



# Off-balance sheet exposures and banking crises in OECD countries

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## ABSTRACT

Against the background of the acknowledged importance of off-balance-sheet exposures in the sub prime crisis, we seek to investigate whether this was a new phenomenon or common to earlier crises. Using a logit approach to predicting banking crises in 14 OECD countries we find a significant impact of a proxy for the ratio of banks' off-balance-sheet activity to total (off and on balance sheet) activity, as well as capital and liquidity ratios, the current account balance and GDP growth. These results are robust to the exclusion of the most crisis prone countries in our model. For early warning purposes we show that real house price growth is a good proxy for off balance sheet activity prior to the sub-prime episode. Variables capturing off-balance sheet activity have been neglected in most early warning models to date. We consider it essential that regulators take into account the results for crisis prediction in regulating banks and their off-balance sheet exposures, and thus controlling their contribution to systemic risk.

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## 1. Introduction

Public commentary on the sub-prime crisis has highlighted the role of banks' off-balance sheet (henceforth OBS) activities (Barrell and Davis, 2008). Figures stressing the exposure of banks to OBS risks have been widely cited.<sup>1</sup> Structured investment vehicles (SIVs) and conduits, for example, were often lightly regulated with little capital cover, and the authorities were in some cases surprised by the volume of such activity that came to light in the crisis (Davis, 2009).

Academic commentators have started to focus on the design and appropriate regulation of banks' OBS vehicles, but to our knowledge there are no formal systematic cross-country empirical investigations of the contribution of OBS activities to financial crises, despite the extensive literature on early warning models for banking crisis prediction (Davis and Karim, 2008). The lack of empirical work seems largely due to paucity of data and not from a lack of underlying justification. Indeed, both banking theory, suggesting that moral hazard arises from less regulated activities, and the sizeable

impact OBS activities have had empirically on banks' profits, argue for a major effort to be made with research.<sup>2</sup>

In this paper we investigate the effect of off-balance sheet activity on the vulnerability of the banking sectors in 14 OECD countries to crises in combination with key regulatory, financial and macroeconomic variables. We are interested to see whether OBS activity was a crisis determinant across our entire sample (1980–2008), in which case transactions traditionally regarded as risk-reducing were systemically problematic, or whether OBS activity only started to raise crisis probabilities when it moved into risky securitisation associated with regulatory arbitrage in recent years. If the latter is true, OBS risks will be found to be a feature of the most recent crises only and hence will not add value to an early warning system based on our sample.<sup>3</sup>

There are important policy implications of an analysis of OBS and crises: periods of structural change, when OBS income becomes associated with risky securitisation, may pose particular risks to financial stability. This paper demonstrates clearly that this was the case, showing for the first time that OBS activity contributed

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<sup>1</sup> See for example, Blundell-Wignall et al. (2008).

<sup>2</sup> Barrell et al. (2006) investigated the direct negative effects of crises on consumption and the indirect effects on confidence, uncertainty and credit rationing in the OECD. This illustrates the importance of crisis prediction and thus the need to test new leading indicators such as OBS activity.

<sup>3</sup> Our OBS measure will still serve as another example of crisis risk arising from financial innovation which is a feature of many historic banking crises (Davis, 1995).

significantly to crisis probabilities after 2003. Expanding on our earlier work (Barrell et al., 2010a,b), we test this proposition on the banking sectors of Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, Norway, Spain, Sweden, the UK and the US.<sup>4</sup>

The paper is structured as follows. Section 2 provides background on the importance of OBS activity in the recent crisis and introduces measures of off-balance sheet exposures for OECD country banking sectors. Section 3 introduces the literature on banking crisis prediction and considers additional variables employed to predict crises. Section 4 covers the estimation and analyses the results of a logit model of the determinants of banking crisis probabilities that includes OBS. Section 5 discusses forecasting crises with logit models and Section 6 concludes.

## 2. The relevance and measurement of OBS

Traditionally, OBS activity was seen as a risk reducing tool whereby parent companies could venture into new business lines without exposing their shareholders to the concurrent risks; parents could hold minority interests in a legally separated entity which bore the risks instead. However the explosion of OTC derivatives trading by banks allowed them to generate increasing levels of non-interest income whilst securitisation allowed them to earn additional fee based income whilst placing the assets off the balance sheet. This raised profitability further by avoiding the need to hold costly regulatory capital against these assets.

Acharya and Richardson (2009) note that the move towards securitisation-generated income became a feature of market-based banking systems of several OECD economies. This was particularly pronounced in the period after 2003 in the US when asset backed security (ABS) issuance exploded, driven by banks' desire to avoid holding costly capital against their assets. Altunbas et al. (2009) note similar strategies were adopted in Europe and date the acceleration of securitisation in European banks around the same time (post-2004).

One way banks engaged in regulatory arbitrage was by removing assets off the balance sheet by holding asset-backed securities in SIVs and conduits, for which banks then sought asset-backed commercial paper financing. The other was holding other banks' AAA ABS tranches on-balance sheet, which required a low capital weighting. Acharya and Richardson (2009) suggest this regulatory arbitrage was the main cause of the sub-prime episode, whilst Affinito and Tagliaferri (2010) discuss the link between securitisation and crises in general. Only the on-balance sheet form of regulatory arbitrage will be captured by conventional measures of capital-assets ratios, and even there, an unadjusted measure of bank leverage (as employed by Barrell et al., 2010a) rather than a risk-based capital adequacy measure would have captured risks better.

The recent increase in OBS activity may also have been due to banks' desire to mimic the business strategies of their peers. Farhi and Tirole (2009) suggest the maturity mismatch within SIVs and conduits (between long-term mortgage-backed assets and the short term commercial paper used to finance them) was a structural feature of the business models of most banks which displayed strategic complementarities with their peers. When authorities bail out failing banks, society incurs a fixed cost which is only justified if sufficient banks need bailing out. Therefore, each individual bank correlates its risk exposure with other banks, such that OBS risks can become systemically high.

As the recent crisis has shown (Barrell and Davis, 2008), capital adequacy and liquidity ratios that did not take into account the riskiness of OBS activities proved to be misleading. Whereas banks may have appeared healthy and compliant with regulatory rules, they were in fact weak due to the undercapitalisation of OBS activity. The question arises whether this was a unique feature of the recent crisis or whether there are historical precedents.

Accordingly, our aim in this paper is to take into account the degree of overall OBS activity by banks and its impact on systemic risk by introducing it in early warning models for banking crises along with other key macroprudential indicators. The first step is to estimate the amount of OBS activity of the banking system of each sample country. The literature on estimating OBS at a macro level is limited. One exception is Boyd and Gertler (1994) who questioned whether US banks' share of intermediation had been maintained by a shift to OBS activity.<sup>5</sup> They used the rate of return for on-balance sheet assets to derive a measure of OBS assets according to the scale of non-interest income. It was assumed that non-interest income<sup>6</sup> was generated by implicit off-balance sheet assets with the same risk and return characteristics as on-balance sheet activity as indicated by net interest income. The exception was fee-based off-balance sheet activities (trust-type activities and service charges on deposits) which the authors classed as "non-risky" forms of income. The authors note that a similar form of capitalisation of certain OBS activities that entailed risk exposure was required under Basel 1 for capital adequacy purposes (where this was to provide credit equivalents).

Feldman and Lueck (2007) replicated the Boyd–Gertler calculations for US data up to 2006. They found that capitalizing non-interest income gave a roughly constant share of banks in total intermediation despite a decline in the share of on balance sheet assets, illustrating the growing importance of OBS activity. They noted limitations to the Boyd–Gertler approach, notably the assumption that banks generate equal profitability from on and off-balance sheet assets, but nonetheless found it plausible. Clearly, if banks are more competitive in traditional lending than in non-interest generation,<sup>7</sup> the latter could include a wider margin and hence OBS assets could be overestimated by this method, and hence its use as a way of calculating the share of intermediation undertaken by banks may be questioned. However, income from off-balance sheet activities may contain information about the risk banks face, even if it is not a good measure of their assets. We focus on relative income shares below.

Further relevant contributions are from Stiroh (2004, 2006) who examined the effects of the ratio of non-interest income to total income on measures of bank risk and return in the US. The author found that at the aggregate level, declining volatility of total income occurred over 1984–2001 despite rising volatility of non-interest

<sup>5</sup> The pattern of growing non-interest income and its implications for intermediation were also noted by Rogers (1998), who pointed out that from the late 1960s onwards, US banks had reduced their reliance on interest income from traditional activities. Instead, they placed increasing importance on the fee-based incomes they generated from securitisation.

<sup>6</sup> Non interest income comprises revenue from banks' securitisations and other off-balance sheet and non-interest activities (which also include loan sales, backup lines of credit, and risk sharing through derivatives) as well as profits on proprietary trading, fees and service charges on deposits, securities underwriting fees and commissions on brokered securities transactions for third parties. However the non-interest income figures reported by the OECD do not decompose the revenues generated by these different activities.

<sup>7</sup> De Bandt and Davis (2000) in a study of the competitiveness of banking systems found that the competitive position for interest-generating and non-interest generating activities varied between countries. In the US the non-interest income market was found to be a more competitive than that for interest income, whilst in France the opposite was true. In Germany and Italy positions were comparable.

<sup>4</sup> Our choice of countries and of the time period we cover is constrained by the availability of data on capital ratios as well as on off balance sheet income.

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