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## Testing for a significant change in the Egyptian economy under the economic reform programme era

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Discussion Paper No. 2002/59

## **Testing for a Significant Change in the Egyptian Economy under the Economic Reform Programme Era**

Mohammed Omran \*

June 2002

### **Abstract**

Late 1990, Egypt witnessed major and radical changes in all areas of its national life—political, legal, economic and social—as a reflection of implementing an economic reform programme in order to achieve progress in its economic indicators. This paper aims to examine the extent to which Egypt has succeeded in implementing its economic reform programme, and how this affected key aspects of the whole economy. For this purpose, logistic regression is made to determine whether the Egyptian economy has changed after 1991, the year of introduction of the economic reform programme. Particular attention is paid to several economic variables, mainly, interest rates, real interest rates, rate of inflation, exchange rate stability, real GDP growth rate, per capita income, and the budget deficit. The logistic regression results indicate that there is strong evidence that after 1991, with the exception of real GDP growth rate, there was a structural change in economic indicators.

Keywords: public finance, development, prices

JEL classification: E6, O1, P22

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## **1 Introduction**

Most socialist and communist economies followed the capitalist approach by adopting several economic reform programmes in order to save their economies from corruption. All Eastern Europe countries, the former Soviet Union, China, Latin America, Africa, Middle East, and many other regions and countries realised the importance of such programmes, supported mainly by international organizations such as the International Monetary Fund (IMF) and the World Bank.

As economic reform programmes have become the new phenomena of the last two decades, Egypt—like most developing countries—also experimented with the same programme aiming at achieving economic stabilization. In fact, by the mid-1980s, Egypt had faced many difficulties due to a sharp reduction in oil prices as well as the decrease in both dues from the Suez Canal and workers' remittances.

In the light of the above, by late 1990, a well-tailored economic reform programme, with full support from the IMF and the Bank, was cumulatively implemented to cover the whole economic spectrum. The programme was aimed at improving both monetary and fiscal policy, as Egypt suffered from hyperinflation (more than 20 per cent), negative real interest rates (around –6 per cent), and a huge budget deficit (nearly 20 per cent of GDP). During its first phase, fiscal and monetary reforms constituted the core of the programme, whereas structural reforms of the real sector made up the rest of the programme.

The plan of the paper is as follows. In the next section, an overview of the Egyptian economy is presented using various indicators and ratios. Section 3 sets out the hypotheses of the paper, while section 4 describes the data set and develops a simple model, including the methodology, used to test the hypotheses. The empirical results and further comments are presented in section 5 and a summary and conclusions are given in section 6.

## **2 Overview of the Egyptian economy**

Even though the transformation from centrally planned economies to market-based economies appears to be a complicated process, the Egyptian government launched the first IMF agreement because of the country's poor economic situation in the mid-1980s. The agreement was cancelled after only three months because of the government's failure to meet the requirements of IMF.

In late 1990, it became obvious that the economy could not meet the needs of the society without external aids. Furthermore, Egypt faced a problem with its creditors, as it was not able to maintain debt service payments. The following key indicators highlight the gravity of the Egyptian economy by late 1990:

- External debt totalled around US\$ 49 billion;
- External debt to GDP amounted to 150 per cent;
- Budget deficit was around 20 per cent of GDP;
- Rate of inflation raged at more than 20 per cent;

- Real interest rate was around –6 per cent; and
- Reserves were valued at just over three weeks of imports.

In the light of the above, Egypt was obliged to turn to the IMF for help, which produced another round of negotiations, ultimately resulting in an economic reform programme by the end of 1990.

The key elements of this programme were as follows (see Ash 1993; Youssef 1996; and Roads 1997):

- Reduce the size of the public sector through privatization;
- Remove controls over investment and eliminate most tariffs on imports;
- Sell manufactures at market prices;
- Raise energy and transport prices to realistic levels;
- Reduce consumer subsidies and target them towards the poorest group; and
- Deregulate private investment and encourage private sector activity in all sectors including financial services.

In the meantime, the new agreement with the World Bank and the IMF included the immediate introduction of several measures, including (Anonymous 1992):

- Removing interest rate ceilings;
- Liberalizing exchange rates; and
- Introducing a new sales tax.

Egypt's support for the allied cause in connection with the Gulf War did, however, have positive results. In particular, it led to an increase in internal financial support, bilateral as well as multilateral. For the first time since 1979, the Gulf States provided aid to Egypt as well as offered the write-off of long-term debt valued at US\$ 7 billion. In addition, the United States wrote off a substantial US\$ 6.7 billion in military debts, and the Paris Club Agreement, in conjunction with the other seventeen major official creditor governments, provided a 50 per cent relief on their outstanding commercial debt, to be written off in stages over the next three years. This was dependent on Egypt complying with the IMF agreement on economic reform programme (CBE 1992; Roads 1997). The second IMF agreement was concluded in 1993 and by the end of 1996 the third agreement triggered the final phase of commercial debt reduction. This was further supported with a 24-month financial standby arrangement.

In conclusion, the agreement with the international organizations, complemented with the benefits flowing into Egypt as a result of its stand after the Iraqi invasion of Kuwait, represents the corner-stone of the economic reform programme in Egypt.

Between late 1990, when economic reform programme was introduced and the end of 1996, Egypt benefited from debt forgiveness as follows:

- i) US\$ 6.7 billion in the write-off of long-term debt to the United States;
- ii) US\$ 7 billion in the write-off of long-term debt to the Gulf States;
- iii) 50 per cent write-off of Egypt's commercial debt to the Paris Club as follows:
  - US\$ 3 billion in 1991, representing the first phase at 15 per cent;
  - US\$ 3 billion in 1993, representing the second phase at 15 per cent;
  - US\$ 4 billion in 1996, representing the final 20 per cent phase.

In fact, at the start of the programme, the IMF favoured quick implementation (shock therapy). However, as the Egyptian government preferred a more gradual approach (gradualism) in order to minimize side effects and thus avoid negative impacts on the living standard of its society, the programme was introduced slowly. The measure of success achieved by the reform programme since the end of 1990 is given in Table 1. As can be seen from the Table and Figure 1, Egypt's external debt decreased significantly from US\$ 49 billion in 1990/1 to only US\$ 26.6 billion in 1997/8, implying a decrease rate of 46 per cent. But this significant improvement can be mainly attributed to debt forgiveness from the Gulf States, the United States, and the Paris Club rescheduling agreement.

In terms of total external debt, it is noteworthy that the debt-to-GDP ratio has dropped significantly from 151 per cent in 1990/1 to only 37.7 per cent in 1997/8, a 75 per cent improvement in the country's debt situation. Indeed, this kind of improvement can be ascribed, as mentioned previously, to the significant decrease of total external debt as well as the acceleration of GDP growth triggered by the economic reform programme.

In terms of real interest rates, it should be mentioned that real rates of interest should be positive in order to encourage a society to save. But in the case of Egypt, inflation rate was higher than the nominal interest rates, which caused the negative real interest rates shown in Table 1 and Figure 4.

Table 1  
Some economic indicators before and after the economic reform programme

| Description                                | 1990/1 | 1997/8 |
|--|--------|--------|
| Total external debt (billions of US\$)     | 49.2   | 26.6   |
| Total external debt as a percentage of GDP | 151    | 37.7   |
| Real interest rates, %                     | (6)    | 5      |
| Inflation rate, %                          | 21.2   | 4.1    |
| Total foreign reserve (billions of US\$)   | 3.6    | 21.8   |
| Budget deficit as a percentage of GDP      | 18.2   | 0.06   |
| Real GDP growth rate                       | 3.6    | 5.7    |

Source: CBE and IDCS (various issues from 1992-98).

Figure 1: Total external debt, 1990/1-1997/8

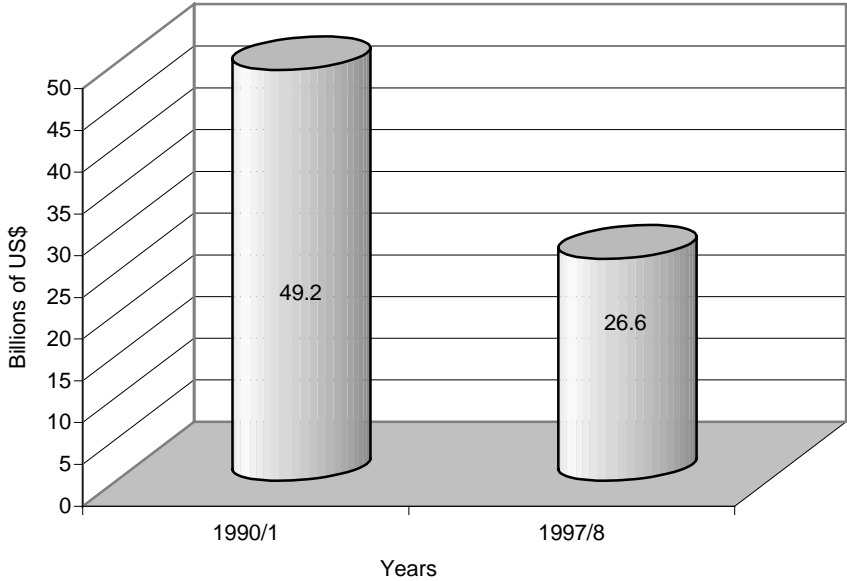


Figure 2: Total external debt as percentage of GDP, 1990/1-1997/8

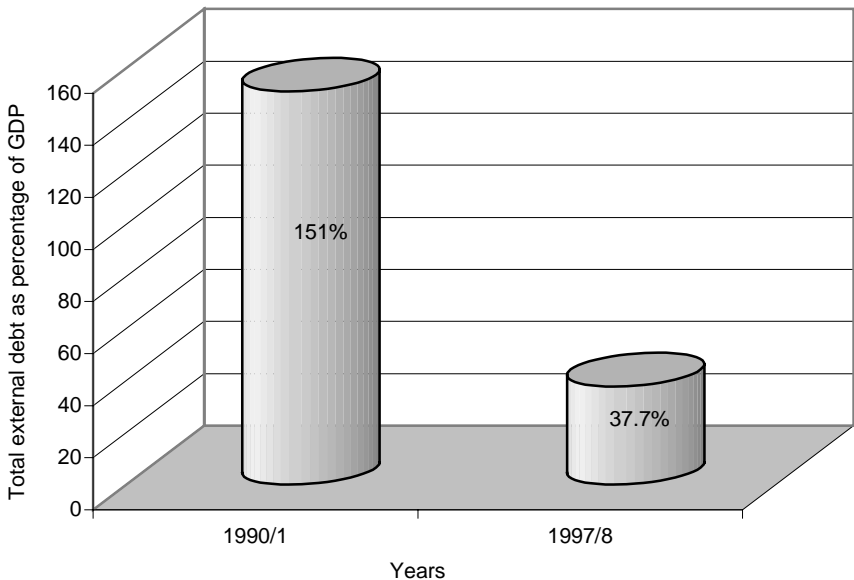
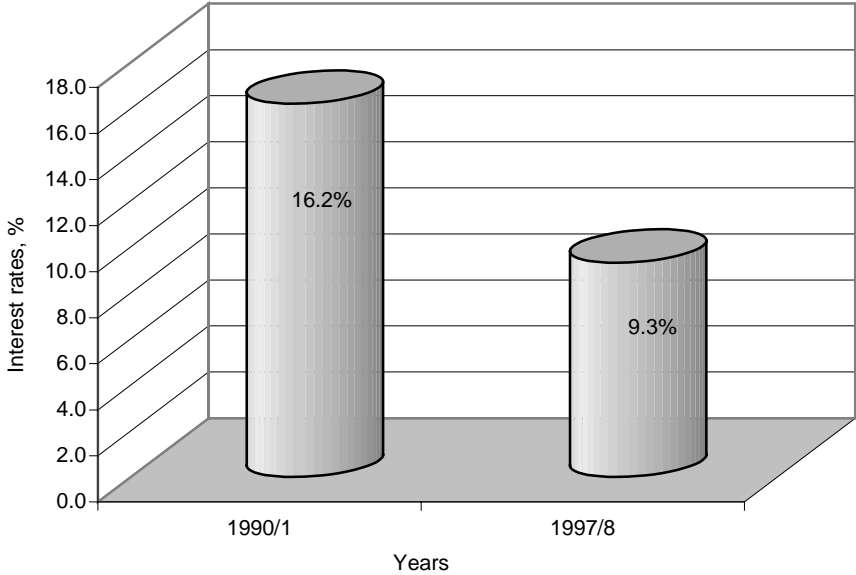


Figure 3: Interest rates in Egypt, 1990/1-1997/8



Source: Own diagram based on data from CBE and IDSC (various issues).

As Figure 4 shows, real interest rates in Egypt prior to the economic reform programme were negative. But with the introduction of economic reform, the country linked interest rates to inflation to avoid similar development.

By January 1991, the official limits on interest rates were lifted, and treasury bill auctions were introduced. These were followed by the elimination of lending limits to the private and public sectors in 1992 and 1993, respectively (Handy and Subramanian 1997). Thus, cancellation of interest rate ceilings and making these dependent on market forces, bridged at first the gap between the nominal interest rate and the inflation rate. Furthermore, with a sharp drop in inflation, real interest rates rose to +5 per cent in 1997/8, compared to the 1990/1 interest rate of -6 per cent. Indeed, this dramatic change in real interest rates assisted the financial institutions, in particular banks, in attracting more savings from the society for investment in many projects in Egypt. In addition, even though the increase in interest rates depressed the business environment in the beginning, inverse interest rates were a natural consequence, once inflation decreased sharply. Now interest rates are reasonable and attractive for both money supply and demand.

In terms of inflation, one of the main problems for the Egyptian economy was hyperinflation (Figure 5). The rate of inflation declined sharply from 23.6 per cent in 1990/1 to only 4.1 per cent in 1997/8, translating into 83 per cent rate of decrease. It was vital for the Egyptian economy to depress the high inflation rate during the first stage of the economic reform programme period, and the government restricted the demand for goods and services by putting the inflation rate under control in the short term. The alternative—increasing the supply of goods and services—usually works only over a long timeframe. In view of this, the government introduced treasury bills in 1991, followed by treasury bonds (5-10 years) in 1995. In the meantime, interest rates were liberalized, contributing to positive rates. These measures helped to absorb the level of liquidity, and consequently liquidity growth declined from over 27 per cent in 1990/1 to only 8.7 per cent in 1997/8 (CBE 1998). On the other hand, the decline in the budget deficit in conjunction with a relatively stable exchange rate assisted in reducing inflation, as is discussed later.

It is important for a country to minimize exchange rate fluctuations in its local currency against other currencies because the greater the fluctuation, the less attractive is investment in the domestic market relative to other markets.

In fact, Egypt, like many other developing countries, had a multiple exchange rate system (MER). After the introduction of the economic reform programme, the former multiple exchange rate system was replaced by a single rate, market-oriented system with fully floating Egyptian pound (£E), to be used for all public and private transactions. Hence, for the first time non-bank dealers were permitted to participate in the foreign exchange market (CBE 1992). Under the economic reform programme, the country made substantial progress in reducing overvalued exchange rates.

As can be seen from Figure 6, after 1991 and the introduction of economic reform, the Egyptian pound became more stable relative to the earlier period. In fact, by March 1991, the government unified the official and commercial rates into a new free market rate, and 12 per cent devaluation was made in the exchange rate to match free market rates.



Figure 4: Real interest rates in Egypt, 1990/1-1997/8

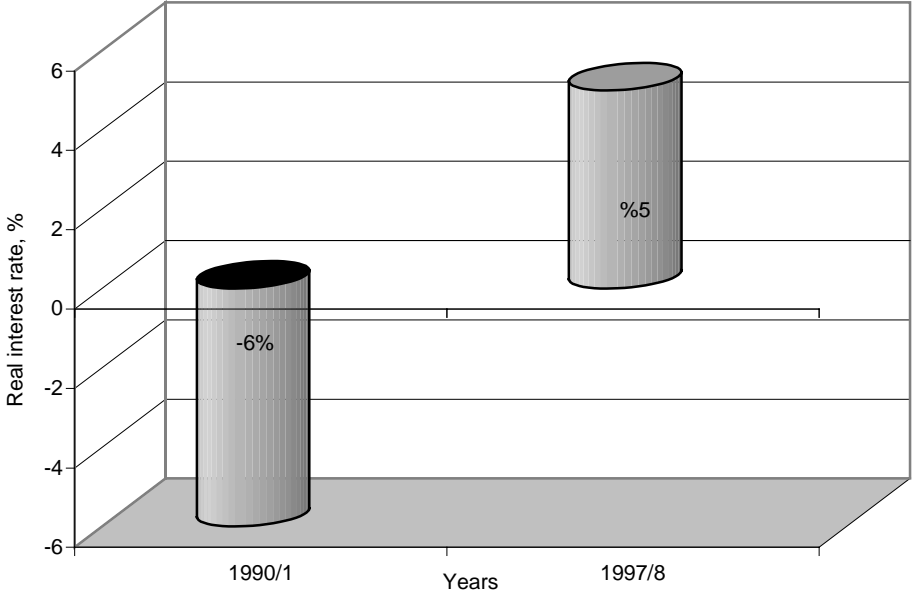


Figure 5: Inflation rate, 1990/1-1997/8

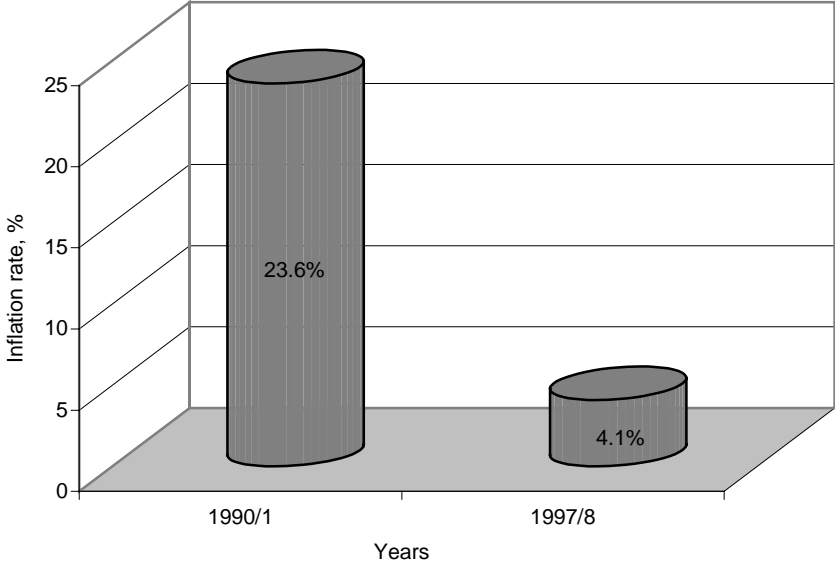
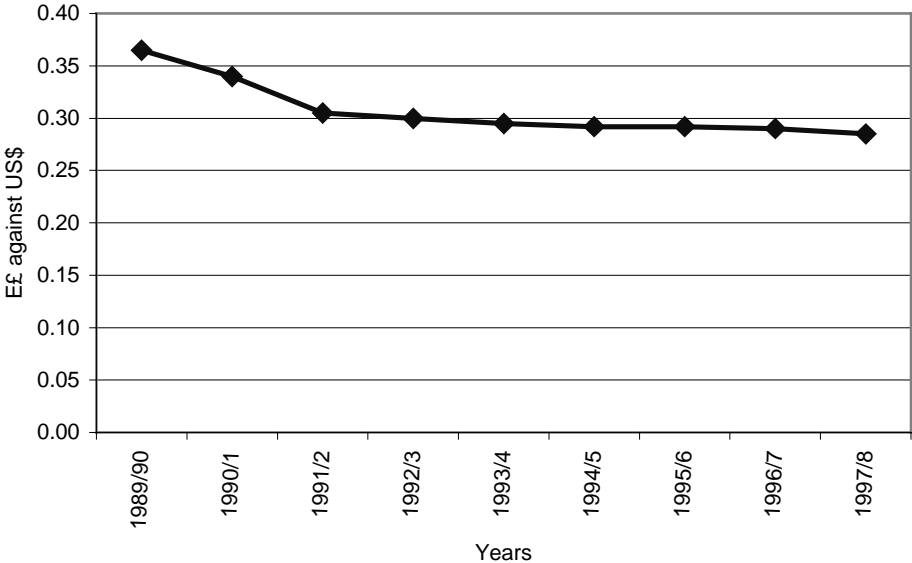


Figure 6: The value of the Egyptian £ against US\$, 1990/1-1997/8



Source: Own diagram based on data from CBE; IDSC (various issues).

Although the Egyptian pound depreciated sharply during 1991 as exchange rate reform was being implemented, the currency has, since the third-quarter of 1991 to the fourth-quarter of 1998, remained more or less stable in the range £E 3.35-3.41 to US\$1. In addition, it is useful to mention that starting from 1992, the central bank regularly entered the market, using its foreign reserves to keep the Egyptian pound level. This was an effort to avoid deep currency depressions which could threaten foreign investment, or sharp appreciation which could erode the competitiveness of the country's exports. In fact, at this time the exchange rate was boosted by extensive debt relief as well as high returns on the treasury bill, which led to a flood of capital inflows from abroad.

Indeed, both the World Bank and the IMF had long maintained that the Egyptian currency was overvalued by as much as 30 per cent (Euromoney 1996). The Central Bank of Egypt argued that the majority of the country's foreign exchange earnings came from tourism, Suez Canal revenues, workers' remittances and oil sales, and that they were denominated in US dollars and thus unaffected by local exchange rate movements. Also it is argued that any devaluation would therefore have little effect on foreign exchange earnings, but would push up the cost of imports and subsequently impact on the budget. In addition, devaluation would depress foreign investment and make the Egyptian markets unattractive.

The Central Bank of Egypt with its foreign reserve was well placed. The country's foreign reserve has increased more than 500 per cent from only US\$ 3.6 billion in 1990/1 to US\$ 21.8 billion in 1997/8. With this huge foreign reserve compared to the situation in 1990, the central bank holds an important instrument for intervening in the market to stabilize the Egyptian pound, and to ward off any depreciation to the currency in case of speculation.

The Egyptian pound has been substantially stabilized by another vital factor. As mentioned earlier, real interest rates were sharply negative, which in turn created a strong incentive to borrow in domestic currency and to increase the dollar balance. Therefore, confidence in the economy was ebbing, reflecting a growing dollarization with nearly 50 per cent of the total liquidity being accounted for by foreign currency deposits. But in early 1991 when ceilings on interest rates were eliminated, the reverse occurred: the sharp rise in interest rates encouraged a reduction in dollar holdings in favour of the tax-free high interest-paying savings accounts in domestic currency. Subsequently, it was advantageous for investors to transfer their foreign currencies into local currency, as the gap in the rates of interest between the two was 15 per cent in 1991 (18 per cent for the Egyptian pound versus only 3 per cent for US dollar). This difference now stands at 5 per cent. Ultimately, in 1997/8 foreign deposits represented 21 per cent of total deposits (Handy and Subramanian 1997; IDSC 1998a).

Figure 8 shows the development of Egypt's real GDP growth rate over the period of economic reform.

The real GDP growth rate, after declining sharply during the first two years of economic reform programme to 1.9 per cent and 2.5 per cent, respectively, because of tight monetary and fiscal policy, rebounded quickly and was followed, albeit with a one-year lag, by a reduction in inflation. Indeed, the real GDP growth rate has grown steadily since 1993, reaching 5.7 per cent in 1997/8 (CBE1998; IDSC1998a).

Figure 7: Total foreign reserves in Egypt, 1990/1-1997/8

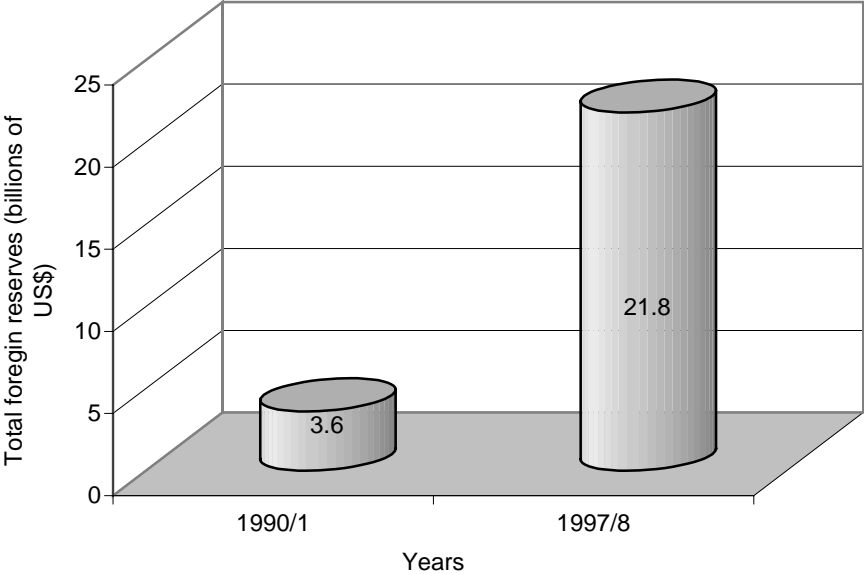


Figure 8: Real GDP growth rate in Egypt, 1990/1-1997/8

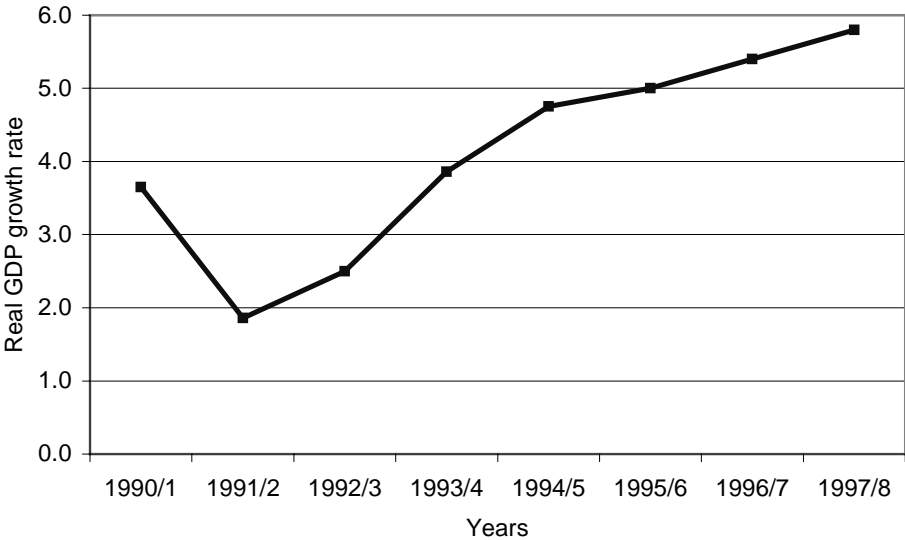
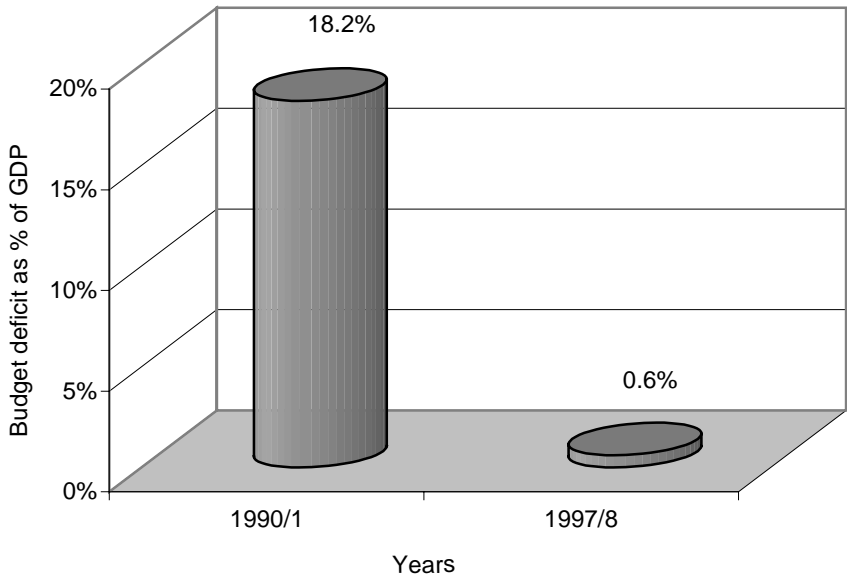


Figure 9: Budget deficit as percentage of GDP in Egypt, 1990/1-1997/8



Source: Own diagram based on data from CBE; IDSC (various issues).

Along with the steadily growing real GDP growth rate and the low inflation rate, the country has also experienced a drop in the population growth rate, which has gone from 2.7 per cent in 1990/1 to only 2.1 per cent in 1996/7 (UN 1997). This has translated into an increase in the per capita income of the population, but in spite of this, Egypt is still ranked as a low-income country (IFC 1997).

There has been a significant decrease in the budget deficit over the period from 1990/1 to 1997/8 (Figure 9). The overall deficit as a per cent of GDP has declined sharply from about 18.2 per cent in 1990/1 to only 0.06 per cent in 1997/8, a 97 per cent improvement in the government budget.

In fact, the reduction in the overall deficit was achieved through increased revenues and reduced expenditures. The largest single component on the revenue side was the exchange rate change in 1991. This raised receipts from the Suez Canal, oil, and taxes on international trade on average by about 2 per cent. In addition, introduction of the sales tax and its subsequent expansion in 1991 contributed about 1.4 per cent in the total revenue (CBE 1998). On the other hand, expenditures were cut by a total of 7.5 per cent of GDP. This reduction was distributed mainly between current and investment expenditures in the ratio of 16 and 64 per cent, respectively (Handy and Subramanian 1997).

Concerning current expenditure, which was reduced by 1.2 per cent of GDP, subsidies and transfers witnessed a decline of about 2.4 per cent, while wages and salaries were affected by a modest reduction of about 0.6 per cent. Although interest expenditures on domestic debt were about 2.1 per cent higher during the economic reform programme period, Egypt's foreign interest bill was substantially reduced as a result of debt forgiveness and Paris Club rescheduling agreement (Handy and Subramanian 1997).

In addition, state-owned enterprises (SOEs) can be considered a major contributor to the government budget deficit. Privatization, as will be discussed later, eased the burden of the state-owned enterprises' losses. In connection with privatization, it is worthwhile mentioning that public sector companies have handled most of Egypt's economic activity under the direction of the various ministries since the 1960s. In the past, these companies, as part of their objective, were to create as many employment opportunities as possible. Inevitably, poor management and weak capitalization of the state-owned enterprises (SOEs) had an effect on their efficiency and financial viability (Roads 1997; Banker 1990). Reduction in size of the public sector through privatization has, therefore, been an important part of the economic reform programme. This is now the special responsibility of the minister for the public enterprise sector and the public enterprise office.

In 1991 Public Enterprise Law No. 203 was introduced as a transitional measure. The immediate purpose of this law was to grant autonomy to state-owned companies and, by guaranteeing to their new boards an increased level of accountability for their operations, to promote the conduct of business according to market principles. This law, however, will eventually be merged with the existing Companies Law No. 159 to consolidate regulations so that a single code applies to all enterprises, both public and private, in the business sector as a whole.

The first phase of the privatization process, started in May 1991, was to cut off subsidies to the state-owned enterprises. This was followed by the removal of public

enterprises from direct ministerial control (Field 1995). The 314 public sector companies were grouped in 1991 under 27 holding companies (now reduced to 16), with responsibility for all the affiliates in a particular sector (Roads 1997; Timewell 1991).

The government's strategy for the divestment of public sector holdings encompassed two approaches: first, the sales of shares through the stock market, and second, the sales of a strategic stake of shares to anchor investors through public auction (Mckinney 1996). In addition, liquidation was applied to companies suffering from huge debt burdens with no possibilities of improvement. The outcome of the Egyptian privatization programme is given in Table 2. As can be seen, 92 out of the country's 314 state-owned companies had been privatized by the middle of 1998, which means that 28 per cent of SOEs had been partially or fully privatized.

The total value of the privatized companies accruing for the period from 1994 until June 1998 is given in Table 3 and Figure 10. The privatization programme which started in 1994 was slow at the beginning, as only 10-20 per cent of the shares were allowed to be sold. Starting from mid-1996, however, with the appointment of the new cabinet, privatization was accelerated. As the message began to spread and attract international interest, the government sold, for the first time since the start of the privatization programme, more than 50 per cent of its stakes in state-owned enterprises in order to improve the supply of stocks on the exchange. The total value of privatized companies accelerated significantly, reaching £E 10.853 billion.

Table 2  
Number of privatized companies in Egypt

| Companies covered by the privatization programme                         | No. of companies affected |
|--|---------------------------|
| Companies sold to:   |                           |
| The public (through the stock market)                                    | 34                        |
| Anchor investors   | 8                         |
| Labour unions  | 15                        |
| Companies with more than 51% of equity sold to private sector            | 57                        |
| Companies sold as assets   | 17                        |
| Companies with more than 40% of its equity sold through the stock market | 9                         |
| Companies with less than 40% of its equity sold through the stock market | 9                         |
| Companies with less than 50% of its equity sold to date                  | 18                        |
| Total  | 92                        |

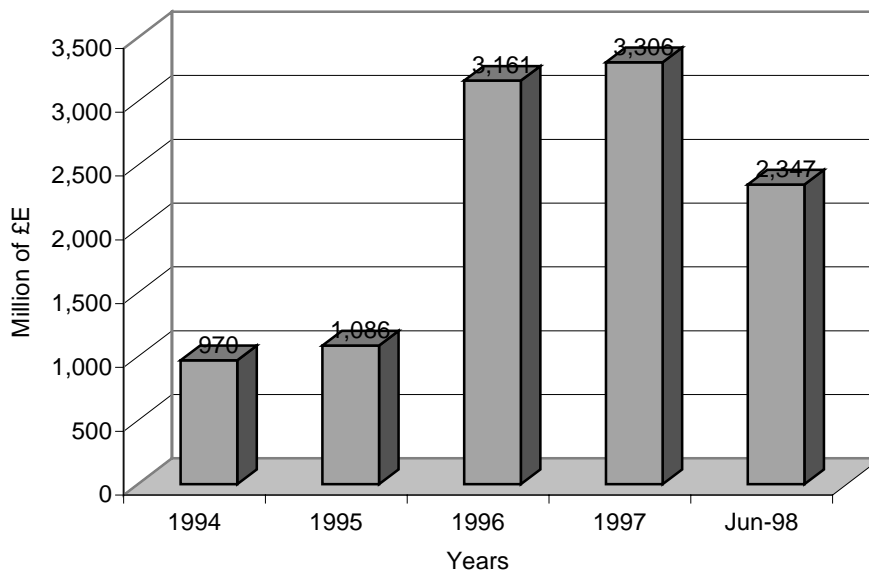
Source: Ministry of Public Enterprise Sector (1998).

Table 3  
Value of privatized companies in Egypt between 1994 -June 1998

| Years     | Value of privatized companies (million of £E) |
|-----------|---|
| 1994      | 970   |
| 1995      | 1,086   |
| 1996      | 3,161   |
| 1997      | 3,306   |
| June 1998 | 2,347   |

Source: Ministry of Public Enterprise Sector (1998).

Figure 10  
Value of privatized companies in Egypt, 1994-June 1998



Source: Ministry of Public Enterprise Sector (1998).

In addition, many other steps were taken in order to create an environment favourable for investment:

- A unified tax law (No. 187) was introduced in 1993, which reduced marginal tax rates, simplified the tax structure, and administration;
- Tax incentives were introduced. Tax holidays granted by the General Authority of Investment and others are operating under the umbrella of the ministry of economy and foreign trade. Egypt offers, under the Income Tax Law, investors not only attractive tax incentives, but also the challenges and high yields of an emerging market economy. In addition, Egypt has concluded double taxation treaties with certain countries, which a potential investor should bear in mind when assessing the viability of the Egyptian market (Shawki 1997). As a result of the investment incentives offered by the government, the private sector's contribution to the economy was more than 70 per cent, compared to the previous period's figure of less than 30 per cent (General Authority of Investment 1998);
- A sales tax was introduced in order to reduce the budget deficit. Customs and stamp duties were raised, and petroleum and electricity prices increased. The dual pricing system was eliminated and there has been a progressive reduction of subsidies;
- The list of prohibited imports has been cut by two-thirds. Also, import tariffs have been reduced from the maximum of 120 per cent to only 70 per cent, and then to 50 per cent. Indeed, Egypt is planning to further reduce the tariff gradually up to the year 2005 to meet GATT's requirements; and

- A social fund for development (The Egyptian Social Fund For Development [SFD]) was established in 1991 by President Decree No. 40, to alleviate hardship caused by the economic reform programme, by creating jobs, countering unemployment and promoting rural development (Roads 1997). Furthermore, the fund was intended to provide short-time assistance to low-income population groups most directly affected by the economic reform measures. In the medium term, the fund aimed to strengthen the government's institutional capacity to design and monitor poverty alleviation policies. This is being financed by international organizations, as well as by grants from creditor countries. Indeed, the fund has created up to 180,000 permanent and 80,000 temporary jobs (SFD 1998).

### **3 Hypotheses**

One main reason for Egypt adopting the economic reform programme was the poor situation of its economy by late 1980s, and macroeconomic stability was the core element of the programme. In turn, the main hypothesis of this paper is to test whether this objective has been achieved. The following hypothesis can be tested for this point:

*The Egyptian government succeeded in implementing its economic reform programme.*

To test the robustness of this hypothesis, several sub-hypotheses are examined. After the introduction of the economic reform programme, there was:

- i) A significant decrease in interest rates;
- ii) A significant increase in real interest;
- iii) A significant decrease in the inflation rate;
- iv) A significant stability in the exchange rate stability;
- v) A significant increase in the real GDP growth rate; and
- vi) A significant decrease in the budget deficit.

## **4 Data and methodology and empirical model**

### **4.1 Data set**

The data of this analysis covered the period from 1980/1 to 1997/8, which incorporates both the pre- and post-economic reform time periods. Data have been collected from various sources. The Central Bank of Egypt, the Egyptian Cabinet Information and Decision Support Center, the IMF, the World Bank and the Egyptian Ministry of Public Enterprises have been consulted as data sources.

The economic reform programme comprised seven variables; interest rates, real interest rates, inflation rate, exchange rate stability, real GDP growth rate, budget deficit and privatization programme. Real interest rate has been calculated accordingly to the Fisher

equation (1930) of the interest rate. Consider first one plus the nominal rate of interest as given in Davis and Pointon (1994):

$$(1 + n) = (1 + i)(1 + r) \quad (1)$$

Where:

$n$  = nominal interest rate,

$i$  = inflation rate, and

$r$  = real interest rate

Then, real interest rate can be calculated as follows:

$$\begin{aligned} \frac{1+n}{1+i} &= 1+r \\ \therefore r &= \frac{1+n}{1+i} - 1 \\ &= \frac{1+n-(1+i)}{1+i} = \frac{n-i}{1+i} \\ \therefore r &= \frac{n-i}{1+i} \end{aligned} \quad (2)$$

With regard to the exchange rate, the nominal exchange rate is substituted by an estimate of real exchange rate because of the fact that the nominal rate is targeting, so the slight observed variation between the two rates depends on the policymaker decision. The difference between the inflation rate in both Egypt and the USA is used as a proxy of real exchange rate.

With respect to privatization, this variable had to be excluded from the analysis since the privatization programme just started in Egypt in 1994. Consequently, because of the short time series of the privatization data, using such data in the analysis is inadvisable.

## 4.2 Methodology and empirical model

Since this paper attempts to evaluate Egypt's economic reform programme, an examination is made of the environmental conditions from 1991 (the introduction of the programme) in all series for the economic reform programme variables. For this purpose, several logistic regressions are performed to assess whether the Egyptian economy witnessed a significant change after 1991 compared with the prior period. In other applications, logistic regression has been applied to diverse areas such as the determination of whether UK companies that use finance leases are more likely to have tax losses and advance corporation tax carried forward (Lasfer and Levis 1998); an investigation into the success of a tender offer in US take-overs (Raad and Ryan 1995); and the ability of financial statement analysis to predict abnormal returns (Morton and Shane 1998).



The logistic regression uses logit as a link function, that is, it takes the log of the odds of the success ratio. The fitted regression will show the log of the odds ratio as a linear function of the independent variables. Each regression takes the following form.

$$\ln [p / (1 - p)] = \alpha + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_n x_n \quad (3)$$

Where

$$\begin{aligned} \ln &= \text{the natural logarithm,} \\ p / [1 - p] &= \text{the odds ratio,} \\ \alpha &= \text{constant,} \\ \beta_1, \beta_2, \dots &= \text{other regression coefficients, and} \\ x_1, x_2, \dots &= \text{explanatory variables.} \end{aligned}$$

It follows that

$$p = \frac{e^{\alpha + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_n x_n}}{1 + e^{\alpha + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_n x_n}} \quad (4)$$

Although this methodology is normally used to predict the success or failure of events, success here refers to a significant positive change in the economic reform programme variables, while failure is defined as a non-significant change. Thus, the intention here is to examine whether the data prior to 1991 can be separated from the data relating to the period from 1991. Clearly, the terms success and failure are used purely in the sense of a Bernoulli distribution, which implies binary responses that are categorized as one for a Bernoulli success and zero for a Bernoulli failure. In this case, zero represents the period prior to 1991 and one for the period starting from 1991. In addition, for this purpose, a categorical binary variable is used, hence, the log of the odds ratio is regressed against a linear function of the continuous variables. The odds ratio is calculating by taking the probability that the data relate to the economic reform programme period, divided by the probability that the data relate to the previous period. The deviance of the logistic regression is approximately Chi-square distributed (Open University 1998). Hence, if the significance probability of the deviance of the logistic regression for the given degrees of freedom is small, then the null hypothesis of no significant change in the data prior to and after the introduction of the economic reform programme is rejected, hence there is strong evidence that there is a structural change in the data, thus differentiating between the environmental conditions of the two periods.

However, a diagnostic char was made for each logistic regression, using index plot of the cook statistics. The cook statistic measures the extent to which parameter estimates change when respective points are excluded from the regression. Points with high values of the cook statistic are likely to have large residuals on lie away from the rest of

the data, or a combination of both. For each test the index plot was viewed and it was confirmed that the data points were not unusual in this regard.

## 5 Empirical results and further comments

### 5.1 Empirical results

The test results of this hypothesis using logistic regression analysis are given in Table 4. As seen from the first entry in the table, the results of the logistic regression reveal very small standardized residuals for the economic reform programme variables as a whole, hence demonstrating an excellent fit. As mentioned previously, to test whether the changes in the economic reform programme variables are significant, the significance probability of the deviance of the logistic regression, which refers to Chi-square, should be near to zero. In other words, if the probability of the Chi-square of the regression deviance is significantly different from zero, then the null hypothesis of no significant change in the data prior to and after the introduction of the economic reform programme cannot be rejected, meanwhile, the alternative hypothesis of a significant change in the data series will be rejected. With regard to this point, the economic reform programme as a whole indicated that the Chi-square is highly significant, in turn it cannot be accepted that the probability of the Chi-square is significantly different from zero, that is, it does not exceed the ten per cent selected critical value, and the null hypothesis of no significant change in the data prior to and after 1991 will be rejected. Hence there is strong evidence that there is a structural change in the data, thus differentiating between the environmental conditions of the two periods. On the other hand, for each individual variable, the results indicated the same conclusion except for the real GDP growth rate. In fact, most of the economic reform programme variables witnessed a dramatic change after the introduction of this programme compared with the situation prior to 1990/1. The analysis in the previous section indicated that interest rates decreased from around 16.2 per cent to only 9.3 per cent, real interest rates increased from negative 6 per cent to positive 5 per cent, inflation rate decreased from 23.6 per cent to only 4.1 per cent, the exchange rate witnessed very high stability starting from 1991, per capita income

Table 4  
Testing for structural change in environmental conditions in economic reform programme variables using logistic regression

| Economic reform programme variables | Standardized residual |         | Regression deviance | Probability of Chi-square of regression deviance |
|-------------------------------------|-----------------------|---------|---------------------|--|
|                                     | Maximum               | Minimum |                     |  |
| All 7 variables                     | 0.00                  | 0.00    | 24.06               | 0.0011   |
| Interest rates                      | 0.01                  | -0.01   | 24.06               | 0.0000 <sup>a</sup>                              |
| Real interest rates                 | 0.02                  | -0.02   | 24.06               | 0.0000 <sup>a</sup>                              |
| Inflation rate                      | 2.23                  | -1.2    | 13.56               | 0.0002 <sup>a</sup>                              |
| Exchange rate stability             | 0.01                  | -0.01   | 24.06               | 0.0000 <sup>a</sup>                              |
| Real GDP growth rate                | 2.3                   | -1.04   | 0.58                | 0.446  |
| Budget deficit                      | 0.00                  | 0.00    | 24.06               | 0.0000 <sup>a</sup>                              |

Note: <sup>a</sup> Significant at 1 % level.

increased from US\$ 600 to US\$ 1460 and the budget deficit decreased from 18.2 per cent to only 0.06 per cent. The one exception to this phenomenon is the real GDP growth rate, and there is strong evidence that this variable did not witness a significant change after the introduction of the economic reform programme. Clearly, Egypt benefited significantly from its open door policy and from oil prices in terms of the rate of growth within the 1980s. With the oil collapse in 1986, the rate of growth was still high, but with the introduction of the economic reform programme in late 1990, the GDP growth rate declined sharply in the first two years because of tight monetary and fiscal policy. Even though it rebounded quickly, there was still no significant change compared with the period prior to 1991.

As a conclusion, the hypothesis cannot be rejected indicating that the Egyptian government succeeded in implementing its economic reform programme. Besides this, six out of seven sub-hypotheses cannot be rejected, indicating that there is a significant change in these variables prior to and after 1991. The only rejected sub-hypothesis is that the real GDP growth rate did not improve significantly in the period after the introduction of the economic reform programme compared with the prior period. It may be worth mentioning again at this point that Egypt needs to increase both the saving and investment ratio in order to accelerate its rate of growth. For example, the level of investment in Egypt at only 18 per cent of GDP is below the average level for developing countries and the fast growing Asian countries (26 and 31 per cent of GDP, respectively).

## **5.2 Further comments**

In spite of all these remarkable changes, Egypt is still at the beginning of the road. In fact, many other areas did not show any improvement. The gap between exports and imports is still too high, and the trade balance still suffers from a huge deficit. The level of exports increased under the economic reform programme period, but the level of imports exceeded the increase in exports. As a result, the deficit of the balance of trade deteriorated from US\$ 6.62 billion in 1990/1 to US\$ 9.8 billion in 1997/8 (UN 1996; IDSC 1998b). In this framework, it is important to mention that the miracle of the South and Eastern Asian countries was mainly due to the fact that they were export-oriented. Thus, Egypt needs to concentrate on this direction and to pay more attention to export items in addition to oil goods, which have been affected by the sharp decrease in prices. Of course, the main goal for any given country is to diversify their exports to avoid having to rely only on one or two of goods or services, to circumvent any external shocks if the market has been affected for some reason.

On the other hand, even though the rate of growth picked up as stabilization took hold, it was not strong enough to generate substantial gains in improving the standard of living in Egypt, or to make a dent in rising unemployment, which stood at 11 per cent (UN 1996; IDSC 1998a). In fact, Egypt needs to raise the level of investments to around 25-30 per cent of GDP to achieve a rate of growth between 7-8 per cent in the following few years for creating the 500,000 new job opportunities needed annually to meet the growing ranks of the workforce entering the market every year (Ministry of Planning 1998; World Bank 1998).

Finally, two other points should be considered, as they are vital for the Egyptian economy: the exchange rate and the tax incentive system. It has been noticed that there

is a recent shortage of US dollars in Egypt. The central bank reserves fell significantly from US\$ 20.12 billion in March 1998 to just US\$ 17.6 billion in September 1999. The multinationals now prefer to keep their money in major foreign currencies despite interest rates on the Egyptian pound being approximately 5 per cent higher than the average rate on major currencies. The problem here is exchange rate risks that could deter foreigners from investing in Egypt.

The other crucial point is related to investment incentives, particularly the tax holiday, which seems to give foreign investment more advantage compared with local incentives. Of course, it might be considered that this will attract more foreign investment to the country, but over a long period of time, this will definitely be harmful for the Egyptian companies. Given that foreign investment has more tax incentives, the costs of products will be lower in comparison to those produced by the Egyptian companies. Furthermore, competition will not be fair, and local companies will be ousted from the market in the long run.

## **6 Summary and conclusion**

Under the economic reform programme umbrella, Egypt enjoyed a positive economic climate as its total external debt declined from US\$ 49.2 billion in 1990/1 to US\$ 26.6 billion in 1997/8 due to debt forgiveness. Within the same period, its total external debt-to-GDP ratio declined from 151 per cent to only 37.7 per cent.

Using logistic regression to test for a structural break in the macroeconomic variables, the results indicate that these variables witnessed a significant improvement after the introduction of this programme except for the real GDP growth rate, which may have been due to tight monetary and fiscal policy at the beginning of the programme. Again, Egypt needs to raise saving and investment ratios and to narrow the gap in the trade balance in order to accelerate the rate of growth. Generally speaking, the results have supported the view that the Egyptian government succeeded in implementing its economic reform programme.

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