility of the banking sector. The Central Bank introduced in 1992 a capital adequacy ratio regulation compatible with the Basle committed rules. In order to further improve bank solvency, this ratio which constitutes the principal prudential regulation instrument used by the Central Bank, was raised to 10% in 1996 and 12% in 1997.

In addition, the Central Bank introduced in 1992 a regulation regarding credit concentration, according to which any exposure on a single customer above 10% of the paid-up capital of bank must be authorized by the Central Bank, and such exposure cannot rise above 25%.

Finally, loan classification and provisioning of non-performing loans had been already introduced in the pre-reform period. The regulation defines three categories of NPLs: (a) Substandard debt with a delay of debt servicing between 6 months and a year; (b) Doubtful debt with a delay of servicing above 12 months; and (c) Lost debt (whenever the bank obtains evidence that the loan is not recoverable). Mandatory provisioning on these NPLs are respectively 50%, 100% of the portion of the loan which is not covered by collaterals, and 100% of the total loan. This

regulation is less stringent than international standards, which usually classify debt as doubtful after three months of delay in servicing, instead of 6 months. On the other hand, recoverable loans should be covered by a provision of 1 to 2%, which is restrictive by international standards. Until recently, however, these rules were not strictly applied. This situation has been remedied by the introduction of the new Bank Law, which strengthens supervisory powers of the Central Bank, and also provides for tax-deductibility of provisions for NPLs. A private evaluation estimated NPLs at close to 11% of total loans of the 21 licensed banks in 2001, which is much lower than in Egypt, Tunisia and Morocco, and reports of individual banks suggest that such NPLs are decreasing.

All in all, the Jordan banking sector appears, by regional standards, relatively well developed. Regulatory reforms, although relatively late, have contributed to reducing its fragility. Several ingredients played a role in the relative success of the banking sector reforms. Due to worker remittances, the sector has already been quite large and buoyant in the pre-reform period. This sector has been essentially private. Bank restructurings have been implemented early, and the Central Bank has been able to inject large amounts of money to help the bank restructuring process; thanks to this restructuring, the Central Bank is able to impose strict regulatory standards (stricter than those defined by the Basle core principle), which now guarantee the soundness of the financial sector.

Synthesis

This survey of country experiences provides some significant observations. Banking sector reforms in all four countries have had shortcomings.

- Reform introduction and implementation was lengthy; even in Jordan, where reforms were comparatively faster and deeper and a new Bank Law passed only in 2000, more than ten years after the start of the reforms.
- All four country experiences share in common the difficulties faced by the authorities in promoting bank sector restructuring, which may explain some delays in reform implementation. Certainly, such restructurings have been more difficult in Egypt, Tunisia and Morocco, where the state sector still plays a significant role, than in Jordan.
- Non-restructured public sector banks are the least efficient and also the least viable, given their high NPLs ratios and insufficient provisioning, and sometime their exemption from standard prudential regulations.
- Reforms in all countries have attempted to introduce modern prudential regulations, inspired by the Basle core principles, but the pace of introduction of such regulations has been uneven. Moreover, they have not been fully implemented due to the inadequate supervisory power of the Central Bank and the heavy weight of public sector banks, particularly in Egypt.
- Shortcomings in the legal systems, which create in particular, cumbersome obstacles to the collection of collaterals, hinder improvements in the financial soundness of commercial banks.
- In this context of long-lasting fragility of the banking sector, ways and means utilized by the Central Banks to prevent systemic crises and protect depositors, lead to incentive issues such as moral hazard. At this point, the recent introduction of the Depositor Insurance Corporation in Jordan suggests a possible direction to improve the situation.

Conclusion

Overall, Arab countries have implemented cautious and gradual financial sector reforms over the past 10 to 15 years. Their financial systems are still dominated by relatively concentrated and highly oligopolistic commercial bank sectors. Very often, they are still controlled by the State, even in countries which have adopted market-economy reforms such as Tunisia and Morocco. Although restrictive regulations in the banking sectors have been softened, there are still a number of impediments to competition, diversification and innovation, such as those concerning the involvement of foreign banks. A counterfactual example is Jordan, where the financial sector is essentially private and open to foreign competition, and where reforms would have been more productive.

Capital markets are generally recent, with the notable exceptions of Morocco, Egypt and Jordan. The numbers of listed companies, the capitalization of stock markets and their trading activity are limited. Capital market segments such as bond markets are still underdeveloped. In general, both because of the lack of competition and innovation in the banking sector and of the limited development of capital markets, the access of private companies to finance is uneasy. In particular, small- and medium-sized businesses face significant financing obstacles.

To some extent, this picture may be related to the cautiousness and slowness of financial reforms, which have not been able to stimulate a critical mass of change, although it has also minimized so far, the risks of emergence of financial sector crises. Clearly, there has been a trade-off between the speed and coverage of reforms on one hand and

the avoidance of bank crises on the other hand. This has delayed and lessened reforms in many countries, particularly those which inherited an ailing public financial sector from the pre-reform period. However, the absence of critical change in the financial sector must be also related to broader issues such as the need to strengthen property rights protection and the rule of law and to improve corporate governance, which are critical for the development of a credit market.

Not all Arab countries face the same shortcomings. Jordan and Lebanon, as well as GCC countries such as Saudi Arabia, already have a significant bank intermediation activity. This is also true also to some extent, to Egypt, Tunisia and Morocco. However, in these three countries, the banking sector needs further pro-market reforms, including privatization of state-owned banks and diversification of financial services, and the further development of financial market infrastructure. On the other hand, Algeria, Iraq, Libya, Sudan and Syria, where public authorities are still very much directly involved in the financial sector, still need more basic pro-market reforms.

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Modeling the Egyptian Stock Market Volatility Pre- and Post Circuit Breaker

**Eskandar A. Tooma
Maged S. Sourial**

Modeling the Egyptian Stock Market Volatility Pre- and Post Circuit Breaker

Eskandar A. Tooma*
Maged S. Sourial*

Abstract

Circuit breakers (price limits and trading halts) are regulatory instruments aiming to reduce severe price volatility and provide markets with a cooling-off period. This paper investigates the impact of price limits on volatility dynamics in the Egyptian Stock Exchange. A variety of mean and variance specifications in GARCH type models (GARCH, GJR, and APARCH) and four different error distributions (Normal, Student- t , GED, and Skewed- t) are utilized. Results from examining a split sample suggest significant changes in the time varying volatility process. Results prior to the imposition of price limits exhibit leptokurtosis; yet show no sign of the widely cited leverage effect. Results after the imposition of price limits display both leptokurtosis and the leverage effect.

اسكندر توما
ماجد سوريال

student GJR GARCH APARCH GED
normal .skewed-t leptokurtosis leverage effect

* Tooma is Assistant Professor of Finance and Finance Unit Head, Department of Management, The American University in Cairo, P.O. Box 2511, Cairo 11511, Egypt. Tel: 202 797 6831. email: etooma@aucegypt.edu. Sourial is the Vice Chairman of the Cairo and Alexandria Stock Exchanges, 4A, Sherifein St., Down Town, Cairo, Egypt. Tel: 202 395 5477; 395 5266; Fax: 202 395 5799. email: mshawky@egyptse.com. N.B. The views expressed in this article are those of the authors and do not necessarily reflect those of the institutions they represent. The authors would like to thank Professor Blake LeBaron for his support and valuable comments; Math Works for their support in sharing the upgrades of the MATLAB GARCH ToolBox; Professor Sebastian Laurent for his immense help and valuable comments with operating the GARCH 2.3 package; Mr Karim Alaa and Ms Aliaa Bassiouny for research assistance.

Introduction

Circuit breakers (price limits and trading halts)⁽¹⁾, with all their multi-dimensional complexities, have started to interest economists within the last decade or so. Unfortunately, there is no agreement on whether circuit breakers are effective tools or not. Also, to date, most of the existing literature do not aid in resolving this issue.

“Our ignorance is unfortunate because circuit breakers can have very significant effects upon markets” (Harris, 1998). Whether these effects are positive or negative⁽²⁾ is debatable. Regulators clearly need to know more about these effects if they are to make optimal decisions on whether or not to apply circuit breakers to their stock exchanges. And if they do apply them, they need to know which ones are the most effective.

Many financial asset markets have daily price limits on individual assets. U.S. futures markets are perhaps the best-known example, followed by emerging equities markets.⁽³⁾ Advocates of limits claim that they reduce price volatility in two ways:

(a) Firstly, they give participants a “time out” or cooling-off period to digest information and help markets avoid unwanted price fluctuations; and (b) Secondly, the limits literally set a ceiling and a floor for the price to move within a trading day. Critics, on the other hand, assert that limits may have several adverse effects on the market. Empirical literature criticizing price limits has concentrated on three different hypotheses: (a) Volatility spillover; (b) Delayed price discovery; and (c) The trading interference hypotheses.

This article examines the effects of price limits on the Egyptian Stock Exchange (ESE)⁽⁴⁾ where a tight symmetric 5% daily limit was imposed during most of the period between 1997-2001. Unlike other studies, this paper does not research on the effectiveness of price limits in the ESE. Rather, it tests their impact on the time-varying market volatility process. Data used include daily adjusted closing prices for two major market indices that allow the comparison of the time-varying volatility process during the limit time period with an earlier no-limit time period, January 3, 1993 through January 31, 1997. A variety of GARCH models (GARCH, APARCH, JGR) is used with different density specifications (Normal, Student-*t*, Skewed Student-*t*, and GED) to examine empirically whether estimated volatility changes significantly as a result of the imposition of symmetric price limits.

After examining a split sample, results suggest significant changes in the time-varying volatility process. Empirical results, prior to the imposition of price limits, exhibit leptokurtosis yet show no sign of the widely cited leverage effect. Following the imposition of price limits, results display both leptokurtosis and the leverage effect. Economically, this indicates that regulatory and/or structural shifts in the market lead to a different conditional volatility model structure.

Literature

While there is a growing literature on the effectiveness of circuit breaker mechanisms,⁽⁵⁾ this paper focuses on the theoretical and empirical studies of financial time series. Financial time series, unlike other series, usually exhibit a set of peculiar characteristics. Firstly, volatility clustering is often observed, i.e., large changes tend to be followed by large changes and small changes tend to be followed by small changes; (see Mandelbrot, 1963 for early evidence). Secondly, financial data often exhibit leptokurtosis. In other words, the distribution of their returns tends to be fat-tailed, i.e., the kurtosis exceeds the kurtosis of a standard Gaussian distribution (see Mandelbrot, *op. cit.*; or Fama, 1965). Moreover, the so-called “leverage effect,” initially noted by Black (1976), refers to the fact that changes in stock prices tend to be negatively correlated with changes in volatility, i.e., volatility is higher after negative shocks than after positive shocks of the same magnitude.

Over the past two decades, enormous effort has been devoted to modeling and forecasting the movement of stock returns and other financial time series. Seminal work in this area of research may be attributed to Engle (1982), who introduced the standard Autoregressive Conditional Heteroskedasticity (ARCH) model. Engle’s process proposes

⁽¹⁾ According to Harris (1998): “All circuit breakers limit trading activity in some way. Trading halts stop trading when prices have moved, or will imminently move, by some pre-specified amount. Trading resumes after some time interval. Price Limits require all trade prices to be within a certain range.”

⁽²⁾ Empirically, some researchers have concluded that circuit breakers reduce volatility (Ma, Rao, and Sears (1989a; 1989b). Others find that volatility increases (Mecagni and Sourial, 1999; Lee, Ready and Seguin, 1994). Still, others find that trading restrictions have little effect in the long run (Lauterbach and Ben-Zion, 1993; Santoni and Liu, 1993; Overdahl and McMillan, 1997.)

⁽³⁾ For example: Austria, Belgium, Egypt, France, Italy, Japan, Korea, Malaysia, Mexico, Netherlands, Spain, Switzerland, Taiwan, Thailand and Turkey among others.

⁽⁴⁾ Mecagni and Sourial (1999) using a normal and symmetric GARCH-in mean specification tested for the same effect. Their results provide evidence that price limits negatively impacted the market by: reducing the welfare of investors, reducing efficiency and increasing market volatility.

⁽⁵⁾ For a detailed literature survey, see Harris (1998).

to model time-varying conditional volatility using past innovations to estimate the variance of the series. Empirical evidence shows that high ARCH orders have to be selected in order to catch the dynamics of the conditional variance. This argument gave rise to the Generalized ARCH (GARCH) model of Bollerslev (1986), which introduces the time-varying volatility process as a function of both past disturbances and past volatility. Today, the ARCH and GARCH literature have grown immensely and its applications have expanded from stock returns to interest rates, foreign exchange, inflation and so on. Excellent survey papers by Bollerslev, Chou, and Kroner (1992), as well as, Bollerslev, Engle and Nelson (1994) cite more than 200 papers on this subject. The ability to estimate and forecast financial market volatility has expanded even further because of its importance in the portfolio selection and asset management processes. This is in addition to its importance in the pricing of primary and derivative assets.

Although most researchers agree that volatility is predictable in many asset markets, they differ on how this volatility predictability should be modeled within an ARCH/GARCH context. As a result, a variety of new extensions were produced, some of which were motivated by pure theory, whereas others were simply empirical trial-and-error suggestions. The most interesting of these approaches targeted the structural form of the GARCH model by allowing for "asymmetries" to capture the aforementioned "leverage effect." Among the most widely applied models are the Exponential GARCH (EGARCH) of Nelson (1991); the so-called (GJR) of Glosten, Jagannathan and Runkle (1993); and the Asymmetric Power ARCH (APARCH) of Ding, Granger and Engle (1993).⁽⁶⁾

Another area heavily researched in the GARCH domain is the method of estimation. GARCH models are estimated using a Maximum Likelihood (ML) approach.⁽⁷⁾ The logic of ML is to interpret the density as a function of the parameters set, conditional on a set of sample outcomes. This function is called the *likelihood function*. As noted earlier, financial time-series often exhibit non-normality patterns, i.e., excess kurtosis and skewness. Bollerslev and Wooldridge (1992) propose a Quasi Maximum Likelihood (QML) method that is robust to departures from normality. Indeed Weiss (1986) and Bollerslev and Wooldridge (1992) show that under the normality assumption, the QML estimator is consistent if the conditional mean and the conditional variance are correctly specified. This estimator, however, is inefficient, with the degree of inefficiency increasing as departure from normality increases. This penalty imposed for not knowing the true conditional density results in failure to capture the fat-tails property of high-frequency financial time series (Engle and Gonzalez-Rivera, 1991). Consequently, this has led to the use of non-normal distributions to better model excessive third and fourth moments.

It is expected that excess kurtosis and skewness displayed by the residuals of conditional heteroscedasticity models will be reduced when a more appropriate distribution is used. Bollerslev (1987); Baillie and Bollerslev (1989); Kaiser (1996); and Beine, Laurent, and Lecourt (2000), among others, use Student-*t* distribution while Nelson (1991) and Kaiser (*op. cit*) suggest the Generalized Exponential Distribution (GED). Other propositions include mixture distributions such as the normal-lognormal (Hsieh, 1989) or the Bernoulli-normal (Vlaar and Palm, 1993). Finally, to better capture skewness, Fernandez and Steel (1998) and Lambert and Laurent (2000; 2001) use a skewed student-*t* distribution.

⁽⁶⁾ Other famous asymmetric GARCH models include the Threshold GARCH (TGARCH) of Zakoian (1994), the Quadratic GARCH (QGARCH) of Sentana (1995), the Volatility Switching ARCH (VS-ARCH) of Fornari and Mele (1996), and the Logistic Smooth Transition ARCH (LST-ARCH) of Gonzales-Rivera (1996) and Hagerud (1996).

⁽⁷⁾ As an alternative to ML and Quasi Maximum Likelihood (QML) estimation, GARCH models can also be estimated directly with Generalized Method of Moments (GMM). This was suggested and implemented by Glosten, Jagannathan and Runkle (1993).

Empirical Methodology

Models

Let the adjusted closing price of a market index at time t be denoted by P_t . Stock market returns, R_t , through out this paper is defined as continuously compounded or (log) returns at time t . R_t measured as the natural log difference in the closing market index between two consecutive trading days $\{\ln \{ |P_{t+1}| / |P_t| \} = \ln (P_t) - \ln (P_{t-1})\}$ and are assumed to follow the AR(p)-process:

$$R_t = \varphi_0 + \sum_{i=1}^p \varphi_i R_{t-i} + \varepsilon_t \quad (1)$$

where ε_t denotes a discrete-time stochastic process taking the form:

$$\varepsilon_t = z_t \sigma_t \quad (2)$$

where $z_t \sim iid(0,1)$, and σ_t is the conditional variance of return at time t , whose dynamics are to be modeled using ARCH/GARCH type specifications.

Bollerslev's (1986)⁽⁸⁾ GARCH model assumes that the conditional variance is generated by:

$$\sigma_t^2 = \gamma_0 + \sum_{i=1}^q \alpha_i \varepsilon_{t-i}^2 + \sum_{j=1}^p \beta_j \sigma_{t-j}^2 \quad (3)$$

where γ, α , and β are non-negative constants.

For the GARCH process to be defined, it is required that $\alpha > 0$.

The first asymmetric GARCH type model is the GJR model of Glosten, Jagannathan and Runkle (1993)⁽⁹⁾. Its generalized version is given as:

$$\sigma_t^2 = \gamma_0 + \sum_{i=1}^q (\alpha_i \varepsilon_{t-i}^2 + \omega_i S_{t-i}^- \varepsilon_{t-i}^2) + \sum_{j=1}^p \beta_j \sigma_{t-j}^2 \quad (4)$$

where, S_t^- is an indicator function that takes the value of one when $\varepsilon_{t-1} < 0$ and zero otherwise. It may be seen clearly that this model assumes the impact of ε_t^2 on the conditional variance σ_t^2 is different when ε_t is positive or negative. In sum, it assumes that negative shocks have a higher impact than positive ones.

Ding, Granger, and Engle (1993) propose the Asymmetric Power ARCH (APARCH). The APARCH model may be expressed as:

$$\sigma_t^\delta = \gamma_0 + \sum_{i=1}^q \alpha_i \left(|\varepsilon_{t-i}| - \tau_i \varepsilon_{t-i} \right)^\delta + \sum_{j=1}^p \beta_j \sigma_{t-j}^\delta \quad (5)$$

where, $\delta > 0$ and $-1 < \tau_i < 1$ ($i = 1, \dots, q$). This model's strength arises from the fact that it couples the flexibility of a varying exponent with the asymmetry coefficient (to take the "leverage effect" into account).

⁽⁸⁾ It is straightforward to show that Bollerslev's (1986) GARCH model is based on the infinite ARCH model introduced by Engle (1982).

⁽⁹⁾ The Threshold GARCH (TGARCH) model of Zakoian (1994) is very similar to the GJR but models the conditional standard deviation instead of the conditional variance.

To summarize, the shocks (news) of the aforementioned asymmetric volatility models capture the leverage effect by allowing either the slope of the two sides of the news impact curve⁽¹⁰⁾ to differ or the center of the news curve to locate at a point where ε_{t-i} is positive. In the standard GARCH model, this curve is a quadratic function centered on $\varepsilon_{t-i} = 0$. GJR captures asymmetry because its news impact curve has a steeper slope on its negative side than on its positive one. Finally, APARCH detects the asymmetry by allowing its news impact curve to be centered at a positive ε_{t-i} .⁽¹¹⁾

Estimation Methodology and Density Assumptions

To estimate the parameters of these models, a maximum likelihood (ML) approach is used. The innovations z_t is assumed to be following a conditional distribution. Hence, a log-likelihood function is considered for maximization using a standard numerical method. Again, it may be expected that excess kurtosis and skewness displayed by the residuals of GARCH models are reduced when a more appropriate distribution is used. The next few paragraphs will describe the different densities used in this paper and provide their log-likelihood functions.

The normal distribution is the most widely used when estimating GARCH models. Given both the mean equation in Equation 1, the variance equation for any of the models presented in Equations 3, 4 and 5, and the stochastic process of the innovations given by Equation 2, the log-likelihood function for the standard normal distribution is given by:

$$L_{normal} = -\frac{1}{2} \sum_{t=1}^T [\ln(2\pi) + \ln(\sigma_t^2) + z_t^2] \quad (6)$$

where T is the number of observations.

For a Student- t distribution, the log-likelihood is:

$$L_{student-t} = T \left\{ \ln \Gamma\left(\frac{\nu+1}{2}\right) - \ln \Gamma\left(\frac{\nu}{2}\right) - \frac{1}{2} \ln[\pi(\nu-2)] \right\} \\ - 0.5 \sum_{t=1}^T \left\{ \ln \sigma_t^2 + (1+\nu) \ln \left[1 + \frac{z_t^2}{\nu-2} \right] \right\} \quad (7)$$

Furthermore, the GED log-likelihood function of a normalized random error is:

$$L_{GED} = \sum_{t=1}^T \left[\ln(\nu/\lambda_\nu) - 0.5 \left| \frac{z_t}{\lambda_\nu} \right|^\nu - (1+\nu^{-1}) \ln(2) - \ln \Gamma(1/\nu) - 0.5 \ln(\sigma_t^2) \right] \\ \text{where } \lambda_\nu = \sqrt{\frac{\Gamma\left(\frac{1}{2} + \frac{\nu-2}{\nu}\right)}{\Gamma\left(\frac{3}{\nu}\right)}} \quad (8)$$

⁽¹⁰⁾ Engle and Ng (1993) performed a comparison among the standard GARCH model and the EGARCH, GJR, and APARCH. They suggest an increasing metric by which to analyze the effect of news on conditional heteroskedasticity. Holding constant the information dated at $t-2$, they examined the implied relation between ε_{t-1} and σ_t . They call this curve, with all lagged conditional variances evaluated at the level of the unconditional variance of the stock return, *the news impact curve* because it relates past return shocks (news) to current volatility. This curve measures how new information is incorporated into volatility estimates using the various proposed models.

⁽¹¹⁾ For a more detailed discussion, see Engle and Ng (1993) and for methods of extrapolating news impact curves for a wide variety of models, see Hentschel (1995).

The previous two densities account for fat tails, but do not take into account asymmetries. Lambert and Laurent (2001) applied and extended the skewed Student- t density proposed by Fernandez and Steel (1998) to a GARCH framework:

$$L_{SkStudent} = T \left\{ \ln \Gamma \left(\frac{\nu+1}{2} \right) - \ln \Gamma \left(\frac{\nu}{2} \right) - 0.5 \ln [\pi(\nu-2)] + \ln \left(\frac{2}{\xi + \frac{1}{\xi}} \right) + \ln(s) \right\} \\ - 0.5 \sum_{t=1}^T \left\{ \ln \sigma_t^2 + (1+\nu) \ln \left[1 + \frac{(sz_t + m)^2}{\nu-2} \xi^{-2I_t} \right] \right\} \quad (9)$$

where $I_t = 1$ if $z_t \geq -\frac{m}{s}$ or -1 if $z_t < -\frac{m}{s}$

$$m = \frac{\Gamma \left(\frac{\nu+1}{2} \right) \sqrt{\nu-2}}{\sqrt{\pi} \Gamma \left(\frac{\nu}{2} \right)} \left(\xi - \frac{1}{\xi} \right) \quad \text{and} \quad s = \sqrt{\left(\xi^2 + \frac{1}{\xi^2} - 1 \right)} - m^2.$$

See Lambert and Laurent (2001) for further details.

Specification Tests

To estimate the unknown parameters of the models, iterative numerical methods with the help of software, are required. These procedures are usually time-consuming, especially if the code must be written, and if the model in question explains the data badly, the estimation might not converge. This is why specification tests play a crucial role. They investigate whether or not a certain model might have been the data-generating process of a time series. Following the recommendations of Wooldridge (1991) and Hagerud (1997), a “bottom-up” strategy is used when performing specification tests. In other words, specifying the conditional mean is the initial step. Once the conditional mean is formulated and estimated satisfactorily, tests for the conditional variance specification are initiated.

When attempting to specify the conditional mean, only possible autocorrelations in the returns are tested for.⁽¹²⁾ To test for autocorrelation, the Autocorrelation Function (ACF) and Partial Autocorrelation Function (PACF) are employed, in addition to a test developed by Richardson and Smith (1994),⁽¹³⁾ which is a robust version of the standard Box-Pierce (1970) procedure. If $\hat{\rho}_i$, is the estimated autocorrelation between the returns at time t and $t-i$, then the (RS) is formulated as:

$$RS(k) = T \sum_{i=1}^k \frac{\hat{\rho}_i^2}{1 + c_i} \quad (10)$$

⁽¹²⁾ Other studies have tested for “day-of-the-week effects” and the possibility of the conditional variance as the explanatory variable of the returns. These specifications are not considered in this study.

⁽¹³⁾ Cited in Hagerud (1997).

where c_i is an adjustment factor for heteroskedasticity and is calculated as:

$$c_i = \frac{\text{COV}[\overline{r_t^2}, \overline{r_{t-i}^2}]}{\text{var}[r_t^2]} \quad (11)$$

where $\overline{r_t^2}$ is the demeaned return at time t . Under the null of no autocorrelation, this test is distributed χ^2 with k degrees of freedom. If the null cannot be rejected, it can be deduced that the specification of the conditional mean in (1) is equal to a constant plus a residual. On the other hand, if the null is rejected, an AR(1) model is estimated on the series. Furthermore, to ensure that this AR(1) specification has captured all the autocorrelation, Equation 10 is applied on the estimated residuals of the AR(1) process. The residual testing using Equation 10 is compared to a χ^2 distribution with $k-1$ degrees of freedom. If the null cannot be rejected, it is concluded that returns are generated by an AR(1) model. If the null is rejected, the testing continues with higher-order AR models until the null cannot be rejected.

Once the conditional mean equation has been specified, tests for the presence of heteroskedasticity are performed. The most widely cited and used test for this purpose is the LM test of no ARCH of Engle (1982)⁽¹⁴⁾. The test procedure is to run an OLS regression on Equation 1 after having calculated the "correct" lags from the Richardson and Smith test in Equation 10 and save the residuals. Then, regress the squared residuals on a constant and p lags and test $T \cdot R^2$ on a χ^2 distribution with p degrees of freedom.

If the null of no ARCH(q) cannot be rejected, the investigation continues with tests for asymmetric GARCH. The fact that negative return shocks cause more volatility than positive return shocks of the same magnitude, tells us that the standard GARCH model will underpredict the amount of volatility following bad news and overpredict it following good news. These observations suggest testing for whether it is possible to predict the squared normalized residuals by variables observed in the past, which are not included in the volatility model being used. If these variables can predict the squared normalized residuals, then the variance model is misspecified. The sign bias test proposed by Engle and Ng (1993) considers a dummy variable S_{t-i}^- , which takes the value of one when ε_{t-i} is negative and zero otherwise. This test examines the impact of positive and negative return shocks on volatility not predicted by the model under consideration. The general derived form of the test using a slightly different notation than Engle and Ng (*op. cit*) is:

$$v_t^2 = \underline{z}_{0t} \underline{\vartheta}_0 + \underline{z}_{at} \underline{\vartheta}_a + u_t \quad (12)$$

where, \underline{z}_{0t} is a $k \times 1$ vector of explanatory variables of the model hypothesized under the null,⁽¹⁵⁾ $\underline{\vartheta}_0$ is the $k \times 1$ vector of parameters under the null. $\underline{\vartheta}_a$ is a $m \times 1$ vector of additional parameters corresponding to \underline{z}_{at} , which is a $m \times 1$ vector of missing explanatory variables. $v_t \equiv \varepsilon_t / \sigma_{0t}$, where, σ_{0t} is the conditional standard deviation vector estimated using the hypothesized model under the null and finally, u_t is the residual.

Theoretically, the right hand side of Equation 12 should have no explanatory power at all. To actually perform the sign bias test \underline{z}_{at} is replaced by S_{t-i}^- and an actual regression takes the following form:

$$v_t^2 = a + b S_{t-1}^- + \underline{\beta}' \underline{z}_{0t} + e_t \quad (13)$$

⁽¹⁴⁾ Engle's (1982) LM test of no ARCH is standard in any statistical or econometric software package.

⁽¹⁵⁾ Usually a symmetric GARCH(1,1).

where, a and b are constant parameters, β is a constant parameter vector, and e_t is the residual. The sign bias test is defined as the t -statistic for the coefficient b in regression Equation 13.

Furthermore, according to Engle and Ng (1993), the sign bias test can also be used on raw data to explore the nature of the time-varying volatility in a time series, without first imposing a volatility model. In this case, ε_t , and v_t would be defined as:

$$\varepsilon_t = R_t - \mu \quad (14a)$$

$$v_t = \frac{\varepsilon_t}{s} \quad (14b)$$

where, μ and s are the unconditional mean and standard deviation of the time series R_t , respectively. If b from Equation 13 is statistically significant, then it is justifiable to use Models 4 and 5.

Data

The behavior of the ESE stock returns was analyzed using two major daily aggregate indices.⁽¹⁶⁾ These indices have different composition and therefore worthwhile looking at in order to assess the sensitivity of the empirical results. The indices are:

- **The Hermes Financial Index** (HFI) started on July 1, 1992. The HFI is the benchmark of the Egyptian market and is used to monitor the overall market overall performance. HFI tracks the movement of the most active Egyptian stocks traded on the ESE. Although HFI is broad-based, it limits its constituents only to companies that have genuine liquidity in the market, as opposed to those companies that trade only a few sporadic pre-arranged trades. The HFI is capitalization weighted for registered stocks that are openly traded,⁽¹⁷⁾
- **The Egyptian Financial Group Index** (EFGI) started on January 3, 1993, and is capitalization-weighted for registered stocks. EFGI tracks the movement of large capitalization Egyptian companies⁽¹⁸⁾ that are most actively traded on the ESE.

The sample consists of 2237 daily observations on stock returns of the HFI and the EFGI indices. It covers a nine-year period beginning on January 3, 1993 and ending on December 31, 2001. For illustrative purposes, Figure 1 (Appendix) compares the two indices' daily closing values taken across the sample period. Figure 2 (Appendix) looks at the behavior of the EFGI and HFI returns, respectively, over the sample period.

The effect of policy change has been explored by dividing the sample into two parts: pre-and post-imposing the circuit breaker⁽¹⁹⁾. Moreover, a restricted F-Chow test⁽²⁰⁾ was formulated to test for the significance of the structural change. The result rejects the null hypothesis of no structural change in daily returns, and consequently the sample was partitioned into two sub-samples. The descriptive statistics of both indices (found in Appendix Tables 1, 2 and 3) over the two sub-sample periods highlighting the following:

- Mean returns for the EFG Index are slightly larger than the HFI⁽²¹⁾, whereas the Median returns for HFI are larger than EFGI's for the first sub-sample. As for the second sub-sample, the exact opposite occurs.
- Non-conditional variances for both indices increased in the second sub-sample over the first one. Furthermore, there is evidence of volatility clustering (see Figure 2 and that large or small asset price changes tend to be followed by other large or small price changes of either sign (positive or negative). This implies that stock return volatility changes over time. Furthermore, the figures indicate a sharp increase in volatility starting from the year 1997.
- The returns for both indices are positively skewed. The null hypothesis for skewness coefficients that conform with a normal distribution's value of zero has been rejected at the 5% significance level.⁽²²⁾
- The returns for both indices also display excess kurtosis. The null hypothesis for kurtosis coefficients that conform to the normal value of three is rejected for both indices.⁽²³⁾
- The high values of Jarque-Bera test for normality decisively rejects the hypothesis of a normal distribution.

⁽¹⁶⁾ The two indices (EFGI) and (HFI) have been chosen because they represent the largest and most actively traded stocks. They also entail the largest sample information. Other indices cited by Mecagni and Sourial (1999) were not used for reasons as follows: (a) The Capital Market Authority index (CMAI), was not used due to the dominance of infrequently traded stocks which results in a downward bias of index momentum; (b) The Prime Index for Initial Public Offerings (PIPO) was not used because it represents the partially and wholly privatized companies only; and (c) the MSCI and IFC (Global and Investable) indices were not used in this paper since they would entail a sizable loss in sample information. The two indices were started in 1996 and 1997, respectively.

⁽¹⁷⁾ No Over the Counter (OTC) traded stocks.

⁽¹⁸⁾ Companies with a market capitalization that exceeds L.E.500 million.

⁽¹⁹⁾ The sample is divided into two sub-samples: (a) Sub-sample 1 starting from 1/3/93 and ending 1/31/97 just before imposing the price limit regulation in February 1997; and (b) Sub-sample 2 starting after the regulation and ending on December 31 2001.

⁽²⁰⁾ To carry out the test, the data were partitioned into two sub-samples. Each sub-sample contained more observations than the number of coefficients in the equation so that the equation can be estimated. The Chow breakpoint test compares the sum of squared residuals obtained by fitting a single equation to the entire sample with the sum of squared residuals obtained when separate equations are fit to each sub-sample of the data. E-Views, reports the F-statistic for the Chow breakpoint test. The F-statistic is based on the comparison of the restricted and unrestricted sum of squared residuals and in the simplest case involving a single breakpoint.

⁽²¹⁾ A Z-test was conducted to test for significant differences in the means.

⁽²²⁾ The t-stat was calculated in the following matter: $(S-0)/se(S)$, where (S) stands for skewness coefficient and $(se(S))$ stands for the standard error. Standard error $= (6/\text{number of observations})^{1/2}$.

⁽²³⁾ The t-stat was calculated in the following matter: $(K-3)/se(K)$, where (K) stands for kurtosis coefficient and $(se(K))$ stands for the standard error. Standard error $= (24/\text{number of observations})^{1/2}$.

- Although the Augmented Dicky-Fuller (ADF) unit root tests strongly reject the hypothesis of non-stationarity,⁽²⁴⁾ both returns display a degree of time dependence. This can be seen through the Autocorrelation Function (ACF) for both indices. Correlograms (taken over 36 lags) were estimated for the returns on both indices. For the first sub-sample, the correlograms show a pattern of smooth decay typical of stationarity, and a second-order autoregressive process AR(2).⁽²⁵⁾ The second sub-sample has a sharper decay after the first lag indicating the presence of an AR(1). This has been confirmed using the Richardson and Smith test (1994) calculated on ten autocorrelations. (see Appendix Table 2)
- Engle's (1982) test of no ARCH is calculated for distinct orders ($q=2,5$ and 10) (see Appendix Table 3). Both indices show signs of heteroskedasticity in both sub-samples, indicating the legitimacy of using ARCH/GARCH type models.

The statistical results for both indices appear to have very similar characteristics. They both display positive skewness, were found to be deviating from normality, and display a degree of serial correlation. These stylized results of non-conformity to normality are consistent with previous empirical work on the ESE⁽²⁶⁾ and similar to a number of previous empirical works on mature markets⁽²⁷⁾.

Finally, Engle and Ng's (1993) sign bias test on the raw data was conducted. The test was performed by estimating Equation 13 using Equations 14a and 14b as proxies for \mathcal{E}_t and V_t . For the first sub-sample, the results show no signs of asymmetry in the data because of the insignificance of b in the two regressions for the two indices. On the other hand, for the second sub-sample, b is significant for both indices at the 5% level, which in turn, justifies estimating asymmetric GARCH type models.

In sum, looking at the first sub-sample, it may be hypothesized from the specification tests that the simple symmetric GARCH should outperform all other asymmetric GARCH models. Furthermore, given the fact that the residual series exhibited some excess kurtosis, it can also be predicted that a fatter-tailed distribution such as the student- t , or maybe a GED, should generate better results than just simply a normal distribution or a more complex asymmetric student- t . As for the second sub-sample, the sign bias test on the raw series predicts that asymmetric GARCH models should do a better job in explaining the ESE's dynamics. In addition, both the presence of excess kurtosis and asymmetry tell us that a skewed student- t distribution should excel.

Estimation Results

To estimate the parameters of the earlier mentioned models, we use the GARCH ToolBox in MATLAB, as well as, the [G@RCH 2.3](#) Ox programmed package of Laurent and Peters (2001).⁽²⁸⁾ Models⁽²⁹⁾ 3, 4, and 5 will only be studied in their most simple structure, when both of the lags, p and q , are equal to one. Low-order lag lengths were found to be sufficient to model the variance dynamics over very long sample periods.⁽³⁰⁾

As already previously mentioned, a maximum likelihood approach is used to estimate the three models with the four underlying error distributions. For the first sub-sample, convergence was not reached for any of the models using the GED distribution. Furthermore, convergence was not reached either for the APARCH model under any of the four distributions. Failures often occur because the series of the conditional variance is given a negative value, or because stationarity conditions on the estimated parameters could not be met⁽³¹⁾. Appendix Tables 4 and 5 present the

⁽²⁴⁾ While it may appear that the test can be carried out by performing a **t-test**, the t-statistic under the null hypothesis of a unit root does not have the conventional t-distribution. Dickey and Fuller (1979) showed that the distribution under the null hypothesis is nonstandard, and simulated the critical values for selected sample sizes. More recently, MacKinnon (1991) has implemented a much larger set of simulations than those tabulated by Dickey and Fuller. In addition, MacKinnon estimates the response surface using the simulation results, permitting the calculation of Dickey-Fuller critical values for any sample size and for any number of right-hand variables. These MacKinnon critical values for unit root tests were the ones used in this paper.

⁽²⁵⁾ See Enders (1994).

⁽²⁶⁾ See, Mecagni and Sourial (1999).

⁽²⁷⁾ Fama (1965) showed that the distribution of both daily and monthly returns for the Dow Jones depart from normality, and are negatively, leptokurtic, and volatility clustered. Furthermore, Kim and Kon (1994) found the same for the S&P 500. Finally, Peters (2001) showed similar results for two major European stock indices (FTSE 100 and DAX 30). In general, most mature markets were found to have negatively skewed return series. For a more detailed discussion see Harvey and Siddique (1999) or Harvey and Siddique (2000).

⁽²⁸⁾ The authors would like to thank Prof. Blake LeBaron and Math Works for their support in sharing the upgrades of the MATLAB GARCH ToolBox; Prof. Sebastian Laurent for his immense help and valuable comments with operating the [G@RCH 2.3](#) package. Finally, the authors are thankful to Dean Peter Petri and GSIEF for their financial support.

⁽²⁹⁾ The EGARCH model of Nelson (1991) was also tried but did not converge in any of the attempts.

⁽³⁰⁾ French, Schwert, and Stambaugh (1987) analyzed daily S&P stock index data for 1928-1984 for a total of 15,369 observations and required only four parameters in the conditional variance equation (including the constant).

⁽³¹⁾ See Hagerud (1997).

estimation results for the first sub-sample's parameters of the GARCH and GJR models, respectively. GJR's use appears to be unjustified for sub-sample 1, since the symmetric coefficients were not significant for both indices.

Since one of the objectives of this study is to jointly investigate which of the GARCH type models and underlying distributions "best" models the conditional variance for the ESE. Three selection criteria for finding the best model and distribution are used: (a) the value of the likelihood function, which is maximized; (b) the BIC⁽³²⁾ information criteria of Schwartz; and the AIC⁽³³⁾ information criteria of Akaike, which are both minimized.⁽³⁴⁾

Appendix Tables 6 to 8 report the log likelihood value, the information criteria, and other useful in-sample statistics.⁽³⁵⁾ Not surprisingly, the models with the most parameters always maximize the likelihood function, in this case, GJR. However, when the number of parameters is given consideration, as in the AIC and BIC, the simple traditional GARCH always outperforms the more parameterized GJR across both indices. This result strengthens the hypothesis drawn earlier from the specification tests that the use of asymmetric models is, for the first sub-sample, unnecessary.

Regarding the densities, the two student-*t* distributions clearly outperform the Gaussian. Again, it is not surprising to see the log-likelihood function increase strongly when using the skewed student-*t* density against the two other symmetric densities. The presence of asymmetry in the density is not needed because in all cases for sub-sample 1 (when using GARCH and GJR), the student-*t* outperforms the skewed-*t* for both indices (see Appendix Tables 9 and 10).

Both models that converge for the first sub-sample seem to do an adequate job of describing the dynamics of the first and second moments. The Box-Pierce statistics under the null of no autocorrelation, for the residuals and the squared residuals, are, for the most part, non-significant at the ten percent level.

Appendix Tables 11 to 13 present the estimation results for the second sub-sample's parameters of the GARCH, GJR and APARCH models respectively. Both uses of GJR and APARCH appear to be justified for sub-sample 2, since the symmetric coefficients are all significant at the 5% level for both indices.

Looking at the log likelihood values AIC and BIC in Appendix Tables 14-17, the fact that GJR or APARCH models better estimate the series for both indices than the traditional GARCH, may almost be highlighted. However, this conclusion should be cautiously drawn because of the very small differences in values for these tests.

In looking at densities for the second sub-sample, no single distribution stands as being the best. (See Appendix Tables 18 to 20). Yet again, the two Student-*t* distributions clearly outperform the Gaussian and the GED distributions for both indices. Unlike the first sub-sample, where the use of asymmetric densities was not needed, in the second sub-sample the usefulness of asymmetry is not clear-cut. If the Skewed Student-*t* density gives better results than the symmetric Student-*t* when modeling the EFGI, the opposite is observed for the HFI. A possible explanation for this deviation is that if skewness is significant in both series, its magnitude might be lower for the HFI.

GARCH, GJR and APARCH for the second sub-sample also do a decent job in describing the dynamics of the first and second moments. The Box-Pierce statistics, under the null of no autocorrelation, for the residuals and the squared residuals are non-significant at the ten percent level.

Conclusion

This paper examines whether the imposition of daily price limits changes the return volatility dynamics. As laboratory, the Egyptian Stock Exchange was used where 5% daily limits were imposed in early 1997.

$$^{(32)} \text{Schwartz} = -2 \frac{\text{Log}L}{n} + 2 \frac{\log(k)}{n}$$

$$^{(33)} \text{Akaike} = -2 \frac{\text{Log}L}{n} + \frac{k}{n}$$

where, *LogL* = log likelihood value, *n* = number of observations and *k* is the number of estimated parameters.

⁽³⁴⁾ For a more detailed discussion of AIC and BIC see Green, (2000).

⁽³⁵⁾ Reported are: the Box-Pierce statistics at lag (*l*) for both the standardized and squared standardized residuals and the adjusted Pearson goodness-of-fit test that compares the empirical distribution of innovations with the theoretical one.

The study compares different GARCH-type models with different underlying distributional assumptions for the innovations in an effort to understand the data generation process of the series. The comparison focuses on two different aspects, specification tests and in-sample estimates, in order to determine the “best” fitted model. Moreover, the time series is divided into two sub-samples to examine changes in performance of the models as a result of the circuit breaker regulation that affected the trading environment.

The estimation results conform to a series of ex-ante specification tests. For the first sub-sample, the evaluation criteria for the in-sample estimates show that a simple GARCH model with student- t innovations outperforms any of the more sophisticated asymmetric models. Regarding the second sub-sample, it was clear that APARCH and GJR gave better estimates over the traditional GARCH. The favorite density was yet again the fat-tailed student- t distribution.

The empirical evidence provided in this article confirms Mecagni and Sourial (1999) findings that the symmetric price limits on individual shares failed to dampen volatility in the market. However, this paper adds two more important findings.

- Firstly, regulatory and/or structural shifts in the market results in a different conditional volatility model structure. In other words, the appropriateness of assuming the same underlying volatility model for both *pre* and *post* samples is questioned.
- Secondly, the leverage effect, captured in the post-limit sub-sample, shows Egyptian investors to be very risk-averse (negative shocks tend to have a deeper impact on conditional volatility than positive shocks). With price limits in place, investors find it hard to exit the market, which forces them to advance their trades. This advancement of trades creates a volatility spillover effect on subsequent trading days.

To conclude, in many emerging markets, circuit breakers are implemented with a belief that they will protect the market from harmful volatility and speculation. However, in many cases, circuit breakers end up paving the way for speculative attacks. Thus, to fully evaluate the consequences of circuit breakers such as price limits, it would be important to examine their effects on the overall market efficiency.

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Appendix

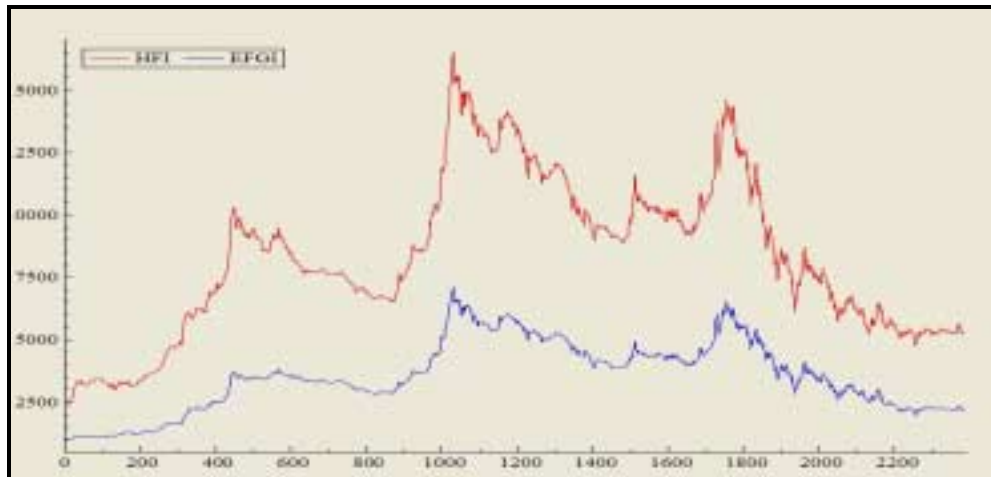


Figure 1. EFGI and HFI daily closing prices
January 3, 1993 to December 31, 2001.

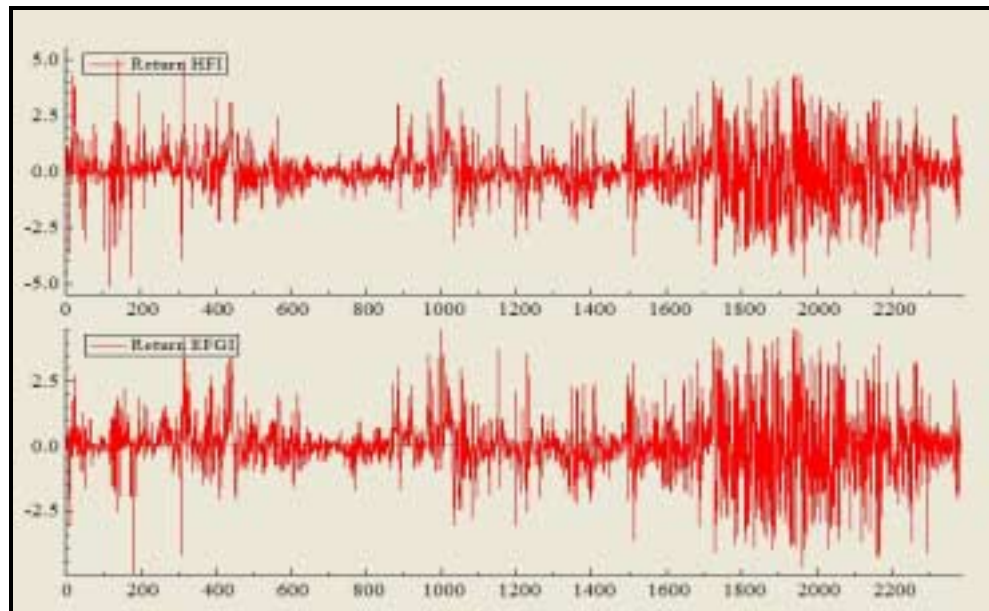


Figure 2. EFGI and HFI daily returns.
January 3, 1993 to December 31, 2001.

Table 1. Descriptive Statistics for Sub-samples 1 and 2

Results
Tests of

Descriptive Statistics	Sub-sample (1) Jan 3, 1993 – Jan 31, 1997		Sub-sample (2) Feb. 2, 1997 – Dec. 31, 2001	
	HFI	EFGI	HFI	EFGI
Mean (%)	0.1717	0.1760	-0.0701	-0.0735
Standard Error	0.0292	0.0254	0.0421	0.0442
Median (%)	0.0527	0.0707	-0.0937	-0.0960
Standard Deviation (%)	0.9321	0.8107	1.3807	1.4493
Variance	0.0087	0.0066	0.0191	0.0210
Kurtosis	9.2774	9.2799	3.9512	3.9083
Skewness	0.4690	0.7587	0.2019	0.1442
Jarque-Berra Normality Test	1706.634	1768.753	422.352	401.385
Augmented Dickey-Fuller Unit Root Test	-10.6552	-10.368	-12.6053	-12.8503
Range	0.1021	0.0941	0.0902	0.0918
Minimum	-5.1527	-4.9213	-4.6796	-4.6910
Maximum	5.0565	4.4893	4.3417	4.4971
Sample Size	1017	1017	1219	1219

Table 2.
from

Autocorrelation for Sub-samples 1 and 2

Index	<i>RS(10)</i> on r_t (<i>p-value</i>)	<i>RS(10)</i> on ε_t from AR(1) (<i>p-value</i>)	<i>RS(10)</i> on ε_t from AR(2) (<i>p-value</i>)
Sub-sample (1) Jan 3, 1993 – Jan 31, 1997			
HFI	0.005	0.039	0.172
EFGI	0.003	0.018	0.092
Sub-sample (2) Feb 2, 1997 – Dec 31, 2001			
HFI	0.041	0.365	-----
EFGI	0.033	0.296	-----

N.B. Column two gives *p-values* for the Richardson and Smith's (1994) test for autocorrelation calculated on the demeaned returns.

Table 3. Results from Tests of No ARCH for Sub-samples 1 and 2

Index	No ARCH (2)	No ARCH (5)	No ARCH (10)	$\kappa(\epsilon)$	$s(\epsilon)$
Sub-sample (1) Jan 3, 1993 – Jan 31, 1997					
HFI	46.866 (0.000)	23.634 (0.000)	12.890 (0.000)	10.009	0.187
EFGI	59.026 (0.000)	27.540 (0.000)	14.546 (0.000)	9.3512	0.171
Sub-sample (2) Feb 2, 1997 – Dec 31, 2001					
HFI	135.770 (0.000)	70.150 (0.000)	37.609 (0.000)	4.919	0.253
EFGI	158.290 (0.000)	75.545 (0.000)	40.125 (0.000)	4.008	0.203

Table 4. AR(2)-GARCH (1,1) Estimation Results for Sub-sample 1 from January 3, 1993 to December 31, 1997

	HFI				EFGI			
	Normal	Student-t	GED	Skewed-t	Normal	Student-t	GED	Skewed-t
φ_0	0.0281 (0.0376)	0.0248 (0.0267)	Fail	0.0450 (0.0358)	0.0173 (0.0269)	0.0160 (0.0203)	Fail	0.0137 (0.0266)
φ_1	0.2819 (0.0373)	0.2834 (0.0359)	Fail	0.2811 (0.0361)	0.2296 (0.0406)	0.2837 (0.0358)	Fail	0.2786 (0.0358)
φ_2	0.1270 (0.0376)	0.0869 (0.0338)	Fail	0.0844 (0.0339)	0.0906 (0.0409)	0.0527 (0.0330)	Fail	0.0508 (0.0331)
γ_1	0.0079 (0.00821)	0.0584 (0.0513)	Fail	0.0609 (0.0523)	0.0046 (0.0019)	0.0116 (0.0070)	Fail	0.0124 (0.0083)
α_1	0.3431 (0.3250)	0.2527 (0.2262)	Fail	0.2539 (0.2497)	0.2231 (0.2116)	0.1567 (0.1075)	Fail	0.1456 (0.1642)
β_1	0.6480 (0.0641)	0.7418 (0.1228)	Fail	0.7422 (0.1194)	0.7679 (0.0119)	0.8258 (0.0347)	Fail	0.8354 (0.0373)
ν		2.6442 (0.3059)	Fail	2.6113 (0.3068)		2.7294 (0.3478)	Fail	2.6155 (0.3448)
ξ			Fail	-0.0388 (0.0463)			Fail	-0.0734 (0.0441)

Table 5. AR(2)-GJR (1,1) Estimation Results for Sub-sample 1 from January 3, 1993 to December 31, 1997

	HFI				EFGI			
	Normal	Student-t	GED	Skewed-t	Normal	Student-t	GED	Skewed-t
φ_0	0.0242 (0.0359)	0.0348 (0.0246)	Fail	0.0258 (0.0327)	0.0038 (0.0267)	0.0256 (0.0198)	Fail	0.0069 (0.0257)
φ_1	0.2802 (0.0357)	0.2759 (0.0343)	Fail	0.2742 (0.0347)	0.2344 (0.0384)	0.2723 (0.0342)	Fail	0.2679 (0.0346)
φ_2	0.1404 (0.0359)	0.0887 (0.0322)	Fail	0.0876 (0.0324)	0.0945 (0.0389)	0.0597 (0.0312)	Fail	0.0577 (0.0313)

γ_1	0.0016 (0.0009)	0.0595 (0.0365)	Fail	0.0592 (0.0364)	0.0056 (0.0021)	0.0153 (0.0082)	Fail	0.0149 (0.0082)
α_1	0.0485 (0.0938)	0.4618 (0.2217)	Fail	0.4726 (0.2290)	0.1145 (0.0197)	0.3132 (0.1162)	Fail	0.3432 (0.1363)
β_1	0.9577 (0.0063)	0.7098 (0.0982)	Fail	0.7091 (0.0975)	0.08936 (0.1234)	0.8099 (0.0378)	Fail	0.8067 (0.0373)
ω_1	-0.0140 (0.0104)	-0.1879 (0.1459)	Fail	-0.1905 (0.1485)	-0.0128 (0.0287)	-0.0914 (0.0940)	Fail	-0.0938 (0.1016)
ν		2.7377 (0.2958)	Fail	2.7248 (0.2971)		2.8401 (0.3409)	Fail	2.7675 (0.3414)
ξ			Fail	-0.0184 (0.0444)			Fail	-0.0475 (0.0431)

Table 6. Post-estimation Statistics for Sub-sample 1 Using a Normal Distribution

	HFI		EFGI	
	GARCH	GJR	GARCH	GJR
AIC	2.2919	2.2931	1.9779	1.9798
BIC	2.3234	2.3289	2.0094	2.0167
LL	-1044.840	-1043.931	-900.872	-900.773
Q(20)	27.0796	28.3415	27.1476	26.9028
Q²(20)	27.7842	29.9136	6.8547	6.8535
P(50)	165.4973	156.2279	145.1047	142.2694
P-Val (lag-1)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
P-Val(lag-k-1)	[0.0000]	[0.0000]	[0.0000]	[0.0000]

Table 7. Post-estimation Statistics for Sub-sample 1 Using a Student-t Distribution

	HFI		EFGI	
	GARCH	GJR	GARCH	GJR
AIC	1.9999	2.0016	1.7329	1.7339
BIC	2.0367	2.0417	1.7697	1.7760
LL	-909.983	-908.839	-787.570	-787.027
Q(20)	22.6572	22.4837	22.1934	21.0600
Q²(20)	51.5792	52.7243	8.0535	7.7841
P(50)	62.4438	59.8266	45.7590	63.7525
P-Val (lag-1)	(0.0939)	(0.1382)	(0.0605)	(0.0766)
P-Val(lag-k-1)	[0.0218]	[0.02891]	[0.0318]	[0.0129]

Table 8. Post-estimation Statistics for Sub-sample 1 Using a Skewed-t Distribution

	HFI		EFGI	
	GARCH	GJR	GARCH	GJR
AIC	2.0019	2.0018	1.7337	1.7348
BIC	2.0439	2.0489	1.7757	1.7821
LL	-909.889	-908.754	-786.903	-786.419
Q(20)	22.5149	22.3562	20.5837	19.6528

$Q^2(20)$	52.3955	53.5165	7.8765	7.6543
$P(50)$	57.4275	54.4831	51.8659	58.4089
$P\text{-Val}(\text{lag-1})$	(0.1912)	0.2738	(0.2678)	(0.1680)
$P\text{-Val}(\text{lag-k-1})$	[0.0457]	[0.0531]	(0.0989)	[0.0301]

Tables 6-8 compare post estimation statistics across models for the specifications that converged with the first sub-sample series. *AIC*, *BIC* are the Akaike and Schwartz information criteria. *LL*, is the log likelihood value. $Q(20)$ and $Q^2(20)$ are respectively the Box-Pierce statistic at lag 20 of the standardized and squared standardized residuals. $P(50)$ is the Pearson Goodness-of-fit with 50 cells. P-values of the non-adjusted and adjusted test are given respectively in parentheses and brackets. The period investigated is from Jan 3, 1993 to Dec 31, 1997.

Table 9. Post-estimation Statistics for Sub-sample 1 Using GARCH

	HFI			EFGI		
	Normal	Student-t	Skewed-t	Normal	Student-t	Skewed-t
AIC	2.2919	1.9999	2.0019	1.9779	1.7329	1.7337
BIC	2.3234	2.0367	2.0439	2.0094	1.7697	1.7757
LL	-1044.84	-909.98	-909.88	-900.87	-787.57	-786.90
Q(20)	27.0796	22.6572	22.5149	27.1476	22.1934	20.5837
Q²(20)	27.7842	51.5792	52.3955	6.8547	8.0535	7.8765
P(50)	165.497	62.4438	57.4275	145.1047	45.7590	51.8659
P-Val (lag-1)	(0.0000)	(0.0939)	(0.1912)	(0.0000)	(0.0605)	(0.2627)
P-Val(lag-k-1)	[0.0000]	[0.0218]	[0.0457]	[0.0000]	[0.0318]	[0.0989]

Table 10. Post-estimation Statistics for Sub-sample 1 Using GJR

	HFI			EFGI		
	Normal	Student-t	Skewed-t	Normal	Student-t	Skewed-t
AIC	2.2931	2.0016	2.0018	1.9798	1.7339	1.7348
BIC	2.3289	2.0417	2.0489	2.0167	1.7760	1.7821
LL	-1043.93	-908.83	-908.75	-900.77	-787.02	-786.42
Q(20)	28.3415	22.4937	22.3562	26.9028	21.0612	19.6528
Q²(20)	29.9136	52.7243	53.5165	6.8535	7.7841	7.6543
P(50)	156.2279	59.8266	54.4831	142.269	63.7525	58.4089
P-Val (lag-1)	(0.0000)	(0.1382)	(0.2738)	(0.0000)	(0.0766)	(0.0168)
P-Val(lag-k-1)	[0.0000]	[0.0289]	[0.0530]	[0.0000]	[0.0129]	[0.0301]

Tables 9 and 10 compare post estimation statistics across distributions for the specifications that converged with the first sub-sample series. *AIC*, *BIC* are the Akaike and Schwartz information criteria. *LL*, is the log likelihood value. $Q(20)$ and $Q^2(20)$ are respectively the Box-Pierce statistic at lag 20 of the standardized and squared standardized residuals. $P(50)$ is the Pearson Goodness-of-fit with 50 cells. P-values of the non-adjusted and adjusted test are given respectively in parentheses and brackets. The period investigated is from Jan 3, 1993 to Dec 31, 1997

Table 11. AR(1)-GARCH (1,1) Estimation Results for Sub-sample 2

	HFI				EFGI			
	Normal	Student-t	GED	Skewed-t	Normal	Student-t	GED	Skewed-t
φ_0	-0.0436 (0.0343)	-0.0784 (0.0314)	-0.0712 (0.0325)	-0.0495 (0.0344)	-0.0505 (0.0339)	-0.0720 (0.0317)	-0.0671 (0.0328)	-0.0529 (0.0342)
φ_1	0.2974 (0.0315)	0.3037 (0.0312)	0.02965 (0.0307)	0.3120 (0.0313)	0.2736 (0.0310)	0.2767 (0.0311)	0.2754 (0.0318)	0.2812 (0.0311)
γ_1	0.0585 (0.0129)	0.0332 (0.1060)	0.0442 (0.0125)	0.0337 (0.1067)	0.0532 (0.0122)	0.0351 (0.0109)	0.0435 (0.0122)	0.0353 (0.0110)
α_1	0.3543 (0.0497)	0.3810 (0.0583)	0.3700 (0.0577)	0.3687 (0.0577)	0.3409 (0.0479)	0.3564 (0.0544)	0.3488 (0.0539)	0.3467 (0.0542)
β_1	0.6575 (0.0368)	0.6725 (0.0384)	0.6646 (0.0403)	0.6812 (0.0387)	0.6715 (0.0366)	0.6827 (0.0386)	0.6773 (0.0398)	0.6895 (0.0393)
ν		7.7052 (1.6180)	1.4717 (0.0846)	7.8586 (1.7111)		9.8063 (2.5201)	1.5809 (0.0919)	9.9566 (2.6137)
ξ				0.1050 (0.0448)				0.0744 (0.0449)

This table reports results from AR(1)-GARCH (1,1) estimation using different densities. The number of observations was reduced by one hundred for forecast evaluation purposes. Columns 2, 3, 4, 5 are the different model estimations using normal, student, GED and skewed student-t respectively. Asymptotic heteroskedasticity-consistent standard errors are given in parentheses, **(bold)** denoting significance at the 5% level. The period investigated is from February 2, 1997 to Dec 31, 2001.

Table 12. AR(1)-GJR (1,1) Estimation Results for Sub-sample 2

	HFI				EFGI			
	Normal	Student-t	GED	Skewed-t	Normal	Student-t	GED	Skewed-t
φ_0	-0.0730 (0.0360)	-0.1066 (0.0325)	-0.0974 (0.0328)	-0.0783 (0.0351)	-0.0754 (0.0357)	-0.0965 (0.0332)	-0.0899 (0.0343)	-0.0776 (0.0353)
φ_1	0.2931 (0.0314)	0.2981 (0.0311)	0.2911 (0.0289)	0.3013 (0.0311)	0.2702 (0.0310)	0.2739 (0.0310)	0.2727 (0.0320)	0.2750 (0.0310)
γ_1	0.0559 (0.0126)	0.0315 (0.0102)	0.0418 (0.0121)	0.0311 (0.0101)	0.0512 (0.0120)	0.0336 (0.0106)	0.0416 (0.0119)	0.0335 (0.0106)
α_1	0.2921 (0.0476)	0.2902 (0.0538)	0.2900 (0.0535)	0.2804 (0.0527)	0.2863 (0.0476)	0.2871 (0.0527)	0.2847 (0.0525)	0.2790 (0.0519)
β_1	0.6580 (0.0363)	0.6761 (0.0378)	0.6664 (0.0396)	0.6838 (0.0378)	0.6751 (0.0360)	0.6868 (0.0379)	0.6816 (0.0391)	0.6923 (0.0384)
ω_1	0.1348 (0.0587)	0.1876 (0.0711)	0.1708 (0.0697)	0.1798 (0.0685)	0.1074 (0.0540)	0.1374 (0.0629)	0.1267 (0.0614)	0.1349 (0.0614)
ν		7.6317 (1.5682)	1.4712 (0.0835)	7.8635 (1.6844)		9.6895 (2.4451)	1.5795 (0.0911)	9.9519 (2.5851)
ξ				0.1032 (0.0448)				0.0747 (0.0447)

This table reports results from AR(1)-GJR (1,1) estimation using different densities. The number of observations was reduced by one hundred for forecast evaluation purposes. Columns 2, 3, 4, 5 are the different model estimations using normal, student, GED and skewed student-t respectively. Asymptotic heteroskedasticity-consistent standard errors are given in parentheses, **(bold)** denoting significance at the 5% level. The period investigated is from February 2, 1997 to Dec 31, 2001.

Table 13. AR(1)-APARCH (1,1) Estimation Results for Sub-sample 2

	HFI				EFGI			
	Normal	Student-t	GED	Skewed-t	Normal	Student-t	GED	Skewed-t
φ_0	-0.0682 (0.0378)	-0.1057 (0.0326)	-0.0955 (0.0345)	-0.0752 (0.0366)	-0.0734 (0.0360)	-0.0965 (0.0331)	-0.0893 (0.0345)	-0.0772 (0.0354)
φ_1	0.3007 (0.0321)	0.3005 (0.0313)	0.2960 (0.0317)	0.3042 (0.0315)	0.2706 (0.0312)	0.2739 (0.0310)	0.2731 (0.0321)	0.2751 (0.0310)
γ_1	0.0654 (0.0142)	0.0356 (0.0124)	0.0491 (0.0144)	0.0361 (0.0122)	0.0554 (0.0136)	0.0333 (0.0122)	0.0440 (0.0137)	0.0342 (0.0122)
α_1	0.3328 (0.0443)	0.3620 (0.0572)	0.3493 (0.0535)	0.3446 (0.0551)	0.3275 (0.0461)	0.3536 (0.0573)	0.3385 (0.0537)	0.3408 (0.0560)
β_1	0.6870 (0.0359)	0.6939 (0.0433)	0.6908 (0.0417)	0.7062 (0.0427)	0.6915 (0.0403)	0.6852 (0.0487)	0.6918 (0.0460)	0.6959 (0.0485)
τ_1	0.0978 (0.0441)	0.1267 (0.0466)	0.1188 (0.0482)	0.1256 (0.0477)	0.0804 (0.0411)	0.0973 (0.0428)	0.0926 (0.0444)	0.0985 (0.0434)
δ	1.4600 (0.2856)	1.7215 (0.3706)	1.5785 (0.3430)	1.6533 (0.3629)	1.7186 (0.3670)	2.0253 (0.4770)	1.8313 (0.4299)	1.9451 (0.4635)
ν		7.7057 (1.6078)	1.4782 (0.0845)	7.9737 (1.7466)		9.6814 (2.4453)	1.5815 (0.0916)	9.9763 (2.6088)
ξ				0.1063 (0.0450)				0.0752 (0.0449)

This table reports results from AR(1)-APARCH (1,1) estimation using different densities. The number of observations was reduced by one hundred for forecast evaluation purposes. Columns 2, 3, 4, 5 are the different model estimations using normal, student, GED and skewed student-t respectively. Asymptotic heteroskedasticity-consistent standard errors are given in parentheses, **(bold)** denoting significance at the 5% level. The period investigated is from February 2, 1997 to Dec 31, 2001.

Table 14. Post-estimation Statistics for Sub-sample 2 Using a Normal Distribution

	HFI			EFGI		
	GARCH	GJR	APARCH	GARCH	GJR	APARCH
AIC	3.0126	3.0093	3.0087	3.0881	3.0862	3.0876
BIC	3.0368	3.0362	3.3017	3.1195	3.1101	3.1190
LL	-1680.570	-1677.726	-1676.408	-1722.82	-1720.768	-1720.516
Q(20)	38.7892	40.9358	39.7497	35.6250	38.9075	38.8009
Q ² (20)	17.7525	18.5805	18.0303	21.6192	22.3666	22.1063
P(50)	66.6850	49.4093	60.9374	51.1072	56.0223	54.3244
P-Val (lag-1)	(0.0471)	(0.0456)	(0.1178)	(0.0390)	(0.0228)	(0.0278)
P-Val(lag-k-1)	[0.0152]	[0.0232]	[0.0294]	[0.0214]	[0.0087]	[0.0096]

Table 15. Post-estimation Statistics for Sub-sample 2 Using a Student-t Distribution

	HFI			EFGI		
	GARCH	GJR	APARCH	GARCH	GJR	APARCH
AIC	2.9806	2.9754	2.9767	3.0688	3.0660	3.0678
BIC	3.0075	3.0068	3.0126	3.0967	3.0964	3.1037
LL	-1661.667	-1657.744	-1657.503	-1711.00	-1708.451	-1708.451
Q(20)	38.0908	43.9911	43.7125	37.3773	41.8335	41.8408
Q ² (20)	20.1930	20.9786	20.6143	23.8263	24.0072	24.0410
P(50)	39.4004	27.5147	37.0769	64.0652	48.1582	46.1921
P-Val (lag-1)	(0.0834)	(0.0994)	(0.0894)	(0.0728)	(0.0507)	(0.0587)
P-Val(lag-k-1)	[0.0628]	[0.0958]	(0.0645)	(0.0202)	[0.0237]	[0.0266]

Table 16. Post-estimation Statistics for Sub-sample 2 Using a GED Distribution

	HFI			EFGI		
	GARCH	GJR	APARCH	GARCH	GJR	APARCH
AIC	2.9888	2.9846	2.9854	3.0752	3.0730	3.0746
BIC	3.0157	3.0160	3.0212	3.1021	3.1044	3.1105
LL	-1666.27	-1662.93	-1662.34	-1714.61	-1712.36	-1712.28
Q(20)	38.2406	43.6063	42.8182	36.384	40.3427	40.2542
Q ² (20)	19.1555	19.9843	19.4103	22.8130	23.3187	23.1316
P(50)	39.5791	34.2172	43.0643	50.6604	48.4263	45.5666
P-Val (lag-1)	(0.0829)	(0.0946)	(0.0711)	(0.0407)	(0.0496)	(0.0613)
P-Val(lag-k-1)	[0.0620]	[0.0797]	[0.0382]	[0.0196]	[0.0229]	[0.0287]

Table 17. Post-estimation Statistics for Sub-sample 2 Using a Skewed- t Distribution

	HFI			EFGI		
	GARCH	GJR	APARCH	GARCH	GJR	APARCH
AIC	2.9774	2.9724	2.9735	3.0682	3.0653	3.0671
BIC	3.0088	3.0083	3.0139	3.0996	3.0912	3.1005
LL	-1658.89	-1655.08	-1654.70	-1709.66	-1707.09	-1707.08
Q(20)	37.0505	43.3402	42.9835	36.5826	41.5144	41.5002
Q ² (20)	20.5418	21.5452	21.4203	23.886	24.2280	24.1888
P(50)	40.5621	41.7239	48.9625	44.0474	40.2046	43.4218
P-Val (lag-1)	(0.0799)	(0.0760)	(0.0476)	(0.0673)	(0.0810)	(0.0697)
P-Val(lag-k-1)	[0.0534]	[0.0439]	[0.0156]	[0.0384]	[0.0505]	[0.0327]

Tables 14-17 compare post estimation statistics across models for the specifications that converged with the first sub-sample series. *AIC*, *BIC* are the Akaike and Schwartz information criteria. *LL*, is the log likelihood value. *Q(20)* and *Q²(20)* are respectively the Box-Pierce statistic at lag 20 of the standardized and squared standardized residuals. *P(50)* is the Pearson Goodness-of-fit with 50 cells. P-values of the non-adjusted and adjusted test are given respectively in parentheses and brackets. The period investigated is from February 2, 1997 to Dec 31, 2001.

Table 18. Post-estimation Statistics for Sub-sample 2 Using GARCH

	HFI				EFGI			
	Normal	Stud-t	GED	Skew-t	Normal	Stud-t	GED	Skewed-t
AIC	3.0126	2.9806	2.9888	2.9774	3.0881	3.0688	3.0752	3.0682
BIC	3.0360	3.0075	3.0157	3.0088	3.1195	3.0967	3.1021	3.0996
LL	-1680.57	-1661.67	-1666.27	-1658.89	-1722.82	-1711.01	-1714.61	-1709.66
Q(20)	38.7892	38.0908	38.2406	37.0505	35.625	37.3773	36.3840	36.5826
Q ² (20)	17.7525	20.1930	19.1555	20.5418	21.6192	23.8263	22.8130	23.886
P(50)	66.6850	39.4004	39.5791	40.5621	51.1072	64.0652	50.6604	44.0474
P-Val	(0.0471)	(0.0834)	(0.0829)	(0.0799)	(0.0390)	(0.0728)	(0.0407)	(0.0673)
P-Val	[0.0152]	[0.0628]	[0.0620]	[0.0534]	[0.0214]	[0.0202]	[0.0196]	[0.0384]

Table 19. Post-estimation Statistics for Sub-sample 2 Using GJR

	HFI				EFGI			
	Normal	Stud-t	GED	Skew-t	Normal	Stud-t	GED	Skewed-t
AIC	3.0093	2.9754	2.9846	2.9724	3.0862	3.0660	3.0730	3.0653
BIC	3.0362	3.0068	3.0160	3.0083	3.1101	3.0964	3.1044	3.0912
LL	-1677.73	-1657.74	-1662.93	-1655.079	-1720.77	-1708.45	-1712.35	-1707.09
Q(20)	40.9358	43.9911	43.6063	43.3402	38.9075	41.8335	40.3427	41.5144
Q ² (20)	18.5805	20.9786	19.9843	21.5452	22.3666	24.0072	23.3187	24.2280
P(50)	49.4093	27.5147	34.2172	41.7239	56.0223	48.1582	48.4263	40.2046
P-Val	(0.0456)	(0.0994)	(0.0946)	(0.0760)	(0.0228)	(0.0507)	(0.0496)	(0.0810)
P-Val	[0.0232]	[0.0958]	[0.0797]	[0.0439]	[0.0087]	[0.0237]	[0.0229]	[0.0505]

Table 20. Post-estimation Statistics for Sub-sample 2 Using APARCH

	HFI				EFGI			
	Normal	Stud-t	GED	Skew-t	Normal	Stud-t	GED	Skewed-t
AIC	3.0087	2.9767	2.9854	2.9735	3.0876	3.0678	3.0746	3.0671
BIC	3.3017	3.0126	3.0212	3.0139	3.1190	3.1037	3.1105	3.1005
LL	-1676.41	-1657.50	-1662.33	-1654.70	-1720.52	-1708.45	-1712.28	-1707.08
Q(20)	39.7497	43.7125	42.8182	42.9835	38.8009	41.8408	40.2542	41.5002
Q ² (20)	18.0303	20.6143	19.4103	21.4203	22.1063	24.0410	23.1316	24.1888
P(50)	60.9374	37.0769	43.0643	48.9625	54.3244	46.1921	45.5666	43.4218
P-Val	(0.1178)	(0.0894)	(0.0711)	(0.0476)	(0.0278)	(0.0587)	(0.0613)	(0.0697)
P-Val	(0.0294)	[0.0645]	[0.0382]	[0.0156]	[0.0096]	[0.0266]	[0.0287]	[0.0327]

Tables 18-20 compare post estimation statistics across distributions for the specifications that converged with the first sub-sample series. *AIC*, *BIC* are the Akaike and Schwartz information criteria. *LL*, is the log likelihood value. *Q(20)* and *Q²(20)* are respectively the Box-Pierce statistic at lag 20 of the standardized and squared standardized residuals. *P(50)* is the Pearson Goodness-of-fit with 50 cells. P-values of the non-adjusted and adjusted test are given respectively in parentheses and brackets. The period investigated is from February 2, 1997 to Dec 31, 2001.