Chapter 12

Multi-Agent Financial Network (MAFN) Model of US Collateralized Debt Obligations (CDO): Regulatory Capital Arbitrage, Negative CDS Carry Trade, and Systemic Risk Analysis

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ABSTRACT

A database driven multi-agent model has been developed with automated access to US bank level FDIC Call Reports that yield data on balance sheet and off balance sheet activity, respectively, in Residential Mortgage Backed Securities (RMBS) and Credit Default Swaps (CDS). The simultaneous accumulation of RMBS assets on US banks’ balance sheets and also large counterparty exposures from CDS positions characterized the $2 trillion Collateralized Debt Obligation (CDO) market. The latter imploded at the end of 2007 with large scale systemic risk consequences. Based on US FDIC bank data, that could have been available to the regulator at the time, the authors investigate how a CDS negative carry trade combined with incentives provided by Basel II and its precursor in the US, the Joint Agencies Rule 66 Federal Regulation No. 56914, which became effective on January 1, 2002, on synthetic securitization and Credit Risk Transfer (CRT), led to the unsustainable trends and systemic risk. The resultant market structure with heavy concentration in CDS activity involving 5 US banks can be shown to present too interconnected to fail systemic risk outcomes. The simulation package can generate the financial network of obligations of the US banks in the CDS market. The authors aim to show how such a Multi-Agent Financial Network (MAFN) model is well suited to monitor bank activity and to stress test policy for perverse incentives on an ongoing basis.

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1. INTRODUCTION

The 2007 financial crisis which started as the so-called ‘sub-prime’ crisis in the US has had severe global repercussions. There has been a contraction in output and employment, bank bailouts\(^1\), increased tax burdens, and accelerated fiscal austerity to levels not previously recorded since the Great Depression. The crisis has exposed shortcomings of monetary economics (Buiter, 2009) and the regulatory framework of Basel II (Brunnermeier, et al., 2009; Hellwig, 2010; Markose, 2011). Eichengreen (2010) has concluded that “fundamentally, the [2007] crisis is the result of flawed regulations and perverse incentives in financial markets.” Macroeconomic modeling and its use in policy analysis have come under heavy criticism. Critics have accused macroeconomists of an insidious reliance on a particular class of macroeconomic models that has abstracted away institutional details and financial interconnections in the provision of liquidity, capital adequacy and solvency (Wieland, 2010; Colander, et al., 2009). Most of all, what is prominent is the absence of a framework to deal with regulatory and market failure arising from the negative externalities from excessive credit creation and leverage. On the operational front, serious deficits remain in the economics curricula in not providing integrated quantitative tools for holistic visualization and monitoring of the financial system to identify systemic risk threats from activities of financial firms. Further, central tenets of the regulatory framework were and continue not to be stress tested in an ongoing way to see if they are prone to creating perverse incentives. The main objective of this chapter is to provide an exemplar of a quantitative integrative financial framework using multi-agent modeling, which can monitor and analyse systemic risk from activities of financial intermediaries within the context of the regulatory incentives and prevailing market conditions.

The specific institutional propagators of the 2007 crisis involved Residential Mortgage Backed Securities (RMBS), which had grown to over $8.5 trillion in the US alone by 2006 (Figure 1), surpassing US securities and corporate bonds. This whole asset class suffered considerable impairment of market value with the collapse of US house prices. Except for government agency issues, post 2008, new issuance of MBS has dropped to almost zero. The buildup of systemic risk occurred in two distinct phases. In the first ‘originate and distribute’ phase of securitization of bank loans, banks followed an aggressive strategy of loan portfolio expansion by overcoming restrictions placed by the size of a bank’s deposit base by reissuing the capital released from securitization into new mortgages/loans. This regulatory arbitrage which placed securitized assets off balance sheet in Special Purpose Vehicles (SPV) in order to reduce the 8% minimum capital requirement of the Basel I Accord has been found by many (see, Goderis, et al., 2007) to enable banks to achieve 50% higher loan target levels and reduce equity capital to asset ratio to about 5.3% as opposed to the 9.8% for those that did not. The second phase of the crisis involved an accelerated growth of RMBS, especially in its subprime form, as collateral in structured Collateralized Debt Obligations (CDO)\(^2\) held as bank assets and in bank liabilities in conduits such as Asset Backed Commercial Paper (ABCP) in short term repo markets. The liquidity crunch is seen as a run on the repo market. As noted by Gorton and Metrich (2009), outdated models of money and banking prevented central banks and supervisory bodies from seeing the $12 trillion procyclically sensitive collateralized securities in the repo and shadow banking system as being part of the fractional system of private credit creation which will suffer convertibility problems vis-à-vis central bank regulated funds and reserves for which the tax payer remains liable.

Emphasizing the problem of how the above individually rational activity of financial institutions aimed at expanding their loan market share will undermine system stability, Jones (2000), from the Division of Research and Statistics of