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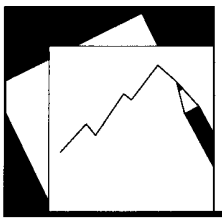

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Nonperforming Loans in the GCC Banking System and their Macroeconomic Effects

Raphael Espinoza and Ananthakrishnan Prasad

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Nonperforming Loans in the GCC Banking System and their Macroeconomic Effects

Prepared by Raphael Espinoza and Ananthakrishnan Prasad

Authorized for distribution by Abdelhak Senhadji

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Abstract

According to a dynamic panel estimated over 1995–2008 on around 80 banks in the GCC region, the NPL ratio worsens as economic growth becomes lower and interest rates and risk aversion increase. Our model implies that the cumulative effect of macroeconomic shocks over a three year horizon is indeed large. Firm-specific factors related to risk-taking and efficiency are also related to future NPLs. The paper finally investigates the feedback effect of increasing NPLs on growth using a VAR model. According to the panel VAR, there could be a strong, albeit short-lived feedback effect from losses in banks' balance sheets on economic activity, with a semi-elasticity of around 0.4.

JEL Classification Numbers: E44; G21

Keywords: NPLs; macro-financial linkages; Gulf Cooperation Council; Stress-testing

Author's E-Mail Address: respinoza@imf.org; aprasad@imf.org

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I. INTRODUCTION[1]

The global crisis exposed the vulnerabilities of the banks in the Gulf Cooperative Council (GCC) countries to varying degrees. GCC countries experienced significant increases in banking system credit between 2003 and 2008. The favorable macroeconomic environment in the years preceding the global crisis had been conducive to favorable credit conditions and lower nonperforming loans (NPLs) of banks. In 2009, NPLs increased sharply and credit stagnated, raising worries that the recovery could be slowed down by credit constraints.

The current crisis highlights the importance of linking the macroeconomic conditions to the health of the banking system. The main goal of macroeconomic stress tests, which have become more common with the financial crisis, is to identify structural vulnerabilities in the financial system in order to assess its resilience to shocks (Drehmann, 2009), in particular losses in the loan books. Credit risk increases as the economic situation deteriorates and interest payments rise, a result found in many credit risk models (see for instance IMF, 2006). Conversely, a deterioration in banks' balance sheets may feedback into the economy because banks will tighten credit conditions, especially if there remain uncertainties on the valuation of projects and of assets.

This paper focuses on the relationship between macroeconomic variables and NPLs (credit risk) in GCC banks' books. This is to the best of our knowledge the first attempt to model NPLs in the GCC countries, using bank-level data. This additional level of disaggregation strengthens the accuracy of estimation and allows a discussion of the impact of macro-variables and of bank-specific characteristics. It also allows a discussion of meaningful non-linearities, in particular the finding that banks with higher levels of NPLs are also more sensitive to macroeconomic shocks. The model estimates elasticities that are a key input for stress testing banks' balance sheets in the GCC. This study also estimates a macroeconomic panel VAR in order to discuss the potential feedback effects of bank performance on the supply of credit and growth. Although there are precedents on other regions, this is the first attempt on GCC countries data.

The study conducts this analysis using bankwise data from Bankscope. According to a dynamic panel estimated over 1995–2008 on around 80 banks in the GCC region, the NPL ratio worsens as economic growth becomes lower and interest rates increase. Larger banks and banks with lower expenses would also have lower NPLs. Finally, high credit growth in the past could generate higher NPLs in the future. According to all models, NPLs are very persistent, which would suggest that the response of credit losses to the macroeconomic cycle could take time to materialize, although it would also imply that NPL would then cumulate to high levels. The model implies that the cumulative effect of macroeconomic shocks over a three year horizon is indeed large.

[1]This paper was completed when Raphael Espinoza was working in MCD. We are grateful for comments from Adolfo Barajas, Maher Hasan, May Khamis, Adnan Mazarei, Ratna Sahay, Christian Schmieder, Abdel Senhadji and participants at the MCD seminar at the IMF, and we are indebted to Inessa Love for sharing her panel VAR codes. Arthur Ribeiro and Renas Sidahmed provided outstanding research assistance.

The paper also investigates the feedback effect of increasing NPLs on growth using a VAR model. Overall, the model suggests that there is strong albeit short-lived feedback effect on non-oil growth, with a semi-elasticity of around 0.4. However, these results are the outcome of an analysis during a period in which the region did not suffer from systemic banking crises. Since the feedback effect is likely to be nonlinear, costs could increase significantly once NPLs cross a certain threshold. Looking ahead, the results of the study have implications for regulation and supervison of the financial system in the GCC countries. In the context of their exchange rate pegs, a stronger focus on macroprudential regulation, particularly through capital and liquidity buffers and countercyclical provisioning norms, would help mitigate the impact of macroeconomic risks on the banking system and the feedback effect of credit risks on the economy.

The paper is organized in the following manner. Section II highlights some stylized facts on the GCC banking system with a focus on credit and NPLs. Section III reviews the literature on determinants of credit risk in banks' loan books and their feedback effects on the real economy. Section IV presents our results on bank-level regressions for the GCC countries, while Section V investigates the macroeconomic effects of default. Section VI concludes.

II. STYLIZED FACTS

The current low levels of NPLs in the GCC are partly the result of the good economic fortune of the region, but the recent downturn in the Gulf economies could severely affect the outlook for credit risk. NPLs reached very high levels in the GCC before the boom years, and NPL ratios in double-digits were not uncommon.[2] We present in Table 1 some summary statistics on NPLs in the GCC banking system, based on a Bankscope database that covers around 80 banks in the GCC (see Table 4 for coverage).

Table 1. Summary Statistics on Nonperforming Loans

NPL Ratios in Banks 1995–2008

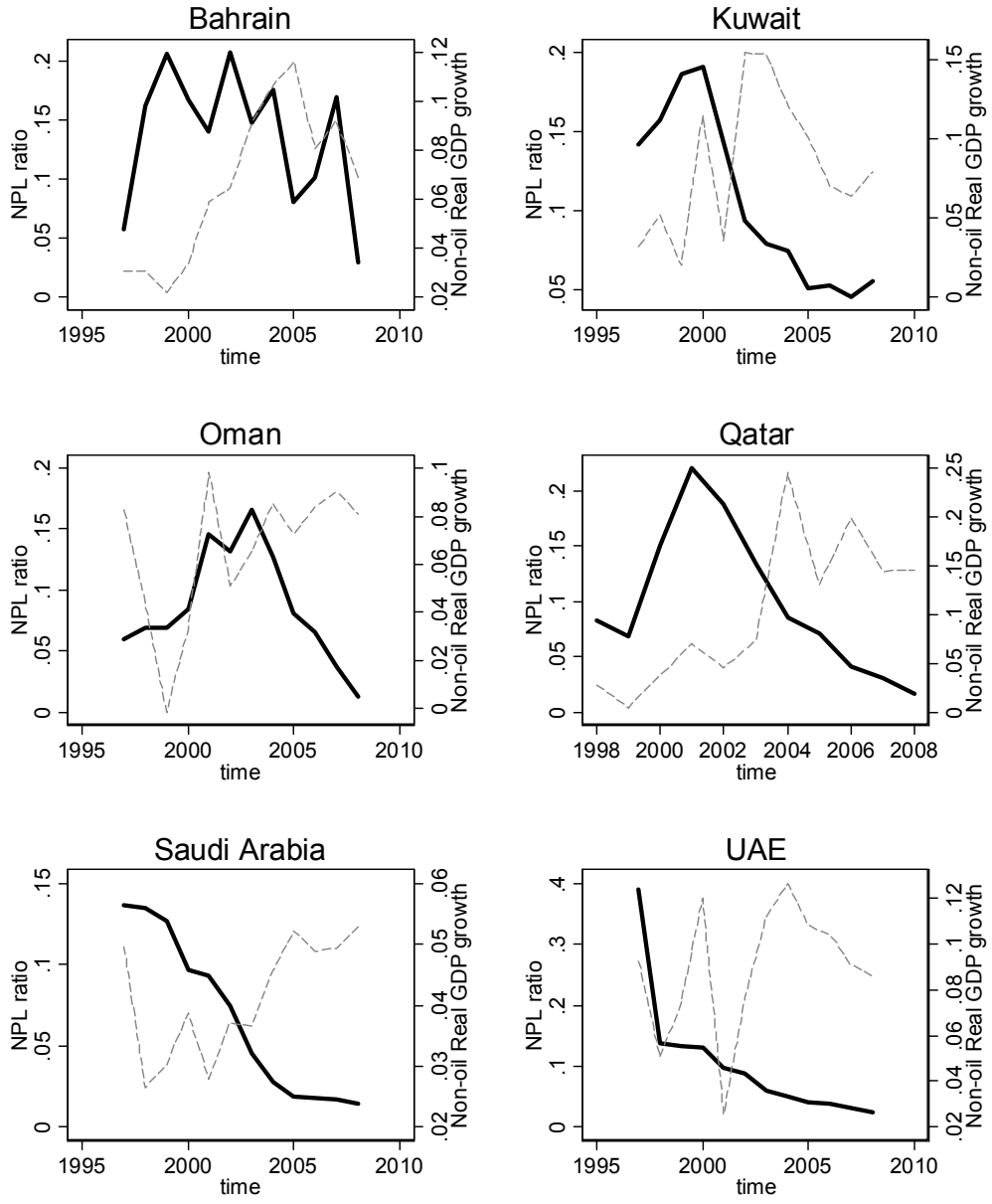
	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
No. Banks	26	15	16	9	20	32
NPL ratio in 2008 (unweighted)	2.9	5.5	1.2	1.7	1.4	2.4
NPL ratio (1995–2008)						
25th percentile	2.1	3.4	3.5	1.3	1.7	1.7
Median	5.9	6.7	6.5	3.1	3.1	4.3
75th percentile	14.8	12.5	11.3	11.5	7.3	9.6

Source: Bankscope and staff calculations

[2] Nonperforming loans increased in most GCC countries in 2009 to 3.9 percent in Bahrain, 9.7 percent in Kuwait, 2.8 percent in Oman, 1.7 percent in Qatar, 3.3 percent in Saudi Arabia, and 4.6 percent in the U.A.E. (Khamis and Senhadji, 2010).

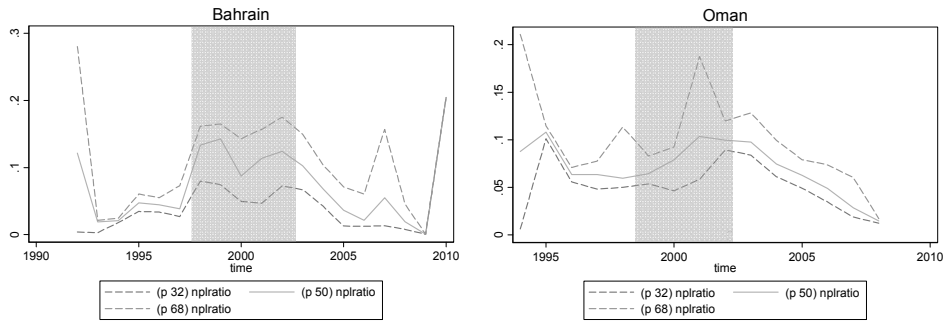
Figure 1. NPL Ratio and Economic Activity in the GCC

NPL ratio (solid line, LHS scale); non-oil real GDP growth (dashed line, RHS scale)



Sources: Bankscope and authors' calculations

Figure 2. Bank Heterogeneity and the Business Cycle



Sources: Bankscope and authors' calculations. Periods of lowest growth in shaded area.

The GCC countries experienced particularly high levels of NPLs in the 2000–02 period, when low oil prices and deflated stock markets hurt liquidity and balance sheets (Figure 1). . Although impaired loans fluctuated with the macroeconomic conditions, banks' individual situation mattered as well. Figure 2 shows for Bahrain and Oman (and the same is true across the GCC) that although in good times NPLs are low across the board, in bad times, NPLs increase much faster for banks with higher levels of NPLs.

III. LITERATURE

A. Macroeconomic Factors

Our focus in this section will be on the determinants of NPLs. A reader, who is interested in the general context and practices of stress-testing can find several other surveys. For example, the special feature of the Financial Stability Report of the European Central Bank (2006) provides a brief introduction into macro stress testing as well as an overview of EU country-level macro stress testing practices.[3] A detailed introduction into stress testing and an overview of the related literature is given in Sorge (2004).

Financial system shocks can emanate from firm specific factors (idiosyncratic shocks) and from macroeconomic imbalances (systemic shocks). Overall, the literature on the major economies has confirmed that macroeconomic conditions matter for credit risk. Keeton and Morris (1987) had already showed, for over 2400 insured commercial banks in the U.S. during 1979–85, that local economic conditions explained the variation in loan losses recorded by banks. Authors who looked at asset-price evidence also found a linkage between credit risk increases and adverse macroeconomic conditions (Mueller, 2000; Anderson and Sundaresan, 2000; Collin-Dufresne and Goldstein, 2001).[4]

[3] Macro stress-testing refers to a range of techniques used to assess the vulnerability of a financial system to exceptional but plausible macroeconomic shocks.

[4] It is important to bear in mind for macro stress-testing that not only credit exposures but also default probabilities and recovery rates may change in the simulated macro stress scenario, compared to estimates derived from a benign sample period. In fact, Sorge (2004) documents several empirical studies that provide evidence of the sensitivity of default probabilities and recovery rates to macroeconomic variables. For example, Carey (1998) provides evidence of significant differences in default rates and loss severity between "good" and "bad" years. Altman (2002) documents the increase in default rates and decrease in recovery rates in the U.S. during the recession of 1990–91 and the downturn of 2001–02, and contrasts it with the low levels recorded during the expansion years 1993–98. In this paper, we leave the issue of recovery rates aside as we did not have access to recovery rates data for the GCC.

Kent and D'Arcy (2000) suggested in a study of Australian banks that, although risks tended to be realized during the contractionary phase of the business cycle, they actually peaked at the top of the cycle. Rajan and Dhal (2003) looked at Indian banks and uncovered a similar relationship. Bercoff, Giovanni and Grimard (2002) analyzed Argentina's banking system using an accelerated failure time model and found that the money multiplier, credit growth and reserve adequacy affected NPLs. Interest rates were also found to be significant in several studies. For instance, Fuentes and Maquieira (2003) found, looking at Chilean banks, that interest rates had a greater effect on NPLs than the business cycle. Other macroeconomic variables, in particular the exchange rate, unemployment, and asset and house prices can also be important (see for instance the study on Spain by the IMF, 2006).

B. Bank-Specific Factors

In addition to macro-economic factors, many of these studies included bank-specific variables, since they can signal or cause risky lending. For instance, Salas and Saurina (2002) showed for Spanish banks that, in addition to real GDP growth and credit growth, bank size, capital ratio and market power also explained variations in NPLs. Bercoff, Giovanni and Grimard (2002) showed that asset growth, operating efficiency and exposure to local loans also helped explain NPLs. Understanding the determinants of risk-taking behavior of banks has been a subject of much attention in the banking literature. Risk-taking tends to be affected by a number of factors, including, among others, moral hazard, agency problems, ownership structure, and regulatory actions.

Because of moral hazard induced by deposit insurance, banks may increase their risk positions and more so as capital declines. In practice, such risk-shifting activities of banks are not common, as empirical evidence for the U.S. would testify (Duan et al., 1992). Indeed, risk taking driven by moral hazard is limited by effective regulatory oversight and market discipline. The debate on the effect of government intervention on banks' risk taking behavior is large and need not be summarized here (Levine (2004) provides a short survey of the literature).

Additional bank specificities are also likely to be correlated with credit risk. For instance, Hughes et al. (1995) link risk taking to banks' operating efficiency. The argument is that risk-averse managers are willing to trade off reduced earnings for reduced risk, especially when their wealth depends on the performance of the bank. In order to improve loan quality, they will increase monitoring and incur higher costs, affecting the measure of operating efficiency. Therefore, a less efficient bank may in fact hold a low risk portfolio.

On the other hand, riskier loans also generate higher costs for banks. As a result, one has to be careful when assessing the direction of causality. Our solution is to use a lagged measure of efficiency in order to prevent avoid this issue of endogeneity. Overall, while studies examining the interplay between capital and portfolio risk have been considered in the literature (Shrieves and Dahl, 1992; Jacques and Nigro, 1997), little work has been forthcoming on the examination of the relationship between capital and credit risk and its interaction with operational efficiency. The literature has also ignored the GCC banking system, although Boudriga et al. (2010) provide a recent analysis on forty-six MENA banks.

C. Feedback Effects

As banks' balance sheets have remained affected in the aftermath of the 2007 global crisis, worries have been raised that credit growth may remain sluggish—as was indeed the case in past episodes in MENA (Barajas et al., 2010)—hampering the speed of the recovery. This feedback effect from the banking sector to the macroeconomy has been taken into account in the stress-testing literature, and has been the subject of renewed attention in the recent crisis.[5]

An early study on U.S. data was done by Keeton (1999), who used a VAR model and found a strong relationship between credit growth and delinquencies. Lis et al. (2000) also used a simultaneous equation model to explain bank loan losses in Spain and found that GDP growth (contemporaneous, as well as one period lag term), bank size, and CAR, had a negative effect while loan growth, collateral, net-interest margin, debt-equity, market power, regulation regime and lagged dependent variable had a positive effect on problem loans.

Sorge (2004) documents a number of studies that examine the feedback effects between credit losses and the macroeconomy. The feedback effect is in general difficult to assess because it is blurred by the direct effect (from growth to NPLs and balance sheets) and therefore one has to *identify* a supply shock. Numerous papers have, however, suggested that some form of financing effect must be at play (Drehmann (2008) surveys studies that link the real and the financial sectors). For instance, Carling et al. (2003) using a multivariate Granger causality found corporate default as a useful predictor of economic activity. Jacobsen et al. (2005) set up a panel VAR to model macro factors and the likelihood of default for Swedish companies and find evidence of macro feedbacks.

Von Peter (2004) emphasized the feedback of losses to the macroeconomy through restrictions in lending to meet binding capital constraints. The channel of transmission would seem to a large extent through investment. Peek and Rosengreen (2000) and Dell'Ariccia et al. (2005) found indeed evidence of a negative relationship between investment and conditions in the banking sector.

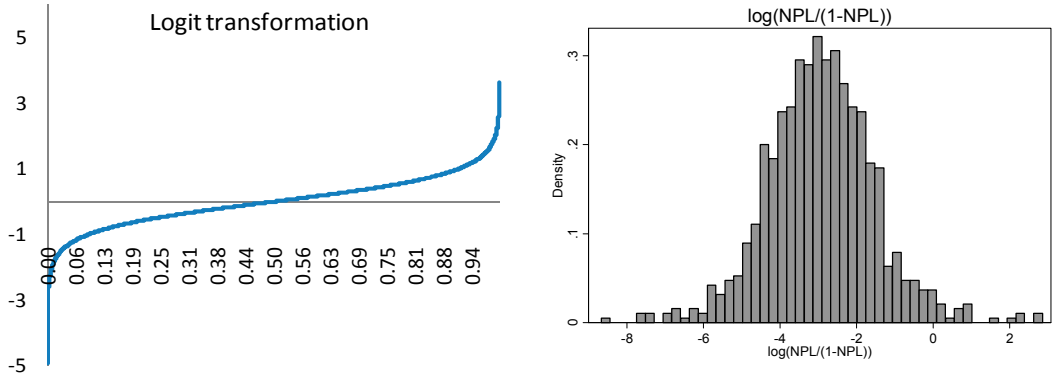
More recently, Ciccarelli et al. (2010) focus on the recent financial crisis and look at the role played by banks' balance sheet constraints in reducing GDP through tighter credit provision. They disentangle demand and supply shocks in loan growth using the Bank Lending Survey for the euro area and the Senior Loan Officer Survey for the U.S., and find indeed that restrictions of credit supply to firms played an important role in reducing output growth in the euro area.

[5] Kida (2008) explains four feedback effects in the macro stress testing literature–the interbank contagion effect where individual exposures to risk spreads to the system; correlation between credit and market risks where interest rate raises the default risk of banks, which lead to higher interest rates; interactions between asset prices and bank portfolios where asset price shocks lead to balance sheet shocks leading to asset sale and further depression of asset prices; and the feedback of financial shock to the real economy where shocks to the banking system from the macroeconomy can lead to risk aversion and tighter credit, and further weaken economic conditions. This study focuses on the last feedback effect.

IV. DETERMINANTS OF CREDIT RISK

We first investigate the determinants of NPL ratios in GCC banks using panel data of individual banks' balance sheets from Bankscope. Although some of the data goes as far back as 1995, for most of the banks, data were available only from 1998 (the list of banks is available in Table 4). As in much of the literature on credit risk, the dependent variable is the logit transformation of the NPLs ratio (i.e. log(NPLs/(1-NPLs)) where NPLs is the NPLs ratio), as this transformation ensures that the dependent variable spans over the interval]-∞; +∞ [(as opposed to between 0 and 1) and is distributed symmetrically (see Figure 3).

Figure 3. Logit Transformation of the NPL ratio



The macroeconomic explanatory variables include non-oil real GDP growth, stock market returns, interest rates, world trade growth, the VIX index (proxying for global risk aversion and tight financing conditions) and a 1997–1998 dummy for the Asian crisis.[6]

Unemployment was not used since in the GCC the importance of the foreign labor force means that unemployment is very stable and very low (Saudi Arabia is an exception as its domestic labor force is larger). Housing prices were not used either owing to paucity of a consistent data series in the GCC. Finally, because the pegged exchange rate regimes of the GCC countries do not give rise of exchange rate risk for banks' foreign currency exposures, we did not include the exchange rate in a model of NPLs. The regressions also control for firm-level variables. In particular, we look at the risk factors suggested by the literature: the capital adequacy ratio, different measures of efficiency (the expenses/asset ratio, the cost/income ratio, and the return on equity), size (we use the logarithm of equity), the lagged net interest margin, and lagged credit growth (deflated by the CPI).

Several econometric specifications of the dynamic panel are estimated, including OLS, fixed effects, difference GMM (Arellano and Bond, 1991), and System GMM (Blundell and

[6] Non-oil real GDP is the appropriate variable to use, for both theoretical and econometric reasons. In the GCC countries, NPLs are driven by the state of the non-oil economy: indeed, the government and large oil and petrochemical companies (whose revenues depend directly on oil) are government owned in the region and do not default on loans. To the extent that oil revenues spillover to the non-oil economy, via public spending, household revenues, and downstream activity, etc., this effect will be captured well by non-oil real GDP growth. Econometrically, oil prices are constant across GCC countries and therefore bring less country-specific information on the state of the economy.

Bond, 1998), which may be a better specification when the auto-regressive coefficient is close to 1 (in which case Difference GMM is inefficient). The forward orthogonalization procedure of Arellano and Bover (1995) was also used to reduce observation losses due to differencing. Finally, to reduce the number of instruments, the collapsing method of Holtz-Eakin, Newey, and Rosen (1988) was used. The macroeconomic variables were considered as strictly exogenous (i.e. can be instrumented by itself as a one-column "IV-style" instrument, see Roodman, 2006), while the lagged bank-level variables were modeled as predetermined (and need to be instrumented GMM-style in the same way as the lagged dependent variable). The results are presented in Table 2.

The number of instruments was kept below 40 in all GMM specifications. The Arellano-Bond AR(1) test for autocorrelation of the residuals rejects the hypothesis that the errors are not autocorrelated, which is expected since differencing generates autocorrelation of order 1. The Arellano-Bond AR(2) p-values are above 5 percent. This is needed in order not to reject the hypothesis that the errors in the levels equation are uncorrelated, an assumption that ensures that the orthogonality conditions and the Arellano-Bond specifications are correct. The Hansen-test of overidentifying restrictions also suggests that the instruments are appropriate.

Table 2. Macroeconomic and Firm-Specific Determinants of NPLs

Model specification	(1) OLS	(2) FE	(3) Arellano-Bond 2-step collapsed	(4) System GMM collapsed	(5) System GMM fwd. orth. collapsed
$\ln(NPL/(1-NPL))_{-1}$	0.898***	0.676***	0.714***	0.881***	0.865***
	[37.31]	[15.27]	[12.04]	[11.50]	[12.08]
$\ln(equity)_{-1}$	-0.0543**	-0.364***	-0.359***	-0.102	-0.102
	[-2.468]	[-4.439]	[-3.107]	[-1.193]	[-1.221]
$(expenses/avg.\ assets)_{-1}$	0.0483*	0.0868*	0.154**	0.114**	0.106**
	[1.803]	[1.931]	[2.524]	[2.576]	[2.141]
$loans\ growth_{-2}$	0.104**	0.0946*	0.0993*	0.137	0.145
	[2.364]	[1.709]	[1.913]	[1.499]	[1.490]
non-oil GDP growth	-1.948***	-0.974	-1.893**	-2.156*	-2.090*
	[-2.597]	[-0.812]	[-2.337]	[-1.887]	[-1.711]
$interest\ rate_{-1}$	0.0241*	0.0535**	0.0044	-0.0053	0.0001
	[1.778]	[2.197]	[0.376]	[-0.163]	[0.00291]
VIX	0.0131***	0.0115***	0.0119***	0.0140***	0.0132***
	[3.162]	[2.825]	[4.228]	[2.982]	[3.040]
Constant	-0.599**	0.488		-0.342	-0.402
	[-2.275]	[0.997]		[-0.527]	[-0.592]
Observations	426	426	347	426	426
R-squared	0.84	0.69			
Number of banks		79	67	79	79
No. of instruments			34	38	38
Hansen test p-value			0.27	0.48	0.52
A-B AR(1) test p-value			0.00	0.00	0.00
A-B AR(2) test p-value			0.17	0.18	0.19

t-statistics in brackets

*** p<0.01, ** p<0.05, * p<0.1

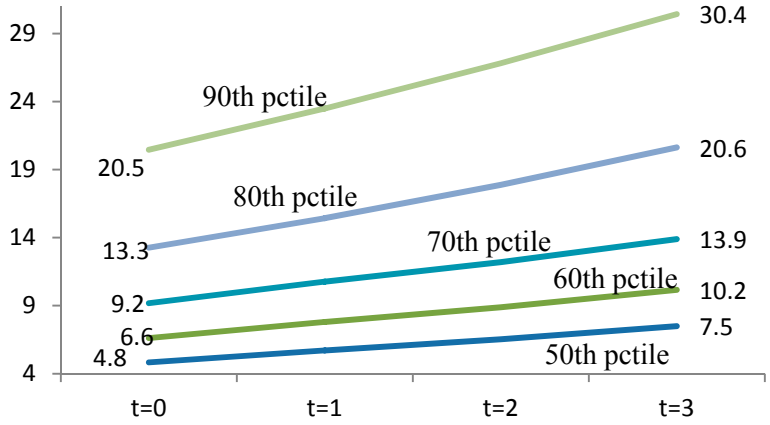
Our analysis shows that both macroeconomic variables and bank-specific variables contributed to the build-up in NPLs in the GCC countries. Non-oil GDP and interest rates were dominant in the first category, and the size of capital, credit growth and efficiency (noninterest expenses/assets) were found to be the significant bank-specific variables. Starting with firm-specific variables, the NPL ratio exhibits a strong autocorrelation, estimated to be between 0.6 (the fixed effect model suffers from a downward Nickell-bias) and 0.9 (the OLS estimate is upward biased). As a result, NPLs should be expected to worsen relatively slowly when affected by a shock, but in the same vein, it would be reasonable to anticipate long lasting increases in NPLs.

Indeed, the macroeconomic conditions were found to be important and with the expected sign in all models. A temporary decrease by 3 percentage points in non-oil GDP growth would increase NPLs by 0.3 to 1.1 percentage points, depending on the initial level of NPLs (the model is non-linear and therefore one can only interpret the coefficients using marginal effects at different points of the distribution of NPLs). The effect of a 300 basis points in interest rates would be similar. Since the AR coefficient of the logit transformation of NPL is high (between 0.6 and 0.9), these shocks cumulate to a large extent. Since the logit model is non-linear, shocks also have larger effects for banks with lower-quality loans, in line with what was shown in Figure 2. The effect of maintained macroeconomic shocks for banks starting at different levels of NPLs is shown in Figure 4.

World trade growth and the Asian crisis dummy were not found to be significant, but the VIX index was highly significant in all specifications. External financing conditions, in addition to interest rates, seem therefore to matter more than the global trade cycle in driving credit risk in the GCC. We also investigated, using interaction terms, whether banks that have higher expenses or that expanded faster are more sensitive to decreases in activity, but we found no significant effect. It is likely that the non-linearity embedded in the logit transformation already captures some of these effects since banks that expanded quickly or are inefficient also are likely to start from a higher base of NPLs.[7]

[7] Results are overall similar when looking at post-2001 data, with coefficient robust to the smaller sample. Lagged credit growth becomes significant in all specifications, suggesting that balance sheet expansion drives future NPLs, but non-oil growth loses significance in the GMM specifications as data covers a smaller part of the business cycle.

Figure 4. Dynamics of NPLs with Maintained Macroeconomic Shocks



Note: Effect of a 3 percentage point fall in non-oil real GDP and a 300 basis points increase in interest rates.

V. Feedback from the Banking System to the Real Economy

We also investigated the macroeconomic and dynamic consequences of an increase in NPLs using a panel VAR of the GCC economies.[8] In particular, we were interested in the effect of an increase in NPLs on credit and on growth, a feedback effect that could not be estimated using the bank-level database. The data used are exclusively macroeconomic data, and NPLs refer now to banking-system NPLs (Figure 5).

In addition to the NPL ratio, the panel VAR includes credit growth (we later included non-oil real GDP growth) and the three-month interbank rate. We tested for stationarity using the Levin-Lin-Chu (2002) test (to determine whether the autoregressive parameter —assumed to be homogenous within the panel— is negative). The Levin-Lin-Chu test works exclusively for strongly balanced panels, whereas our panel is unbalanced. We therefore restricted the sample period in order to perform the Levin-Lin-Chu test (however the panel VAR was estimated on the entire unbalanced panel).

The unit-root test results were not robust to the time period chosen (see Table 3). In particular, although the NPL ratio was found stationary within the 1999–2008 period, the Levin-Lin-Chu test could not reject the presence of a unit root in the larger sample. The same result held for non-oil real GDP growth. Credit growth was found to be I(1) and interest rates to be stationary.

[8] We found data on the NPL ratio of the banking system dating since the end of the 1990s. More precisely, data was available since 1999 for Bahrain, 1996 for Kuwait, 1997 for Oman, 1999 for Qatar, 1997 for Saudi Arabia and 1996 for the U.A.E.). It is important to note that the data set is very small, and therefore to underline the tentative nature of our results.

Figure 5. Banking System Nonperforming Loans

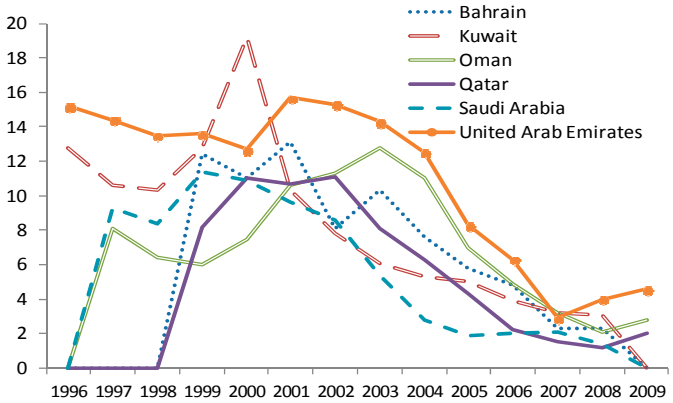


Table 3. Panel Unit Root Tests (Levin-Lin-Chu)

H0: Panels contain unit roots	level		difference	
NPLs/Total Loans 1999-2008	12.7	***		
NPLs/Total Loans 2000-2008	-0.6		-4.6	***
Non-oil real GDP growth 1998-2008	-3.3	***		
Non-oil real GDP growth 1999-2008	-0.7		-1.4	*
Credit growth 1998-2008	1.9		-3.2	***
Credit growth 1999-2008	1.5		-3.0	***
Interest rate 1998-2008	-6.2	***		
Interest rate 1999-2008	15.3	***		
Inflation 1998-2008	6.0		1.6	
Inflation 1999-2008	-5.7	***	-2.1	**

* significant at 10%; ** significant at 5%; *** significant at 1%

As a result, we estimated two panel VARs, one in which the NPL ratio was included in level, and one in which it was included in first differences. With a time dimension limited to 9 years, we restricted the lag structure to the minimum, i.e. we only included 2 lags in the VAR.[9] Finally, the variables were demeaned using the Helmert procedure as in Love and Zicchino (2006).

The identification procedure is based on a Choleski decomposition with the interest rate ordered first, followed by credit growth (we later use non-oil real GDP growth), and the NPL ratio ordered last. This ordering is predicated by the pegged exchange rate regime (interest rates follow dollar rates and are mostly unaffected by domestic conditions) and the assumption that causality initially runs from growth to NPLs. In particular, the Choleski decomposition assumes that the NPL ratio cannot affect instantaneously credit or non-oil growth.

[9] The results were robust to the use of three lags – for which data from Qatar had to be excluded as Qatar NPLs were only available since 1999.

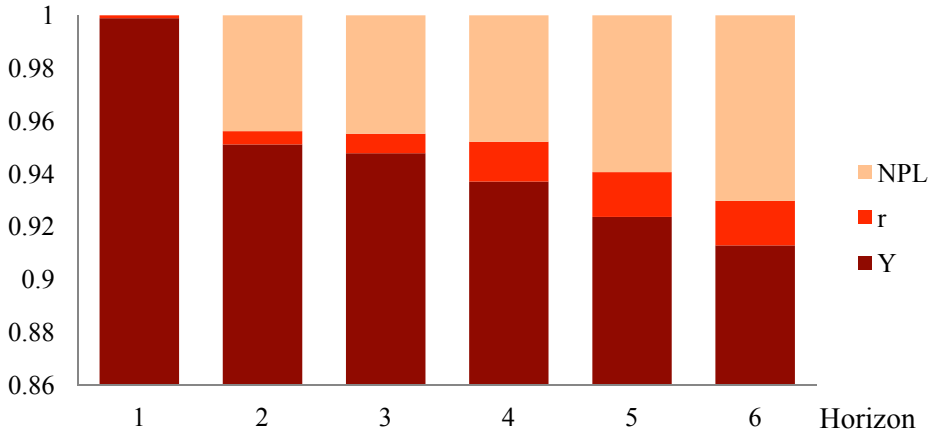
The results of the Panel VAR are presented in Figures 7 to 10. The first model uses the level of the NPL ratio (ordered last) as well as the interest rate and the change in credit growth. Higher interest rates increase NPLs (although the effect is not significant) and higher credit reduces the NPL ratio (row 3, columns 1 and 2). The feedback effect of higher NPLs suffered by the banking sector is shown in the last column of the second row: a one-standard deviation increase in the NPL ratio (an increase by 2.1 percentage point) reduces credit growth by 1.5 and 2.2 percentage points after two and three years, and the effect is significant in the third period.

A similar VAR was estimated using real GDP growth as opposed to growth in credit, and the results were very comparable. Higher interest rates increase NPLs and higher non-oil growth reduces NPLs. The two effects were found to be significant (see Figure 8). Furthermore, a 2 percentage point increase in the NPL ratio was found to reduce non-oil GDP growth by 0.8 percentage point a year after the shock, and the feedback effect was again significant (including at the 95 percent confidence interval). The model in which the NPL ratio and the growth rate were used in difference shows again that the feedback effect is significant, although the effects of interest rate and GDP shocks on NPLs disappear (Figure 9).

Overall, the model suggests that there is a strong, though short-lived feedback effect of default on non-oil growth, with a semi-elasticity of around 0.4. However, default shocks do not occur often. The forecast error variance decomposition shows that only 5 to 7 percent of the non-oil GDP growth variance can be explained by NPLs shocks (Figure 6).

As a robustness check, we include the consumer price index to see whether the different shocks are properly identified and fit intuition – in particular we want to see whether the monetary shocks are associated with a decrease in the consumer price index whereas the (demand) GDP shocks that reduce NPLs also increase inflation. Adding a fourth variable in a VAR with around 50 degrees of freedom is risky, and we indeed lost significance for several variables (see Figure 10). Nevertheless, the feedback effect from NPLs to growth remained significant. Furthermore, inflation moved in the expected direction after the different shocks (see the last row): inflation decreases after a tightening of monetary policy, but increases when activity is above trend – and both effects are significant.

Figure 6. Variance Decomposition, Non-oil Real GDP



VI. Conclusion

This study attempted to ascertain the determinants of NPLs in the GCC banking sector using a bankwise panel dataset and fixed effect, difference GMM, and System GMM models. Our empirical results support the view that both macro-factors and bank-specific characteristics determine the level of nonperforming loans. In particular, we found strong evidence of a significant inverse relationship between real (non-oil) GDP and nonperforming loans. The study also showed that global financial market conditions have an effect on NPLs of banks. This implies that regulators and central banks in the GCC have to be wary about increasing NPLs during periods of low growth and tight financing. Among bank control factors, efficiency and past expansion of the balance sheet were found to be significant.

The study also attempted to estimate the feedback from rising NPLs to the real economy using a panel VAR. Overall, the model suggests that there is strong albeit short-lived feedback effect on non-oil growth in the GCC, with a semi-elasticity of around 0.4. However, these results are the outcome of an analysis during a period in which the region did not suffer from systemic banking crises. Since the feedback effect is likely to be nonlinear, costs could increase significantly once NPLs cross a certain threshold. Our model therefore implies that policymakers in the GCC should monitor carefully the evolution of default in the loan books of banks.

Looking ahead, the results of the study have implications for regulation and supervison of the financial system in the GCC countries. In the context of their exchange rate pegs, a stronger focus on macroprudential regulation, particularly through capital and liquidity buffers, and countercyclical provisioning, could help mitigate the impact of macroeconomic risks on the banking system and the feedback effects of credit risks on the economy.

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Table 4. Bankscope Coverage in the GCC

Country	Bank	Country	Bank
Qatar	Ahli Bank QSC	Bahrain	Commercial Bank of Bahrain B.S.C.
Qatar	Commercial Bank of Qatar (The) QSC	Bahrain	Gulf International Bank BSC
Qatar	Doha Bank	Bahrain	National Bank of Bahrain
Qatar	International Bank of Qatar	Bahrain	Shamil Bank of Bahrain B.S.C.
Qatar	Qatar Development Bank Q.S.C.	Bahrain	TAIB Bank B.S.C. (2)
Qatar	Qatar International Islamic	Bahrain	United Gulf Bank (BSC) EC
Qatar	Qatar Islamic Bank SAQ	Kuwait	Al Ahli Bank of Kuwait (KS
Qatar	Qatar National Bank	Kuwait	Bank of Kuwait & The Middl
Oman	Ahli Bank SAOG	Kuwait	Burgan Bank SAK
Oman	Bank Dhofar SAOG	Kuwait	Commercial Bank of Kuwait
Oman	Bank Muscat SAOG	Kuwait	Gulf Bank KSC (The)
Oman	Bank Muscat SAOG (2)	Kuwait	Industrial Bank of Kuwait
Oman	Bank of Oman, Bahrain and Kuwait SAOG	Kuwait	Kuwait Finance House
Oman	Commercial Bank of Oman S.A.O.G. (Old)	Kuwait	Kuwait International Bank
Oman	Majan International Bank SAOC	Kuwait	National Bank of Kuwait S.A.K.
Oman	National Bank of Oman (SAOG)	UAE	Abu Dhabi Commercial Bank
Oman	Oman Arab Bank SAOG	UAE	Abu Dhabi Islamic Bank - P (2)
Oman	Oman Development Bank SAOG	UAE	Bank of Sharjah
Oman	Oman International Bank	UAE	Commercial Bank International P.S.C.
Saudi Arabia	Al Rajhi Bank-Al Rajhi Banking & Investment Corporation	UAE	Commercial Bank of Dubai P.S.C.
Saudi Arabia	Arab National Bank	UAE	Dubai Bank (2)
Saudi Arabia	Bank Al-Jazira	UAE	Emirates Bank International PJSC
Saudi Arabia	Bank AlBilad	UAE	Emirates Industrial Bank
Saudi Arabia	Banque Saudi Fransi	UAE	Emirates NBD PJSC
Saudi Arabia	National Commercial Bank (The)	UAE	First Gulf Bank
Saudi Arabia	Riyad Bank	UAE	Invest Bank P.S.C.
Saudi Arabia	Samba Financial Group	UAE	Mashreqbank
Saudi Arabia	Saudi British Bank (The)	UAE	National Bank of Abu Dhabi
Saudi Arabia	Saudi Hollandi Bank	UAE	National Bank of Dubai Public Joint Stock Company
Saudi Arabia	Saudi Investment Bank (The)	UAE	National Bank of Fujairah
Saudi Arabia	United Saudi Bank	UAE	RAKBANK-National Bank of Ras Al-Khaimah (P.S.C.) (The)
Bahrain	Ahli United Bank (Bahrain) B.S.C.	UAE	National Bank of Umm Al-Qaiwain
Bahrain	Bahrain International Bank	UAE	Sharjah Islamic Bank
Bahrain	Bahrain Islamic Bank B.S.C. (2)	UAE	Union National Bank
Bahrain	Bahraini Saudi Bank (The)	UAE	United Arab Bank PJSC
Bahrain	BBK B.S.C.		

Figure 7. Feedback Effect with Credit, 3 Variable Level Model

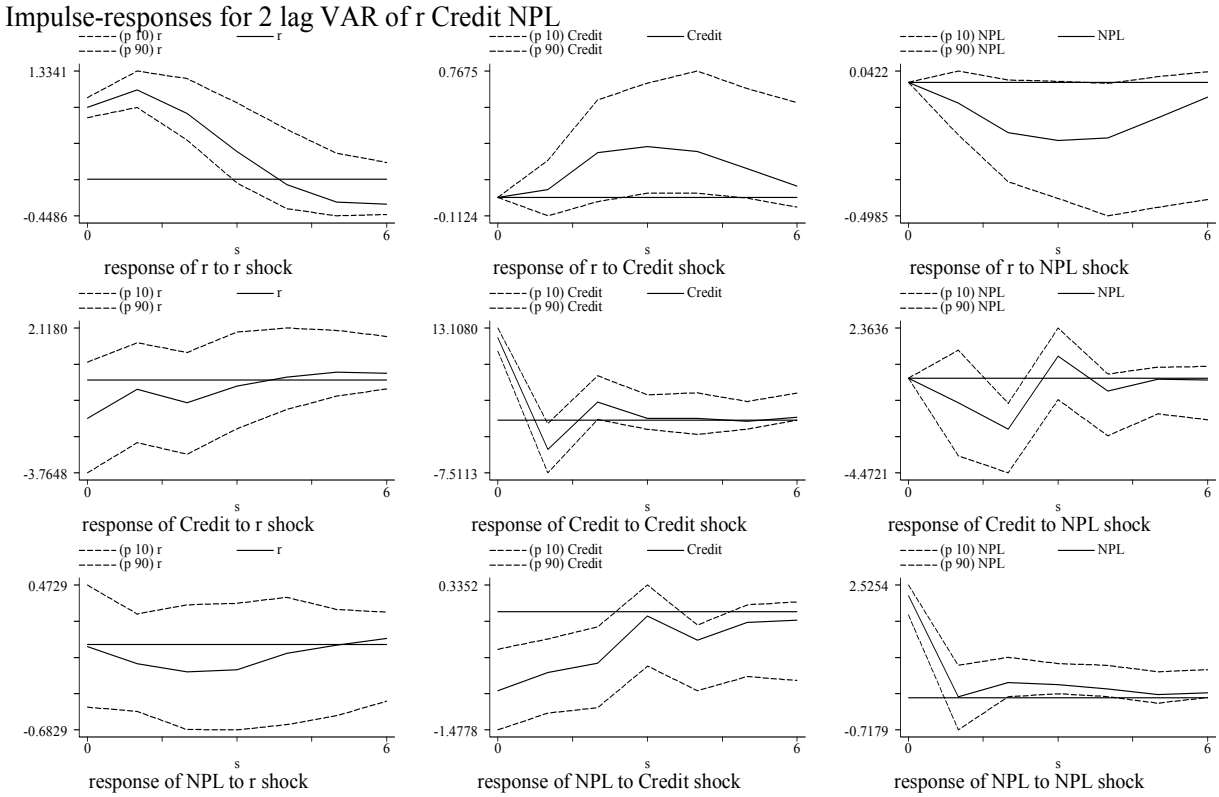


Figure 8. Feedback Effect with GDP, 3 Variable Level Model

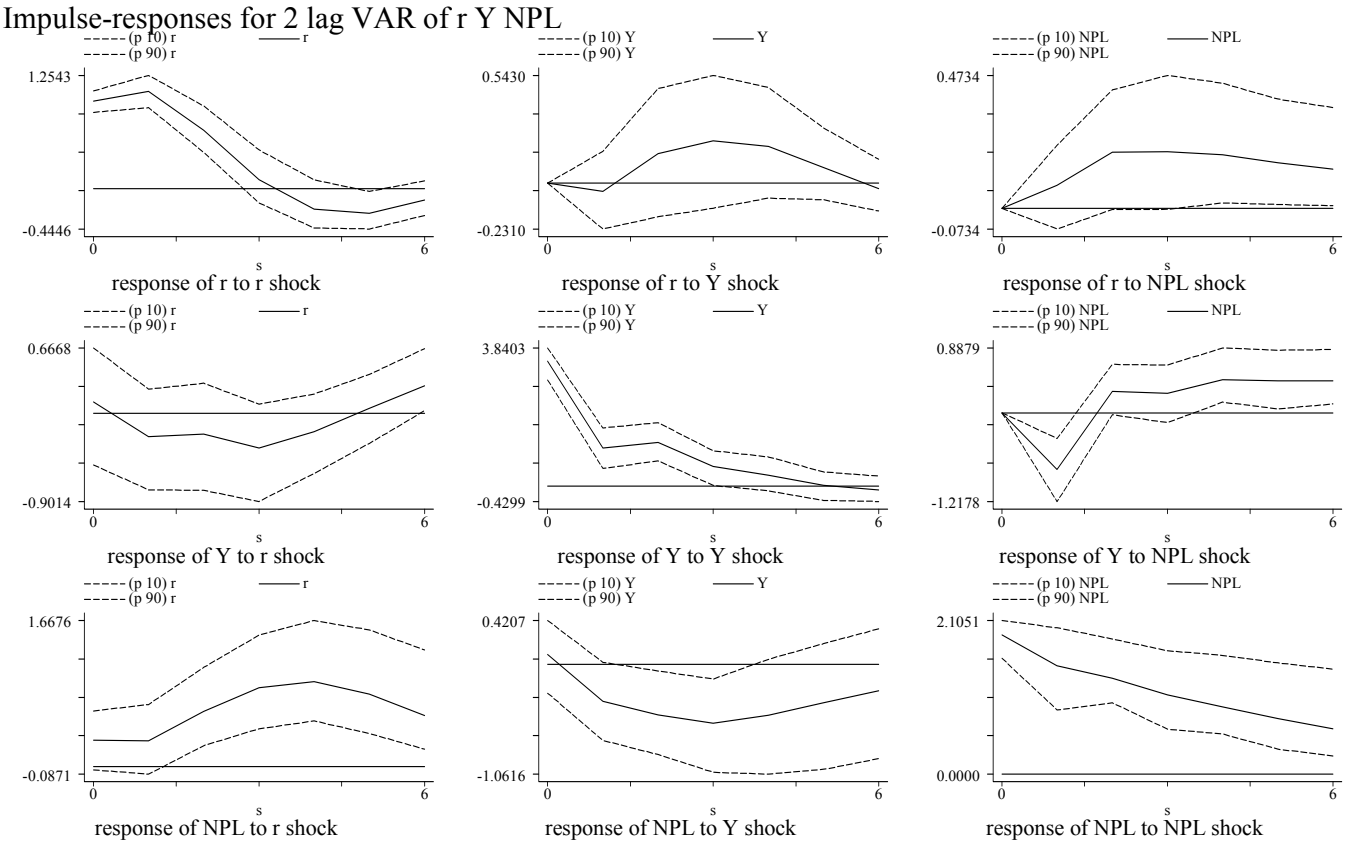


Figure 9. Feedback Effect, 3 Variable Difference Model

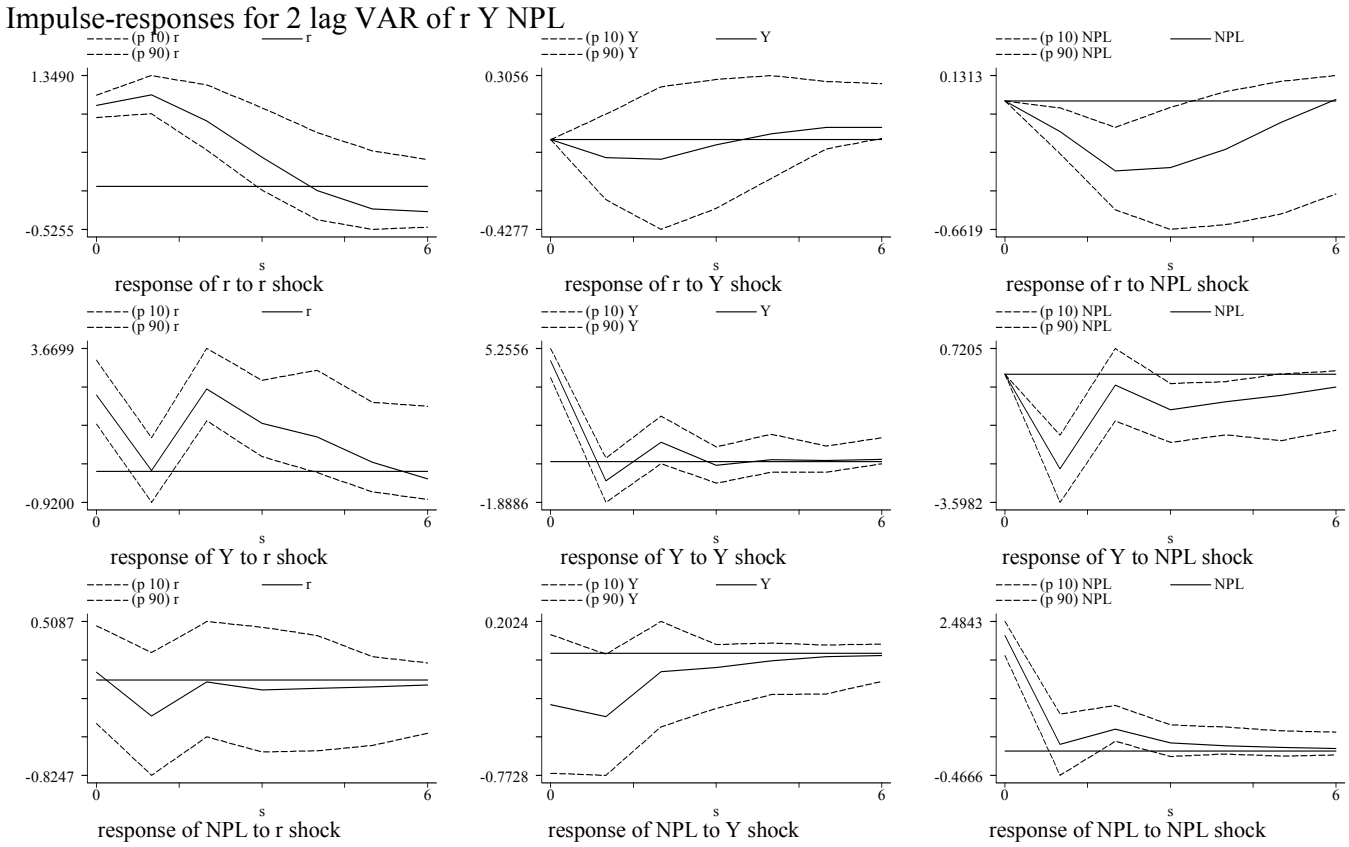
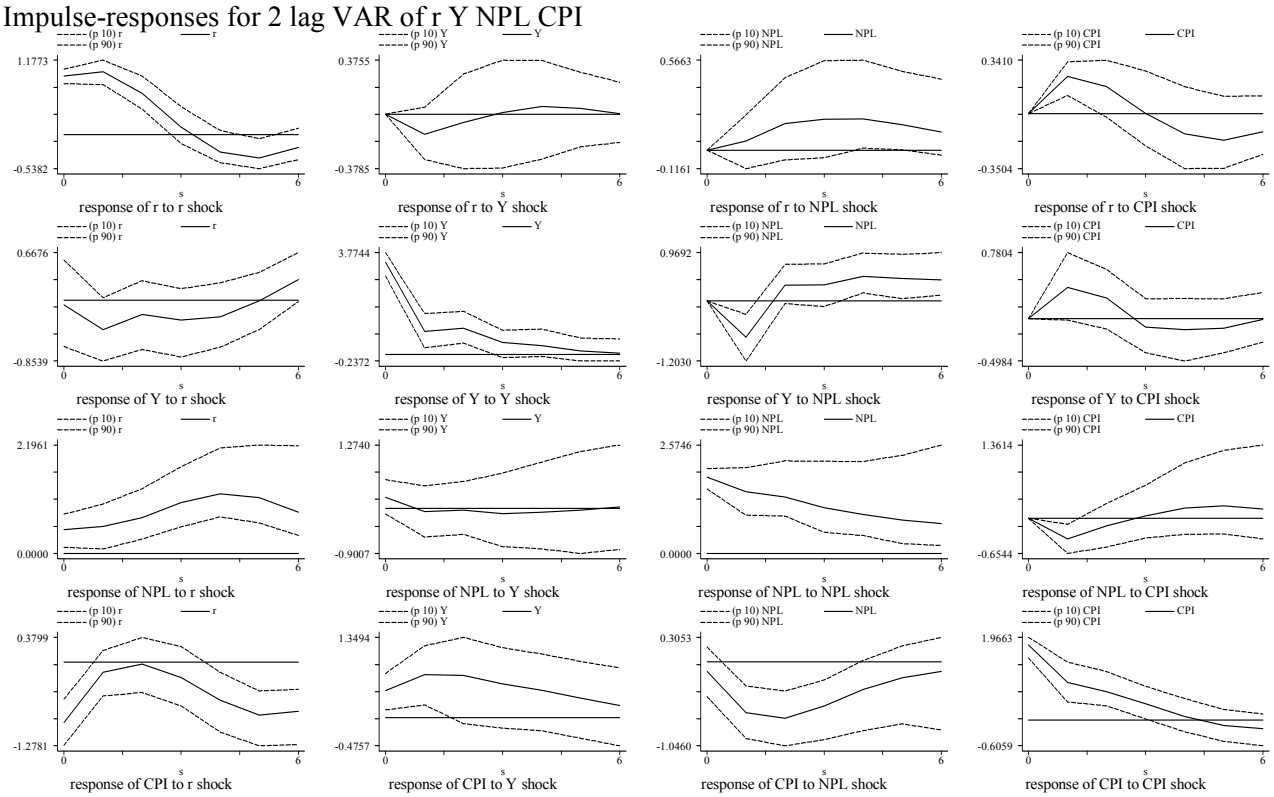


Figure 10. Feedback Effect, 4 Variable Level Model



Errors are 10% on each side Generated by Monte-Carlo with 500 reps