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## Journal of Financial Economics

journal homepage: [www.elsevier.com/locate/jfec](http://www.elsevier.com/locate/jfec)

# The subprime credit crisis and contagion in financial markets<sup>☆</sup>

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## ARTICLE INFO

*Article history:*

Received 12 December 2008

Received in revised form

22 September 2009

Accepted 29 November 2009

Available online 25 January 2010

*JEL classification:*

G01

G12

G14

*Keywords:*

Contagion

Asset-backed securities

Subprime CDOs

Liquidity

Toxic assets

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## ABSTRACT

I conduct an empirical investigation into the pricing of subprime asset-backed collateralized debt obligations (CDOs) and their contagion effects on other markets. Using data for the ABX subprime indexes, I find strong evidence of contagion in the financial markets. The results support the hypothesis that financial contagion was propagated primarily through liquidity and risk-premium channels, rather than through a correlated-information channel. Surprisingly, ABX index returns forecast stock returns and Treasury and corporate bond yield changes by as much as three weeks ahead during the subprime crisis. This challenges the popular view that the market prices of these “toxic assets” were unreliable; the results suggest that significant price discovery did in fact occur in the subprime market during the crisis.

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## 1. Introduction

During the past three years, financial markets have suffered catastrophic losses. These were originally triggered by the threat of massive defaults by subprime borrowers in the mortgage markets. The resulting subprime crisis of 2007 led rapidly to massive declines in the market values of large portfolios of highly rated asset-backed securities (ABS) held by many financial institutions. In addition, the subprime crisis brought about an almost complete halt to the fledgling structured-credit

market, a serious credit crunch for both individuals and financial institutions, and a major decline in the liquidity of debt securities in virtually every market.

In 2008, the subprime crisis spilled over and became the catalyst for a much broader global financial crisis. During the year, the markets reeled from the collapse or forced mergers/bailouts of Bear Stearns, AIG, Fannie Mae, Freddie Mac, Lehman Brothers, IndyMac Bank, Merrill Lynch, Wachovia, Washington Mutual, and many others. Concerns about the long-term financial viability of the U.S. Treasury, which has provided an unprecedented amount of liquidity, capital, and financial guarantees to the market, has resulted in credit default swaps on the U.S. Treasury trading at spreads as high as 100 basis points. Much of the intervention by the Treasury and the Federal Reserve in the financial markets has been motivated by the objective of avoiding broader contagion and spillovers to other markets and sectors of the economy.

Understanding the nature of contagion in financial markets is of fundamental importance and there is an

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<sup>☆</sup> I am very grateful for helpful discussions with Joshua Anderson, Vineer Bhansali, Bruce Carlin, Richard Clarida, Rajna Gibson, Robert Gingrich, Anil Kayshup, Hanno Lustig, Alfred Murata, Steve Schullist, and Jiang Wang, and for the comments of seminar participants at Barclays Global Investors, the CFA Institute Conference, Claremont McKenna College, New York University, PIMCO, the University of Colorado, and UCLA. I am particularly grateful for the comments and suggestions of the editor Bill Schwert and two anonymous referees. All errors are my responsibility.

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extensive literature addressing its causes and effects. Important recent papers on contagion include Allen and Gale (2000), Kyle and Xiong (2001), Kodres and Pritsker (2002), Kiyotaki and Moore (2002), Kaminsky, Reinhart, and Vegh (2003), Allen and Gale (2004), Brunnermeier and Pedersen (2005, 2009), and many others. From a research perspective, the crisis in the subprime asset-backed market provides a near-ideal “laboratory” for studying the role that contagion may play in financial markets when an asset class becomes severely distressed.<sup>1</sup>

The contagion literature identifies at least three possible mechanisms by which shocks in one market may spill over into other markets. First, Kiyotaki and Moore (2002), Kaminsky, Reinhart, and Vegh (2003), and others describe mechanisms in which negative shocks in one market represent the arrival of economic news that directly affects the collateral values or cash flows associated with securities in other markets. In this mechanism, contagion can be viewed as the transmission of information from more-liquid markets or markets with more rapid price discovery to other markets. Second, Allen and Gale (2000), Brunnermeier and Pedersen (2009), and others show how investors who suffer losses in one market may find their ability to obtain funding impaired, potentially leading to a downward spiral in overall market liquidity and other asset prices via a “flight to quality.” In this mechanism, contagion occurs through a liquidity shock across all markets. Third, Vayanos (2004), Acharya and Pedersen (2005), Longstaff (2008), and others imply that a severe negative shock in one market may be associated with an increase in the risk premium in other markets. In this mechanism, contagion occurs as negative returns in the distressed market affect subsequent returns in other markets via a time-varying risk premium.

The objective of this paper is to shed some light on the mechanisms involved in financial contagion by studying the subprime asset-backed collateralized debt obligation (CDO) market during the 2006–2008 period and exploring how negative shocks affected other markets as the subprime crisis of 2007 unfolded and then evolved into the global financial crisis of 2008. The study is based on an extensive data set of prices for the ABX indexes of subprime mortgage-related asset-backed CDOs. Using a vector autoregression (VAR) framework, I examine the extent to which ABX returns are related to returns in other financial markets as well as to market leverage and trading activity measures.

Several key results emerge from this analysis. First, despite the lower liquidity of the asset-backed CDO market, I find that ABX index returns developed significant predictive ability (Granger causality) for subsequent stock market returns, Treasury yield changes, corporate

bond spread changes, and changes in the VIX volatility index as the 2007 subprime crisis unfolded. In fact, ABX returns have significant forecast power for stock returns, Treasury yield changes, corporate yield spread changes, and changes in the VIX as far as three weeks ahead. Treasury bond prices increase in response to negative shocks to asset-backed CDO values, consistent with a flight-to-quality pattern. This effect, however, is much stronger for short-term Treasury bonds than for longer-term Treasury bonds. In contrast, negative shocks to the ABX indexes map into significant subsequent negative returns for the Standard and Poors (S&P) 500 index as well as for the subset of financial firms in the S&P 500. Thus, I find strong evidence of contagion in the financial markets during the 2007 subprime crisis.

Second, I find that this forecast ability dissipates during 2008 as the subprime crisis gave way to the broader global financial crisis. Thus, contagion appeared to spread from the ABX market at the beginning of the crisis when subprime losses were the primary concern. After concerns about a meltdown of the general financial markets and the potential for a global depression became widespread in 2008, however, the ABX market no longer functioned as a vector of contagion (and no longer Granger-caused returns) in other markets. Intuitively, this is consistent with the usual view of contagion as a major shock or event in which there is a significant but temporary increase in the linkages between different financial markets.

Taken together, these results provide a number of important insights about the nature of the mechanisms driving contagion across markets in the present crisis. For example, finding that shocks tended to be transmitted with a lag from the less-liquid ABX index market to the highly liquid stock and Treasury bond markets argues against a correlated-information view of financial contagion. We would expect price effects to be contemporaneous in the highly liquid stock and Treasury bond markets if contagion was due to correlated information. Thus, the results (which, of course, are limited to the specific episode studied) appear to be more consistent with either the liquidity-induced contagion mechanisms presented by Allen and Gale (2000), Kodres and Pritsker (2002), and Brunnermeier and Pedersen (2005), or the risk-premium contagion mechanisms implied by Vayanos (2004), Acharya and Pedersen (2005), and Longstaff (2008).

To explore this latter implication in more depth, I again use a VAR framework to explore the relation between ABX index returns and various measures of market activity, liquidity, and funding availability. I find that shocks in the ABX market have significant predictive power for trading activity in financial stocks, trading disruptions in the fixed-income markets, and the availability of short-term asset-backed financing during the crisis. These results reinforce the view that market- and funding-liquidity effects were a major factor in the transmission of contagion during the subprime crisis.

The remainder of this paper is organized as follows. Section 2 briefly reviews the literature on contagion in financial markets. Section 3 provides an introduction to

<sup>1</sup> Important papers focusing on the valuation of distressed assets include Shleifer and Vishny (1992), Asquith, Gertner, and Scharfstein (1994), Opler and Titman (1994), Clark and Ofek (1994), John and Ofek (1995), Andrade and Kaplan (1998), Pulvino (1998), Kahl (2002), Longstaff (2004), Vayanos (2004), Acharya and Pedersen (2005), Brunnermeier and Pedersen (2005), Carlin, Lobo, and Viswanathan (2007), and Longstaff and Myers (2009).

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