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THE SPILLOVER EFFECTS OF THE GLOBAL FINANCIAL CRISIS ON ECONOMIC ACTIVITY IN EMERGING ECONOMIES – INVESTIGATING THE EGYPTIAN CASE USING THE FINANCIAL STRESS INDEX

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Abstract

The global financial crisis of 2007 raised concerns about spillover effects to economic activity in emerging market economies. Economic theory suggests that there are a number of channels through which spillovers of a crisis are transmitted from one economy to another, most importantly the trade channel, the investment channel and the banking sector. This paper quantifies the magnitude of spillover effects of the global financial crisis to economic activity in Egypt through calculating Egypt's financial stress index (FSI), then fitting it in the VAR analysis to investigate spillovers of financial stress and economic activity of trade partners to economic activity in Egypt. Findings are consistent with economic theory as well as empirical literature in the sense that increased financial stress, lower economic activity in Egypt's main trade partners along with elevated oil and commodity prices during the global financial crisis imposed adverse spillovers on Egypt's real GDP growth figures and projections. However, the impact of the slowdown in Egypt's main trade partners' economic activity accounted for the largest magnitude and the longest durability of the adverse financial crisis spillovers to the Egyptian economy. The paper, thus, concludes with relevant policy implications.

JEL Classification: C22, C43, E66.

Keywords: Spillover, financial stress, Egypt.

ملخص

أثارت الأزمة المالية العالمية عام 2007 المخاوف بشأن الآثار غير المباشرة على النشاط الاقتصادي في اقتصادات السوق الناشئة. النظرية الاقتصادية تشير إلى أن هناك عددا من القنوات التي من خلالها يتم نقل الآثار غير المباشرة للأزمة من اقتصاد إلى آخر، وأهمهم قنوات التجارة والاستثمار والقطاع المصرفي. تقدر هذه الورقة الحجم الكمي للآثار غير المباشرة للأزمة المالية العالمية على النشاط الاقتصادي في مصر من خلال حساب مؤشر مصر الضغوط المالية(FSI) ، ثم ادماجه في التحليل VAR للتحقيق في الآثار غير المباشرة من الضغوط المالية والنشاط الاقتصادي للشركاء التجاريين للنشاط الاقتصادي في مصر. تتفق النتائج مع النظرية الاقتصادية وكذلك الأدب التجريبي، بمعنى أن زيادة الضغوط المالية، ونشاط اقتصادي أقل لشركاء مصر التجاريين الرئيسيين مع وارتفاع أسعار النفط والسلع الأساسية خلال الأزمة المالية العالمية فرضت الآثار غير مباشرة وسلبية على أرقام نمو الناتج المحلي الإجمالي الحقيقي والمتوقع فى مصر. ومع ذلك، ساهم التباطؤ في نشاط شركاء مصر التجاريين الرئيسيين فى أكبر حجم و أطول قوة التحمل لآثار الأزمة المالية السلبية الغير مباشرة على الاقتصاد المصري. وبالتالي تخلص الورقة الى الآثار المترتبة على السياسات ذات الصلة.

1. Introduction

In 2007, the world economy was hit by the global financial crisis which originated in the United States when top subprime mortgage lenders, commercial and investment banks started to file for bankruptcy. The turmoil unleashed by the crash in the global credit and equity markets was reflected on real GDP growth figures and projections. Figure 1 demonstrates that world output shrank at a rate of 0.9 percent in 2009 compared to a three percent growth in 2008. The financial crisis aggressively dampened economic activity in advanced economies, where output contracted by 3.2 percent in 2009 compared to an expansion of 0.5 percent in 2008. In parallel, emerging and developing economies recorded an average growth rate of output of 2.4 percent in 2009 down from 6.1 percent in 2008, indicating that these economies were relatively insulated from the immediate repercussions of the global financial crisis, however this insulation barely lasted.

Egypt's GDP recorded an annual growth rate of 4.7 percent in 2009 compared to 7.2 percent in 2008 (Figure 1). Robust growth performance was sustained until the third quarter of 2008, where the Egyptian economy grew at 7.5 percent and 6.8 percent during the first and second quarters of 2008, respectively (Figure 2). This strong growth performance was achieved despite the unfavorable developments on the international front, most notably the global economic slowdown and the unprecedented increases in the prices of energy, minerals and basic commodities. However, the Egyptian economy started to witness a slowdown in GDP growth momentum in the third quarter of 2008, where GDP growth rate stood at 5.8 percent compared to 6.5 percent during the corresponding period in 2007. The slowdown reflected the unfavorable developments on the international front, most notably the global economic slowdown in response to the turmoil unleashed by the crash of the global credit and equity markets. The Egyptian economy embarked on its journey to recovery at the beginning of 2009.

This paper constructs a composite financial stress index as a measure of the level of financial stress in the Egyptian economy. Whilst financial stress indices have proven to be efficient in capturing some aspects of the financial market stress in advanced economies, they have yet failed to measure stress in emerging economies for several reasons, the most important of which is that long-term consistent data does not usually exist for emerging economies. To deal with this limitation, many empirical studies have lately been trying to calculate financial stress in emerging economies through tracking a bunch of financial indicators over time; nevertheless the majority of these studies have addressed no more than one financial sector (see Chan-Lau 2010 and Barajas et al. 2010). In its April 2009 World Economic Outlook (WEO), the IMF presented a FSI which is designed specifically to measure the level of financial market stress in emerging economies. The intuition behind the FSI for emerging economies (EM-FSI) is that it uses price movements relative to past trends as a proxy for the level of financial strain in markets. It overcomes the problem of data limitation in emerging economies by saving the degree of freedom in models used for empirical analysis. The EM-FSI was first presented in Chapter 4 of the IMF's April 2009 World Economic Outlook (WEO) to study the transmission of financial stress from advanced to emerging economies.

We first construct the EM-FSI for Egypt, which we then use in the Vector Autoregression (VAR) analysis to empirically investigate the spillover effects of the global financial crisis to economic activity in emerging economies, taking Egypt as a case study.

The paper is divided into five sections. Section 2 presents data sources used in the paper. Section 3 introduces the methodology. Section 4 discusses the results. Section 5 concludes with relevant policy issues.

2. Data

2.1 The Financial Stress Index (FSI)

Data required to calculate Egypt's FSI is obtained from Bloomberg, the IMF's IFS database and J.P. Morgan (Table 1). Calculations of Egypt's FSI follow Chapter 4 in the IMF WEO (April 2009) on the methodology used to construct the index for emerging economies.

2.2 The VAR Model

To deduce our conclusions regarding how financial stress and slowdown in economic activity in advanced economies have affected the Egyptian economy during and post the global financial crisis, this paper relies on quarterly data from Q3 2001 to Q3 2009 for five economic and financial variables which are: Egypt real GDP growth, Egypt's FSI (Figure 5), real GDP growth of Egypt's main trade partners (the United States, the European Union and China), commodity prices change and oil prices change. The rationale behind using quarterly data (versus annual data) is to obtain more data points and larger degrees of freedom. Monthly data could not be used because the Egyptian Ministry of Economic Development publishes the real GDP growth figures on a quarterly basis only.

As illustrated in Section 2.1, data required to calculate Egypt's FSI was obtained from Bloomberg, the IMF IFS database and J.P. Morgan. Data on real GDP growth of Egypt's main trade partners was obtained from Chapter 1 in the IMF WEO (April 2010). Commodity and oil price changes were calculated based on data from the 2010 IMF WEO database. A brief description of each variable used is presented in Table 2.

3. Methodology

3.1 The Financial Stress Index (FSI)

The EM-FSI is a composite index of five equally-weighted[1] components: the "banking sector" beta, stock market returns, time-varying stock market return volatility, sovereign debt spreads[2] and an exchange market pressure index (EMPI). These five components cover three financial sectors, as illustrated in Table 1. Each variable is standardized: de-meaned[3] and divided by its standard deviation. The normalized components are then summed up to yield the index. A value of zero indicates a neutral condition – on average – across the three segments of financial markets. A positive value of the EM-FSI signals the presence of financial strain (i.e. prices of the time period in question are above past levels). A value of 1 implies that there is a standard deviation of scale 1 from average financial conditions across the markets, whereas a value of 1.5 or greater has constantly been observed during the presence of a financial crisis.

EM-FSI = BETA + STOCK RET + STOCK VOL + SOV SPR + EMPI

where:

I. The "banking sector" beta (BETA) is estimated from the standard capital asset pricing model (CAPM), and is estimated as follows:

II. $$\beta_{i,t} = \frac{Cov\,(r_{i,t}^{M}, r_{i,t}^{M})}{\sigma_{i,M}^{2}},$$

1 There is no meaningful rationale for assigning different weights to the components of the index. To overcome this problem (we must sum up the components to construct the index), each component is first standardized before the adding up process.

2 Vernimmen et al (2005) defines the sovereign spread as the difference between bond yields issued on international markets by the country in question versus those offered by governments with AAA ratings, i.e. it is a measure of the degree of riskiness of lending to this country (or its cost of borrowing).

3 Each variable is de-meaned by subtracting its arithmetic mean.

III. where r denotes the year-on-year banking sector returns, computed over a 12-month rolling window.[4] As implied by the CAPM, a value of beta greater than 1 indicates that the banking sector is relatively risky[5], which raises the alarm that a banking crisis might arise.

IV. Stock market returns (STOCK RET) are calculated as the year-on-year change in the stock market index (e.g. EGX 30 Index[6] in the case of Egypt) multiplied by minus 1 to denote that increased securities market-related stress is accompanied by a decline in equity prices.

V. Stock market volatility (STOCK VOL) is calculated as the 6-month (backward looking) moving average of the squared month-on-month growth rate. A greater value of STOCK VOL indicates escalating financial uncertainty in an economy.

VI. Sovereign debt spreads (SOV SPR) is calculated as the bond yield minus the 10-year United Stated Treasury yield based on the J.P Morgan EMBI Global spreads. An increase in the value of sovereign spreads signifies increased external default risk of a country.

VII. The exchange markets pressure index (EMPI) captures depreciations of the exchange rate and declines in international reserves. The EMPI of country *i* at time *t* is calculated as follows:

$$EMPI_{i,t} = \frac{(\Delta e_{i,t} - \mu_{i,\Delta e})}{\sigma_{i,\Delta e}} - \frac{(\Delta RES_{i,t} - \mu_{i,\Delta RES})}{\sigma_{i,\Delta RES}},$$

where Δe and ΔRES denote the month-on-month percent changes in the nominal exchange rate vis-à-vis an anchor currency and total reserves minus gold, respectively. The symbols μ and σ denote the mean and the standard deviation, respectively, of the relevant series. EMPI increases/declines as the exchange rate depreciates/appreciates and as the reserves decline/increase.

3.2 The VAR Model

This section builds on the EM-FSI, calculated in Section 3.1, to examine how financial stress and slowdown in economic activity in advanced economies have affected the Egyptian economy during and post the global financial crisis.

Economic theory suggests that there are numerous channels through which the spillovers of a crisis are transmitted from one economy to another. Key supply-side and demand-side channels include the exchange rate channel, the trade channel (exports demand), the investment channel (foreign direct and portfolio investments), the banking sector and remittances. Therefore, adverse spillovers to the Egyptian economy can take place through a collapse in export demand for Egyptian goods and services, a decline in remittance inflows from Egyptian immigrants (Barajas et al. 2010) and a sudden drop of capital inflows (foreign direct investment, portfolio investment and bank loans) (Ghosh et al. 2009). The impact of the previous channels on the Egyptian economy can be measured by estimating how Egypt's GDP responded to the slowdown of its trade partners' economic activity and increased financial stress in advanced economies.

Since we are interested in investigating the dynamic impact of random shocks (i.e. the global financial crisis) on a system of macroeconomic variables, the analysis of this paper will rely on the unrestricted VAR model to estimate Egypt's GDP response to global financial crisis.

4 The rolling window analysis is carried out as follows: first a window length (e.g. one year) is selected, and it is moved forward (e.g. two months at a time). One period of observation is added at a time and an initial period of observation is dropped such that the length of the window is fixed and "rolls forward" over time.

5 As elaborated by the IMF technical description of the EM-FSI, riskiness is due to the fact that banking stocks move more than proportionately with the overall stock market.

6 EGX 30 Index, previously named CASE 30 Index, is defined by the Egyptian Exchange as an index of the most actively traded 30 listed stocks. It is a market capitalization weighted index.

$$g_t^y = \alpha_i + \beta FSI_t + \sum_j \delta_j g_t^{Tr} + \sum_k \theta_k X_t^k + \varepsilon_t$$

where:

g_t^y = Egypt real GDP growth (year-on-year) at period t

FSI_t = Egypt's FSI at period t

g_t^{Tr} = real GDP growth (year-on-year) at period t of Egypt's main trade partners

X_t^k = a vector of control variables (year-on-year oil and commodity prices change)

The VAR model above summarizes the key channels by which spillover effects of the global financial crisis are transmitted to the Egyptian economy given the fact that the EM-FSI summarizes the spillovers to a number of markets, namely the banking sector, the stock market, the bond market and the exchange market. Note that the spillovers through the trade channel are accounted for by the EMPI.

Prior to estimating the VAR model specified above, we start our analysis by testing for stationarity using both the Augmented Dickey-Fuller (ADF) Unit Root test and the Phillips-Perron (PP) Unit Root test. The lag structure of the VAR model is determined using the Akaike Information Criterion (AIC) and the Schwarz Information Criterion (SIC). Moreover, to ensure that the VAR model is well specified, we review the results of some specification tests for the model, namely the VAR Residual Serial Correlation LM test, the VAR Residual Normality test and the VAR Residual White Heteroskedasticity test.

4. Results

4.1 The Financial Stress Index (FSI)

We can rely on the IMF's definition of EM-FSI to capture some of the key channels of transmitting financial spillovers of the global financial crisis to emerging economies in general and to Egypt in particular. Figure 3 aggregates FSIs on a regional level covering the period July 2001 to September 2009. Financial stress has been relatively neutral, on average, until July 2007 (Latin American Economic Crisis 2002). In August 2007, financial stress in advanced economies exhibited a sharp increase due to the negative spillovers of the subprime mortgage crisis in the United States, which tightened credit around the world. Whilst financial stress in emerging economies has remained relatively neutral until January 2008, it increased significantly after May 2008 in all regions. Figure 3 demonstrates the presence of a considerable correlation between FSIs across the world; which have become even more obvious during the post-crisis period, where we can detect a general upward trend exhibited by regional FSIs. A general downward trend can be detected after February 2009.

The correlation between FSIs can as well be detected on a country level as illustrated in Figure 4, which reveals that increased financial stress in the Egyptian economy has apparently been following the footsteps of the United States' economy, whereby the sharp increase in financial stress in the United States after October 2007 was followed by a parallel – but a lagged – increase in Egypt after June 2008. A weaker correlation can be observed between financial stress in Egypt and in advanced economies.

Figure 5 plots Egypt's FSI disaggregated into its components covering the period July 2001 to September 2009. The Figure suggests that the key source which accounted for the increased financial stress in the Egyptian economy in each sub-period since June 2008 was as follows:

June – July 2008: stock market returns volatility

August – September 2008: the banking sector

October 2008: stock market returns volatility

November 2008 – April 2009: stock market returns

4.2 The VAR Model

Economically meaningful Granger's causalities, impulse responses and variance decompositions are considered, drawing particular attention to GEG and FSEG for the purpose of this paper. The VAR estimation output (Table 6) will not be discussed due to the difficulty in interpretation. Moreover, the significance of the model coefficients (i.e. interactions between the variables) is usually affected by many factors such as the lag length selected and the number of variables included in the model. However, it is worth mentioning that the VAR estimation output indicates that the model has relatively good statistical properties (Table 7).

4.2.1 Granger Causality

Granger causality implies that lagged values of a variable provide statistically significant information to predict another variable. Granger causality tests examine the presence of correlation between the current value of one variable and the lagged values of other variables in the system. In addition, Granger causality tests can be used to decide whether a particular variable can be treated as exogenous (i.e. not affected by any variables in the model).

The results of both the VAR Pairwise Granger Causality/Block Exogeneity Wald test and the Pairwise Granger Causality test suggest that GEU Granger causes FSEG. This is an interesting result which provides evidence of the lagged impact of the overall slowdown of the economic activity in Europe on increasing financial stress in Egypt. We suggest that the key transmission channel of Europe slowdown to the Egyptian economy is the trade links. Egyptian exports to the European Union (EU) declined dramatically post the onset of the global financial crisis due to the decline in the European private consumption demand (Figure 6). In parallel, Egyptian imports from its main European trade partners did not decline significantly during the period in question, constituting a further pressure on the Egyptian exchange rate.

However, the null hypothesis that FSEG, GUS, GEU, GCH, OILP and COMP do not Granger cause GEG cannot be rejected. Likewise, the null hypothesis that GEG, GUS, GEU, GCH, OILP and COMP do not Granger cause FSEG cannot be rejected at 5 percent significance level (Tables 3 and 4). The failure to reject the null hypothesis is not considered an alarming signal because Granger causality tests may generate misleading results when the relationship involves two or more variables (i.e. if both the first and second variables are driven by the past values of a third variable).

Causality tests do not indicate the sign of the relations between variables and the duration of the effect. Therefore, the paper proceeds to perform impulse responses and variance decompositions.

4.2.2 Impulse Response Functions

An impulse response function traces both direct and indirect effects of a shock to one variable on current and future values of all of the endogenous variables in the VAR model (i.e. the responses of all variables to innovations/impulses generated for a specific variable).

Figure 7 represents the GEG impulse response functions to Cholesky one standard deviation innovations in GEG, FSEG, GUS, GEU, OILP and COMP. Consistent with economic theory, the initial response of GEG to a positive shock in FSEG is negative. The largest negative effect takes place in both the second and the third quarters. The negative effect fades away

completely at the beginning of the fifth quarter, indicating that the negative impact of a financial crisis on the real side of the Egyptian economy does not persist[7].

The previous result of the GEG impulse response function is consistent with what actually took place in the Egyptian economy, where right after the outbreak of the global financial crisis, many investors hastily exited from the Egyptian Exchange[8]. This financial panic gradually eased away as uncertainty fell. In parallel, financial stress on the exchange rate front also eased away basically due to the gradual recovery in the global consumption demand. Note that the crisis did not result in any Egyptian bank failures.

The Egyptian economy has been relatively stable since the 1990s thanks to the aggressive structural reforms including massive external debt relief, market-oriented fiscal and monetary policies, privatization and the new business regulatory framework. That is the reason why adverse spillovers of the increased financial stress post the financial crisis did not persist in Egypt unlike other emerging economies.

Contrary to the initial response of GEG to a shock in FSEG, the initial response of GEG to a positive shock in GUS, GEU and GCH was positive. This positive effect reached its peak during the second quarter before it started to vanish. Although the positive response of GEG to a shock in GUS took place prior to the response of GEG to a shock in GEU, the favorable effect tended to last longer in the case of GEU, reflecting the deep economic relations between Egypt and Europe, especially after the launch of the Euro-Mediterranean Partnership by the Barcelona Declaration of 1995. Although Egypt and the United States have lately witnessed an increasing level of economic cooperation, it is worth mentioning that the relation between the two countries remains political at first place.

One interesting result is that the response of GEG to a positive shock in GUS, GEU and GCH turned to be negative during the four quarters which preceded the fading out of the effect of the shock. One possible explanation for this negative response of GEG is that the earlier positive response of GEG induced inflation which persisted for a number of quarters until interest rates were raised enough to control it.

Consistent with economic theory, the initial response of GEG to a positive shock in OILP and COMP was negative. This negative response persisted for three quarters followed by a slight positive response before the effect of the shock finally started to fade away at the beginning of the sixth quarter through supply (e.g. production) and demand (e.g. imports) adjustments to higher prices.

The discussion above suggests that the slowdown in Egypt's main trade partners' economic activity accounted for the largest share of the adverse financial crisis spillovers to the Egyptian economy. Moreover, these spillovers lasted the longest.

4.2.3 Variance Decomposition

While impulse response functions trace the responses of all endogenous variables to innovations in one endogenous variable, variance decompositions indicate the relative importance of each random innovation in affecting the variables in the system. Thus, variance decompositions determine the proportion of the variance of the forecast error for any variable in the system that is explained by innovations in other endogenous variable by breaking down the forecast error variance for each variable into its components.

The variance decomposition results for GEG presented in Table 5 with 1-, 4-, 8-, 12-, and 16-quarter time horizon suggest that all of the forecast error variance for GEG was accounted for by itself in the first quarter. This proportion decreased gradually until it reached 90 percent in the 16th quarter, whereas 10 percent of the overall forecast error variance for GEG was

7 This is in contrast to the repercussions of a negative productivity shock which tend to persist for a longer period of time.

8 The Egyptian Exchange is the formal name of Egypt's stock market.

accounted for by innovations in FSEG, GUS, GEU, GCH, OILP and COMP combined. While FSEG explained 2.5 percent of the variance for GEG in the 16th quarter, GUS, GEU and GCH combined explained 3 percent of the variance for GEG.

Unlike the variance decomposition results for GEG, the results for FSEG suggest that 79.2 percent of the forecast error variance for FSEG was accounted for by itself in the first quarter. This proportion decreased dramatically starting from the second quarter until it reached 61.3 percent in the 16th quarter, whereas 39.7 percent of the overall forecast error variance for FSEG was accounted for by innovations in GEG, GUS, GEU, GCH, OILP and COMP combined. GEG and COMP explained 23.6 percent and 8.0 percent, respectively, of the variance for FSEG in the 16th quarter.

Conclusions deduced from variance decompositions analysis are consistent for the largest part with the findings of the impulse responses analysis.

5. Conclusion

This paper empirically investigates the spillover effects of the global financial crisis on economic activity in Egypt. Given the lack of literature on the spillovers at a country level, the main contribution of this paper is to quantify the magnitude of these spillovers in the Egyptian case. The findings of the paper are consistent with economic theory as well as literature in the sense that increased financial stress, lower economic activity in Egypt's main trade partners along with elevated oil and commodity prices during the global financial crisis had adverse spillovers on Egypt's real GDP growth figures and projections. Nevertheless, the impact of the slowdown in Egypt's main trade partners' economic activity has accounted for the largest magnitude and the longest durability of the adverse financial crisis spillovers to the Egyptian economy as suggested by impulse responses' findings. Conclusions deduced from variance decompositions analysis are consistent for the largest part with the findings of the impulse responses analysis.

An understanding of the mechanisms by which the global financial crisis was transmitted from Egypt's main trade partners to the Egyptian economy has significant policy implications. Three policy lessons are deduced:

(1) The fact that the key source which accounted for the increased financial stress in the Egyptian economy is stock market returns volatility implies that risk-sharing mechanisms should be introduced. In this context, financial innovation and integration are of high relevance. Moreover, financial regulation and supervision should target hedging financial risks.

(2) Vulnerabilities of the Egyptian economy, mainly represented in the lack of trade diversification and the widening external imbalances, deepened the adverse crisis spillovers to the Egyptian economy. Diversification of Egyptian exports along with building up the reputation of Egyptian exporting firms through raising productivity and knowledge are of crucial importance.

(3) The particularly strong link between the slowdown in Egypt's main trade partners' economic activity and adverse financial crisis spillovers to the Egyptian economy suggests that we can rely on trade to spur growth of the Egyptian economy during its recovery in parallel to spurring domestic demand.

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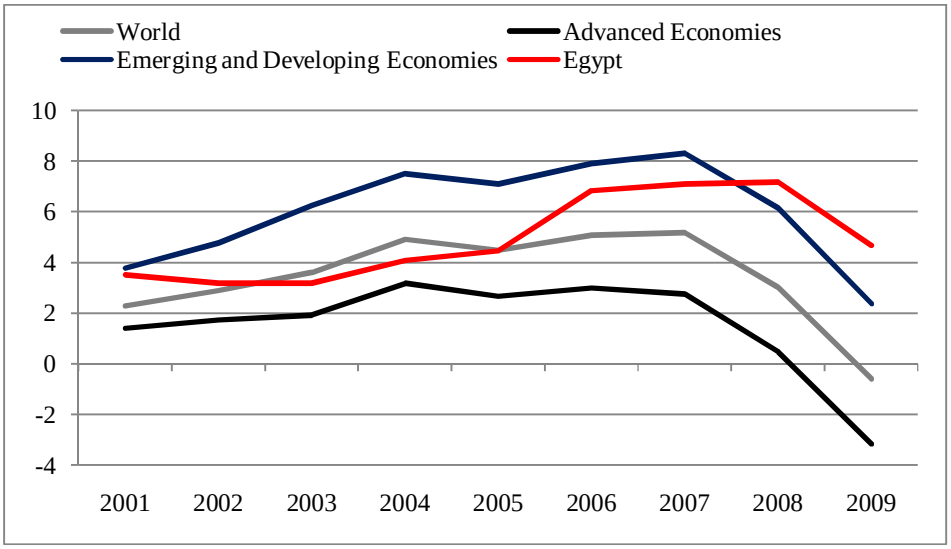
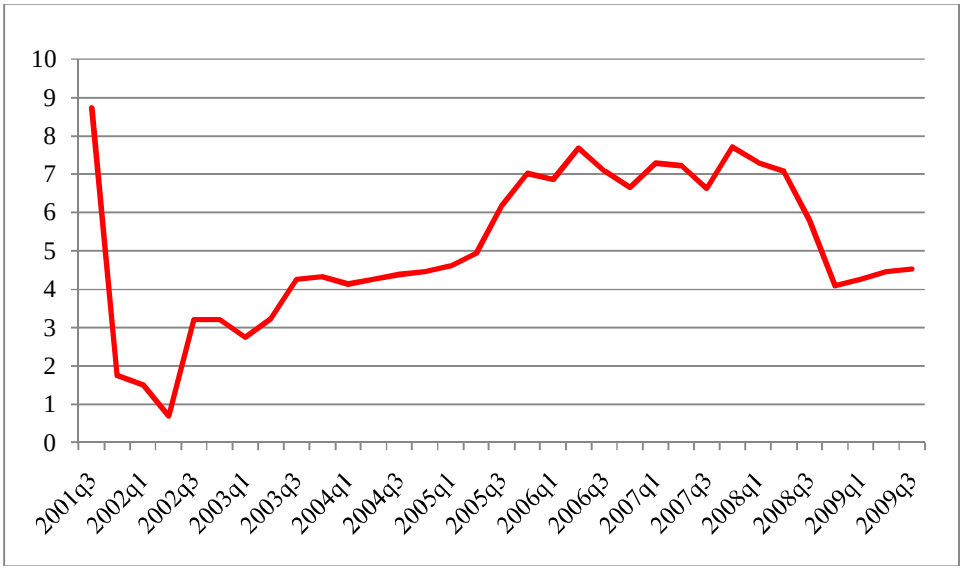
Figure 1: Real GDP Growth (Year-on-Year) (2001 – 2009)



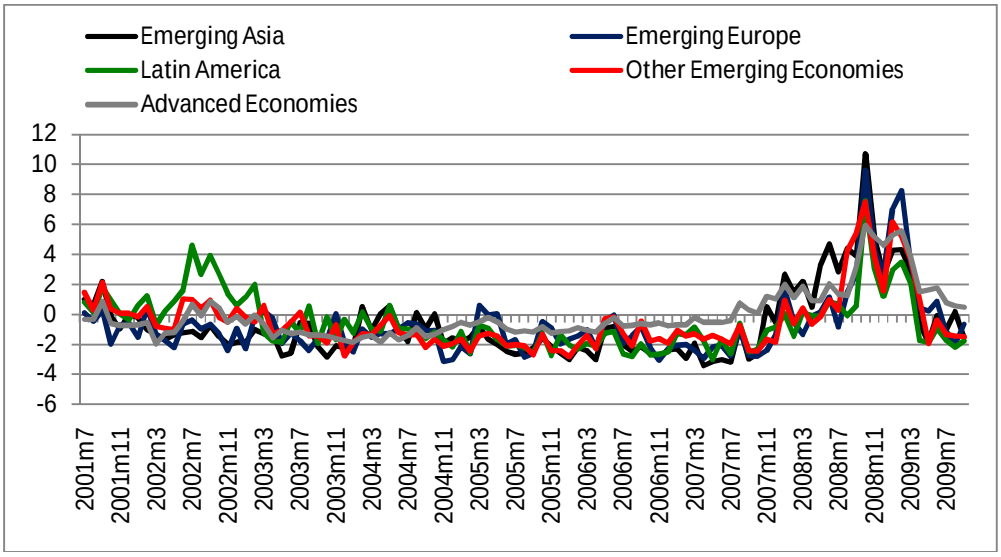
Source: World Economic Outlook

Figure 2: Egypt Quarterly Real GDP Growth (Year-on-Year) (Q3 01 – Q3 09)



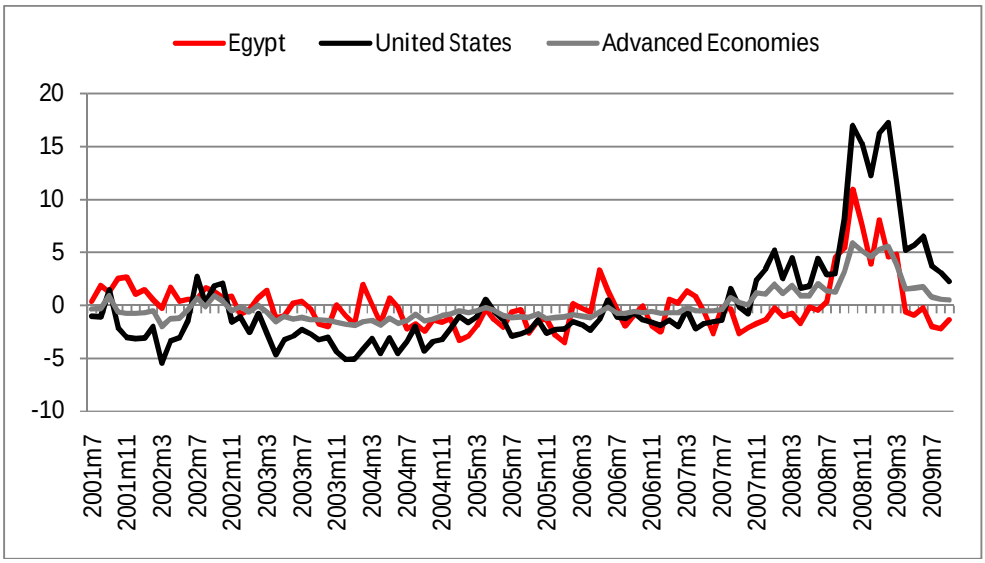
Source: Egyptian Ministry of Economic Development

Figure 3: FSI – Regional Aggregations (Jul 01 – Sep 09)



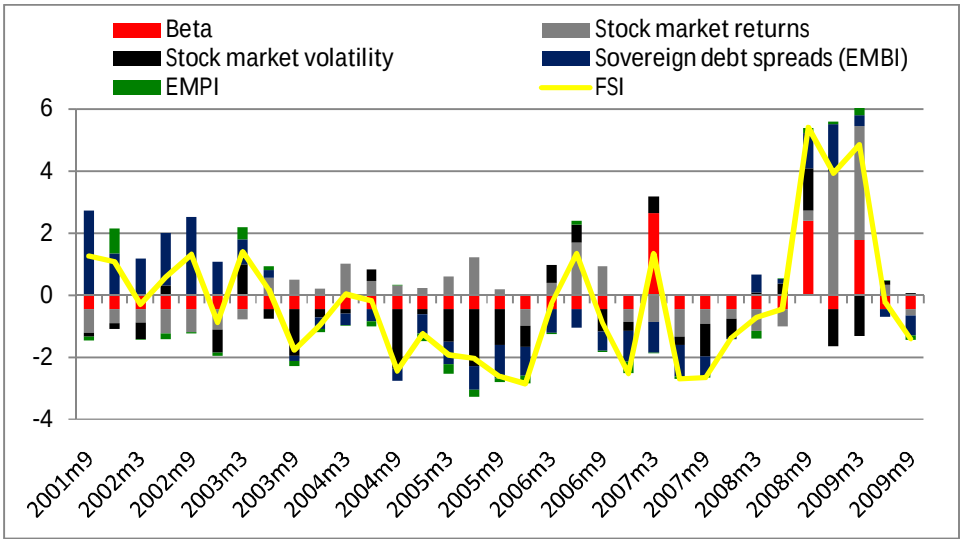
Source: IMF Database

Figure 4: FSIs of Egypt, the United States and Advanced Economies (Jul 01 – Sep 09)



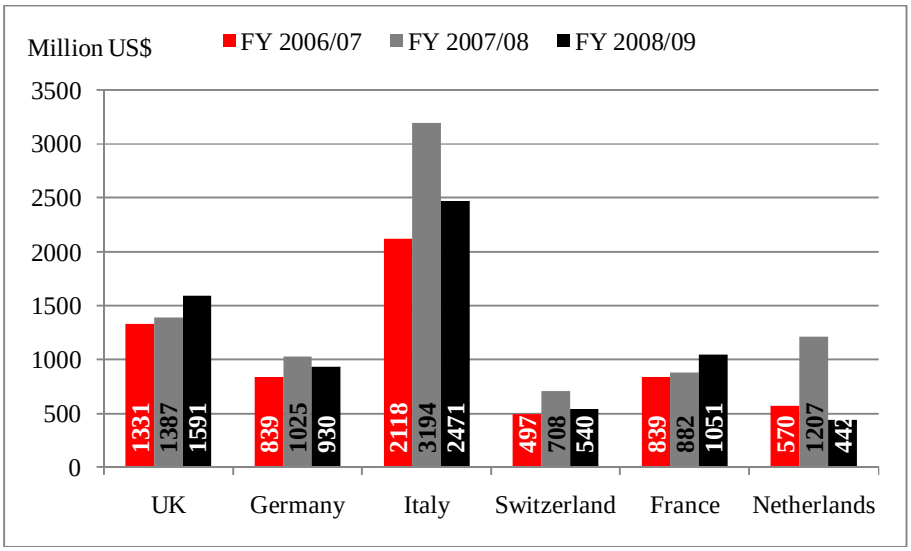
Source: The FSI series for advanced economies and the United States was obtained from the IMF database. Egypt's FSI was calculated based the IMF's definition of EM-FSI, and relying on data from Bloomberg, International Financial Statistics (IFS) and J.P. Morgan.

Figure 5: Egypt's FSI Disaggregated into its Components (Jul 01 – Sep 09)



Source: Calculated based the IMF's definition of EM-FSI, and relying on data from Bloomberg, International Financial Statistics (IFS) and J.P. Morgan. The FSI is disaggregated to its components at the end of each quarter.

Figure 6: Egypt's Volume of Exports to its Main European Trade Partners (FY 2006/07 – FY 2008/09)



Source: Central Bank of Egypt

Figure 7: Response of GEG to One Standard Deviation Innovations

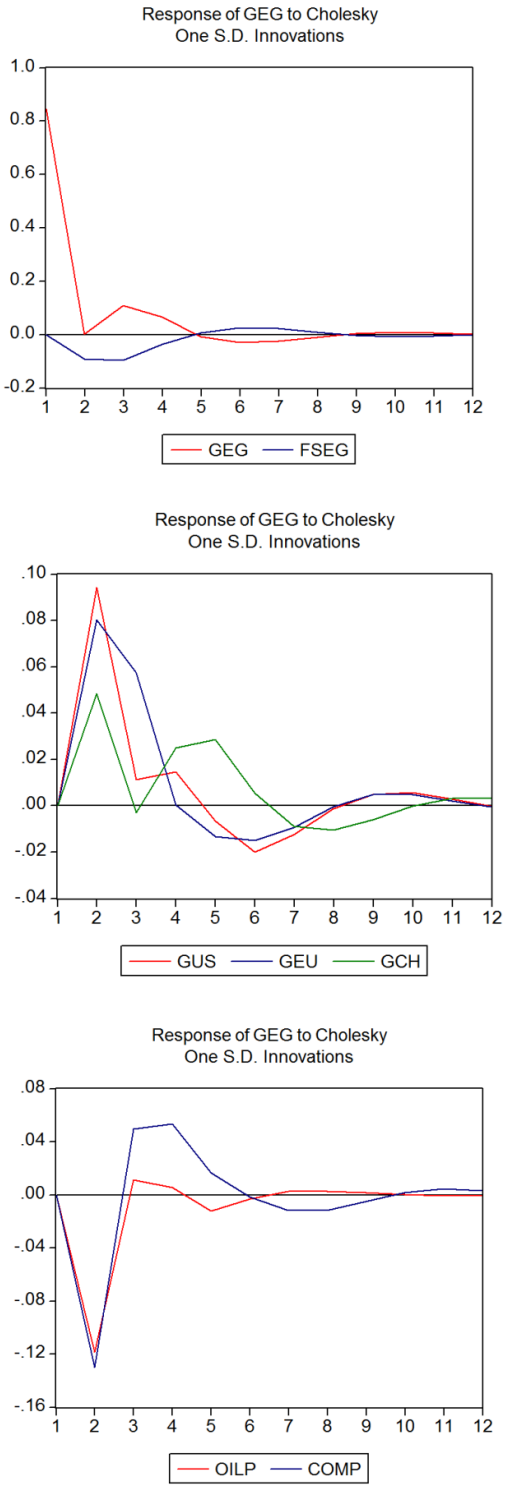


Table 1: Composition of the IMF's EM-FSI

Financial Sector	Variable	Concept	Description	Units	Source
Banking sector	BETA	"Banking sector" beta	12-month rolling beta of bank stock index	Capital asset pricing model (CAPM) beta	Bloomberg, International Financial Statistics (IFS)
Securities markets	STOCK RET	Stock market returns	Monthly stock returns measured as declines	Index	Bloomberg, International Financial Statistics (IFS)
	STOCK VOL	Time-varying stock market return volatility	Six-month rolling monthly squared stock returns	Rate	Bloomberg, International Financial Statistics (IFS)
	SOV SPR	Sovereign debt spreads	J.P. Morgan Emerging Markets Bond Index (EMBI)[9]	Index	J.P. Morgan EMBI Global spreads
Foreign exchange markets	EMPI	Exchange market pressure index	An index calculated to capture depreciations of the exchange rate and declines in international reserves	Index	International Financial Statistics (IFS)

Table 2: Variable Description

Variable	Concept	Description	Units	Source
GEG	Egypt GDP growth	Real GDP growth (quarterly percent change from one year earlier) of Egypt	Rate of change	Egyptian Ministry of Economic Development
FSEG	Egypt's FSI	The EM-FSI (Section 3.1)	Index	Calculated based on data from Bloomberg, the IMF IFS database and J.P. Morgan
GUS, GEU, GCH	Growth rates of the United States, the European Union and China, respectively	Real GDP growth (quarterly percent change from one year earlier) of Egypt's main trade partners: the United States, the European Union and China	Rate of change	April 2010 IMF WEO (Chapter 1)
OILP COMP	Year-on-year oil prices change and commodity prices change	Change in oil prices = Change in Average Petroleum Spot index of UK Brent, Dubai, and West Texas Change in commodity prices = Change in Non-Fuel Primary Commodities index (2005=100)	Rate of change	Calculated based on data from the April 2010 IMF WEO database

9 As defined by J.P. Morgan, EMBI Global is an index which tracks total returns for U.S. dollar-denominated debt instruments issued by emerging markets' sovereign and quasi-sovereign entities, including Brady bonds, loans and Eurobonds.

Table 3: VAR Pairwise Granger Causality/Block Exogeneity Wald Tests

Exclude		Dependent Variable	
		GEG	FSEG
GEG	Chi-sq		0.059
	Prob.		0.808
FSEG	Chi-sq	0.329	
	Prob.	0.566	
GUS	Chi-sq	0.283	0.195
	Prob.	0.595	0.658
GEU	Chi-sq	1.759	7.378
	Prob.	0.185	0.007
GCH	Chi-sq	0.037	1.414
	Prob.	0.848	0.235
OILP	Chi-sq	0.103	0.173
	Prob.	0.103	0.677
COMP	Chi-sq	0.854	3.440
	Prob.	0.356	0.064
All	Chi-sq	3.067	8.967
	Prob.	0.800	0.175

Table 4: Pairwise Granger Causality Test (10 Lags)

Null Hypothesis:	F-Statistic	Probability
FSEG does not Granger Cause GEG	54.865	0.105
GUS does not Granger Cause GEG	0.779	0.716
GEU does not Granger Cause GEG	478.919	0.036
GCH does not Granger Cause GEG	0.935	0.675
OILP does not Granger Cause GEG	0.114	0.986
COMP does not Granger Cause GEG	5.004	0.336
GEG does not Granger Cause FSEG	0.500	0.812
GUS does not Granger Cause FSEG	34.941	0.131
GEU does not Granger Cause FSEG	1.909	0.514
GCH does not Granger Cause FSEG	8.912	0.255
OILP does not Granger Cause FSEG	1.460	0.573
COMP does not Granger Cause FSEG	1.317	0.596

Table 5: Variance Decomposition of GEG and FSEG

Variable Explained	Quarter	By Innovation in (%)						
		GEG	FSEG	GUS	GEU	GCH	OILP	COMP
GEG	1	100.000	0.000	0.000	0.000	0.000	0.000	0.000
	4	90.448	2.343	1.139	1.204	0.369	1.752	2.744
	8	90.011	2.481	1.206	1.257	0.494	1.761	2.792
	12	89.972	2.495	1.213	1.262	0.500	1.760	2.797
	16	89.968	2.497	1.214	1.263	0.501	1.760	2.797
FSEG	1	20.817	79.183	0.000	0.000	0.000	0.000	0.000
	4	23.455	62.736	2.005	2.271	1.170	0.688	7.675
	8	23.546	61.412	2.204	2.366	1.745	0.728	7.999
	12	23.555	61.303	2.220	2.377	1.787	0.729	8.030
	16	23.556	61.294	2.222	2.378	1.790	0.729	8.032

Table 6: VAR Estimation Output

		GEG	FSEG	GUS	GEU	GCH	OILP	COMP
GEG(-1)	Coefficients	0.008	-0.059	-0.146	0.052	-0.126	-1.982	-0.017
	Std. Errors	-0.109	-0.244	-0.082	-0.059	-0.127	-3.402	-1.071
	T-statistics	[0.074]	[-0.243]	[-1.783]	[0.873]	[-0.992]	[-0.583]	[-0.016]
FSEG(-1)	Coefficients	-0.055	0.054	-0.212	-0.200	-0.228	-2.099	-1.659
	Std. Errors	-0.095	-0.213	-0.072	-0.052	-0.111	-2.971	-0.935
	T-statistics	[-0.574]	[0.255]	[-2.963]	[-3.876]	[-2.054]	[-0.707]	[-1.775]
GUS(-1)	Coefficients	0.144	0.268	0.267	0.270	0.070	11.833	4.270
	Std. Errors	-0.271	-0.606	-0.203	-0.147	-0.316	-8.443	-2.657
	T-statistics	[0.532]	[0.442]	[1.313]	[1.838]	[0.222]	[1.402]	[1.607]
GEU(-1)	Coefficients	0.415	1.901	0.080	0.037	-0.344	-5.614	-3.105
	Std. Errors	-0.313	-0.700	-0.235	-0.169	-0.364	-9.743	-3.066
	T-statistics	[1.326]	[2.716]	[0.342]	[0.220]	[-0.945]	[-0.576]	[-1.013]
GCH(-1)	Coefficients	-0.036	-0.493	0.205	0.099	0.263	4.731	2.097
	Std. Errors	-0.185	-0.415	-0.139	-0.100	-0.216	-5.775	-1.817
	T-statistics	[-0.192]	[-1.189]	[1.474]	[0.990]	[1.219]	[0.819]	[1.154]
OILP(-1)	Coefficients	-0.003	0.008	-0.010	-0.002	-0.005	-0.050	-0.068
	Std. Errors	-0.009	-0.019	-0.006	-0.005	-0.010	-0.269	-0.085
	T-statistics	[-0.321]	[0.416]	[-1.614]	[-0.491]	[-0.489]	[-0.184]	[-0.808]
COMP(-1)	Coefficients	-0.026	-0.118	0.008	0.030	0.028	0.413	0.293
	Std. Errors	-0.028	-0.064	-0.021	-0.015	-0.033	-0.887	-0.279
	T-statistics	[-0.924]	[-1.855]	[0.376]	[1.956]	[0.843]	[0.465]	[1.049]
C	Coefficients	0.179	0.258	-0.086	-0.110	-0.016	0.036	-0.274
	Std. Errors	-0.164	-0.366	-0.123	-0.089	-0.191	-5.100	-1.605
	T-statistics	[1.094]	[0.704]	[-0.700]	[-1.236]	[-0.082]	[0.010]	[-0.171]

Table 7: Summary VAR Statistics

R-squared	0.122	0.289	0.506	0.757	0.307	0.222	0.391
Adj. R-squared	-0.145	0.073	0.355	0.683	0.096	-0.015	0.206
Sum sq. resids	16.450	82.435	9.277	4.826	22.353	15977.760	1582.186
S.E. equation	0.846	1.893	0.635	0.458	0.986	26.357	8.294
F-statistic	0.456	1.338	3.360	10.219	1.454	0.938	2.113
Log likelihood	-34.165	-59.147	-25.287	-15.159	-38.918	-140.784	-104.942
Akaike AIC	2.720	4.332	2.148	1.494	3.027	9.599	7.287
Schwarz SC	3.090	4.702	2.518	1.864	3.397	9.969	7.657
Mean dependent	0.090	-0.128	-0.098	-0.164	0.073	-0.141	-0.186
S.D. dependent	0.790	1.966	0.791	0.813	1.037	26.166	9.309
Determinant Residual Covariance		555.639					
Log Likelihood (d.f. adjusted)		-405.872					
Akaike Information Criteria		29.798					
Schwarz Criteria		32.389					