Predicting success of government intervention during GFC

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1. INTRODUCTION

Banking crises are not easily managed due to the fact that each crisis is unique. For example, the Global Financial Crisis (GFC) and Asian Financial Crisis (AFC) which occurred a decade apart were both banking crises but had very different causes and drivers. A given set of government intervention tools which insulate one crisis may exacerbate an economy in another crisis. The timeliness of response to a crisis also plays a critical role in the success of such an intervention. To tackle a banking crisis, the policy makers need 'the right tools at the right time' or a forecasting model to revise the theoretical and quantitative framework(s) of analysis.

This paper develops such a model to predict the success of government intervention during banking crises. Existing work in the currency crisis literature (Eichengreen, Rose, & Wyplosz, 2003), analyses predictors of a successful defence mechanism against speculative attacks using a multinomial logit model. This paper uses the Eichengreen, Rose, & Wyplosz framework to measure the success of banking crisis management by governments, where the aim is to successfully bring a country out of crisis, and/or prevent the crisis from occurring in the first place. This is the first study to develop a model that aims to distinguish between successful and unsuccessful government crisis defence. As such it helps in understanding which policy tools might be an aid to successful defence. The results of this paper should therefore be of interest to policy makers.

We use the recent banking crisis in 2007 – 2009 to examine different policy intervention tools employed using a multi-state (no crisis, and successful and unsuccessful defence states of the economies) multinomial logit model. We examine the micro/macroeconomic situation evolving across three nations, the United States (U.S.), the United Kingdom (U.K.) and Japan. The probability of different outcomes (no crisis, successful defence, and unsuccessful defence), are estimated against four broad areas of banking crises policy responses (monetary policy, liquidity support, fiscal measures, financial sector measures and finally non-intervention policy) together with a set of macro and microeconomic variables

2. THE MODEL

We develop a multi-state multinomial logit model, based on pooled data analysis to examine the intervention tools employed by government, together with the effect of micro and macroeconomic variables on three discrete events/states of the economy: no crisis, successful defence and unsuccessful defence.

$$P(y_{it} = j) = \gamma_{1j} GDE_{it} + \gamma_2 POL_{it} + \gamma_3 FSI_{it} + \gamma_4 LEN_{it} + \gamma_5 HOU_{it} + \gamma_6 CAP_{it} + \gamma_7 NPL_{it} + \gamma_8 FIN_{it} + \gamma_9 FIS_{it} + \gamma_{10} MON_{it} + \gamma_{11} LIQ_{it} + \gamma_{12} NON + \varepsilon_{it} \quad (1)$$

where $(j = 0,1,2)$

Three broad categories of monthly data from 2007 to 2009 are used: state of the economy variables (dependent variables), macro and microeconomic variables (independent variables) and intervention tool variables (independent variables). Data on the state of the economy, bull, bear and crisis regimes are identified from the results of a regime switching model. The model classification of three refined regimes, bull/bear/crisis, is based on the estimated mean and variance of the banking system stock return, and the transition probability of being in each individual regime. To construct the state of the economy dependent variables y_{it} listed in column 1 and 2 on Table 1, the three state regime switching output (bull/bear/crisis) is consolidated into two regimes (tranquil/crisis) by categorizing bull and bear states as the tranquil period.

Table 1 The list of dependent variables

(1) y_{it}	(2) State of the Economy	(3) Regime switching output	(4) Change in output loss
$y_{it} = 0$	No crisis	Tranquil: bull or bear regime	-
$y_{it} = 1$	Successful defence	Crisis regime	positive
$y_{it} = 2$	Unsuccessful defence	Crisis regime	negative

The state of the economy dependent variables y_{it} represent the 'no banking crisis' (state 0), 'successful defence' (state 1) and 'unsuccessful defence' (state 2). The probability of an economy being in each of these states is constructed based on two conditions: the regime

switching output (tranquil/crisis) and changes in output loss.[1] The change in output loss is used to distinguish between two possible outcomes: a successful defence by the government (state 1) or otherwise an unsuccessful defence (state 2). If the government is able to contain the crisis, then we expect to see output loss decreasing from its previous period value. Conversely if the government is not able to contain the crisis, then we expect to see output loss increasing or remaining constant compared to its previous period value. Table 2 provides definitions of the variables used in the analysis.

Two types of predictive variables (X_{it}) are considered, namely banking crises and successful defence predictors. The predictors for banking crises are the macro and microeconomic variables listed in Table 2 below, which have been identified in previous literature as determinants of banking crises (Demirguc-Kunt & Detragiache, 1998; Kaminsky & Reinhart, 2008). All variables are measured on a monthly frequency.

Table 2 Explanatory variables

Type of variables	Explanatory variables	Acronym
Macroeconomic	Growth rate of gross domestic production by expenditure	GDE
	Policy rate	POL
	Financial Stress Index	FSI
	Growth rate of bank lending (to private sector) [2]	LEN
	Growth rate of new Housing (construction or Dwelling)	HOU
Microeconomic	Bank capital to assets ratio (%)	CAP
	Non-performing loans to total gross loans (%)	NPL
Intervention tools	Fiscal policy	FIS
	Monetary policy	MON
	Liquidity support	LIQ
	Financial sector policies	FIN
	Non-intervention policy	NON

An important variable for the analysis is the *Financial Stress Index (FSI)*, which is motivated by the literature on government intervention for example, IMF (2009), and Balakrishnan, Danninger, Elekdag, & Tytell (2011) who use *FSI* as a proxy for the presence of strains in

[1] Output loss data is computed by comparison of actual GDP with a GDP trend. The GDP trend is constructed by extrapolating the GDP using the Hodrick-Prescott filter (Hodrick & Prescott, 1997). Finally, the change in output loss is calculated using differences of output losses between two periods, expressed as a percentage of previous output loss.

[2] Includes enterprise lending but excludes government and interbank lending.

financial markets and on intermediation.[3] *FSI* data is retrieved from IMF (Balakrishnan et al. 2009) and comprises variables in the three markets listed in Appendix A.[4]

To manage and contain a banking crisis, there are several intervention tools that can be launched by the regulators. The predictors for successful defences are policy events based on the IMF policy news database constructed by Ait-Sahalia, Andritzky, Jobst, Nowak, and Tamirisa (2011). We categorize policy news announcements in five policy areas: fiscal, monetary, liquidity, financial sector and non-intervention policy. The last category comprises the range of actions that did not involve enacting comprehensive, system-wide or principle-based measures to contain the crisis. That is, non-intervention policy focused on the inaction of the policy maker (intentionally or unintentionally) during the containment phrase and later stages includes allowing bank failure or stepping in to bail-out institutions during failures. The details of all the intervention tools included in each category are shown in Appendix B.

[3] See section 2.2 for further discussion.
[4] This paper sources these data from Datastream, Haver Analytics, IMF and OECD.

3. RESULTS

Table 3 contains the results of estimating the Marginal effect of multinomial logit regression

Estimation result for the Marginal effect of multinomial logit regression with macro, microeconomic and intervention tools variables for the sample of 3 countries for the period of June 2007 to March 2009.

Variables/State	0	1	2
	No crisis	Successful Defence	Unsuccessful Defence
GDE	-0.805***	0.530**	0.275*
	(0.295)	(0.236)	(0.156)
POL	-0.152**	0.174**	-0.022
	(0.066)	(0.081)	(0.056)
FSI	-0.164***	0.095***	0.069***
	(0.048)	(0.036)	(0.026)
LEN	0.043	0.043	-0.086
	(0.042)	(0.051)	(0.057)
HOU	-0.021**	-0.001	0.022**
	(0.010)	(0.011)	(0.009)
CAP	0.511***	-0.484***	-0.026
	(0.161)	(0.161)	(0.084)
NPL	-2.983***	2.295***	0.688
	(0.919)	(0.789)	(0.453)
FIN	0.085	-0.063	-0.022
	(0.114)	(0.085)	(0.054)
FIS	-0.149	0.021	0.128
	(0.218)	(0.189)	(0.113)
MON	-0.366**	0.102	0.264*
	(0.182)	(0.172)	(0.145)
LIQ	-0.300***	0.285**	0.015
	(0.093)	(0.123)	(0.078)
NON	0.110	0.212	-0.321**
	(0.074)	(0.141)	(0.136)

Notes: The dependent variable state zero represents no crisis, the dependent variable state two represents an unsuccessful defence of crisis. Standard errors are given in parentheses. One, two and three asterisks indicate significance levels of 10, 5, and 1 per cent, respectively.

The marginal effects for each variable differ across different states. In terms of the intervention tools variables which are of greatest interest, the most striking feature of Table 3 is the impact of the monetary, liquidity support and non-intervention policy variables. First, liquidity support policy (*LIQ*) is effective in defending banking crises. Liquidity policy has a positive sign in state 1: providing liquidity support increases the probability of a successful defence by 0.285. Liquidity support policy (*LIQ*) is not significant in state 2. Hence, it has no significant impact on the probability of unsuccessful defence. This arises because of a liquidity squeeze in the interbank market during 2008, when liquidity risk was a central concern around the world. Thus, the response by central banks to provide liquidity support to

the financial system is crucial, as providing liquidity may be effective in supporting credit supply to the private sector and alleviating the banking crisis duration. In addition, this finding validates the importance of provision of liquidity support during a banking crisis as found by many recent studies. Among others, Aït-Sahalia et al. (2011) suggest that liquidity provision (in not only the U.S., but also in the U.K. and Japan) did help lower interbank risk premiums and stabilize financial markets during this crisis. Likewise, Laeven and Valencia (2010) confirm that initially, liquidity support and blanket guarantees were effective during the containment phase.

While the results show liquidity support policy (*LIQ*) as a successful defence during the crisis, the policy makers need to be certain that they are in crisis before using this tool. Liquidity support policy (*LIQ*) has a negative sign in state 0: it decreases the probability of having no crisis by approximately 0.3. This policy is perceived as a negative signal (that the economy is in a worse stage than previously thought) thus increasing the public's concern about the soundness of the overall financial system. In short, liquidity support policy (*LIQ*) can be a powerful tool if it is used at the right time, crisis period. On the other hand, if the policy makers use the right tool at the wrong time, non-crisis period, it can exacerbate or drag an economy into the crisis.

Government can decide to intervene, they can decide not to intervene or they can make no decision and consequently do nothing. Non-intervention policy (*NON*) has a negative sign in state 2: non-intervention and the decision to allow bank failures/bailouts decrease the probability of an unsuccessful defence by 0.32. On the other hand, Non-intervention policy (*NON*) is insignificant in states 0 and 1, suggesting a government deciding not to intervene, has no effect on the probability of an economy not being in crisis but also has no effect on the probability of a successful defence. Therefore, it seems that a government doing nothing or making a conscious decision not to intervene does not harm in either crisis situation or in normal time.

Though bank failures and bailouts may seem to be at different ends of the spectrum, these policies reflect actions outside orderly resolution regimes or financial sector support packages. Possibly, one of various approaches to policy making depends on a good

judgement to bail out viable banks and let non-viable banks fail. Bank bailouts consist of approximately half of the interventions employed in Non-intervention policy (*NON*) category, and are aimed at rescuing distressed financial intermediaries (FIs) to avoid the immediate system turbulence and melt down.[5] Bank bail-outs may lessen or avoid the risk of contagion to other FIs or the systemic effect which might subsequently exacerbate the crisis. Examples of ad hoc interventions to bail out troubled FIs during the subprime crisis include the bailout of Bear Stearns in the United States, and guarantees to Northern Rock in the United Kingdom (Brunnermeier, 2009; Laeven & Valencia, 2012, respectively).

Two plausible outcomes of making the wrong policy intervention can be compared from the main findings. One possibility is when there is no crisis but policy makers misread the signs and decide to intervene, for example with liquidity support policy (*LIQ*). This action can lead to adverse outcome of decreasing the probability of an economy being in the non-crisis state. Another possibility is that in a crisis the policy makers decide not to intervene or fail to intervene (*NON*), but the approach leads to a decrease in the probability of unsuccessful defence. These findings suggest that if the state of an economy is uncertain, intervention should be procrastinated.

Monetary policy appears to be ineffective in defending against banking crises. As shown in Table 3, monetary policy actions have a (marginally statistically significant) positive sign in state 2. This intervention increases the probability of unsuccessful defence by 0.26, providing some support for the conclusion that monetary policy is ineffective in mitigating strains in the economy. One possible explanation is monetary policy operates with a lower bound on interest rates in a weakened banking system. Consequently authorities have few options but to mainly rely on quantitative and credit easing which is subject to debate in terms of its effectiveness for the recent crisis and the past crisis in Japan in the 90s (Sellon, 2003). Additionally, the public and banks may have interpreted monetary policy announcement (*MON*) as evidence of forthcoming bad news about the soundness of other FIs even when the economy is not in crisis. As shown in Table 3, monetary policy (*MON*) has a negative sign in state 0: it decrease the probability of having no crisis by approximately 0.36. This associative

[5] Non-intervention policy and bank failures/bailouts consist of 50 per cent of bank bailouts, 40 per cent of the constant interest rate actions and 10 per cent of bank failures. We do not consider long term effects and market discipline or the moral hazard argument in this study.

signalling leads to the observed relation rather than suggesting a causal relationship between effectiveness of these tools and the state of the economy.

4. CONCLUSION

The results lead to the conclusion that the right tool tailored to the symptoms of a particular crisis is needed to manage a banking crisis. Our findings suggest that during the GFC, liquidity support policy (*LIQ*) is an effective intervention tool, rather than conventional policies, such as fiscal and monetary policy, aimed at the economy more generally with lagged effects. It was the right tool targeting the credit crunch facing the financial sector at that time. Our conjecture is that the policy makers need to implement 'the right tool(s) at the right time'. The policy maker may consider employing a Non-intervention policy (*NON*) when the stage of an economy is unknown.

The implication of our analysis for future government intervention is to carefully consider timing and the tools for implementation after diagnosing the problem and state of economy. Our main contribution has also been to link the findings of Diamon & Rajan (2005) that banking system liquidity was an important determinant of the recent GFC, with the result that liquidity also plays an important role in crisis prevention and management. In addition the paper explores the effectiveness of other methods of government intervention in the 2007-2009 credit and liquidity crunch.

APPENDIX A

Components of the Financial Stress Index

Components	Explanation
Banking sector	
Banking sector beta	Standard capital asset pricing model (CAPM) beta
TED or interbank spread	3-month Libor or commercial paper rate minus the government short term rate
The inverted term spread	government short term rate minus government long term rate
Securities market	
Corporate debt spreads	Corporate bond yield minus long term rate minus government long term rate
Stock market returns	Month over month change in the stock index multiplied by minus one
Stock market volatility	Time varying measure of market volatility obtained from a GARCH(1,1) specification
Foreign exchange market	
Foreign exchange volatility	Time-varying measure of the monthly percentage change of the real effective exchange rate using GARCH(1,1)

Source: Balakrishnan et al. 2009

APPENDIX B

The measures of each of the intervention tools

Intervention categories and tools	Measures
Fiscal Policy *(FIS)*	
Fiscal stimulus packages	Increases in expenditures or reductions in taxes
Monetary Policy *(MON)*	
Interest rate cuts	
Quantitative and credit easing	Quantitative easing involves the central bank's purchasing government securities Credit easing consists of purchases of private sector debt in primary or secondary markets, including mortgage-backed securities
Liquidity Support *(LIQ)*	
Domestic currency liquidity support	Broadened access to central bank refinancing and relaxation of collateral framework; change in funding terms or auction schedule. For example US Term Auction Facility (TAF), launch of the Term Asset-Backed Securities Loan Facility (TALF), Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility (ABCP MMMF or AMLF) Support of money markets
Foreign currency swaps	Provision of foreign currency liquidity through FX swaps (between central banks and central bank) and FX funding
Financial Sector Policies *(FIN)*	
Asset Purchases	Asset purchases, for example, Troubled Assets Relief Program (TARP). Ring-fencing of bad assets conducted either off-balance sheet through special purpose vehicle or on balance sheet through asset guarantees
Liability Guarantees	Guarantees for old or new liabilities Enhancement of depositor protection Provision of lender of last resort facilities to individual banks
Recapitalization	Capital injection Nationalization (acquisition of controlling share)
Non-intervention policy and Bank Failures/Bailouts *(NON)*	
Interest rate increases/ to maintain interest rates unchanged	
Bank Bailouts and Assisted Mergers	
Bank Failures	

REFERENCES

Ait-Sahalia, Y., Andritzky, J., Jobst, A., Nowak, S., & Tamirisa, N. (2011). Market response to policy initiatives during the global financial crisis. *Journal of International Economics, 87*(1), 162-177.

Balakrishnan, R., Danninger, S., Elekdag, S., & Tytell, I. (2011). The Transmission of Financial Stress from Advanced to Emerging Economies. *Emerging Markets Finance & Trade, 47*, 40-68.

Brunnermeier, M. K. (2009). Deciphering the liquidity and credit crunch 2007-2008. *Journal of Economic Perspectives, 23*(1), 77-100.

Demirguc-Kunt, A., & Detragiache, E. (1998). The Determinants of Banking Crises in Developing and Developed Countries. *International Monetary Fund Staff Papers, 45*(1), 81-109.

Diamond, D. W., & Rajan, R. G. (2005). Liquidity Shortages and Banking Crises. *Journal of Finance, 60*(2), 615-647. doi: http://www.blackwellpublishing.com/journal.asp?ref=0022-1082

Eichengreen, B., Rose, A., & Wyplosz, C. (2003). *Exchange Market Mayhem: The Antecedents and Aftermath of Speculative Attacks*: Cambridge and London: MIT Press.

Hodrick, R. J., & Prescott, E. C. (1997). Postwar US business cycles: an empirical investigation. *Journal of Money, credit, and Banking*, 1-16.

IMF. (2009). Global Financial Stability Report: Navigating the Financial challenges ahead (Vol. April, pp. Chapter III). Washington DC: International Monetary Fund.

Kaminsky, G. L., & Reinhart, C. M. (2008). The Twin Crises: The Causes of Banking and Balance-of-Payments Problems. In F. Allen & D. Gale (Eds.), *Financial Crises* (pp. 122-149): Elgar Reference Collection. International Library of Critical Writings in Economics, vol. 218. Cheltenham, U.K. and Northampton, Mass.: Elgar. (Reprinted from: [1999]).

Laeven, L., & Valencia, F. (2010). *Resolution of Banking Crises: The Good, the Bad, and the Ugly*. IMF Working Papers: 10/146. International Monetary Fund Retrieved from http://www.imf.org/external/pubs/ft/wp/2010/wp10146.pdf

Laeven, L., & Valencia, F. (2012). *Systemic Banking Crises Database: An Update*. IMF Working Papers: 12/163. International Monetary Fund

Sellon, G. H. (2003). Monetary policy and the zero bound: policy options when short-term rates reach zero. *Economic Review-Federal Reserve Bank of Kansas City, 88*(4), 5-44.