Financial Liberalisation and Capital Adequacy in Models of Financial Crises.

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Abstract: We characterize the effects of financial liberalization indices on OECD banking crises, controlling for the standard macro prudential variables that prevail in the current literature. We use the Fraser Institute's Economic Freedom of the World database. This yields a variable that captures credit market regulations which broadly measures the restrictions under which banks operate. We then test for the direct impacts of some of its components, deposit interest rate regulations and private sector credit controls, on crisis probabilities and their indirect effects via capital adequacy. Over the period 1980 – 2012, we find that less regulated markets are associated with a lower crisis frequency, and it appears that the channel comes through strengthening the defence that capital provides. Deposit interest rate liberalisation adds to the strength of capital in protecting against crises. However, private sector credit liberalisation, appears to increase the probability of having a crisis, albeit not significantly. If policy makers are concerned about the costs of low risk events, they may wish to control private sector credit even if it has a probability of affecting significantly crises of between 10 and 20 per cent.

Keywords:

1. Introduction

The reminder of the paper is structured as follows. Section 2 prese

for no others) the OECD database of country-aggregates for banks' balance sheets and profit and loss does include capital, and that determines our country choice.

Indicators that would affect var(BL), as discussed in Beck et al (2006), such as growth of real GDP, changes in terms of trade and the rate of inflation can be seen to capture macroeconomic developmenwould lopmt affect banks' asset quality. Rapid credit growophsonindicbte lbx lending standards as well as potenwoially triggering an asset boom, as wacommonly suggested prior to the subprime crisis. Lbx monetary policy, as indicbted by the short term real interest rbte may also induce lax lending and feed asset bubbles. Fiscal deficits may also affect the risk of crises by overhebting the economy. A large fiscal deficit also reduces the scope available to recapitalise banks should difficulties emerge, making a systemic crisis more likely. Fiscal difficulties were not presenwo prior to the subprime buwo emerged afterwards, as thenomy slowed and authorities d to recapitalise banks.

Results using these types of variables in global samples vary between papers. For example, deprecibtion and the terms of trbde were not significanwo in our compbtor paper, Demirguc Kunt and Detragiache (2005) as well as Beck et al (2006). Furthermoredalunty(s)-11(e)-6( )250TJ 339.72 -13.8
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overextended borrowers in the personal and construction sectors as well as property developers have strong incentives to default. Reinhart and Rogoff (2009) suggest that property price developments can change crisis probabilities, and Barrell, Davis, Karim and Liadze (2010) do find a role for these in OECD crises.

Global imbalances were a key background feature in the run up to the subprime crisis, and they may also raise var(BL). Reinhart and Rogoff (2009) suggest that widening current account imbalances have been common forerunners of banking crises in OECD, and they discuss the international finance literature which links difficulties in the external account to financial crises. Current account deficits may be accompanied by monetary inflows that enable banks to expand credit excessively, generating and reflecting a high demand for credit, as well as boosting asset prices in an unsustainable manner.[5] These trends may be exacerbated by lower real interest rates than would otherwise be the case. The existence of a current account deficit also indicates a shortfall of national saving over investment and hence a need for the banking sector to access the potentially volatile international wholesale market..

However, in the empirical literature, the balance of payments itself is not commonly employed in logit models predicting banking crises, although some variables showing external pressures on the economy and financial system are usually included.[6] When it is included it is often not significant. Hardy and Pasarbasioglu (1999) estimate logit models of crises for both advanced and developing countries and find that the current account was not significant, although the change in the gross foreign liabilities of the banking sector (which may accompany a current account deficit) is often significant with a positive sign at a longer lag and a negative sign as the crisis nears. Using a probit approach, Eichengreen and Rose (1998) again find the current account insignificant as a predictor of banking crises in developing countries. The vulnerability of the banking system to sudden capital outflows may be indicated by the ratio of their deposits to foreign exchange reserves, and this has been found to be significant in global samples, although in most countries affected in the subprime, the level of reserves was quite high.

One focus of this paper is on financial liberalisation and its effects. The idea that the liberty of individuals to pursue their economic goals is welfare improving for the whole society is as old as economics as a science itself. The development of quantitative indices of economic freedom over the last two decades, however, has allowed to explicitly analysing the effects of liberal economic institutions (or the lack of them) on economic welfare. Indeed the indices of economic freedom and the analyses based on them have uncovered the potential of economic liberalization to promote growth opportunities and wealth creation.

Using the economic freedom indices, extensive empirical evidence has been produced focusing on the effect of economic freedom on growth (e.g., De Haan and Sturm, 2000, 2003; Gwartney, 2009; Justesen, 2008; Paldam, 2003; Williamson, 2009). Other studies consider the effects of economic freedom on prosperity (Faria and Montesinos, 2009), inequality (Sala-i-Martin, 2007, Ashby and Sobel, 2008), income convergence (Xu and Haizheng, 2008) entrepreneurship (Nystrom, 2008; Bjornskov and Foss, 2008), labour markets (Feldmann, 2009) and migration flows (Ashby, 2010). Indices of economic freedom have also been used as an explanatory

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[5] In addition foreigners may cease to be willing to finance deficits in domestic currencies if they consider their assets are vulnerable to monetization via inflation, and such a cessation can disrupt asset markets and banks' funding. See Haldane et al (2007) for an assessment of the impact of such a hypothetical unwinding in the US

[6] Indicators of external pressures have been used for global samples in Demirguc Kunt and Detragiache (2005) and in Beck et al (2006) which also highlights the impact of bank concentration on the risk of banking rises.

variable in financial economics (e.g., Roychoudhury and Lawson, 2010; Jones and Stroup, 2010) and in characterizing the effects of the recent global recession (Giannone, et. al., 2011).

Similarly, other studies investigate the relationship between capital adequacy and regulation however the literature on bank regulatory practices is copious. Theoretical studies emphasize the relative importance of capital adequacy requirements in bank regulation (Dewatripont and Tirole, 1993). One of the main functions of capital is the 'risk sharing function' which views capital as a buffer that allows for the orderly disposal of assets and shields debt holders from losses. If capital is adequate then assets will not have to be sold in 'fire sale', a situation that would affect both depositors' losses and, as a consequence, deposit insurance. A second key function of bank capital is that it provides owners and managers with incentives to take less risk (Gale, 2010). Nevertheless, analysts disagree as to whether the imposition of a minimum capital requirement actually reduces risk-taking incentives (Blum, 1999).

More recently, the banking literature focuses on investigating the impact of bank regulations,

Davis, Karim and Liadze (2011) who show major differences in crisis predictors between Asia and Latin America, as well as Eichengreen et al (1998) who as noted argue crises in developed countries have distinct precursors.

3. Methodology and data

We utilise the logit model which has been the standard approach to predicting crises (Demirguc Kunt and Detragiache (2005), Davis and Karim (2008)). The logit estimates the probability that a banking crisis will occur in a given country with a vector of explanatory variables X_{it}. The banking crisis variable Y_{it} is a zero-one dummy which is one at the onset of a banking crisis, and zero elsewhere. Then we have the equation:

$$\Pr ob(Y_{it} = 1) = F(\beta X_{it}) = \frac{e^{\beta' X_{it}}}{1 + e^{\beta' X_{it}}} \qquad (7)$$

where β is the vector of unknown coefficients and $F(\beta X_{it})$ is the cumulative logistic distribution. The log likelihood function is:

$$Log_e \ L = \sum_{i=1}^{n} \sum_{t=1}^{T} [(Y_{it} \log_e F(\beta' X_{it})) + (1 - Y_{it}) \log_e (1 - F(\beta' X_{it}))] \qquad (8)$$

Coefficients show the direction of the effect on crisis probability, although its magnitude is

cent) and the fiscal surplus/GDP ratio (per cent) and the current account as a ratio to GDP. We include a constant to allow for the hypothesis that there is an exogenous probability of a crisis occurring. We do not include some typical institutional variables because they are clearly irrelevant to OECD countries, for example, GDP per capita is broadly comparable across OECD countries, while virtually all OECD countries have some form of deposit insurance scheme Variations in the level of credit/GDP (as opposed to credit growth) may reflect the differing nature of the financial system in OECD countries (i.e. bank versus market dominated) rather than risk of crisis, and we exclude this variable as well. The above macroeconomic and financial data are from the IMF's IFS database, with the following exceptions. House prices are from the BIS database, while banks' unweighted capital adequacy is obtained from the OECD Bank Income and Balance Sheet database, except for the UK where data are obtained from the Bank of England. We use narrow liquidity[7] derived from IFS rather than the broad measure provided in the OECD Bank Income and Balance Sheet database.

Data for economic freedom are collected from the Fraser Institute (2012). There exist two major attempts to measure economic freedom producing the corresponding indexes, 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. Although

eliminated the credit market. The Private Sector Credit (PSC) sub-component measures the extent to which government borrowing crowds out private borrowing. If available, this sub-component is calculated as the government fiscal deficit as a share of gross saving. Since the deficit is expressed as a negative value, higher numerical values result in higher ratings. Finally, ownership of banks (OWN) variable equals the percentage of deposits held in privately owned banks. Greater values here imply more freedom in the domestic credit market.

4. Results

4.1 Estimation of a baseline model

Using these data, in line with the discussion above, we, undertook nested testing of a logit model of OECD banking crises over 1980-2008, starting from a full set of variables typically included in global banking crisistiOO17(l)-11d7( )-29.6833(m)-1.1263328(0)0.5.49687( )-29.63 s

used on its own, when it is larger the probability of a crisis is reduced. It is worth investigating whether this is true for its components, and we turn to those next.

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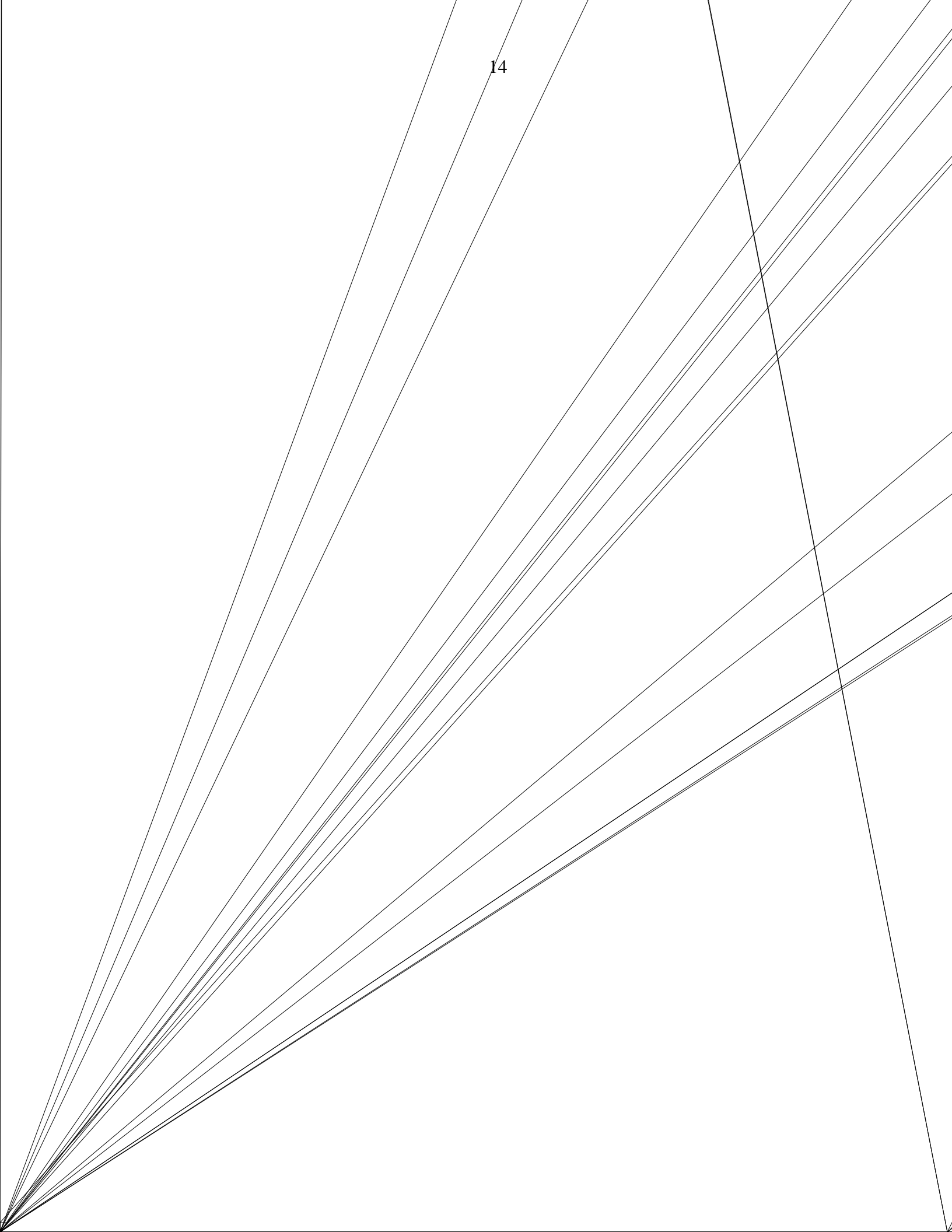
4.3 Model Selection and the use of ROC Curves

Receiver operating characteristic (ROC) curves test the "skill" of binary classifiers and hence can be used to discriminate between competing models. In the context of logit estimators, probabilistic forecasts can be classified for accuracy against a continuum of thresholds. This generates a true positive rate and true negative rate for each threshold and correspondingly a false positive and false negative rate. In the terminology of ROC analysis, the two variables of interest are: sensitivity (true positive rate) and 1 – specificity (which is equal to the false positive rate). Sensitivity is plotted on the y-axes and 1 – specificity on the x- axes, as shown in Figure 1. At a threshold of predicted probability of a crisis being 0.001 almost all crises would be correctly called, because they have a probability in excess of this low number in the model. However, almost all other periods would face a false positive call and we would see ourselves at the top right hand corner of the diagram. As the cut off threshold falls the true positive rate falls, but in a good model it falls much less rapidly than the false positive rate.

The true positive and false positive rates encapsulate the correspondence between probabilistic forecasts and actual binary events and generate a two dimensional co-ordinate in the ROC space. In turn, the mapping between these co-ordinates and the thresholds (or decision criterion), define the ROC curve. Hence ROC curves are closely associated with the "power" of a binary predictor[13].

Figure 1: Receiver Operating Characteristic Curves

ROC curves have been widely used in medical research and are considered to be the most comprehensive measure of diagnostic accuracy available[14]. This is because they impound all combinations of sensitivity and specificity that the diagnostic test can provide as the decision criterion varies (Metz, 2006). Since false positive and false positive errors have ve S eeorn

different social consequences; an EWS that has a high level of sensitivity at the cost of high false positive rates may lead to "tail events" being missed with commensurate economic costs.

that these crosses increase the generalised information content of our analysis. The model with the cross between interest rate regulation an unweighted capital adequacy contains the most generalised information, and we would say that it is our preferred model. We plot the ROC curves for our baseline model and our preferred specification, and it is clear that the interest rate regulation and its cross with capital both have marginally better discrimination at low thresholds, and given the AUC the model including capital crossed with interest rate regulation might be strongly preferred by a policy maker who was looking to operate at these low levels of probability of a crisis, which one might want to do if crises are expensive events

Figure 2 ROCs for Fitted Models

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Countries	2009	2010	2011	2012
Belgium				
Ca(o)44.54199.672(i)-10Qd.672(i)-10Q				
De9.672(i)-10ma(o)44.5419rk				
Fi9.672(i)-10lai				
Fra9.672(i)-10ce				
Gema(o)44.5419ny				
Ita(o)44.5419ly				
J.67.90457(a)-11.4523(p.672(i)-10Q)-11.4523(n)500TJ /R68 9.74856 Tf 69.72 -0.6 Td ()30.2854(=)7.92635(=)-7537.8()-7970.9()-7				
Swed.672(i)-10e(o)44.5419n				
Sp.672(i)-10Qi9.500TJ /R68 9.74856 Tf 74.28 -0.6 Td (=)Tj /R66e9.74856T008di4a0Fd (A)Tj eR68 9.74856mFf 82r56 thTdnoe95				

baseline model with no regulatory indicator which h

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