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# Bank exposure to market fear

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ABSTRACT

We find that increases in implied market volatility (a proxy for market fear) have a significant impact on returns of bank stocks, above and beyond systematic risk proxied by the expected excess market return during a bad economic regime. Large bank returns are favorably affected by increases in implied market volatility during the crisis, while small banks are adversely affected by increases in implied market volatility. We attribute the different effects among the size-categorized bank portfolios to the perception that large banks are protected by too-big-to-fail policies. Within the sample of small banks, the adverse share price response to increased implied market volatility is more pronounced for banks that rely more heavily on non-traditional sources of funds, use a high proportion of loans in their assets, have a higher level of non-performing assets, and have a relatively low provision for loan losses. The adverse effect of negative innovations in implied market volatility on small bank returns during the crisis is primarily driven by exposure of their loan portfolio to weak economic conditions.



## 1. Introduction

Implied market volatility has received much attention by the financial media, especially when economic conditions are weak. It is viewed as an indicator of market fear and can help to explain the underlying reason for market valuations. In an intertemporal asset pricing framework, innovations or surprises in implied market volatility signal current and future time-varying investment opportunities (Merton, 1973; Campbell, 1993, 1996; Chen, 2003). Yet, innovations in implied market volatility may offer special implications for commercial banks beyond what is implied by general stock market conditions because they could signal investors' concern about credit conditions that are not necessarily captured within changes in average market returns, such as flow of funds, creditworthiness, access to credit, liquidity, credit premiums, and willingness to lend. Such a signal may be especially meaningful during a financial crisis, when bank managers, investors, and regulators closely monitor shareholder confidence in banks. We investigate how positive shocks (increases) in implied market volatility affect bank valuations. For this purpose, we disentangle the "fear" effect from general changing investment opportunities.

The exposure of stocks to positive innovations (increases) in implied market volatility may vary among banks during a financial crisis. The banking literature has documented that small banks are more exposed to monetary policy (see Kashyap and Stein, 1995, 2000; Kishan and Opiela, 2000). Also, to the extent that some banks are perceived to receive special protection because they are too big to fail, they could be less exposed to shocks in implied market volatility. Large banks that experience serious financial problems are more likely to be rescued by regulators than small banks (see Uzun and Webb, 2007). Therefore, a rise in implied market volatility is expected to have a more pronounced adverse effect on the valuation of smaller banks. In fact, large banks could even benefit from increases in implied market volatility, because they may possess a competitive advantage over smaller banks under these conditions. They may be more capable of sustaining normal loan operations even when implied market volatility is rising because of implicit regulatory protection, while smaller banks are forced to restrict their lending operations for defensive purposes. Second, smaller banks may be less diversified, and have more limited sources of liquidity (see Fecht et al., 2011), which could also increase their exposure to shocks in implied market volatility. Third, small banks may be more sensitive to signals that reflect more uncertainty about market conditions (see Alfonso et al., 2011).

To account for the possible disparate effects of bank size on sensitivity to market fear, we categorize banks by size before measuring the sensitivity of bank portfolios to increases in implied market volatility. Furthermore, we also attempt to identify other firm specific characteristics of banks that could cause banks to be more exposed to positive shocks in implied market volatility than others. To achieve this objective, we measure the sensitivity of

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each individual bank's returns to positive shocks in implied market volatility, and then conduct a multivariate analysis to determine how this sensitivity is influenced by bank-specific characteristics. Since we anticipate substantial differences in bank sensitivity to large versus small banks, we conduct the multivariate analysis separately for the large and small bank categories.

We find that positive shocks (increases) in implied market volatility have a statistically and economically significant impact on bank stock returns during the crisis regime, beyond the effects caused by general stock market returns. In particular, small bank stock returns are inversely related to shocks in implied market volatility during the crisis regime, while large bank stock returns are positively related to increases in implied market volatility during the crisis regime. Furthermore, our multivariate analysis tests identify other bank-specific factors that influence the degree to which a bank is exposed to shocks in implied market volatility during a period of financial turmoil. Large banks experience relatively weak returns in response to increases in implied market volatility when they rely more heavily on non-traditional sources of funds, use a relatively low proportion of funds for loans, have relatively low capital levels, and rely more on non-traditional services for income. Small banks experience a more pronounced adverse share price response to increases in implied market volatility when they rely more heavily on non-traditional sources of funds, use a high proportion of their funds for loans, have a high level of non-performing assets, and a low provision for loan losses. Thus, the size effect may go beyond whether a bank is too big to fail. Relatively large banks may have better liquidity and options to cope with crisis conditions. The adverse effect of implied market volatility on small banks is primarily conditioned on the exposure of the individual bank's loan portfolio.

The remainder of the paper is organized as follows. The conceptual approach and hypotheses are presented in Section 2. The methodology and sample used in the empirical analysis are covered in Section 3. We disclose results in Section 4. And offer conclusions in Section 5.

## 2. Theoretical motivation

### 2.1. Asymmetric innovations in implied market volatility as a common risk factor

In the aftermath of the financial crisis of 2007, many studies have attempted to apply asset pricing models to explain the banks' exposure to systemic risk (see Hawkesby et al., 2007; Acharya, 2009; van den End and Tabbae, 2012). When the investment opportunity set varies through time as precluded by the intertemporal capital asset pricing model (ICAPM) of Merton (1973), systematic risk premia is a function of the conditional covariances between risky asset returns and innovations in a parsimonious set of state variables driving the dynamics of the investment opportunity set. In further extensions of Merton's ICAPM, Campbell (1993, 1996) shows that risk averse intertemporal investors seek to hedge against unexpected changes in aggregate volatility, which in an ICAPM framework is directly proportional to future expected stock returns. Campbell's framework though does not allow for a direct role for changes in market volatility on expected stock returns as his model is based on the assumption of homoskedasticy. Chen (2003) extends Campbell's model to a heteroskedastic framework, allowing for time-varying covariances and stochastic market volatility. He shows that expected stock returns are a function of market beta, factor loadings on innovations in a parsimonious set of state variables that help to forecast the future market return, and a factor loading on changes in future market volatility. Put simply, during bad economic times forward looking intertemporal risk averse investors will reduce current consumption in order to increase their level of precautionary savings. Hence, implied market volatility serves as an additional "fear" gauge state variable within the ICAPM framework.

Ang et al. (2006) show that innovations in aggregate volatility are priced in the cross section of average stock returns with a statistically significant market price of aggregate volatility risk of approximately −1% per year. According to the authors, one plausible explanation of the small size of the estimate is the existence of a peso problem; that is, there is a relatively small number of observed spikes in aggregate volatility ex-post compared to the number of spikes expected by the market ex-ante. A peso problem usually is the result of a structural break in the equilibrium relation. They find that stocks that perform poorly during a crisis or bad economic regime (defined by an increasing market volatility) have negatively skewed returns, while stocks that perform relatively well during the status quo or good economic regime (defined by decreasing market volatility) tend to have positively skewed returns. In this regard, Harvey and Siddique (2000) show that stocks that are relatively more sensitive to innovations in market volatility have lower returns because of investors' preference for co-skewness.

The empirical ICAPM used by Ang et al. (2006) does not capture the asymmetric effect that market volatility has on stock returns, whereby negative innovations in stock returns lead to higher future market volatility. Much literature has documented the asymmetric effect in the cross section of stock returns (see Bekaert and Wu, 2000; Wu, 2001). The controversy in this literature has been about whether the effect is due to a firm-specific effect such as leverage, or a market-wide effect that works through a feedback relation between the variance and drift return equations. Dennis et al. (2006) use a variance decomposition analysis to show that the empirical relation between individual stock returns and innovations in implied idiosyncratic volatility is marginally negative. On the other hand, the negative relation between individual stock returns and aggregate market volatility is statistically significant. Consequently, their results suggest that the asymmetric effect is more related to systematic market-wide effects than aggregation of firm-specific idiosyncratic effects.

We hypothesize that the relation between negative innovations in implied market volatility and bank stock returns might be unique because of the role that banks play as credit intermediaries. In particular, several banking studies discuss the potential contagion effects in the banking industry during the event of a credit crunch or during the bad economic regime when market volatility is relatively high, including those by Aharony and Swary (1983, 1996), Akhigbe and Madura (2001), Niktin and Smith (2008), Niinimaki (2009), Shleifer and Vishny (2010), Alfonso et al. (2011), Gennaioli et al. (2011). However, none of these studies directly examines the asymmetric effect i.e., whether bank stock returns' sensitivity to shocks in implied market volatility increases during a crisis.

We hypothesize that the stock price response of large bank stocks to positive surprises (increases) in implied market volatility is distinctly different than the stock price response of small bank stocks. One reason for this difference is that small banks are more exposed to monetary policy (see Kashyap and Stein, 1995; Kishan and Opiela, 2000). In addition, large banks are more diversified and may be able to reduce their exposure to market conditions (see Boot and Schmeits, 2000). Their diversification benefits may even allow them cushion so that they can engage in risky activities (see Demsetz and Strahan, 1997). Furthermore, regulatory protection affords larger banks with flexibility to grow market share during a financial crisis, while smaller banks may be forced to manage more conservatively in order to reduce their exposure during a crisis. Since large banks may be perceived to have upside