Journal of Economic Behavior & Organization 83 (2012) 627–646

Contents lists available at SciVerse ScienceDirect

Journal of Economic Behavior & Organization

journal homepage: www.elsevier.com/locate/jebo

'Too interconnected to fail' financial network of US CDS market: Topological fragility and systemic risk☆

Sheri Markose[a,*], Simone Giansante[b], Ali Rais Shaghaghi[c]

[a] Economics Department, University of Essex, Wivenhoe Park, Colchester CO4 3SQ, UK
[b] School of Management, University of Bath, Claverton Down, Bath BA2 7AY, UK
[c] CCFEA, University of Essex, Wivenhoe Park, Colchester CO4 3SQ, UK

ARTICLE INFO

Available online 31 May 2012

JEL classification:
G01
G21
G15
G17
G32

Keywords:
Credit default swaps
Financial networks
Eigenvector centrality
Financial contagion
Systemic risk
Super-spreader tax

ABSTRACT

A small segment of credit default swaps (CDS) on residential mortgage backed securities (RMBS) stand implicated in the 2007 financial crisis. The dominance of a few big players in the chains of insurance and reinsurance for CDS credit risk mitigation for banks' assets has led to the idea of *too interconnected to fail* (*TITF*) resulting, as in the case of AIG, of a tax payer bailout. We provide an empirical reconstruction of the US CDS network based on the FDIC Call Reports for off balance sheet bank data for the 4th quarter in 2007 and 2008. The propagation of financial contagion in networks with dense clustering which reflects high concentration or localization of exposures between few participants will be identified as one that is *TITF*. Those that dominate in terms of network centrality and connectivity are called 'super-spreaders'. Management of systemic risk from bank failure in uncorrelated random networks is different to those with clustering. As systemic risk of highly connected financial firms in the CDS (or any other) financial markets is not priced into their holding of capital and collateral, we design a super-spreader tax based on eigenvector centrality of the banks which can mitigate potential socialized losses.

1. Introduction

The 2007 financial crisis which started as the US 'sub-prime' crisis, through a process of financial contagion led to the demise of major banks and also precipitated severe economic contraction the world over. Since 2008, tax payer bailout and socialization of losses in the financial system has transformed the banking crisis into a sovereign debt crisis in the Euro zone. In the 2002–2007 period, credit risk transfer (CRT) from bank balance sheets and the use of credit derivatives to insure against default risk of reference assets has involved big US banks and non-bank financial intermediaries (FIs) in the credit derivatives market which is dominated by credit default swaps (CDS). This market has become a source of market expectations on the probability of default of the reference entity which since 2008 has increasingly included high CDS spreads on sovereigns and FIs. Banks are major protection buyers and sellers in this market and have become vulnerable as a result. Due to inherent

☆ We are grateful to participants of the 5 October 2009 ECB Workshop on *Recent Advances in Modelling Systemic Risk Using Network Analysis*, the 26–28 May 2010 IMF Workshop On *Operationalizing Systemic Risk Monitoring*, the 2 October 2010, *Can It Happen Again?* Workshop at the University of Macerata and the Reserve Bank of India Financial Stability Division where this work was presented. Sheri Markose is grateful, in particular, to Robert May, Sitabhra Sinha and Sarika Jalan for discussions on the stability of networks and also for discussions with Johannes Linder, Olli Castren, Morten Bech, Juan Solé and Manmohan Singh. Excellent refereeing by Matuesz Gatkowski and special issue editors is acknowledged with thanks. The authors remain responsible for all errors. The EC FP6-034270-2 grant has supported research assistance from Simone Giansante and Ali Rais Shaghaghi.

* Corresponding author.
E-mail address: scher@essex.ac.uk (S. Markose).

0167-2681/$ – see front matter © 2012 Elsevier B.V. All rights reserved.
http://dx.doi.org/10.1016/j.jebo.2012.05.016

structural weaknesses of the CDS market and also those factors arising from poor regulatory design, as will be explained, CDS which constitute up to 98% of credit derivatives have had a unique, endemic and pernicious role to play in the 2007 financial crisis. This paper will be concerned with modelling a specific weakness of CDS which is also well known for other modern risk sharing institutions involving over-the-counter (OTC) financial derivatives, and this pertains to the heavy concentration of derivatives activities among a few main participants.

The key elements of financial crises, the case of 2007 financial crisis being no exception, is the growth of innovations in private sector liquidity and leverage creation which are almost always collateralized by assets that are procyclically sensitive, viz. those that lose value with market downturns.[1] The specific institutional propagators of the 2007 crisis involved residential mortgage backed securities (RMBS) which suffered substantial mark downs with the collapse of US house prices.[2] Then it was a case of risk sharing arrangements that went badly wrong. This came about due to the role of CDS in the CRT scheme of Basel II and its precursor in the US, the Joint Agencies Rule 66 Federal Regulations 56914 and 59622 which became effective on January 1, 2002. This occurred in the context of synthetic securitization and of Collateralized Mortgage Obligations (CMO) which led to unsustainable trends and to systemic risk. Both holders of the RMBS and CMO assets in the banking sector and those servicing credit risk via the CDS market (cf. American Insurance Group (AIG)) required tax-payer bailouts.[3]

The Basel II risk weighting scheme for CRT of assets on bank balance sheets and its forerunner in the US which set out the capital treatment in the Synthetic Collateralized Loan Obligations guidance published by the Office of Comptroller of the Currency (OCC 99-43) for the 2002 Joint Agencies Rule 66, stand implicated for turbo charging a process of leverage that increased connectivity between depository institutions and as yet unregulated non-depository financial intermediaries and derivatives markets. Under Basel I since 1988, a standard 8% regulatory capital requirement applied to banks with very few exceptions for the economic default risk of assets being held by banks. In the run up to Basel II since 2004 and under the 2002 US Joint Agencies Rule 66, the 50% risk weight which implied a capital charge of 4% on residential mortgages could be reduced to a mere 1.6% through the process of synthetic securitization and external ratings which implied 5 times more leverage in the system.[4] In synthetic securitization and CRT, an originating bank uses CDS or guarantees to transfer the credit risk, in whole or in part, of one or more underlying exposures to third-party protection providers. Thus, in synthetic securitization, the underlying exposures remain on the balance sheet of the originating bank, but the credit exposure of the originating bank is transferred to the protection provider or covered by collateral pledged by the protection provider. This strongly incentivized the use of CDS by banks which began to hold more MBS on their balance sheets and also brought AAA players such as AIG, hedge funds and erstwhile municipal bond insurers called Monolines into the CDS market as protection sellers.[5] Only banks were subject to capital regulation while about 49% (see, British Bankers Association for 2006 for the breakdown of institutions involved as CDS protection sellers and buyers) of those institutions which were CDS sellers in the form of thinly capitalized hedge funds and Monolines,[6] were outside the regulatory boundary. This introduced significant weakness to the CRT scheme leading to the criticism that the scheme was more akin to banks and other net beneficiaries of CDS purchasing insurance from passengers on the Titanic. Indeed, a little known Monoline called ACA which failed to deliver on the CDS protection for RMBS held by Merrill Lynch is what finally led to its absorption by Bank of America.[7] Further, as cited in the ECB CDS Report (ECB, 2009, pp. 57–58), in its 2007 SEC filing, AIG FP (the hedge fund component of AIG) explicitly stated that it supplied CDS guarantees, in particular to European banks, in order for them to reduce capital requirements. The benefits that accrued to banks from CRT fell far short of the intended default risk mitigation objectives and as shown by Markose et al. (in press) participants of the CRT scheme were driven primarily by short term returns from the leveraged lending using CDS in synthetic CDOs as collateral in a carry trade.

[1] The use of procyclical RMBS assets as collateral for bank liabilities in asset backed commercial paper (ABCP) conduits in the repo market is given as a fundamental reason for the contraction of liquidity and the run on the repo markets in the 2007 crisis, Gorton (2009). The loss of confidence arising from the uncertainty as to which bank is holding impaired RMBS assets that were non-traded, typically called a problem of asymmetric information, exacerbated the problem.

[2] See Brunnermeier (2009), Stulz (2010), Ashcroft and Schuermann (2008) and Gorton and Metrich (2009). They, respectively, cover the unfolding phases of the crisis, the specific characteristics of credit derivatives, the features relevant to sub-prime securitization and the collateralized debt obligations.

[3] Kiff et al. (2009) place the size of increased collateral calls on AIG's CDS guarantees following its ratings downgrades at a relatively modest $15 bn that is was unable to meet. While the current cost to the US tax payer of the AIG bailout stands at $170 bn, the initial $85 bn payment to AIG was geared toward honouring its CDS obligations to counterparties totalling over $66.2 bn. These include payouts to Goldman Sachs ($12.9 billion), Merrill Lynch ($6.8 bn), Bank of America ($5.2 bn), Citibank ($2.3 bn) and Wachovia ($1.5 bn). Foreign banks were also beneficiaries, including Société Générale and Deutsche Bank, which each received nearly $12 bn; Barclays ($8.5 bn); and UBS ($5 bn). The 15 March 2009 press release "AIG Discloses Counterparties to CDS, GIA and Securities Lending Transactions" provides useful information.

[4] The risk weight of 20% applies when a bank asset has CDS protection from an AAA rated guarantor.

[5] Acharya and Richardson (2010), Blundell-Wignall and Atkinson (2008), Hellwig (2010), Markose et al. (2010), Markose et al. (in press) have given detailed analyses of how the regulatory framework based on risk weighting of capital and CRT resulted in perverse incentives which left the financial system overleveraged and insolvent.

[6] At the end of 2007, AMBAC, MBIA and FSA accounted for 70% of the CDS contracts provided by Monolines with the first two accounting for $625 bn and $546 bn of this. The capital base of Monolines was approximately $20 bn and their insurance guarantees are to the tune of $2.3 tn implying leverage of 115.

[7] Standard and Poor Report of August 2008 states that Merrill Lynch had CDS cover from Monolines to the tune of $18.8 bn and of that ACA accounted for $5 bn. ACA, 29% of which was owned by Bear Stearns, along with other Monolines suffered a ratings downgrade in early 2008 and ACA demised in 2008 defaulting on its CDS obligations. ACA had $69 bn of CDS obligations and only had $425 million worth of capital.