



Credit risk dynamics in response to changes in the federal funds target: The implication for firm short-term debt

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ABSTRACT

The recent credit crisis has raised a number of interesting questions regarding the role of the Federal Reserve Bank and the effectiveness of its expected and unexpected interventions in financial markets, especially during the crisis, given its mandate. This paper reviews and evaluates the impact of expected and unexpected changes in the federal funds rate target on credit risk premia. The paper's main innovation is the use of an ACH-VAR (autoregressive conditional hazard VAR) model to generate the Fed's expected and unexpected monetary policy shocks which are then used to determine the effects of a Federal Reserve policy change on counterparty credit risk and more importantly short-term firm debt financing. The findings answer a longstanding question sought by researchers on the effect of policy makers' announcements on firm debt financing. The results clearly show that the Federal Reserve influences short-term debt financing through the credit channel for both expansionary and contractionary monetary policies. In particular, we find that the growth in counterparty risk appears less responsive to anticipated responses in the Fed funds rate that fail to materialize than to an unanticipated increase in the federal funds rate. Finally, we also document that the results appear to validate the Fed's interventions in financial markets to stem counterparty risk and to make liquidity more readily available to firms.

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1. Introduction

In this paper we examine the impact of changes in the federal funds rate target on firms' short-term credit risk dynamics and the subsequent implications for short-term debt financing. The extreme credit climate of 2007/2008 forced financial markets to reassess and limit counterparty credit risk,² thereby making it difficult for a number of highly leveraged firms to raise operational capital (Silipo, 2011). Concerns about credit risk first arose in early 2008 with the collapse of Bear Stearns and skyrocketed later in that year when Lehman Brothers defaulted on its debt obligations. In fact, fears of systemic defaults were so extreme in the aftermath of the Lehman bankruptcy that Euro-denominated Credit Default Swap (CDS) contracts on the U.S. Treasury were quoted at spreads as high as 100 basis points.

There is a longstanding widespread claim that credit default swaps³ work to lower the cost of firms' debt financing because they create a new source of credit risk transfer for corporate bonds.⁴ Recently, Ashcraft and Santos (2007) challenged this viewpoint arguing that there is no evidence that the CDS actually lowers the interest rates on corporate debt. We believe that Ashcraft and Santos' reliance on time series analysis to evaluate this phenomenon yielded statically significant but shallow results, so we will use an autoregressive conditional hazard VAR procedure that should provide insights that are deep, subjective and dynamic. The academic literature suggests that the credit risk transfer mechanism is itself sensitive to changes in the short-term rate (Dunbar 2008; Houweling & Vorst, 2005; Jarrow & Turnbull, 1995) and as such any action by the Federal Reserve Bank on its lending rate should influence the debt financing and short-term cash-flow financing needs of firms.

While central banks are generally less concerned with the effects of financial market bubbles, during the financial market crisis the

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² This is the risk that an investor may lose part or all of his investment because of an issuer's insolvency or inability to pay the interest and principal. The greater the credit risk, the more interest the issuer has to pay to sell bonds.

³ A rise in the growth of a firm's credit risk premia indicates rising perception that the firm will be unable to meet future bond payments. This will reduce the firm's ability to access external financing to meet current cash flow needs or new investment opportunities.

⁴ This informational role of the CDS market could lead to a reduction in the cost of debt by reducing, for example, the information premium investors' demand on firms' bonds.

U.S. Federal Reserve Bank aggressively cut its benchmark lending rate to make capital more easily available to the productive sector and prevent negative spillovers to the real economy, see [Appendix B](#). The central bank's unexpected interventions to stem the systematic effects of the credit shock provide the motivation of this study. Did the efforts of the Federal Reserve Bank to use the credit channel to ease liquidity concerns and make capital more readily available to firms reduce the cost of short-term corporate debt? More specifically we will attempt to determine (i) the credit risk transfer mechanism's reaction to an unanticipated monetary policy shock given an extreme macroeconomic event that pushes credit risk temporarily away from its long run equilibrium growth path, (ii) the effect of this unexpected Federal Reserve monetary policy change on firms of different credit qualities and ultimately (iii) the implications for short-term debt financing.

Despite the apparent significance of credit risk in financial markets, there has been relatively little empirical research about how it affects the price of short-term debt financing in which counterparties may default. [Appendix A](#) illustrates the credit risk spreads of investment grade debt, high yield debt and their reaction to both expected and unexpected Fed policy responses. The chart plots the time series of the "on-the-run" spreads of the CDX.NA.IG (Investment grade) and the CDX.NA.HY (High yield) indexes. The behavior of the index spreads over the sample period can be divided into two phases. In the phase prior to the credit crisis, the spreads were relatively low in magnitude, while in the second phase starting about June 2007 the spreads became highly volatile. The indexes however retreat before the September 18th 2007 FOMC meeting. On December 31st 2007 both indexes jumped sharply, only to retreat again before the March 18th 2008 meeting.

To better understand the short-term dynamics of changes in the federal funds rate on CDS and the effect of the changes in the CDS on the short-term debt financing of the firm we turn to papers by [Hamilton and Jorda \(2002\)](#) and [Tsai \(2011\)](#) for empirical motivation. Both papers formulate a measure of monetary policy shocks based on the ACH/VAR (autoregressive conditional hazard VAR) methodology for the federal funds rate target. A key feature in these models is that they allow for the analysis of two sources of unexpected changes in the federal funds target. Where, the unexpected increase can be due to either an increase in the federal funds rate target when it was expected to remain constant, or an expected increase in the federal funds rate target that fails to occur. These two events in the ACH-VAR model give rise to completely different information on the expected future federal funds rate.

The remainder of this paper is organized as follows. [Section 2](#) provides a review of the existing literature [Section 3](#) describes the econometric model which is based on the Hamilton and Jorda's ACH and ordered-probit models that is used to model the federal funds rate target, and the ACH-VAR. [Section 4](#) describes the data for ACH, the ordered-probit model, and the ACH-VAR model respectively, while [Section 5](#) contains our empirical results for the ACH and ordered-probit models. [Section 5](#) also discusses the effect of an unanticipated increase in the federal funds rate target on stock returns in the ACH-VAR model. We conclude the paper in [Section 6](#).

2. Review of the literature

There is a large and growing literature on the valuation of the credit risk transfer mechanism (CDS),⁵ within which two distinct approaches dominate. One approach ([Merton, 1974](#)) explicitly relates a credit event to the value of the firm's assets. The firm is assumed to

⁵ A credit default swap is a contingent claim that allows the trading of default risk separately from other sources of uncertainty. This instrument is essentially an insurance contract against the default of an underlying entity.

default on its obligations when the firm value falls below some threshold ([Das, 1995](#); [Pierides, 1997](#)). These types of models are called structural models because the link to some underlying economic fundamentals is explicit. The second approach, which finds its origins in the modeling of the risk-free term structure is referred to as the reduced form approach because the relationship with underlying variables such as the firm value is not explicitly modeled ([Dunbar, 2008](#); [Duffie & Singleton, 1999](#); [Houweling & Vorst, 2005](#); [Hull & White, 2000](#); [Jarrow, Lando, & Turnbull, 1997](#); [Jarrow & Turnbull, 1995](#)). Regardless of the approach used, the short-term rate is used to reflect the Federal Reserves' policy response, which is also a predictor of credit risk. In fact, a number of prior studies have indicated that an increase in the short-term risk-free rate could mean a contractionary monetary policy, which usually increases credit risk, while an expansionary monetary policy reduces credit risk.

Since capital markets are imperfect, information asymmetries are expected to lead to a wedge between the cost of internal and external funds. [Jaffee and Russell \(1976\)](#) and [Stigitz and Weiss \(1981\)](#) both find agency problems in an imperfect capital market makes external financing costly. Many in the academic and practitioner literature claim that credit default swaps lower the cost of borrowing because they provide new hedging opportunities and information on firms. [Almeida and Campello \(2007\)](#) and [Hahn and Lee \(2009\)](#) both provide evidence that a firm's ability to obtain external financing significantly affects corporate investment and ultimately firm value.

To isolate and estimate investor reactions to monetary policy changes, a preponderance of papers has employed the Vector Auto Regression (VAR) technique ([Cook & Hahn, 1989](#)). [Thorbecke \(1997\)](#) measures the effects of monetary policy changes in the federal funds rate on asset prices, and finds that an expansionary monetary policy has had a significant positive effect on asset returns. [Ewing, Forbes, and Payne \(2003\)](#) employ VAR to identify the different responses of five sector-specific S&P 500 stock returns to monetary shocks. [Cassola and Morana \(2004\)](#) use a cointegrated VAR to investigate the effects of monetary policy on the Euro stock market, and also find that a contractionary monetary shock has a positive effect on stock prices. In all these cases, the general consensus was that monetary policy shocks significantly influence the movements of asset prices.

However, a shortcoming with most of these earlier studies is the inability to decompose the Federal Reserve's policy change into components that could be used to isolate the effects of the Fed's actions. This is because ample evidence exists to suggest that financial markets do not respond to anticipated monetary policy changes ([Andersen, Bollerslev, Diebold, & Vega, 2007](#); [Bernanke & Kuttner, 2005](#); [Chulia, Martens, & Dijk, 2010](#); [Guo, 2004](#); [Gurkaynak, Sack, & Swanson, 2005](#); [Wongswan, 2009](#)). In fact, [Bernanke and Kuttner \(2005\)](#) addressed this issue with the use of an innovative policy decomposition procedure introduced in [Kuttner \(2001\)](#), which isolates the unexpected (surprise) policy change which might plausibly generate market (credit risk) responses. This does not mean that credit risk respond to monetary policy only when the Fed surprises the markets. Naturally, credit risk will also respond to expectations about future policy, which in turn may be driven by news about changing economic conditions.

[Bernanke and Kuttner \(2005\)](#) argued that estimating the response of financial markets to monetary policy actions is complicated by the fact that the market is unlikely to respond to policy actions that were already anticipated. [Kuttner's \(2001\)](#) event study methodology decomposes the surprise and expected change in the federal funds target rate and the corresponding Fed funds futures rate on the day of the FOMC announcements. [Kuttner \(2001\)](#) then used the surprise and anticipated decomposition to estimate the impact of the monetary policy event on asset prices. However a weakness in the event study methodology is the fact that it can only estimate the immediate effect of an unanticipated monetary policy on markets. Hence it is not

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