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Interest Rate Liberalization and Capital Adequacy in Models of Financial Crises

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Abstract:

We characterize the effects of interest rate liberalization on OECD banking crises, controlling for the standard macro prudential variables that prevail in the current literature. We We test for the direct impacts of interest rate liberalization on crisis probabilities and their indirect effects via capital adequacy. Over the period 1980 - 2012, we find that interest rate liberalization has a crises reducing effect, and it appears that the beneficial effects work by strengthening capital buffers. We also show that when controlling for liberalization, capital adequacy and liquidity, the main driver of financial crises is property price growth. Our results invariant when we control for alternative sensitivity tests for robustness purposes.

JEL classification: C52; E58; G21; G28

Keywords: Banking crises; Logit; Capital adequacy; Interest rate deregulation; Economic freedom indexes

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1. Introduction

If we are to learn enduring lessons from the sub-prime crisis we need to know whether it was in some way unique, or whether it shared features in common with earlier banking crises. Recent research focusing on the macro determinants of crises provides evidence that OECD banking instability can be explained by capital adequacy, liquidity, house price and current account imbalances (Barrell et al. 2010; 2013a). However by definition, these impacts are conditional on the regulatory environment under which banks operate. Over the last three decades the regulatory architecture has experienced major transformations, yet there is little consensus as to how these changes have affected bank risk taking behavior and hence crises probabilities. Given the established links between financial liberalization, crises and efficiency (Barth et al. 2006; Agoraki et al. 2011; and Chortareas et al. 2012), their interaction with regulatory capital becomes paramount. Regulation of both deposit and lending rates was common, in the OECS during the 1980s and 1990s (Edey and Hviding, 1995). For example, Regulation Q in the U.S. enforced interest rate controls for over 50 years on the premise that controlling deposit rate competition would allow banks to earn normal profits without resorting to risky loans and this in turn mitigated the need for regulatory capital.

This paper constitutes the first attempt, to our knowledge, to explicitly characterize the effects of interest rate deregulation on OECD banking crises between 1980 and 2012. Our approach combines both the macro (prudential) and micro (Chortareas et al. 2013) strands of the literature on banking stability. To capture these dynamics we utilize the economic freedom index drawn from the Fraser Institute. Although the index characterizes different aspects of financial

controls used in the literature, we note an important omission in these studies: none of them consider the impact of interest rate controls on bank behavior and performance. The pace of

Widening current account imbalances have been common forerunners of banking crises in the OECD (Barrell et al., 2013a). They may be accompanied by monetary inflows enabling banks to expand credit excessively which inflates asset prices in an unsustainable manner.[4] These trends may be exacerbated by lower e(x)-9(8enust)-9(e)4ifact 2ls(nt 32)4ifac6(a)4es.[ )]TJETBT1 0 0 13309.31

used of a general control variable. It is only recently that empirical studies have focused on specific aspects of economic freedom/liberalization and governance effectiveness in banking performance (Chortareas et al., 2013). Such studies which isolate the different impacts, confirm the importance of factors such as financial liberalisation, including interest rate deregulation, on bank efficiency.

There are several channels by which interest rate controls may affect crisis probabilities. Situations where governments control deposit and/or lending rates (which are captured by our

For example, in situations where there are deposit rates ceilings, a rise in the policy interest rates will cause a shortage of bank deposits as funds move elsewhere. As a result of the disintermediation, banks may change their scope of operations and move into securitization to increase non-interest income. Therefore, interest rate regulation is likely to decrease bank efficiency in the manner that Berger et al. (2008) describe. Since systemic risk will increase, the role of regulatory capital becomes more important. Conversely, when deposit rates are deregulated banks can revert to traditional lending, which is subject to normal regulatory capital rules so the marginal benefit of capital is reduced (Hellmann et al.,

jointly (Cecchetti and Kohler, 2014). No systematic attempt exists to explicitly measure the impact of interest rate deregulation directly on crisis probabilities and indirectly via capital adequacy and this is the task that we pursue in the following sections.

3. Methodology and data

We utilize the logit model which has been a standard approach for crisis prediction (Demirguc-Kunt and Detragiache, 2005; Davis and Karim, 2008, Barrell et al., 2010; 2013,a,b). The logit estimates the probability that a banking crisis will occur in a given country with a vector of explanatory variables ( ). The banking crisis variable ( ) is a zero-one dummy that takes the value of one at the onset of crisis. The logistic estimator is given by:

$$\Pr ob\, Y_{it} \quad 1 \quad F \quad X_{it} \quad \frac{e^{\ 'X_{it}}}{1 \quad e^{\ 'X_{it}}} \qquad (1)$$

where, is the vector of unknown coefficients and $F(\ ^{'}X_{it})$ is the cumulative logistic distribution. The log likelihood function is given by:

(2)

Coefficients show the direction of the effect on crisis probability, although their magnitudes are conditional[6] on . We include a constant to allow for the hypothesis that crisis probabilities can be exogenous.

To assess the informational value of our variables we use the area under the (AUC) Receiver Operating Characteristic (ROC) curves which

hence can be used to discriminate between competing models. Probabilistic forecasts can be

[6] $ß_i$ represents the effect of X_i

classified for accuracy against a continuum of thresholds, generating true positive and true negative rates[7]. In the terminology of ROC analysis the two variables of interest are the true positive rate (sensitivity of the discriminator) and the false positive rate (1-specificity)[8]. An AUC

t replicates a random coin toss, whilst an AUC above 0.5 implies the model adds value in terms of the ability to call crises correctly with low false negative rates.

Our dataset includes 23 systemic and non-systemic crises in OECD countries. The crises between 1980 and 2003 are from Barrell et al. (2010): Canada (1983), Denmark (1987), Finland (1991), France (1994), Italy (1990), Japan (1991), Norway (1990), Sweden (1991), the UK (1984, 1991, 1995) and the US (1988). In extending the estimation further to 2008 we rely on Laeven and Valencia (2010) who classify crises in the US, the UK, Belgium, France, Germany, Denmark, Spain, Sweden (marginally) and the Netherlands. We date crises in these countries in 2008 with the UK and US having distinct crises in both 2007 and 2008. We evaluate our model using forecast tests for 2009 to 2012, with crises dated by Laeven and Valencia (2012) in Germany and Denmark in 2009 and Spain in 2011.

As discussed in Section 2, the variables included in our model are: real GDP growth, inflation, M2/ Foreign Exchange Reserves, real interest rates, fiscal surplus/GDP ratios, the current account/ GDP and real domestic credit growth.[9] We follow Barrell et al. (2010) and include unweighted bank capital adequacy and bank narrow liquidity as well as real house price

[7] Correspondingly false positive and false negative rates are also generated.
[8] For a recent example of ROC curve usage in the context of crises, see Barrell et al. (2013b) and Schularick and Taylor (2012).
[9] We do not include certain Demirguc-Kunt and Detragiache (1998; 2005)

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growth. The data are [10], with the following exceptions: house prices are from the BIS database and unweighted capital adequacy is obtained from the OECD Bank Income and Balance Sheet database (except for the UK, where data are from the Bank of England).

Data on financial liberalization are collected from the Fraser Institute Annual Reports[11]. The

interest rate deregulation (IRR) variable which is constructed using data on credit-market constraints and regulations, available through the World Bank. This variable ranges between 0 and 10, where greater values indicate more liberalization. In particular, countries in which interest rates are determined by the market, the monetary policy is stable and real deposit and lending rates are positive receive higher ratings.

4. Results

Our testing strategy involves the estimation of a baseline model (without the effect of interest rate regulation) and assessing its information content. The model is then re-estimated with the interest rate regulation effects and changes to the estimates and information content are noted. Finally, we test for the interaction of interest rate regulation and capital since these may

[10] We use narrow liquidity derived from IFS rather than the broad measure provided in the OECD Bank Income and Balance Sheet database. N
central bank, while total assets comprise foreign assets, claims on general government, central bank and private sector.

[11] There exist two major attempts to measure economic freedom, namely the Economic Freedom of the World Annual Reports produced by the Fraser Institute and the Index of Economic Freedom created by the Heritage Foundation and the Wall Street Journal. Because data provided by the Heritage foundation are limited in the time dimension, we are unable to test this in our model.

regulation not significant in this experiment as independent variables, suggesting that interest rate deregulation strengthens the defensive role of a given level of capital.

<Insert Table 2 about here>

The interaction effect clearly increases the predictive power of the early warning system as can be seen by the AUC which increases from 0.785 to 0.792. In terms of our selection criteria we would therefore choose the interaction model as the preferred explanation of OECD banking crises. In the next sections we evaluate the model performance and subject it to various robustness tests.

4.2. In-sample and forecast performance

We evaluate the forecast performance of our preferred interaction model against the baseline version using the in- and out- of sample crisis call rates. Between 1980 and 2008 our in-sample frequency of crises is 0.0631. A predicted probability in excess of this is classed as a [12]. On this basis our interaction model called 11 out of 12 crises (91% success rate) in the sub-prime period, with only one missed crisis in Germany. The crises that were correctly identified are Belgium, Netherlands, Italy, Denmark, Sweden, France, Spain, UK and US (the last two countries being classed as having two distinct crises). One can argue that the German crisis did not follow from domestic problems, but rather from excessive exposure to US sourced MBSs. There were only two false calls, which occurred in Canada, where the combination of an

[12] Assuming it occurred either in the crisis year or the preceding year.

oligopolistic banking system, a well-organized central bank and close knowledge of US mortgage markets resulted in lower systemic

In table 3 the average contributions across countries are reported for each decade. The most striking result is that house price appreciation in the OECD was the largest contributor to

crises. By removing the major systemic crises from our sample and re-estimating the model we can confirm its robustness even in the absence of systemic events. This results in the deletion of the UK, the US, Japan, Norway, Finland and Sweden individually and the US and Japan together to accommodate the high degree of contagion between their banking systems. The estimations in Table 4 show that our results remain virtually the same as those discussed in Section 4.1. Secondly, to confirm whether our results rest on the assumption of the one year lag structure, we allow for the possibility that our independent variables started influencing crises probabilities two years prior to their onset. As shown in Table 5 this amendment does not change the results to any great extent. The global magnitude of the sub-prime crisis is well known and it could be argued that our estimation parameters arise from the inclusion of this episode in our sample. To check that our result can be applied to the OECD from the 1980s onwards we terminate our sample at 2006. Table 6 shows that our results remain robust indicating interest rate regulation should be an important policy issue.

<Insert Tables 4-6 about here>

5. Conclusion

We show that over the last 35 years interest rate liberalization had a crisis reducing effect in the OECD alongside capital, liquidity and current account surpluses. On the other hand, property price growth consistently raised crisis risk. Our results are robust to a variety of alternative estimation checks, including country eliminations and exclusion of the sub-prime episode.

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Table 1.
The effects of interest rate regulation on crises probabilities

Table 3.
Relative c21

Table 5.
Results for the second lag

	Interest Rate Regulation * Capital Adequacy	Interest Rate Regulation
Interest Rate Regulation (-2)	-	-0.228
	-	(0.000)
Liquidity Ratio (-2)	-0.126	-0.088
	(0.000)	(0.008)
D Real House (-3)	0.102	0.117
	(0.002)	(0.000)
Interest Rate Regulation*Capital Adequacy Ratio (-2)	-0.031	-
	(0.000)	-
Current Account Balance (% of GDP) (-2)	-0.185	-
	(0.012)	-

Note: Coefficient (probability). Estimation Period: 1980 – 2008.

Table 6

Appendix A

A.1 The effects of interest rate regulation on crises probabilities 0.096

Dependent Variable: Crisis Onset	Regression Stage									
	1	2	3	4	5	6	7	8	9	10
Interest Rate Regulation (-1)	-0.287 (0.196)	-0.287 (0.194)	-0.283 (0.199)		-0.268 (0.148)	-0.267 (0.149)	-0.266 (0.150)	-0.148 (0.130)	-0.212 (0.000)	-0.226 (0.000)
Liquidity Ratio (-1)	-0.112 (0.011)	-0.112 (0.011)	-0.114 (0.009)	-0.118 (0.005)	-0.117 (0.005)	-0.107 (0.005)	-0.106 (0.005)	-0.099 (0.007)	-0.096 (0.007)	-0.093 (0.008)