The Impact of Oil Prices on the Banking system in the Gulf Cooperation Council

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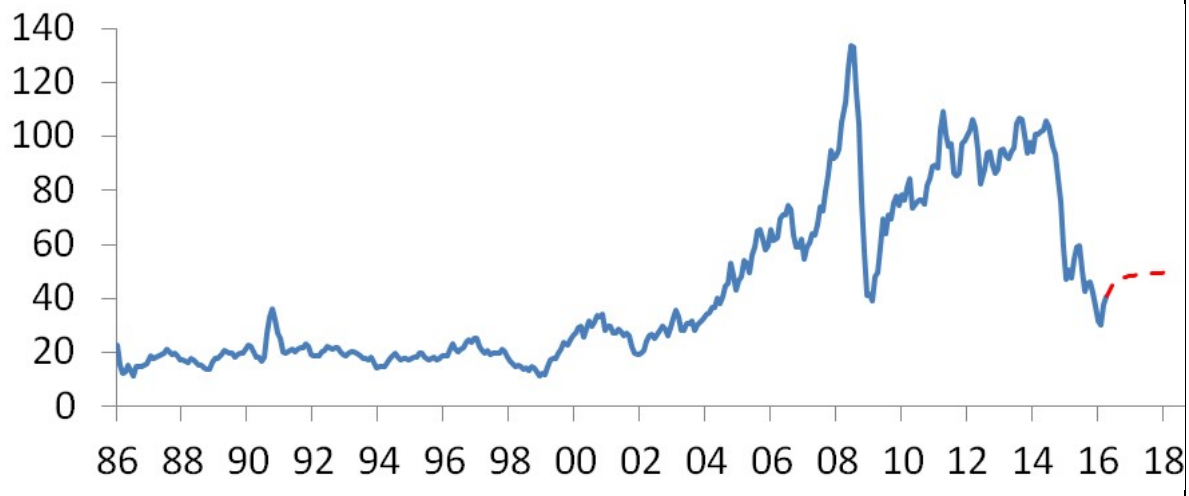
I. Introduction

Oil prices have rebounded vigorously from their trough in early-2016 and are expected to stage a more moderate rally in the next two years (Figure 1). The WTI spot price declined close to $30 a barrel in February 2016 (monthly average data), losing nearly ¾ of its value since June 2014. However, by mid-May, they have rebounded by more than 50 percent. Pricing of futures contracts suggests that oil prices are expected to recover at a more measured pace, by 5-10 percent over the coming two years.

Figure 1. WTI oil prices (U$ a barrel, monthly average)



Sources: Haver and IMF staff calculations.
Note: Actual through end-April 2016. Red broken line based on 3, 6, 12, 24 month futures prices, close of May 12.

Generally, the GCC economies can be adversely affected by low oil prices for at least two reasons:

- First, the GCC economies are highly dependent on oil and gas exports. During 2011–14, hydrocarbon exports represented about 70 percent of exports of goods and services on average (Table 1). Fiscal dependence on hydrocarbon revenues was even greater, accounting for over 80 percent of total fiscal revenues on average. Over the past decade and a half, the dependence on hydrocarbon fiscal revenues did not decline despite efforts at economic diversification.

- Second, macro-financial linkages in the GCC can amplify the effects of oil price movements over the financial cycle. Oil price movements and government spending policies create feedback loops between asset prices and credit that can lead to the buildup of systemic vulnerabilities in the financial sector. Oil price upturns lead to higher oil

revenues, and stronger fiscal and external positions. Equity market returns are larger as investors anticipate the impact of higher oil prices on the corporate sector, and generally stronger government spending growth. In turn, stronger government spending leads to higher non-oil output growth, greater banking sector liquidity and credit growth, higher real estate prices, and stronger bank balance sheets. Asset price appreciation also has positive wealth effects. In the event of an oil price downturn, these developments can reverse. With financial sectors being large in the GCC (Table 2), and oil prices being highly volatile, the unraveling of systemic financial sector vulnerabilities could have significant adverse effects on the real economy.

Table 1. GCC: Dependence on Oil Revenues

	2000-05	2006-10	2011-14
Oil export revenues as percent of total exports of goods and services			
Bahrain	58.7	60.5	65.1
Kuwait	82.7	80.5	87.6
Oman	76.9	69.4	64.3
Qatar	88.5	85.9	88.9
Saudi Arabia	83.4	83.1	83.0
United Arab Emirat	45.0	38.7	32.6
Fiscal oil revenues as percent of total fiscal revenues			
Bahrain	71.7	82.2	87.2
Kuwait	72.7	79.2	83.6
Oman	83.4	83.4	88.7
Qatar	90.5	88.3	90.7
Saudi Arabia	82.8	88.3	90.3
United Arab Emirat	60.2	65.1	69.9

Source: IMF staff calculations.
Note: Fiscal data is of the general government for UAE and central government in other GCC countries

Table 2. GCC: Size of the Financial System
(Percent of GDP)

	Bank Assets	Market Capitalization
Bahrain	259.7	64.1
Kuwait	165.5	72.8
Oman	121.4	28.1
Qatar	148.7	73.7
Saudi Arabia	92.6	71.0
United Arab Emirates	193.4	59.7

Source: GCC authorities, Bloomberg
Note: United Arab Emirates market capitalization is sum of Abu Dhabi and Dubai stock markets; Market capitalization data is as of Sept. 16, 2015. Banking sector data for Bahrain excludes wholesale banks.

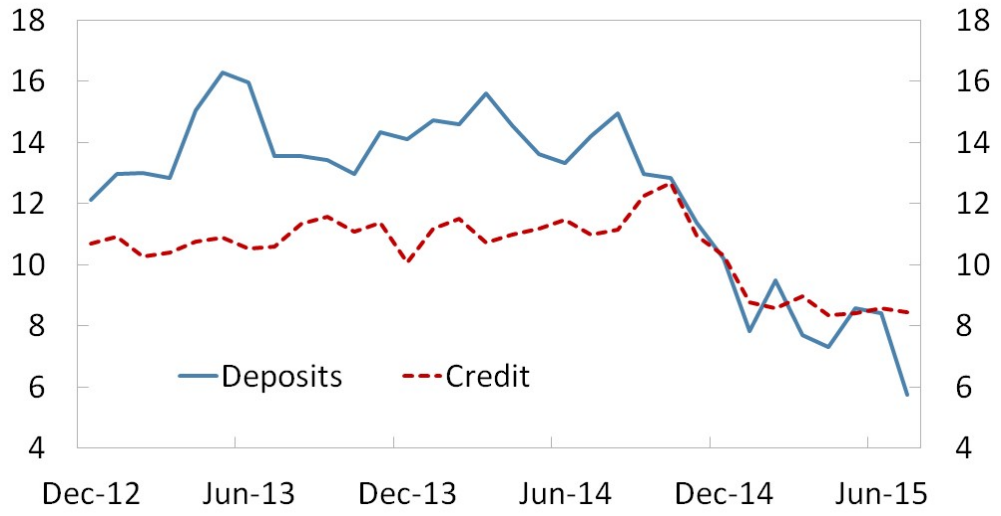
As an important reminder, systemic financial sector risks rose in the GCC countries with the oil price upswing in the years before the global financial crisis. An expanding deposit base and high liquidity (owing to high oil prices and short-term capital inflows) resulted in credit and asset-price booms before the global financial crisis. Al-Hassan and others (2010) explain the role of short-term capital inflows and high oil prices in fueling financial sector vulnerabilities in the run up to the global financial crisis. Arvai and others (2014) also discuss the near doubling of private sector credit as a share of non-oil GDP in the GCC during 2003-08 which contributed to systemic vulnerabilities. Bologna and Prasad (2010) document a sharp increase in household leverage between 2004 and 2008 in Oman. Al-Hassan and others (2010) suggest that the bursting of a domestic real estate bubble and tightening global liquidity conditions played a role in the United Arab Emirates' 2009 financial crisis, while defaults in 2008 by two of the largest investment companies in Kuwait imposed strains on the banking system, with the third-largest bank having to be recapitalized. IMF (2010) discusses Qatar's preemptive recapitalization of banks and other measures to support the banking sector in 2009. As the global financial crisis hit, asset prices and credit declined in several GCC countries, although fiscal stimulus and liquidity support helped cushion the impact.

More generally, evidence suggests that oil price performance has been an important driver of business and financial variables in the GCC economies (Callen, Khandelwal, Miyajima, and Santos (2015)). First, stronger performance of real and financial variables tends to be associated with oil price upturns. For instance, during 1991–2014, the growth rates of real

government spending and non-oil GDP were much stronger during oil price upturns than during downturns. Second, the timing of downturns in business and financial variables in some cases coincides with that of oil prices. Contractions in credit and equity markets reflected oil price movements, along with global financial market developments and the underlying domestic vulnerabilities. Importantly, contractions in real government spending occurred as often as real oil price downturns in the 1990s, but less so since 2000, likely aided by greater fiscal buffers.

Strong banking sector soundness provides an important buffer in the GCC to the oil price decline since mid-2014. GCC banks have strong capital and liquidity buffers as of end-2014. Capital buffers and provisioning levels were above those in many other commodity exporting countries. NPL ratios are low and both loan loss provisions and profits are strong. In fact, provisions fully cover NPLs, on average. Strong macroeconomic performance helped, so did strengthened regulatory frameworks and improved risk management. However, liquidity conditions have started to tighten more recently. While credit growth has remained robust, deposit growth has slowed, largely as governments and government-related entities have withdrawn deposits from the banking system (Figure 2). Interbank rates have edged higher since the beginning of the summer of 2015.

Figure 2. Growth Rates of Bank Credit and Deposits in the GCC Countries (Year on year, percent)



Sources: Haver and IMF staff calculations.

Against this backdrop, this paper addresses three interlinked issues: (i) how oil prices affect NPLs in the GCC; (ii) the links between oil prices and real and financial developments in these countries; and (iii) observed behavior of bank capital and provisioning with respect to indicators of the business and financial cycles. Section II reviews the literature. Section III discusses the strategy of modelling bank asset quality relying on a range of multivariate

approaches and of identifying oil-macro-financial linkages relying on a panel vector autoregression (VAR) approach. Section IV discusses the data used while Section V the empirical results. Section VI empirically assesses the observed behavior of bank capital and provisions with respect to indicators of business and financial cycles. Finally, Section VII provides concluding discussions.

II. LITERATURE

Empirical studies on bank asset quality and macro-financial linkages have expanded to include those of the Middle East and North Africa region. In the area of asset quality assessment, Nkusu (2011) analyzes country-level data spanning 1998–2009 for 26 advanced economies and confirms that adverse macroeconomic developments are associated with rising NPLs. De Bock and Demyantes (2012) use country-level annual observations for 25 emerging markets during 1996–2010 and find that the NPL ratio increases when economic growth declines, the exchange rate weakens, the terms of trade deteriorate and debt-creating capital inflows decline. Klein (2013) uses data spanning 1998–2011 for the ten largest banks in 16 countries (thus a total of 160 banks) in Central, Eastern and South-Eastern Europe and finds that macroeconomic conditions are relatively more important than banks specific factors in explaining NPLs.

Espinoza and Prasad (2010) represent the first attempt to model NPLs in the GCC countries using both macroeconomic and bank-level data. Using data spanning 1995–2008 for about 80 banks in the GCC region, the authors find that the NPL ratio rises as economic growth declines and both interest rates and risk aversion increase. Love and Ariss (2014) analyze a panel of Egyptian banks over 1993–2010 and find that larger capital inflows and stronger GDP growth improve bank loan portfolio quality. Many of the studies, but not all, also investigate macro-financial linkages. Earlier work relies on macro-level data (Nkusu (2011), De Bock and Demyantes (2012), Klein (2013), Vazquez et al (2012)). Espinosa and Prasad (2010) study the GCC economies and find a strong, albeit short-lived feedback effect from weaker bank balance sheet conditions to economic activity. Studies applying a panel VAR approach to bank-level data are emerging. Recent studies focusing on the Middle East and North Africa include Love and Ariss (2014) for Egypt and Miyajima (2016) for Saudi Arabia.

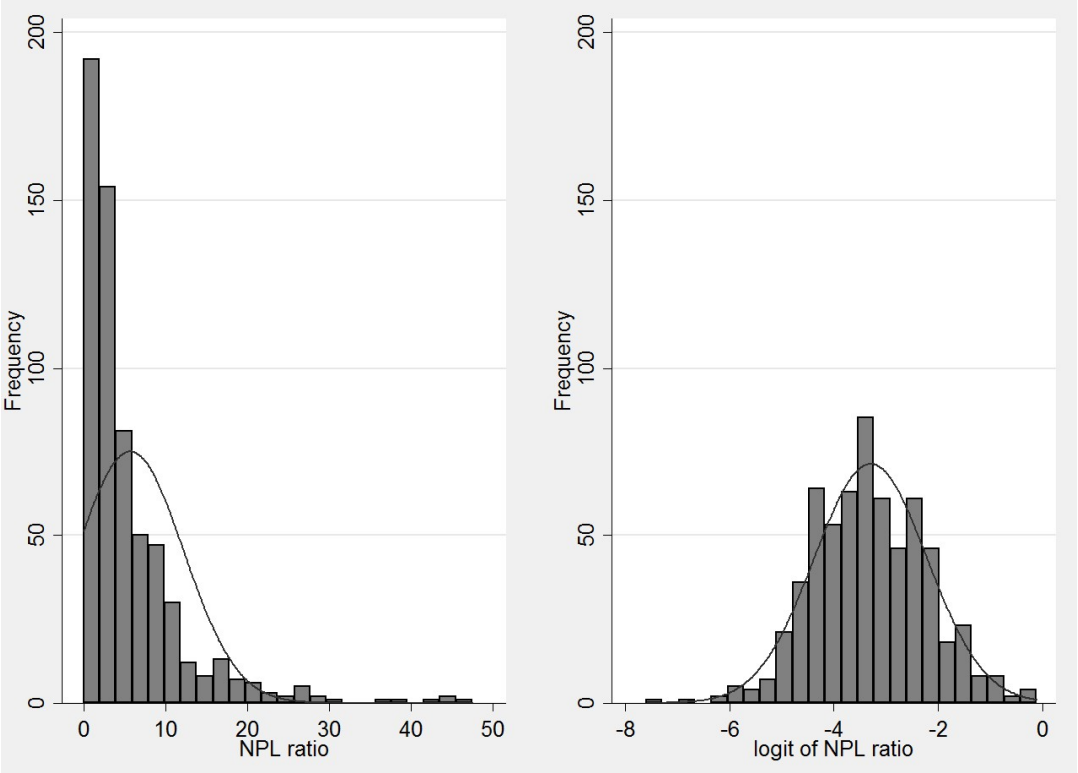
III. ECONOMETRIC APPROACHES

This section discusses two related empirical models of oil-macro-financial linkages - a multivariate model of NPL ratios and a panel VAR model – for the GCC economies.

A. A multivariate model of NPL ratios

A multivariate model is used to empirically assess the determinants of NPLs in the GCC. As is common in the literature, the dependent variable, the bank-level NPL ratio, was used after a logit transformation – this makes the NPL ratio a more normally-distributed variable and captures the empirical regularity that the variable tends to vary most for banks that start out with higher starting levels (Figure 3). A range of explanatory variables was considered, guided by the discussion in the earlier part of the paper (Real US fed funds rate is de-trended as unitroot tests suggest the variable is not stationary).

Figure 3. Distribution of NPL Ratios in GCC



Sources: Bankscope and authors' calculation.

Dummy variables are introduced to help control for potential country effects as well as time effects not directly related to oil price shocks. As discussed earlier, many of the GCC countries experienced such stress events.

The determinants of the NPL ratio are estimated using the following multivariate panel data specification for bank i in year t.

$$logit_{NPLr_{it}} = \alpha_1\, logit_{NPLr_{i,t-1}} + \sum_j \alpha_{2j} Global_{j,t-1} \sum_k \alpha_{3k} Macro_{k,t-1} + \sum_l \alpha_4 Bank_{l,i,t-1} + \alpha_{5,t} year\_dummy_t + \alpha_{6,m} country\_dummy_m + \theta_i + \varepsilon_{i,t} \quad (1)$$

where $logit\_NPLr_{it}$ is the logit transformation of the ratio of nonperforming loaks to total loans and the lagged regressor $logit\_NPLr_{i,t-1}$ captures its persistence commonly found in the literature. $Global_{j,t-1}$ *(j =1)* is the real US Fed funds rate. $Macro_{k,t-1}$ represents macroeconomic variables ($k = 1, 2, 3$) – real growth rates of oil prices, nonoil private sector GDP, and equity prices, lagged by one period. NPL ratios are expected to rise as US interest rates rise and the value of the macro variables declines. $Bank_{l,i,t-1}$ is real credit growth ($l = 1$) lagged by one period. Positive and healthy credit growth would help support economic activity and lead to lower NPL ratios. That being said, in the medium term, higher leverage in the economy could build vulnerabilities. Year and country dummy variables are introduced in the regressions to control for events other than oil price developments that potentially led to an increase in NPL ratios and potential country effects. θ_i and $\varepsilon_{i,t}$ are bank fixed effects and random errors.

Two alternative dynamic panel models were used to check the robustness of the baseline estimates – Fixed Effects (FE) and Least Squares Dummy Variable Correction (LSDVC) (Kiviet, 1995; Bruno, 2005). The fixed effects model incorporates the data's panel structure but ignores the correlation between the lagged dependent variable and the regression error, thus yielding a downward-biased coefficient estimates for the lagged dependent variable. LSDVC corrects the biased in fixed effects-estimated coefficients, assuming that the independent variables are exogenous (The Anderson and Hsiao approach is used). The lagged dependent variable should lie between OLS and FE. The combination of fixed effects and lagged dependent variables can introduce econometric bias. In particular, OLS estimates of the lagged dependent variable's coefficient in a dynamic panel model are biased due to the correlation between the fixed effects and the lagged dependent variable (Nickell (1981)). Such bias declines as panel length increases. Moreover, data property can affect different estimators' performance (Flannery et al, 2013).

B. A panel VAR model of oil-macro-financial linkages

To identify a positive feedback loop between the macroeconomic and bank-level balance sheet variables, a panel vector autoregression (VAR) model, which accounts for bank-level heterogeneity, was estimated. The multivariate model in the previous section considered the uni-directional effects of macroeconomic shocks on the bank NPL ratio. A panel VAR model employed in this section goes one step further and captures the spillback from the bank NPL ratio and other balance sheet variables to the macroeconomy.

$$y_{i,t} = B_0 + B_1(L)y_{i,t} + u_{i,t} \quad (2)$$

where $y_{i,t}$ is a vector of macroeconomic and bank-level variables, B_0 is the deterministic component, (L) is a lag operator and $u_{i,t}$ is the residual. The model was estimated using a panel VAR routine *pvar* developed by Love and Zicchino (2006), which exploits a System-General Method of Moments (GMM) estimator as in Arellano and Bover (1995). As the fixed effects are correlated with the regressors due to lags of the dependent variables, the mean-differencing procedure commonly used to eliminate fixed effects would create biased coefficients. The orthogonality between transformed variables and lagged regressors is preserved by forward mean-differencing (the Helmert procedure in Arellano and Bover, 1995), which removes the mean of the future observations. Then, lagged regressors are used as instruments to estimate the coefficients by system GMM. The number of lags is set at two in view of the short time series dimension of the data discussed later (2000–14).

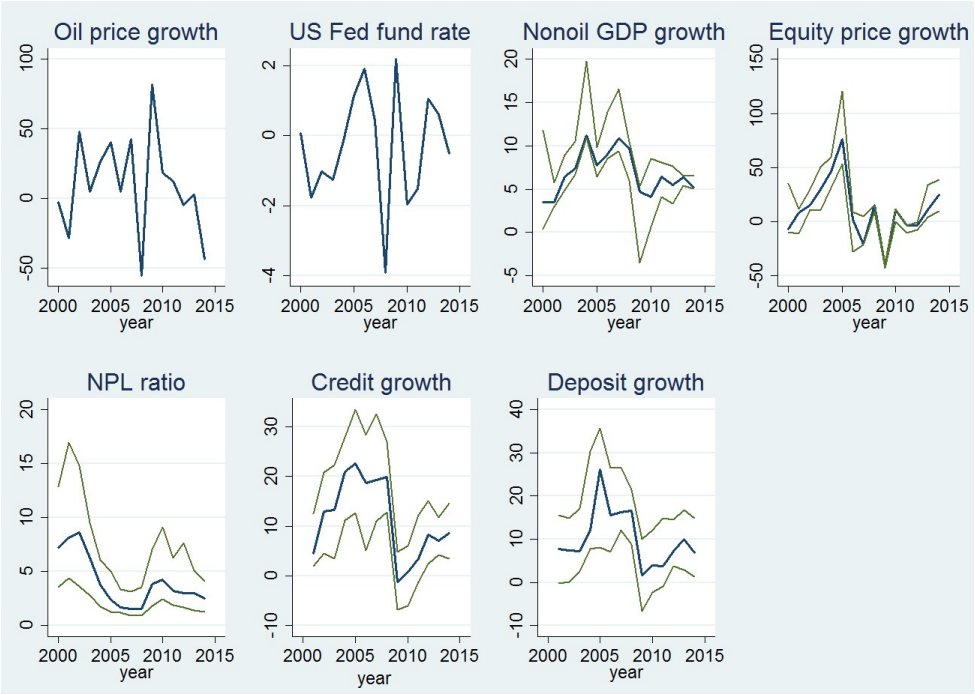
Five macroeconomic and bank level variables were included: macroeconomic variables include real oil price growth and real equity price growth; bank level variables are NPL ratios, real credit growth and real deposit growth for 42 GCC banks for which sufficient time series data are available.

The identification of shocks is based on a Cholesky decomposition where the variables are stacked to explore how macroeconomic shocks affect bank-level variables first, and how the latter affect the former in the second round. In particular, macroeconomic variables *{real oil price growth}* are stacked at the top. The bank-level variables *{NPL ratio, real credit growth, real deposit growth}* are stacked below the macro-level variables. Finally, real equity price growth is stacked at the bottom as commonly done in the literature.

IV. DATA

Our empirical analyses rely on macroeconomic and bank-level data which cover the six GCC economies and span 1999–2014 (Figure 3).

Figure 4. Macroeconomic and Bank Level Variables



Sources: Bankscope, Haver, and authors' calculations.
Note: The green bands represent a 50 percent range around the median value. Real values except for the NPL ratio.

The macroeconomic and financial sector variables included are real oil price growth, nonoil private sector real GDP growth, real equity price growth, and US interest rates. Real oil price growth averaged 17 percent year-on-year during 1999-2011 despite having declined sharply in 2001 and 2009. More recently, it fell increasingly into negative territory, reaching close to -10 percent in 2014. Nonoil private sector real GDP growth jumped in 2004, from around 4 percent year on year on average during the preceding several years to near 20 percent and, despite decelerating, remained above 10 percent through 2008. However, as lower oil prices took their toll on economic activity, the variable's performance fell to below 6 percent in 2014. Stock returns were impressive during the earlier part of the sample period on strong oil price performance. The strong stock price performance may partly reflect the pent-up demand from domestic investors to help diversify their asset allocation after some of the stock markets were established in the early 2000s. Real equity price growth was close to an average of 40 percent every year during 2001–05. Data on real estate prices are unavailable for GCC countries. However, following a sharp 40 percent drop in 2009, real stocks returns have been more subdued, registering an average of 3 percent decline per year during 2009–15. The U.S. Fed funds rate went through several cycles during the period. After increasing through 2000, it declined sharply in 2001. It rose during 2004–06, and declined sharply in 2008 and remained unchanged through 2014.

Table 3. Sampled GCC Banks

	Number of banks	Percent share
Bahrain	4	44
Kuwait	5	60
Oman	6	83
Qatar	7	81
Saudi Arabia	9	77
United Arab Emirates	11	62
Average	7	68
Total	42	...

Sources: Bankscope and authors' calculations.
Note: Percent share measured in terms of the stock of domestic credit.

The bank-level variables include NPLs as a share of total loans (the NPL ratio), real credit growth, and real deposit growth. The analysis incorporates 42 GCC banks for which sufficient time series data are available from Bankscope (Tables 3 and A1). These banks represent on average some 70 percent of the individual banking system in terms of the stock of credit. In terms of broad trends, the NPL ratio broadly declined during the sample period, at an accelerating pace during the first half of the 2000s when the oil price strengthened noticeably. The NPL ratio increased in 2009 coinciding with a sharp oil price decline, but due likely also to the realization of domestic vulnerabilities that had built up during the run up to the global financial crisis. The growth rates of credit and deposits appear to broadly mirror movements of oil prices, economic activity and equity prices. The results suggest that some of the macroeconomic and bank level variables are key determinants of NPL ratios in GCC (Table 4). A number of models were estimated using a system GMM approach. Models 7-12 pass certain statistical tests (Hansen, AR(1) and AR(2)). The NPL ratio exhibits strong persistence. Growth rates of real oil prices and nonoil private sector GDP are significant, suggesting that an increase in oil prices or private sector output leads to a decline in the NPL ratio. The coefficients on real equity prices growth and real credit growth come out with the correct sign but are not statistically significant. Real government spending and real U.S. interest rates do not directly affect NPL ratios in a systematic way (real government spending not shown).

Table 4. Determinants of Bank NPL Ratios in the GCC: System GMM results

Model number	1	2	3	4	5	6	7	8	9	10	11	12
Logit of NPL ratio (L1)	0.932***	0.923***	0.941***	0.714***	0.716***	0.806***	0.872***	0.842***	0.874***	0.620*	0.649*	0.775***
	0.231	0.219	0.181	0.159	0.16	0.14	0.156	0.122	0.082	0.352	0.365	0.227
Real oil price growth (L1)	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***	-0.012*	-0.008*	-0.008***	-0.020*	-0.015	-0.013
	0.002	0.002	0.001	0.001	0.002	0.001	0.006	0.004	0.003	0.011	0.01	0.01
nonoil GDP growth (L1)	0.01	0.001	0.006	-0.055*	-0.059**	-0.037	-0.058	-0.076*	-0.069*	-0.276	-0.234	-0.155
	0.038	0.036	0.032	0.03	0.029	0.024	0.054	0.046	0.036	0.251	0.261	0.192
Real equity price growth (L1)	-0.004	-0.004	-0.004	-0.005	-0.005*	-0.003	-0.012	-0.001	-0.003	-0.012	-0.003	-0.005
	0.003	0.003	0.003	0.003	0.003	0.003	0.017	0.012	0.006	0.017	0.013	0.009
Real credit growth (L1)	-0.005	-0.003	-0.003	0	0.001	0	-0.004	-0.004	-0.003	-0.004	-0.003	-0.002
	0.005	0.004	0.004	0.003	0.003	0.003	0.004	0.003	0.003	0.005	0.004	0.003
Real US fed funds FD (L1)	0.084	0.065	0.086	0.031	0.015	0.08	…	…	…	…	…	…
	0.12	0.11	0.087	0.096	0.092	0.083	…	…	…	…	…	…
Constant	-0.194	-0.18	-0.167	-0.484	-0.458	-0.309	0.348	0.427**	0.478**	0.646	0.661	0.6
	0.565	0.529	0.445	0.441	0.442	0.408	0.31	0.216	0.199	0.7	0.533	0.365
Year dummy	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y
Country dummy	N	N	N	Y	Y	Y	N	N	N	Y	Y	Y
Lag depth	1	2	3	1	2	3	1	2	3	1	2	3
p-values												
AR(1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.023	0.014	0.002
AR(2)	0.206	0.196	0.141	0.103	0.103	0.096	0.364	0.192	0.251	0.144	0.180	0.204
Hansen	0.002	0.012	0.030	0.005	0.026	0.100	0.546	0.634	0.790	0.946	0.850	0.802
Passes tests?	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y

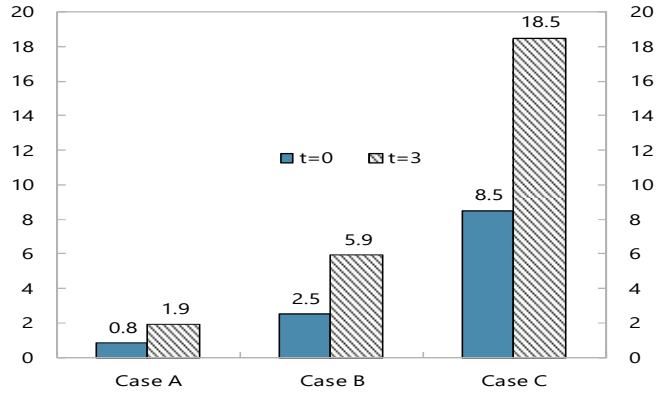
Note: The dependent variable is bank-by-bank (logit transformed) NPL ratio for selected GCC banks spanning 2000-2014 (annual frequency). Relying on a system GMM approach, with the collapsing method. The coefficients represent non-liner effect that depends on starting levels. Sandard errors estimated using the Huber-White sandwich estimators. ***, **, and * signify statistical significance at the 1%, 5% and 10% levels. L1 signifies one period lag. AR(1) and AR(2) signify p-values associated with the null hypothesis of lack of first and second order serial correlation. Hansen signifies p-value associated with the null hypothesis that the instruments are exogenous. A model is cosidered to pass tests if pvalues of both AR(2) and Hansen tests are 10% or greater.
Sources: Bankscope, Haver, Bloomberg, and staff estimates.

The results are subject to some caveats. First, the information content of publicly available bank-level balance sheet data is relatively limited compared with the more granular regulatory data typically used for some other IMF assessments (such as FSAP). Second, any analysis based on historical data might not always account for the effects of recent improvements to risk-management and supervisory frameworks. Third, the data spanning 2000–14 may not capture a sufficient number of oil price and financial cycles. Fourth, as inherent in any econometric analysis, there is parameter uncertainty surrounding the estimated relationship between macroeconomic shocks and NPL ratios.

The empirical results imply that the actual and projected declines in oil prices and slowing of GDP growth could lead to an increase in the NPL ratio (Figure 5). For illustrative purposes, the NPL ratios in 10, 50 and 90 percentiles in 2014 are taken as starting points to which the coefficients obtained from model 8 are applied. Data on actual and projected oil price performance for 2015–20 (see Figure 1) suggest that oil prices will, on average, remain 50-60 percent below the 2014 peak in the medium term. Recognizing the degree of uncertainty surrounding the oil price projections and that the risks are tilted to the upside, for this simulation, oil prices are assumed to decline by 50 percent in $t = 0$, and remain unchanged for three years. Similarly, non-oil GDP growth is assumed to weaken by 3 percentage points. Figure 5 shows that, starting from 0.8 percent, the NPL ratio would rise by 1 percentage point to 1.9 percent in three years. Banks with lower asset quality would witness larger increases. Starting from 2.5 (8.5) percent, the NPL ratio would rise by about

3 (10) percentage points to about 6 (19) percent. Nevertheless, their strong capital buffers, profitability, and provisions provide an important source of resilience for GCC banks.

Figure 5 Dynamics of NPL Ratios After a 50 Percent Decline in Oil Prices and 3 Percentage Point Reduction in Nonoil GDP Growth in t=0



Source: Bankscope, Haver, and IMF staff calculations.
Note: The three cases illustrate banks in the 10th, 50th, and 90th percentile of NPLS in 2014 and the impact of an adverse oil price and growth shock scenario over a three year horizon.

Table 5. Determinants of Bank NPL Ratios in the GCC-Alternative Approaches

	Fixed effects					LSDVC				
Model number	13	14	15	16	17	18	19	20	21	22
Logit of NPL ratio (L1)	0.686***	0.681***	0.694***	0.685***	0.688***	0.686***	0.681***	0.783***	0.762***	0.869**
	0.034	0.038	0.039	0.043	0.036	0.054	0.05	0.058	0.057	0.039
Real oil price growth (L1)	-0.004***	-0.004***	-0.004***	-0.003***	-0.019***	-0.004	-0.004	-0.004***	-0.003***	-0.004*
	0.001	0.001	0.001	0.001	0.001	0.016	0.011	0.001	0.001	0.001
nonoil GDP growth (L1)	-0.033***	-0.030***	-0.023**	-0.023**	-0.009	-0.034	-0.03	-0.021***	-0.021**	-0.004
	0.007	0.008	0.008	0.008	0.007	0.137	0.088	0.008	0.01	0.01
Real equity price growth (L1)	...	-0.002***	-0.002***	-0.002***	0.001	...	-0.002	-0.002**	-0.002*	0
	...	0	0	0	0.001	...	0.013	0.001	0.001	0.001
Real credit growth (L1)	...	...	-0.001	-0.001	-0.004	...	...	-0.001	-0.001	-0.003*
	...	...	0.002	0.002	0.002	...	...	0.001	0.002	0.002
Real US fed funds FD (L1)	...	...	...	-0.023	...	...	...	...	-0.019	...
	...	...	...	0.018	...	...	...	...	0.034	...
Year dummy	N	N	N	N	Y	N	N	N	N	Y
N	575	551	499	499	499	575	551	499	499	499
Overall R^2	0.725	0.719	0.724	0.723	0.762	0.724	0.719	0.726	0.725	0.768

Note: The dependent variable is bank-by-bank (logit transformed) NPL ratio for selected GCC banks spanning 2000-2014 (annual frequency). LSDVC = a bias corrected least squares dummy variable estaimtor (Anderson-Hsiao). The coefficients represent non-liner effect that depends on starting levels. Sandard errors estimated using the Huber-White sandwich estimators. ***, **, and * signify significance at the 1%, 5% and 10% levels. L1 signifies one period lag.
Sources: Bankscope, Haver, Bloomberg, and staff estimates.

Robustness checks

The results using alternative approaches support the key findings of our baseline analysis (Table 5). The NPL ratio exhibits similar levels of persistence. The coefficients of the lagged dependent variable are in a range of 0.68–0.69 based on the fixed effects model (models 13–17), below 0.68–0.86 estimated using LSDVC (models 18–22). A lower autoregressive coefficient generates a steeper path of a projected NPL ratio in a downside scenario analysis. Growth rates of real oil prices, nonoil private sector GDP and real equity prices remain key determinants of NPL ratios in the GCC economies. The coefficients on real credit growth come out with the correct sign but are not statistically significant. Real government spending (not shown) and real U.S. interest rates do not directly affect NPL ratios in a systematic way.

A. A panel VAR model of oil-macro-financial linkages

The estimated results are summarized as follows. Table 6 presents the estimated coefficients from the system GMM approach in the panel VAR model. The estimated coefficients are often statistically significant. Table 7 includes impulse response values after normalizing by the size of each variable's one standard deviation shock. Figure 6 displays the values visually.

Table 6. GCC: Estimated Panel VAR Coefficients and T-Statistics

	roilpg		*nplr*		*rcrg*		*rdpg*		*reqpg*	
	coef.	t-stat.	coef.	t-stat.	coef.	t-stat.	coef.	t-stat.	coef.	t-stat.
L.roilpg	-0.006	-0.078	0.007	0.860	0.070	1.883	0.083	1.894	-0.580	-8.010
L.nplr	1.938	3.149	0.880	6.169	-0.281	-1.034	-0.583	-1.823	0.453	0.668
L.rcrg	0.049	0.496	0.001	0.082	0.045	0.559	-0.012	-0.148	0.343	2.276
L.rdpg	0.241	2.395	-0.030	-3.728	0.328	3.782	0.241	2.754	0.084	0.573
L.reqpg	-0.020	-0.632	-0.003	-0.894	0.004	0.132	-0.023	-0.846	0.377	5.238
L2.roilpg	0.063	1.150	0.003	0.583	0.061	1.769	0.031	0.851	-0.040	-0.603
L2.nplr	0.374	0.956	-0.223	-2.423	0.859	2.925	0.884	3.140	1.738	2.834
L2.rcrg	0.199	2.374	0.006	0.720	0.099	1.461	0.041	0.457	0.207	1.271
L2.rdpg	0.011	0.139	0.019	2.185	-0.007	-0.108	0.036	0.385	-0.259	-2.180
L2.reqpg	0.011	0.363	-0.011	-3.355	0.066	2.517	0.084	3.406	-0.014	-0.284

Sources: Bankscope, Haver, and IMF staff calculations.

Note: Estimated using a panel VAR routine with two lags. Annual data spanning 2000-14. Bank level data for NPL ratio, real credit and deposit growth for 42 GCC banks. "L." and "L.2" are lag operator indicating the first and second lag. roilpg is real oil price growth, nplr is NPL to total loans ratio, rcrg real credit growth, rdpg is real deposit growth, reqpg is real equity price growth.

There is strong empirical evidence of feedback loops between oil price movements, bank balance sheets, and asset prices in the GCC (Figure 6). Results from a panel VAR model suggest that, first, oil price movements affect bank balance sheets in a significant way. A drop in the growth rate of oil prices results in a rise in the ratio of nonperforming loans (NPL) to gross loans, and a reduction in the real growth rates of bank credit and deposits (Figure 1). A 1 percent decline in oil prices leads to a 0.2–0.3 percentage point decline in real credit growth and a 0.1–0.2 percentage point decline in real deposit growth—with timing varying from immediate to 2–3 year lags. The NPL ratio would increase by about 0.1 percentage point in the long run. There is also a feedback effect within bank balance sheets, as a higher NPL ratio leads to lower real bank credit and deposit growth—as solvency risk rises, banks reduce lending to boost capital adequacy ratios, while the customers lose confidence in the banks, and vice versa. These results are consistent with other studies on the GCC economies (see, for instance, Espinoza and Prasad, 2010). Schiozer and Oliveira (2015) find that during times of high systemic uncertainty, liquidity shocks have asymmetric effects on loan supply. That is, loan supply declines as liquidity falls. However, loan supply does not increase much when liquidity increases because banks tend to hold on to liquidity.

Table 7. GCC: Response of Macro and Bank Level Variables

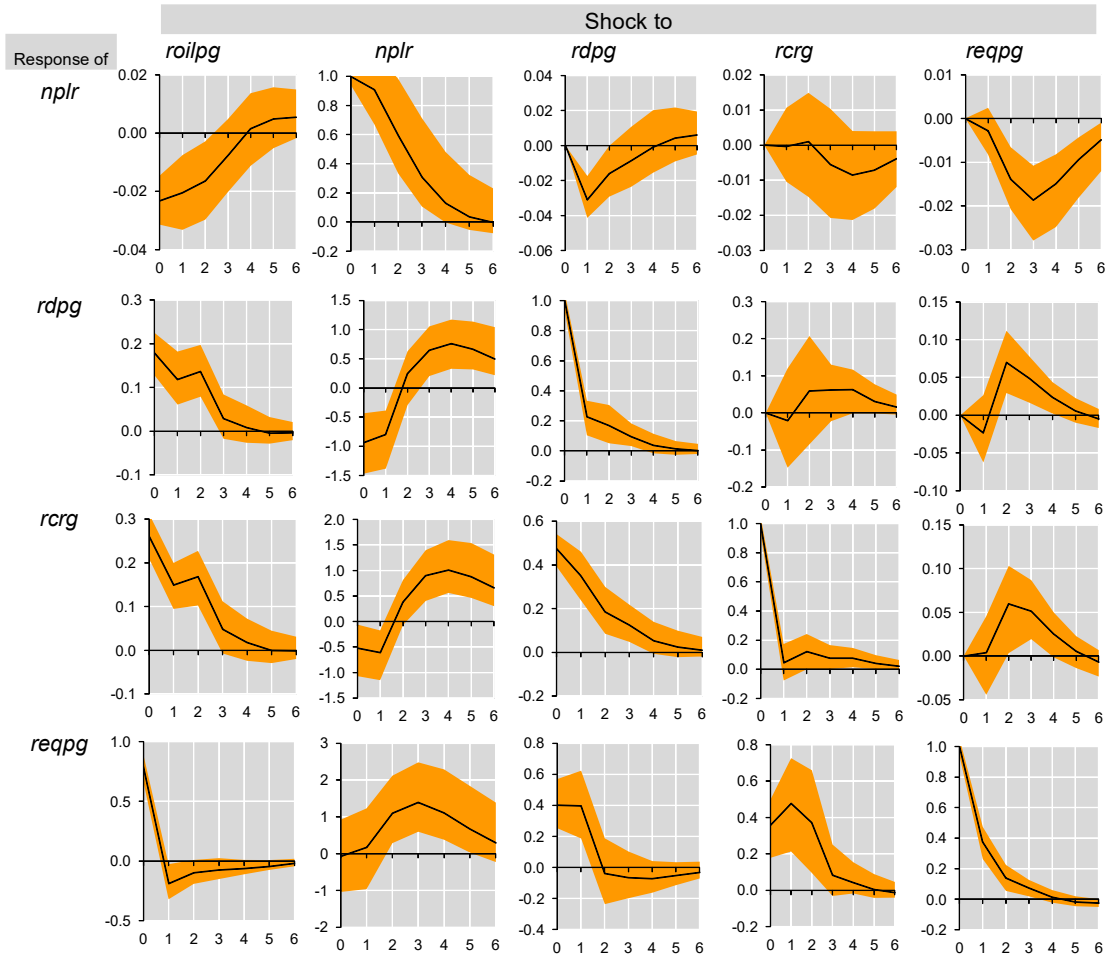
				(Shock variable)		
time		***roilpg***	***nplr***	***rcrg***	***rdpg***	***reqpg***
				(Responses)		
0	*roilpg*	22.241	0.000	0.000	0.000	0.000
1	*roilpg*	-0.240	3.784	2.219	2.907	-0.538
2	*roilpg*	2.611	4.001	2.728	0.277	-0.189
3	*roilpg*	0.697	3.393	1.013	1.059	-0.197
4	*roilpg*	0.686	2.662	0.856	0.367	-0.393
5	*roilpg*	0.330	1.938	0.461	0.376	-0.475
6	*roilpg*	0.327	1.338	0.306	0.261	-0.454
0	*nplr*	-0.517	2.242	0.000	0.000	0.000
1	*nplr*	-0.456	2.037	-0.221	-0.378	-0.075
2	*nplr*	-0.365	1.331	-0.102	-0.204	-0.366
3	*nplr*	-0.171	0.692	-0.116	-0.074	-0.492
4	*nplr*	0.032	0.288	-0.093	0.040	-0.393
5	*nplr*	0.109	0.078	-0.043	0.094	-0.249
6	*nplr*	0.120	-0.003	0.002	0.096	-0.128
0	*rcrg*	5.824	-1.161	13.562	0.000	0.000
1	*rcrg*	3.327	-1.372	2.918	4.041	0.100
2	*rcrg*	3.737	0.858	2.548	1.554	1.569
3	*rcrg*	1.067	2.017	1.666	1.082	1.351
4	*rcrg*	0.399	2.254	1.158	0.212	0.668
5	*rcrg*	-0.004	1.970	0.576	0.062	0.138
6	*rcrg*	-0.028	1.484	0.278	-0.005	-0.184
0	*rdpg*	3.967	-2.105	6.978	12.285	0.000
1	*rdpg*	2.632	-1.797	1.368	2.898	-0.610
2	*rdpg*	3.038	0.546	1.789	1.748	1.842
3	*rdpg*	0.635	1.450	1.296	0.812	1.274
4	*rdpg*	0.178	1.696	0.898	0.075	0.625
5	*rdpg*	-0.094	1.494	0.408	-0.017	0.155
6	*rdpg*	-0.082	1.120	0.180	-0.052	-0.127
0	*reqpg*	17.497	-0.159	6.447	2.852	26.333
1	*reqpg*	-4.211	0.383	7.658	2.101	9.920
2	*reqpg*	-2.158	2.459	3.519	-2.665	3.635
3	*reqpg*	-1.677	3.115	0.390	-1.298	1.938
4	*reqpg*	-1.421	2.486	-0.086	-1.157	0.359
5	*reqpg*	-1.013	1.501	-0.340	-0.692	-0.460
6	*reqpg*	-0.449	0.662	-0.372	-0.322	-0.647

Source: IMF staff calculations.

Second, equity price developments are a channel for amplification of the bank liquidity feedback loop stemming from an adverse oil price shock. A one percent reduction in oil price growth leads to a 0.8 percent decline in the rate of equity price inflation, which in turn leads to a reduction of bank credit and deposit growth by 0.1 percentage point, further depressing equity price performance.

One counter-intuitive result is that a lower NPL ratio leads to lower equity prices. The transmission in the opposite direction is consistent with the prior. That is, higher equity prices lead to a lower NPL ratio. However, the counter-intuitive outcome broadly disappears when the number of lag is increased from two to three (Figure A1).

Figure 6. GCC: Response of Macro and Bank Level Variables - two lags



Sources: Bankscope, Haver, and IMF staff calculations.

Note: Estimated using a panel VAR routine with two lags. Annual data spanning 2000–14. Bank level data for NPL ratio, real credit and deposit growth for 42 GCC banks, *roilpg* is real oil price growth, *nplr* is NPL to total loans ratio, *rcrg* real credit growth, *rdpg* is real deposit growth, *reqpg* is real equity price growth.

V. MOVEMENTS IN BANK CAPITAL AND PROVISIONS IN THE GCC

The existence of oil-macro-financial feedback loops suggests greater needs to build buffers in good times in the GCC. The importance of building buffers to cushion against negative shocks has been well documented. Increasing capital and provisions in good times helps enhance the resilience of the financial system and reduce procyclical feedback effects between asset prices and credit. In Saudi Arabia, empirical evidence confirms the view that bank capital and provisioning buffers have been moved counter-cyclically (Abusaaq et al, 2015). Both the capital and provisioning ratios increase as indicators of business and financial cycles strengthen.

Table 8. Correlation of NPL Provisions and Capital Ratios with Indicators of Business and Financial Cycles: Country Level Analysis
(Correlation and p-values)

			Credit to non oil GDP gap	Real credit growth	Real non oil GDP growth	Real oil price growth
Bahrain	Provisions/NPL	Coeff.	0.07	0.62 ***	0.21	0.29
		p-val.	0.80	0.02	0.46	0.31
	CAR	Coeff.	-0.82 ***	0.45 ***	0.73 ***	0.57 *
		p-val.	0.00	0.10	0.00	0.03
Kuwait	Provisions/NPL	Coeff.	-0.74 ***	0.57 ***	0.45	0.28
		p-val.	0.00	0.03	0.10	0.32
	CAR	Coeff.	-0.34	0.63 ***	0.43	-0.16
		p-val.	0.22	0.01	0.12	0.59
Oman	Provisions/NPL	Coeff.	0.51 ***	0.28	-0.11	-0.22
		p-val.	0.06	0.33	0.70	0.45
	CAR	Coeff.	-0.90 ***	0.30	0.63 ***	0.49 *
		p-val.	0.00	0.29	0.01	0.07
Qatar	Provisions/NPL	Coeff.	-0.46 ***	0.35	-0.09	0.34
		p-val.	0.10	0.21	0.76	0.23
	CAR	Coeff.	-0.77 ***	0.25	0.29	0.31
		p-val.	0.00	0.46	0.39	0.34
Saudi Arabia	Provisions/NPL	Coeff.	0.69 ***	0.09	0.35	-0.09
		p-val.	0.01	0.76	0.22	0.75
	CAR	Coeff.	-0.04	0.30	0.03	0.14
		p-val.	0.88	0.30	0.91	0.63
UAE	Provisions/NPL	Coeff.	0.51 ***	0.28	-0.11	-0.22
		p-val.	0.06	0.33	0.70	0.45
	CAR	Coeff.	-0.62 ***	-0.44	0.21	0.12
		p-val.	0.02	0.11	0.46	0.68

Sources: Bankscope and IMF staff estimates.

Note: ***, **, and * signify statistical significance at the 1 percent, 5 percent, and 10 percent level.

A simple empirical approach is used to shed light on the countercyclical behavior of loan loss provisions and capital ratios in the GCC. Developments in loan loss provisioning and capital adequacy ratios (CAR) are compared to movements in key business and financial cycle indicators, including the credit-to-nonoil GDP gap (estimated as percent deviations from HP trends), real credit growth, and real nonoil GDP growth. The "credit to nonoil GDP gap", defined here as the deviation in the ratio of credit to non-oil GDP from its long run trend, is a key indicator of the financial cycle, but should be complemented by additional indicators and

judgment. It replaces the credit-to-GDP gap which is influenced by oil prices and does not provide a robust indicator of financial sector vulnerabilities in the GCC. The empirical literature finds that, currently, it is the single best early-warning indicator of crises, signaling crises five to three years in advance. To help address the well-known end-point issues with HP filters, the gaps for 2000–14 are calculated with two extra years of data, including forecasts through 2015–16. A two-sided approach is used. To account for GCC-specific factors, real oil price growth is also considered. The degree of countercyclical movement is assessed using correlation coefficients between provisions to NPLs or CAR with each of the four business and financial cycle indicators. The latter are lagged by one period (i.e. one year) to help reduce the chance of capturing reverse causality stemming from macro variables. Positive correlation coefficients, when statistically significant, signal the potential that provisions to NPLs and CAR are countercyclical – these ratios increase during good times. This exercise was conducted using country level data and bank level data.

Table 9. Correlation of NPL Provisions and Capital Ratios with Indicators of Business and Financial Cycles: Bank level analysis
(Number of banks with statistically significant positive correlation)

		Credit to non oil GDP gap	Real credit growth	Real non oil GDP growth	Real oil price growth
Saudi Arabia	Provisions/NPL	7	1	1	2
	CAR	4	2	2	0
United Arab Emirates	Provisions/NPL	3	3	3	0
	CAR	0	2	2	0

Sources: Bankscope and IMF staff estimates.

Note: The total number of banks analyzed is seven for both Saudi Arabia and the United Arab Emirates, respectively.

There is tentative evidence to suggest these tools have moved countercyclically for some GCC banks (Table 8). Country-level loan loss provisions to NPL ratios are calculated using bank level data from Bankscope. Bankscope-based country aggregates are consistent with IMF desk data and, importantly, available with longer time series. The sampled banks represent 50–96 percent (an average of 67 percent) of domestic banking systems measured in terms of percent of the stock of credit. This ratio is countercyclical relative to the credit to nonoil GDP gap in Oman, Saudi Arabia, and the United Arab Emirates; and relative to real credit growth in Bahrain and Kuwait. Country-level CARs are assessed based on published country-level financial soundness indicators data. They are countercyclical in Bahrain, Kuwait, and Oman with respect to real growth of credit, nonoil GDP, or oil prices. No systematic linkage was found for Qatar, Saudi Arabia, and the United Arab Emirates. In four instances either provisions to NPL ratios or CARs are found to be procyclical. The results need to be interpreted with caution as the annual data provide a relatively limited number of observations. Additionally, the estimated credit-to-nonoil GDP gap may not represent sufficiently the financial cycle.

Similar assessments using bank-level data reveal heterogeneity across individual banks. Given the relatively large sample size, a bank level analysis focuses on banks in Saudi Arabia and the United Arab Emirates. Table 9 reports the number of banks with statistically significant positive correlation is reported. In Saudi Arabia, provisions to NPLs ratios are countercyclical, in a statistically significant way with respect to the credit-to-nonoil GDP gap for 7 of the 11 banks, consistent with the evidence based on the aggregate data. The CAR is countercyclical with respect to the credit to nonoil GDP gap for 4 banks. In the United Arab Emirates, provisions to NPL ratios are countercyclical with respect to most macroeconomic variables for 3 out of 7 banks. The CAR is countercyclical with respect to real growth rates of credit and nonoil GDP for 2 of the 7 banks analyzed.

VI. Concluding Remarks

The paper demonstrates the existence of oil-macro-financial linkages in the GCC countries using various quantitative approaches. Generally speaking, the performance of key indicators of business and financial cycles has generally strengthened during oil price upturns. The timing of downturns in those variables has tended to coincide with oil price downturns, even though greater fiscal buffers attenuated the linkage.

These qualitative conclusions are confirmed with quantitative analyses, which were conducted relying on macroeconomic and bank-level data which cover the six GCC economies and span 1999–2014, and two related econometric approaches. The first set of empirical results, using multivariate econometric models, confirmed that oil prices and economic activity tended to significantly affect bank asset quality, and suggested that the actual and projected declines in oil prices and slowing of GDP growth could lead to an increase in the NPL ratio. The second set of empirical results using a panel VAR approach identified feedback loops between oil price movements, bank balance sheets, and asset prices in the GCC. A lower growth rate of oil prices would lead to a rise in the ratio of NPLs to gross loans, and a reduction in the real growth rates of bank credit and deposits. There was also a feedback effect within bank balance sheets, as a higher NPL ratio would lead to lower real bank credit and deposit growth. Equity price performance tended to work as a channel for amplification of the bank liquidity feedback loop stemming from an adverse oil price shock.

In the presence of such oil-macro-financial feedback loops, tentative evidence suggested that banks in the GCC countries tended to set the capital ratio and provisioning for NPLs countercyclically. A simple empirical analysis, using both country- and bank-level data, revealed that loan loss provisions and capital adequacy ratios were positively correlated with indicators of business and financial cycles. In other words, these banks would build up buffers during good times and release them during difficult times. This helped strengthen the resilience of the financial system in the GCC to the oil price decline since mid-2014.

The exposure of the GCC economies and financial sectors to volatile oil prices suggests an important role for countercyclical macroprudential policies to mitigate systemic risks

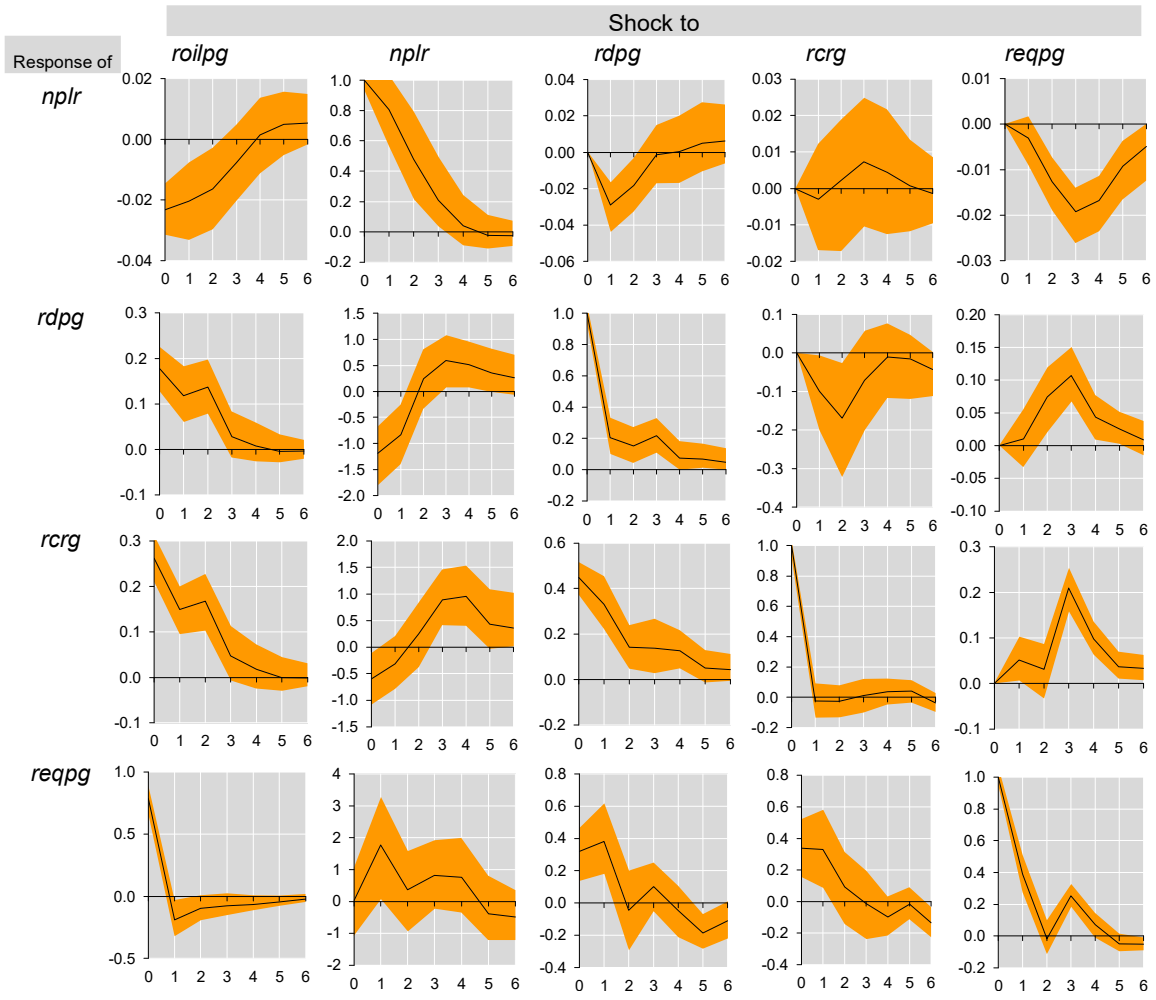
(Callen, Khandelwal, Miyajima, and Santos, 2015). The GCC countries are already implementing a wide range of macroprudential instruments to build resilience in the banking sector. Well-defined macroprudential policy frameworks should help guide the countercyclical use of macro-prudential policy tools in the GCC.

Annex 1. Additional Tables and Figures

Table A1. GCC Banks Included Econometric Analyses

Country		Bank
Bahrain	1	Ahli United Bank BSC
	2	Gulf International Bank BSC
	3	BBK B.S.C.
	4	National Bank of Bahrain
Kuwait	5	National Bank of Kuwait S.A.K.
	6	Kuwait Finance House
	7	Gulf Bank KSC (The)
	8	Commercial Bank of Kuwait SAK (The)
	9	Industrial Bank of Kuwait K.S.C.
Oman	10	Bank Muscat SAOG
	11	Bank Dhofar SAOG
	12	National Bank of Oman (SAOG)
	13	HSBC Bank Oman
	14	Oman Arab Bank SAOC
	15	Ahli Bank SAOG
Qatar	16	Qatar National Bank
	17	Commercial Bank of Qatar (The) QSC
	18	Qatar Islamic Bank SAQ
	19	Doha Bank
	20	Ahli Bank QSC
	21	International Bank of Qatar Q.S.C.
	22	Qatar Development Bank Q.S.C.C.
Saudi Arabia	23	National Commercial Bank (The)
	24	Samba Financial Group
	25	Riyad Bank
	26	Banque Saudi Fransi JSC
	27	Saudi British Bank JSC (The)
	28	Arab National Bank Public Joint Stock Company
	29	Saudi Hollandi Bank
	30	Saudi Investment Bank (The)
	31	Bank AlJazira JSC
United Arab Emirates	32	National Bank of Abu Dhabi
	33	First Gulf Bank
	34	Abu Dhabi Commercial Bank
	35	Abu Dhabi Islamic Bank - Public Joint Stock Co.
	36	Mashreqbank PSC
	37	Union National Bank
	38	Commercial Bank of Dubai P.S.C.
	39	Bank of Sharjah
	40	National Bank of Fujairah PJSC
	41	Commercial Bank International P.S.C.
	42	National Bank of Umm Al-Qaiwain PSC

Figure A1. GCC: Response of Macro and Bank Level Variables – three lags



Sources: Bankscope, Haver, and IMF staff calculations.

Note: Estimated using a panel VAR routine with three lags. Annual data spanning 2000–14. Bank level data for NPL ratio, real credit and deposit growth for 42 GCC banks, *roilpg* is real oil price growth, *nplr* is NPL to total loans ratio, *rcrg* real credit growth, *rdpg* is real deposit growth, *reqpg* is real equity price growth.

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