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MEASURING THE DAMAGE FROM FINANCIAL INTEGRATION IN THE GCC: LESSONS FROM THE GLOBAL CRISIS

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Abstract

In the wake of the global financial crisis, several leading countries of the Gulf Cooperation Council (GCC) experienced considerable economic slowdowns. Equity prices tumbled, bank credit dried up, GDP growth rates came to a halt, spreads on sovereign bonds soared, and risk aversion increased dramatically. These events have demonstrated the negative consequences of financial integration which, combined with financial innovation and deregulation, have increased vulnerabilities in the GCC and created heightened systemic risks. Using data from 2001 to 2009, we calculate a measure of financial stress for GCC countries and estimate the harm caused by the financial crisis to the region's real economy. Our results show that between 2008 and 2009, economic activity in the GCC has slowed by 2.6% after controlling for a variety of factors such as oil and stock price movements. We discuss how policymakers can initiate countercyclical policies to stave off the damage from future financial crisis.

ملخص

في أعقاب الأزمة المالية العالمية، شهدت العديد من البلدان الرائدة في دول مجلس التعاون الخليجي (GCC) تباطؤ اقتصادي كبير. وهوت أسعار الأسهم ، توقف الائتمان المصرفي ، وتوقفت معدلات نمو الناتج المحلي الاجمالي ، ووصل العائد على السندات السيادية إلى عنان السماء ، وزاد البعد عن المخاطرة بشكل كبير. وقد أثبتت هذه الأحداث الآثار السلبية للتكامل المالي والذي، جنبا إلى جنب مع الابتكارات المالية والتحرر من القيود، زاد من نقاط الضعف في دول مجلس التعاون الخليجي، وخلق تزايد المخاطر النظامية. باستخدام بيانات 2001-2009، نحسب قدر من الضغوط المالية لدول مجلس التعاون الخليجي ونقدر الضرر الذي سببته الأزمة المالية على الاقتصاد الحقيقي في المنطقة. نتائجنا تظهر أنه بين عامي 2008 و 2009، تباطأ النشاط الاقتصادي في دول مجلس التعاون الخليجي بنسبة 2.6 ٪ بعد ضبط مجموعة متنوعة من العوامل مثل النفط وتحركات أسعار الأسهم. نناقش كيف يمكن ان يبادر صناع القرار بسياسات معاكسة لدرء الضرر من الأزمة المالية في المستقبل.

1. Introduction

In the wake of the global financial crisis, several leading countries of the Gulf Cooperation Council (GCC) experienced considerable economic slowdown. Equity prices tumbled, bank credit dried up, GDP growth rates came to a halt, spreads on sovereign bonds soared, and risk aversion increased dramatically. In South East Asia, Eastern Europe or other emerging markets, the fallout of the global crisis was devastating, measuring one and a half to two times the impact on Middle Eastern countries, primarily because of greater financial and economic integrations (Goldstein and Xie 2009). Yet, despite this undesirable effect, the global integration of financial markets remains the policy objective of the GCC countries where there is a push for greater deregulation and accelerated liberalization. However, as the crisis began to unfold and financial stress was spreading fast to their markets, the GCC countries began to question whether the benefit of financial integration has been oversold and its potential harmful consequences concealed and underplayed.

The events of the last three years have demonstrated that in some cases financial integration combined with financial innovation and deregulation can increase vulnerabilities and create systemic risks (Papademos 2010). In the years preceding the global crisis, the financial markets in the GCC were evolving at a rapid pace amid a strong desire to integrate globally. Specifically, complex and opaque financial products were introduced, innovative securitization techniques were pioneered, inappropriate incentive structures were adopted, all in an environment of excessive credit growth fueling a real estate bubble. It is important to point that the GCC countries were not unique in this endeavor because worldwide, a sense of encouraged risk-creation and risk-taking was taking over, which, as we now have come to realize, has increased the scope for contagion across institutions, markets and borders. However, as these dynamics were in motion, corporate governance, risk management, and prudential supervision in the GCC regulation were failing to keep up with the rapid transformation of the financial systems, often deliberately in the spirit of greater liberalization and less government regulation. In this context, Dubai is a case in point.

Motivated by these factors, we propose to estimate in this paper the intensity of the financial stress and its transmission to the GCC economies. We ask: is there a measure of financial stress that helps estimate the size of spillovers of the global crisis to the GCC? How strongly and rapidly is financial stress transmitted? What global factors, country characteristics, or policies influence this transmission? The end product (1) quantifies the impact of the global financial crisis on economic activity in the GCC countries and (2) measures the marginal cost/benefit of financial integration in each of the GCC countries.

This paper is related to the existing literature as follows. It builds upon Frank, Gonzalez-Hermosillo and Hesse (2008) that analyzes liquidity spillovers across asset markets. This is also related to a very substantial literature on spillovers and contagion that especially flourished after the Asian Crisis. The identification of shock transmission channels across countries is discussed in Dungey, Fry, Gonzalez-Hermosillo and Martin (2005). Beirne, Caporale, Schulze-Ghattas and Spagnolo (2008) examine volatility spillovers from mature to Emerging Markets countries and test for their changes during crisis periods. Similarly, other studies that jointly investigate spillovers of emerging markets and mature countries are Calvo et al. (2008) and Kaminsky and Reinhart (2003).

The paper is divided into 5 sections. Section 1 explains the problem and state the objectives. Section 2 reviews the literature on the financial stress index and details its construction in both advanced countries and emerging markets. Section 3 discusses the data and the estimation methodology. Section 4 presents the econometric results and discusses the policy implications. Section 5 discusses the results as they relate to the costs and benefits of financial integration and concludes the paper.

2. The Financial Stress Index

In the last quarter of 2008, many emerging economies experienced major stress in their financial infrastructure such as foreign exchange, stock, commodity prices and sovereign debt markets. Noteworthy, the withdrawals from emerging economy equity and debt funds suggested that investors in mature markets had begun to retract from emerging economies around the third quarter of 2008. Borrowers in emerging Europe and Asia were especially affected. At the same time, bank lending was scaled back: liabilities shrunk by 10 to 20% of the receiving countries' GDP by the end of September 2008, compared with their peak in late 2007 (Balakrishnan et al. 2009). Unexpected decreases in capital inflows usually have calamitous consequences on economic activities of emerging financial markets. The decline in the capital flows was partly driven by exchange rate appreciation vis-à-vis the U.S. dollar during the first half of 2008.

The financial crisis began to show its effect on emerging Middle East countries in the third and fourth quarter of 2008, leading to reserve losses, a sharp rise in sovereign bond spreads, and heightened stock market volatility.[1] Given the implications of financial stress on the real economy, it is important to measure the contagion effect of financial stress from advanced economies to the GCC countries. To that end, this paper addresses the following questions: (1) How strong is the link between the stress in advanced economies and the stress in individual GCC countries; (2) what economic factors make emerging economies more susceptible to financial stress, (3) and can these countries immunize their financial markets from the transmission of stress when advanced economies undergo a major financial crisis?

To answer these questions our study employs a variation to the Financial Stress Index, created for advanced economies in the October 2008 *World Economic Outlook*, to study transmission of stress from advanced to emerging economies. Next, we explain how the financial stress index is calculated in advanced economies and then extend the analysis to emerging markets.

2.a Financial stress index for advanced economies[2] (FSI_ADV)

Cardarelli, Elekdag, and Lall (2009) defined financial stress as a period when a country's financial system is under strain and its ability to intermediate is impaired. They stated that when measuring stress, the index primarily relies on price movements relative to past levels or trends to proxy for the presence of strains in financial markets and on intermediation. The original FSI_ADV is structured form seven economic factors. These factors operate to capture the impact of three financial market segments: banking, securities markets, and exchange markets. The seven factors of advanced economies' financial index are the beta of banking-sector (β), the Treasury Eurodollar spread (TED)[3], the stock market returns, time-varying stock market return volatility, sovereign debt spreads, and exchange market volatility. The overall financial stress index is a composite measure of the seven sub-indices that encapsulate the three market movements relative to market averages or trends, as they are likely to indicate stress in financial markets infrastructure. The arithmetic mean of each factor is computed and standardized by dividing it by its standard deviation. Each country's financial stress index is comprised of the sum of the seven standardized factors.

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[1] World economic outlook (International Monetary Fund), 2009 International Monetary Fund, page 134.

[2] Advanced economies are the economies of the following countries: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, Norway, Spain, Sweden, Switzerland, United Kingdom and United States.

[3] TED is the difference between the rate of return on Treasury Bills and the rate of return on Eurodollar Bills. The price differenced is and indicator of credit risk. An increasing TED spread indicates increasing risk and a decrease in TED spread indicates a decrease in risk.

FSI = β + TED spreads + Inverted terms spreads+ Corporate debt spreads + + Stock market returns + Stock market volatility + Exchange market volatility

A neutral market condition is indicated by FSI of zero value. A positive index is a signal of financial stress. An index value of 1 indicates a one-standard deviation from average conditions across sub-indices. A value of 1 or higher has in the past been associated with a crisis. The computation of the seven factors is detailed as follows:

Banking Sector:

The banking-sector beta (βs) is the standard capital asset pricing model (CAPM) beta, and is defined as $\beta_s = Cov\ (R_{tm}\ ,\ R_{ti})/Var\ (R_{tm})$ where *R* represents the year-over-year banking or market returns, computed over a 12-month rolling window. Average beta of the market is one and a beta greater than 1 indicates higher risks and that the percentage change in the banking stocks moves faster than the market index. The higher the risk, the greater the probability of financial stress. To better capture banking-related financial stress, the banking beta was recorded only when banking returns were lower than the overall market return.

The TED spread is defined as the 3-month LIBOR or commercial paper rate minus the government short-term rate.

Inverted yield curve spread or the inverted term spread is defined as the government's short-term rate minus government's long-term rate. This is when government securities' short-term yield exceeds the long term.

Securities Market:

Corporate debt spreads are defined as corporate bond yield minus long-term government bond yield.

Stock market returns are computed as the month-over-month change in the stock index multiplied by minus one, so that a decline in equity prices corresponds to increased securities-market-related stress.

The 6-month moving average of the squared month-on-month returns is used to measure stock market volatility.

Foreign Exchange Market:

The 6-month moving average of the squared month-on-month growth rate of the exchange rate is used to measure the foreign exchange market volatility.

2.b Financial stress index for emerging markets (FSI_EM)

The FSI_EM has one important modification relative to the FSI_ADV proposed by Cardarelli, Elekdag and Lall (2009) because it includes a measure of exchange market pressure, which is a more common source of stress in emerging economies than in advanced economies. The FSI_EM was introduced by Balakrishnan et al. (2009) and it is constructed from five factors aggregated into one index that encapsulates the credit conditions in three financial market sectors (banking, securities markets, and exchange markets). The five components of the FSI_EM are the "banking-sector beta (β_s), stock market returns, time-varying stock market return volatility, sovereign debt spreads, and an exchange market pressure index (*EMPI*). To yield the aggregate financial stress index for an individual country, the five components are standardized and summed up:

FSI_EM = β_s + Stock market returns + Stock market volatility + Sovereign debt spreads + EMPI

When the composite price index for the banking sector is available, the index is used to estimate the banking "beta". If such index is not available, the banking "beta" is based on the information of individual banks' stock prices data which are taken from Bloomberg (i.e.,

first, the average of banking sector stock price returns is constructed from each bank's stock price data. Next, the banking "beta" is estimated based on the computed rate of return). The other components in the FSI_EM are calculated as follows:

- *Stock market returns* are computed as the year-on-year change in the stock index multiplied by minus one, so that a decline in equity prices corresponds to increased securities-market-related stress.
- *Stock market volatility* is a time-varying measure of market volatility obtained from a GARCH(1,1) specification, using month-over-month real returns and modeled as an autoregressive process with 12 lags.
- *Sovereign debt spreads* is defined as the bond yield minus the 10-year United States Treasury yield using JPMorgan EMBI Global spreads. When EMBI data were not available, five-year credit default swap spreads were used.

The *EMPI* captures exchange rate depreciations and declines in international reserves, and is defined for country i in month t as:

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

where Δe and ΔRES denote the month-over-month percent changes in the exchange rate and total reserves minus gold, respectively. The symbols μ and σ denote the mean and the standard deviation, respectively, of the relevant series.

The aggregation of these sub-indices into the EM-FSI is based on a variance-equal weighting. Under this method each component is computed as a deviation from its mean and weighted by the inverse of its variance (similar to Kaminsky and Reinhart 2003) This approach adjusts the stress sub-index for differences in volatility, allows a simple decomposition of stress components, and is also the most common weighting method in the literature.

Figure 1 shows a plot of the FSI for the GCC vis-à-vis the advanced economies. The FSI began a sharp ascension in 2007 reaching its highest levels in the fall of 2008. The FSI for the GCC countries was moving in parallel with the advanced economies, while Kazakhstan had a delayed reaction. One important observation is that by the end of the first quarter of 2009, the FSI was on the decline, yet it remained at a historically high level. Table 1 shows the descriptive statistics of the FSI across a range of countries between 2001 and 2009. The highest level was achieved by advanced economies (13.6). Bahrain had the lowest FSI across the countries under analysis with an index of -7. Because the FSI reflects a country's specific factors, it is more useful to compare its levels over time rather than across countries. In that sense, for a given country, a large variability of the FSI over time reflects financial instability and strain in its markets, all of which represent sources of additional systematic risk. Looking at the standard deviation of the FSI across countries, we find that the GCC as a region has a score of 2.47 compared with 4.12 for advanced economies. Within the GCC, the UAE has the lowest FSI at 2.67, while Bahrain has the highest at 3.51, possibly a reflection of the fact that the financial services industry is the engine of growth in this country, and banking is the dominant sector in the composition of the FSI.

3. Methodology and Analysis

The estimation methodology is based on a panel data of monthly observations from 2001 to 2009 in Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the UAE. One oil exporting country outside the GCC (Kazakhstan) and one non-oil exporting country outside the GCC (Morocco) were selected for comparison. The model is described in more detail in Forbes and Chinn (2004) and the estimation technique is based on fixed and random effects.

The time period is important for several reasons. It includes the crisis following September 11, 2001 and the global financial crisis marked by the collapse of Lehman Brothers in September 2008. The variables of the model are:

- The real GDP growth rate in country i in year t.
- The Financial Stress Index (FSI) available from the IMF since 1998 complemented by a manual calculation from the authors for 1997 using the same methodology. The index includes 4 components: banking, foreign exchange, debt, and equity.

A vector of transmission factors comprised of:

- Monthly change in oil prices (in percent).
- Monthly change in the country stock market index (in percent).
- A measure of economic integration calculated as the ratio of the sum of monthly foreign assets and liabilities to GDP (as explained in Kose, Prasad, Rogoff, and Wei 2006).
- LEHMAN: a dummy variable $= 1$ on or after September 08 and 0 otherwise.
- GCC: a dummy variable $=1$ if a country is part of the GCC and 0 otherwise.
- OILEXPORTG: a dummy variable $=1$ if a country is an oil exporter and 0 otherwise (Morocco).

The dynamic structure of the model (number of lags) is evaluated using the Schwartz criterion. All the data variables are available from Bloomberg and the IMF[4].

To examine the direct relation between the FSI in the GCC countries and their GDP, we propose a panel model of the following form:

$$GDP_{it} = a + b\ GDP_{i,t-1} + c\ FSI_{i,t} + u_{it} \tag{1}$$

Where GDP_{it} represents the growth rate in GDP in country i at time t, and FSI_{it} is the corresponding stress index. The lagged GDP is added to eliminate serial correlation. To estimate the spillover effects from advanced economies to the GCC countries, we propose a cross-section time series fixed-effects model of the form:

$$FSI_{it} = \beta 0 + \beta 1 FSI\_ADV_t + \beta 2\ INTEGRA_{i,t} + \beta 3\ STOCKMKT_{i,t} + \beta 4\ OIL,_t$$
$$+ \beta 5\ LEHMAN + \varepsilon it \tag{2}$$

For comparison, the model is also estimated by allowing for random effects and two more dummy variables:

$$FSI_{it} = \beta 0 + \beta 1 FSI\_ADV_t + \beta 2\ INTEGRA_{i,t} + \beta 3\ STOCKMKT_{i,t} + \beta 4\ OIL,_t$$
$$+ \beta 5\ LEHMAN + \beta 6\ GCC,_t + \beta 7\ OILEXPORTER + \varepsilon it \tag{3}$$

4. Results and Discussion

Table 2 provides the descriptive statistics of the data variables. The mean FSI for all countries under analysis is -0.034 for advanced economies and -0.009 for the non-advanced economies in the sample (GCC, Kazakhstan and Morocco). As expected, the level of the FSI (approximately 0) indicates that financial markets are on average in "normal" mode over the 9 years of study for all countries under analysis. As explained earlier, the important variable in investigating the movement in the FSI is the standard deviation over time as it reflects the instability of the financial markets of that country.

Turning to the econometric analysis, we report the estimation results of the models (1) through (3) in tables 5, 6, and 7. Table 5 reports the results of the stress index's impact on GDP using annual data from 2001 through 2008 (the latest year for which GDP data is available). The coefficient of the FSI is negative (-0.012) and significant (at 1%) indicating

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[4] We wish to thank Kenji Moriyama for providing us with the data.

that a 1 point increase in the FSI would reduce GDP on average by 1.2%. From table 4, we observe that the Financial Stress Index rose by 3.9 points over the two months after the collapse of Lehman Brothers in September 2008. Had the FSI remained at this high level, the slowdown in GDP in the GCC countries would have been 4.7% (3.9 x -0.012) on an annualized basis. Clearly, the financial stress index has a strong bearing on economic activity. Yet it is important to note that this negative impact was only temporary because by April 2009, the FSI in the GCC had returned to its level prior to September 2008.

The impact of the financial stress in advanced economies on the GCC is measured in table 6. All the variable coefficients of model (2) are statistically significant with the proper sign. For example, the coefficient sign of the financial stress in advanced economies is positive. Its magnitude (0.16) measures the spillover effects to the GCC countries, indicating that a 1 point increase in the FSI in advanced economies adds 0.16 to FSI in the GCC.

From table 5, the cumulative change in the FSI in advanced economies during the two months after the collapse of Lehman Brothers totaled 7.3 points. As a result, one is able to measure the direct spillover effects from advanced economies to the GCC countries at 1.2 points (7.3 points x 0.16). Based on the results of table 5, the direct impact of the spillover on GDP in GCC can be measured at 1.44% (1.2 points x 1.2%).

The coefficient of the stock market is strong and statistically significant. The magnitude of the change in the stock market index dwarfs all other variables. The sign of the coefficient indicates that a 10% rally in the stock market index reduces the financial stress index by 0.48 (-4.8 x 10%). A rally in oil prices also has a negative impact on the financial stress with a coefficient that is strong and significant. Finally, the dummy variable representing the collapse of Lehman Brothers in September 08 is positive and significant, suggesting that this event added 2.21 points to the financial stress index in the GCC between September 08 and April 09.   Relying on the results of table 5 again, it appears that the collapse of Lehman Brothers reduced GDP in the GCC by 2.6% (2.21 points x 1.2).

The results of the random effects model (3) are consistent with the fixed effects model (2). The other noteworthy variables in table 7 are the dummy variable for GCC countries and an indicator variable if a country is an oil exporter. Only the latter is marginally significant with a positive sign suggesting that an oil exporting country is on average more likely to experience an increase in its FSI. Finally, the measure of economic integration represented by the sum of foreign assets and liabilities to GDP is statistically insignificant in the random effects model (3) and negative in the fixed effects model (2). It doesn't seem that this variable, as constructed, is an important contributor to financial stress.

Overall, the results suggest that the GCC's financial markets are vulnerable to external shocks and are also exposed to contagion effects from crises originating in advanced economies. These spillover effects are not limited to the traditional links between equity markets in the GCC and their counterparts in advanced economies. In fact, independent of how the GCC stock markets react to financial crises abroad, our results demonstrate that there is a direct relation between the financial stress in advanced economies and that of the GCC with an important bearing on real economic activity in the GCC.

5. Policy Implications and Conclusion
This paper has investigated the existence of an economic indicator that could potentially encapsulate a broad range of components of financial strain. This effort has received considerable attention in the past 2 years as the financial crisis of 2008 put the global economy at risk, forcing economists and policy makers to examine the contagion and shortcomings effects on various countries financial markets. Emerging markets are

particularly exposed because their vulnerability to shocks, domestic or foreign, can stifle their growth and set back reforms.

As the economies of emerging markets become more integrated, the policies of advanced economies need to focus on averting further escalation of stress. This would not only limit the impact on the real economy in advanced economies, but also would thwart future cross-country contagion negative spillovers. As a result, many economists have called for a globally coordinated policy approach.

For over two decades, financial and economic integration have been perceived as two imperatives for a prospering economy. This belief was shaken in 2008, as the financial stress in advanced economies began to spill over to emerging markets. The growing financial correlation among advanced and emerging markets began to serve as a transmitter of stress, puzzling economists and policy makers that have advocated globalization, integration, and openness of economies to the rest of the world.

This paper has investigated the determinants of the Financial Stress Index (FSI) in the GCC and its links with advanced economies. Using data between 2001 and 2009, we found that the FSI in the GCC began to rise sharply in 2007 reaching its peak in the fall of 2008. Throughout the period under investigation, the FSI in the GCC countries was moving in parallel with advanced economies, suggesting a strong link and integration between the respective financial markets. We demonstrated that an increase in the FSI in the GCC has a significant negative impact on the region's real economy. Our results also evaluated the damage caused to the GCC's economies from the financial crisis, and specifically the collapse of Lehman Brothers in September 2008.

During the critical 2 months following this crisis, we estimated that the GCC economies suffered a temporary external shock which translated into a 4.7% reduction in GDP (on an annualized basis). However, by November 2008, the FSI in the GCC began to turn around and fall, and eventually returned to its prior level in March 09. The net effect of the financial crisis in advanced economies on the GCC's GDP was estimated at -2.6% after controlling for a variety of factors such as oil and stock price movements.

These results are important for several reasons. First, it is imperative for financial market leaders to have the ability to predict financial crises to ensure that similar impact can be dealt with effectively. Second, our findings are expected to recommend the type of countercyclical policies that GCC countries could implement to mitigate the spillover effects from more mature economies with which they share significant trading activities. Specifically, because the banking sector is an important factor in the construction of the financial stress index, it is imperative for policymakers to rush and support their banking systems and prevent their collapse. This may require direct intervention by the Central Bank to step in and purchase equity positions in the main banking institutions in order to stabilize their share price. These policies are not without contention because they lie in complete contradiction with 'laissez faire' economic policies. However, they may represent the only solution to stave off a shock transmitted by financial markets that are increasingly interdependent. Third, our results should help GCC policymakers reassess the benefits of global financial integration by focusing not solely on the positive aspects of such an objective, but also recognizing the risks it presents to the stability of their financial markets and their development. For example, can the GCC capital markets enhance efficiency, lower costs, and increase competition without a goal to integrate with more mature markets? Should the GCC capital market rules and regulations be revised to promote 'regional' as opposed to global integration?

References

Balakrishnan, R., S. Danninger, S. Elekdag, and I. Tytell. 2009. The transmission of financial stress from advanced to emerging economies. IMF Working Papers 09/133, June.

Beirne, J., M. Guglielmo, M. Schulze-Ghattas, and N. Spagnolo. 2008. Volatility spillovers and contagion from mature to emerging stock markets. IMF Working Papers 08/286.

Calvo, Guillermo A., Alejandro Izquierdo, and Luis F. Mejía. 2008. Systemic sudden stops: The relevance of balance-sheet effect and financial integration. NBER Working Paper 14026.

Cardarelli, R., S. Elekdag, and S. Lall. 2009. Financial stress, downturns, and recoveries. WEO report, chapter 4, October 2008, available at http://www.imf.org/external/pubs/ft/...8/02/index.htm

Forbes, K., and M. Chinn. 2004. A decomposition of global linkages in financial markets over time. *The Review of Economics and Statistics* 86(3):703–22.

Frank, N., B. Gonzalez-Hermosillo, and H. Hesse. 2008. Global transmission of liquidity shocks: Evidence from the 2007 subprime crisis. IMF Working Paper 08/2008.

Goldstein, M., and D. Xie. 2009. The impact of the financial crisis on emerging Asia. Petersen Institute for International Economics Working Paper 09-11, Washington DC.

Kaminsky, G., and C. Reinhardt. 2003. Financial markets in times of stress. *Journal of Development Economics* 69(2):451–70.

Kose, M. A., E. Prasad, K. Rogoff, and S. Wei. 2006. Financial globalization: Reappraisal. NBER Working Paper 12484.

Moriyama, K. 2010. The spillover effects of the global crisis on economic activity in MENA emerging market countries. IMF Working Paper 10/8.

Papademos, L. 2010. Financial integration and stability: The legacy of the crisis. European Central Bank and the European Commission, Frankfurt am Main, 12 April.

Wigglesworth, R. 2009. Derivatives forecast to make gradual return, Financial Times, May 20, 2009, available at: http://www.ft.com/cms/s/0/dbbc7e78-4550-11de-b6c8-00144feabdc0.html#axzz1P7JWYP22

Financial Stress Index (FSI) Jan 07 - Apr 09

(Normal: FSI = 0, FSI >0 increasing stress, FSI<0 decreasing stress)
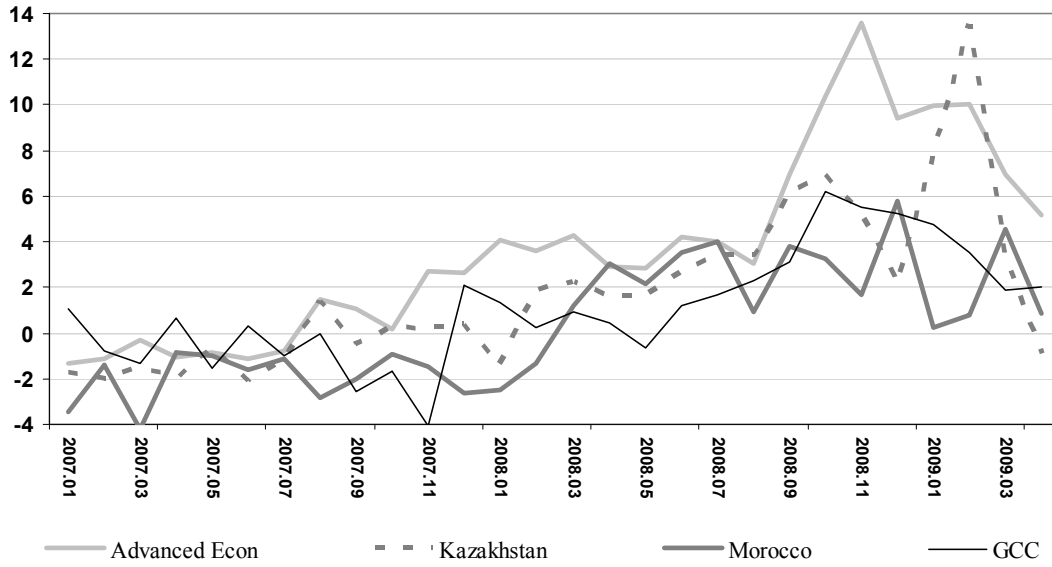
Table 1: Comparison of Financial Stress Index in GCC vs. Other Countries - Jan 2001 – Apr 2009

	BAH	KWT	OMA	QAT	SAR	UAE	GCC	MOR	KAZ	ADV ECO
MEAN	1.0	0.5	0.8	2.0	1.1	1.3	1.1	0.3	1.8	3.7
MEDIAN	0.8	-0.5	0.7	1.8	0.8	1.8	1.0	-0.3	1.5	3.0
MIN	-7.0	-5.3	-6.2	-3.1	-5.4	-3.5	-4.1	-4.2	-2.1	-1.3
MAX	7.8	9.0	6.9	7.6	6.7	7.6	6.2	5.8	13.5	13.6
S.D.	3.51	3.35	3.10	2.74	2.93	2.67	2.47	2.68	3.60	4.12

Table 2: Descriptive Statistics of the Data Variables, Monthly Observations (Jan 2001 – Apr 2009)

	FSI*	FSI_ADV**	INTEGRA	STOCKMKT	OIL
MEAN	-0.009	-0.034	0.146	0.013	0.011
MEDIAN	-0.424	-1.065	0.155	0.012	0.024
MIN	-6.953	-3.817	0.000	-0.738	-0.257
MAX	13.540	13.562	0.413	0.477	0.213
S.D.	2.306	3.345	0.097	0.090	0.087

Notes: * FSI measures the financial stress index for all countries in the GCC (Bahrain, Kuwait, Saudi Arabia, UAE, Qatar, and Oman) and the following non GCC countries: Morocco, Kazakhstan. **FSI_ADV measures the financial stress index in Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, Norway, Spain, Sweden, Switzerland, United Kingdom and United States. INTEGRA: a measure of economic integration calculated as the sum of income of Foreign Assets and Liabilities to GDP. STOCKMKT: is the monthly percent change in a country's stock market index. OIL: is the monthly percentage change in the future price of Oil on the NYMEX (4th future contract)

Table 3: Financial Stress Index by GCC Country, Before & After the Collapse of Lehman Brothers in Sept 2008

	BAH	KWT	OMA	QAT	SAR	UAE	GCC	ADV ECO
Jun-08	-0.4	0.1	2.6	2.4	0.5	2.0	1.2	4.2
Jul-08	-0.1	1.3	2.6	4.3	1.7	0.1	1.7	4.0
Aug-08	2.3	3.3	4.7	3.5	-0.1	0.2	2.3	3.1
Sep-08	3.5	2.3	2.5	7.6	0.8	2.0	3.1	7.0
Oct-08	7.8	8.1	4.9	6.3	6.4	3.7	6.2	10.4
Nov-08	7.4	6.2	4.1	3.3	6.7	5.2	5.5	13.6
Dec-08	7.4	4.9	6.9	4.1	3.5	4.8	5.3	9.4
Jan-09	3.6	9.0	4.2	6.6	2.0	3.3	4.8	9.9
Feb-09	4.7	2.7	2.2	6.0	3.1	2.4	3.5	10.1
Mar-09	1.9	1.8	3.5	2.9	1.1	0.2	1.9	6.9
Apr-09	4.4	-2.4	0.1	1.8	0.5	7.6	2.0	5.2

Table 4: Monthly Change in Financial Stress Index (FSI) by GCC Country, Before & After the Collapse of Lehman Brothers in Sept 2008

	BAH	KWT	OMA	QAT	SAR	UAE	GCC	ADV ECO
Jul-08	0.3	1.3	0.1	1.9	1.1	-1.9	0.5	-0.2
Aug-08	2.4	2.0	2.1	-0.8	-1.8	0.1	0.6	-0.9
Sep-08	1.2	-1.0	-2.2	4.1	0.9	1.8	0.8	3.9
Oct-08	4.4	5.8	2.3	-1.3	5.6	1.7	3.1	3.4
2m Cumulative Change in FSI Pre-Lehman	2.7	3.2	2.1	1.1	-0.7	-1.8	1.1	-1.1
2m Cumulative Change in FSI Post – Lehman	5.6	4.8	0.2	2.8	6.5	3.5	3.9	7.3

Table 5: Impact of the Financial Stress Index (FSI) on the Annual Growth Rate in GDP: Pooled OLS estimates using 59 annual observations, 8 cross-sections: Model: $GDP_{it} = a + b\ GDP_{i,t-1} + c\ FSI_{i,t} + u_{it}$ **. Robust (HAC) standard errors**

	Coefficient	std. error	t-ratio
Const **	0.089	0.018	4.9
FSI **	-0.012	0.005	-2.6
GDP(1 lag) **	0.491	0.096	5.1

Notes: Adjusted R-squared 0.208, F(2, 56) 8.632532 , Schwarz criterion -90.31, DW 1.61. *Significant @ 10% (*) or 1% (**)*

Table 6: Fixed-effects Estimates (713 obs, 9 cross sections) -- Jan 01 – Apr 09: $FSI_{it} = \beta_0 + \beta_1 FSI\_ADV_t + \beta_2\ INTEGRA_{i,t} + \beta_3\ STOCKMKT_{i,t} + \beta_4\ OIL_{,t} + \beta_5\ LEHMAN + \varepsilon_{it}$ **: Robust (HAC) standard errors**

	Coefficient	std. error	t-ratio
Const	0.660	0.315	2.10
FSI_ADV**	0.164	0.035	4.65
INTEGRATION**	-4.771	1.942	-2.46
STOCKMKT**	-4.819	0.803	-6.00
OIL*	-1.511	0.861	-1.75
LEHMAN**	2.215	0.413	5.37

Notes: Adj R-sq 0.39, Log-likelihood -1458.12, Schwarz criterion 3008.21, DW 1.46. *Significant @ 10% (*) or 1% (**),* FSI measures the financial stress index for all countries in the GCC (Bahrain, Kuwait, Saudi Arabia, UAE, Qatar, and Oman) and the following non GCC countries: Morocco, Kazakhstan. FSI_ADV measures the financial stress index in Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, Norway, Spain, Sweden, Switzerland, United Kingdom and United States. INTEGRATION: a measure of economic integration calculated as the sum of income of Foreign Assets and Liabilities to GDP. STOCKMKT: is the monthly percent change in a country's stock market index. OIL: is the monthly percentage change in the future price of Oil on the NYMEX (4th future contract). LEHMAN: dummy variable =1 on or after Sept 08, 0 otherwise

Table 7: Random-effects (GLS) Estimates (713 obs, 9 cross sections) -- Jan 01 – Apr 09. $FSI_{it} = \beta_0 + \beta_1 FSI\_ADV_t + \beta_2\ INTEGRA_{i,t} + \beta_3\ STOCKMKT_{i,t} + \beta_4\ OIL_{,t} + \beta_5\ LEHMAN + \beta_6\ GCC_{,t} + \beta_7\ OILEXPORTER + \varepsilon_{it}$ **. Robust (HAC) standard errors**

	Coefficient	std. error	t-ratio
Const	-0.288	0.339	-0.85
FSI_ADV**	0.167	0.035	4.82
INTEGRATION	-0.427	0.978	-0.44
STOCKMKT**	-5.001	0.803	-6.23
OIL*	-1.465	0.865	-1.69
LEHMAN**	2.321	0.412	5.64
GCC	-0.184	0.204	-0.90
OILEXPORTER*	0.452	0.281	1.61

Notes: SSR 2541.53, Log-likelihood -1464.829, Schwarz criterion 2982.21. *Significant @ 10% (*) or 1% (**).* Breusch-Pagan test - Null hypothesis: Variance of the unit-specific error = 0, Asymptotic test statistic: Chi-square(1) = 1.19 with p-value = 0.27; Hausman test - Null hypothesis: GLS estimates are consistent. Asymptotic test statistic: Chi-square(5) = 5.88 with p-value = 0.32. FSI measures the financial stress index for all countries in the GCC (Bahrain, Kuwait, Saudi Arabia, UAE, Qatar, and Oman) and the following non GCC countries: Morocco, Kazakhstan. FSI_ADV measures the financial stress index in Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, Norway, Spain, Sweden, Switzerland, United Kingdom and United States. INTEGRATION: a measure of economic integration calculated as the sum of income of Foreign Assets and Liabilities to GDP. STOCKMKT: is the monthly percent change in a country's stock market index. OIL: is the monthly percentage change in the future price of Oil on the NYMEX (4th future contract). LEHMAN: dummy variable =1 on or after Sept 08, 0 otherwise. GCC: dummy variable =1 if country is part of the GCC, 0 otherwise. OILEXPORTG: dummy variable =1 if country is an oil exporter, 0 otherwise (ie. Morocco).