



# Financial derivatives, opacity, and crash risk: Evidence from large US banks

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## ABSTRACT

We test how the use of financial derivatives affects banks' informational structure and future stock performance based on a sample of large bank holding companies in the US. Using banks' use of financial derivatives as a proxy for opacity, we find that high level use of interest rate and foreign exchange derivatives are associated with an increase in the synchronicity ( $R^2$ ) of stock price movements with the market index, which indicates less revelation of bank-specific information to the market. This finding is consistent with the prediction of the model developed by Wagner (2007). We document that superior corporate governance tempers these effects. Finally, we find that an increase in the opacity is significantly and positively related to an increase in banks' future stock price crash risk.

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## 1. Introduction

The extant financial economics literature indicates that banks play a critical role in providing liquidity and credit to various economic entities (Kashyap et al., 2002), and that this intermediation role exposes banks to many risks such as solvency risk and liquidity risk (Schuermann and Stiroh, 2006). It also exposes banks to interest rate risk, which is driven by the mismatch in the maturity structure and re-pricing terms of their assets and liabilities. Traditionally, banks have managed their interest rate risk exposure by actively monitoring the net imbalances in the effective maturity of their assets and liabilities and by rebalancing their balance sheets accordingly. Consequently, many studies have investigated the theoretical motivations of hedging through maturity management and many have supported the practice of such hedging by banks. For example, Diamond (1984) suggests that, given how costly bank failures are, banks should hedge all market risks in which they do not have any special monitoring advantages. Under Diamond's model, interest rate risk management should improve the intermediation efficiency of banks by allowing banks to take more credit risk. Smith

and Stulz (1985) show that the hedging of interest rate risk can increase bank value by lowering the expected transaction costs of bankruptcy.<sup>2</sup>

However, this traditional approach of hedging can be costly as it still requires frequent rebalancing of a bank's asset portfolio. Instead, newly developed off-balance sheet financial instruments, for example interest rate derivatives, have largely facilitated banks' active management of their interest rate risk exposures without the frequent rebalancing. Although the motivation of the use of financial derivatives as a hedging tool and the consequences of derivatives usage on a financial institution's capital structure, risk-taking behavior, and stock return have been well studied in the literature (e.g., Flannery and James, 1984; Schrand, 1997), few studies have investigated the informational implications of banks' activities in financial derivatives in general, and interest rate derivatives in particular, and how the use of financial derivatives has affected banks' asset opacity.

<sup>2</sup> Studies within the corporate context relate the motivation of hedging to the cost of financial distress and argue that firms should hedge in order to avoid the cost of external financing in low internal cash-flow states (Froot et al., 1993). Other motivations for managing risks include managerial risk aversion and information asymmetry between the insiders and outsiders of the firm (DeMarzo and Duffie, 1991).

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The opacity of the banking system has been a controversial discussion among academic studies. On the one hand, some studies argue that opacity is beneficial insofar as opaque assets are typically less liquid and therefore managers are less able to trade these assets against the interest of the owners (Myers and Rajan, 1995). Additionally, Cordella and Yeyati (1998) show that when investors are less informed about bank assets, banks are more stable. On the other hand, many scholars perceive the opaque nature of bank assets as justification for more banking regulation. When banks are unusually opaque, market-based discipline may fail and market participants are not able to discipline banks' risk-taking behavior.<sup>3</sup> Moreover, Jones et al. (2012) argue that opacity has the potential to threaten the banking system because it may cause price contagion in the market which may lead to financial instability and systemic risk.

In this study we seek to inform further the debate about the influence of opacity on the banking industry by empirically examining the implications of banks' use of financial derivatives for banks' informational environment and future stock returns distribution. Our study is based on Wagner (2007) who develops a theoretical model that describes the relationship between financial innovations and the opacity of banks. His model suggests that since managers aim to avoid discipline, the use of financial innovations may in fact increase and not decrease the opacity of banks. Our objectives are three-fold: (1) provide empirical evidence to Wagner's (2007) model that suggests a positive relationship between the use of financial derivatives and asset opacity, (2) examine the governance mechanisms that could potentially mitigate this impact of financial derivatives on banks' opacity, and (3) based on Jin and Myers' (2006) finding that informational opacity is a contributing factor to future stock crash risk, we examine whether the specific informational opacity associated with financial derivatives usage can be related to future bank stocks' crash risk.

We use a panel data of US bank holding companies (BHC) to empirically test the theories about the informational implications of banks' use of financial derivatives. We form a sample of about 100 large BHCs (assets >\$5 billion) and focus on their use of interest rate derivatives and foreign exchange derivatives. Our sample is particularly well suited for the purpose for the following reasons: first, interest rate risk is a major risk factor faced by nearly all banks and should be actively managed, hence banks' hedging decisions have a first-order impact on their performance, whereas the hedging of interest rate risk only play a trivial role in corporate firm's financial decision. Second, every large US BHC has international exposure and will rely equally on foreign exchange derivatives to control that exposure. Third, unlike corporate firms with less stringent disclosure requirements for financial derivatives, banks are highly regulated in the US and are required to provide detailed information on their positions in derivatives contracts. Finally, it is well known that because of the additional financial costs and knowledge incurred in utilizing financial derivatives, large banks are the predominant users of derivatives. The banks included in our sample are all publicly traded and represent nearly 80% of the banking sector in the US.

We follow the common approach in the literature on information disclosure and examine the implications of the use of financial derivatives for banks' informational environment: we relate the use of financial derivatives, as a proxy for opacity, to the revelation of bank-specific information in the markets as measured by

the  $R^2$  from a market-index model regression (Roll, 1988; Morck et al., 2000). The premise is that if the use of financial derivatives increases banks' opacity as predicted by Wagner's (2007) model, one ought to observe that, for banks with higher use of financial derivatives, there is less bank-specific information available in the market, or equivalently, banks' prices tend to show higher level of synchronicity with the market price, reflected in a higher level of  $R^2$  from the market-index model regression. We find that the use of financial derivatives does increase the synchronicity of bank stocks. In particular, we find that both interest rate and foreign exchange derivatives diminish the transparency of banks' balance sheets.

Although the positive impact of financial derivatives on banks' opacity can be explained by the complex nature of the products, which makes it difficult for outside investors to monitor and control managers' actions, Wagner (2007) argues that the increasing opacity from using financial derivatives can be attributed to manager's incentive to use opaque financial innovative instruments to substitute transparent traditional assets to avoid discipline. Based on this prediction and the common wisdom about corporate governance wishing to align management's interests with those of shareholders to reduce agency problems, it is possible that some governance mechanisms can curtail management's incentive to use opaque financial innovative instruments. Thus, we investigate if strong governance controls can mitigate the increasing impact of financial innovations on the opacity of banks' assets. We find that both insider and block ownership work effectively to control managerial abuses. The higher the managerial and block ownership, the lower the synchronicity induced by the use of interest rate and foreign exchange derivatives. That is, banks with higher level of managerial and block ownership experience a smaller increase in opaqueness from the use of financial derivatives, hinting that both complexity and managerial incentives combine to create the opaqueness and that stronger governance controls can mitigate the latter factor.

Lastly, we examine the relationship between the use of financial derivatives and future stock crash risk. A large number of financial studies have related the quality of information disclosure to stock price dynamics and some recent studies relate firm's information opacity to the second moment of the stock returns' distribution, and have suggested a positive relationship between opacity and stock price crashes. The common understanding is that firms associated with lower level of transparency tend to conceal bad news and investors tend to be "information herding", and such behaviors may trigger stock price crashes when accumulated negative information suddenly becomes publicly available (Jin and Myers, 2006; Hutton et al., 2009). We find corroborating evidence that banks with larger use of interest rate derivatives are more prone to crash risk. Our crash risk measures are positively and significantly related to the extent to which the BHCs use interest rate derivatives.

Overall, our results show that banks' use of financial derivatives, as a measure of opacity, is significantly positively related with  $R^2$ . We further illustrate that good governance practices help mitigate the positive impact on  $R^2$  induced by managerial incentives. We also document that the opacity due to financial derivatives increases bank stocks' future crash risk. This study hence provides important contributions to the literature in several ways. First, it is the first study, to the best of our knowledge, that provides empirical evidence on the effect of financial developments on the opacity of banks, supporting the model developed by Wagner (2007). Morgan (2002) is the first study that examines the opacity of the financial sector and attributes the opacity to the specialty of bank assets. However, very few studies have attempted to relate financial innovations to opacity and we attempt to fill in this gap. We use stock price movements as a channel to observe the effect of financial derivatives on opacity. Therefore, our study also contributes to the

<sup>3</sup> Evidence on the ability of markets to discipline banks is mixed. Some examples are Flannery and Sorescu (1996), Morgan and Stiroh (2001), Bliss and Flannery (2002), and Goyal (2005).

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