

A Multi-Agent Model of RMBS, Credit Risk Transfer in Banks and  
Financial Stability: Implications for the Subprime Crisis  
(S. Markose, Y. Dong, A. Takeyama, A. R. Shaghagi and M. Gatowski)

Some comments by Leandro D'Aurizio

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I humbly hope I will be vaguely right in some of my comments,  
rather than precisely wrong in all of them



The main features of the paper

**Interesting application of agent-based modelling to a relevant topic (the dawn of the present economic crisis)**

**Multi-period modelisation involving two classes of agents, each performing different tasks with separate aims (banks and financial institutions)**

**The model is calibrated with real data (FDIC dataset for banks and 2007 Citibank Report for financial institutions)**

**Insights are provided on the reasons of the turmoil wreaked into the US financial sector by the subprime crisis and on its consequences for the financial sector**

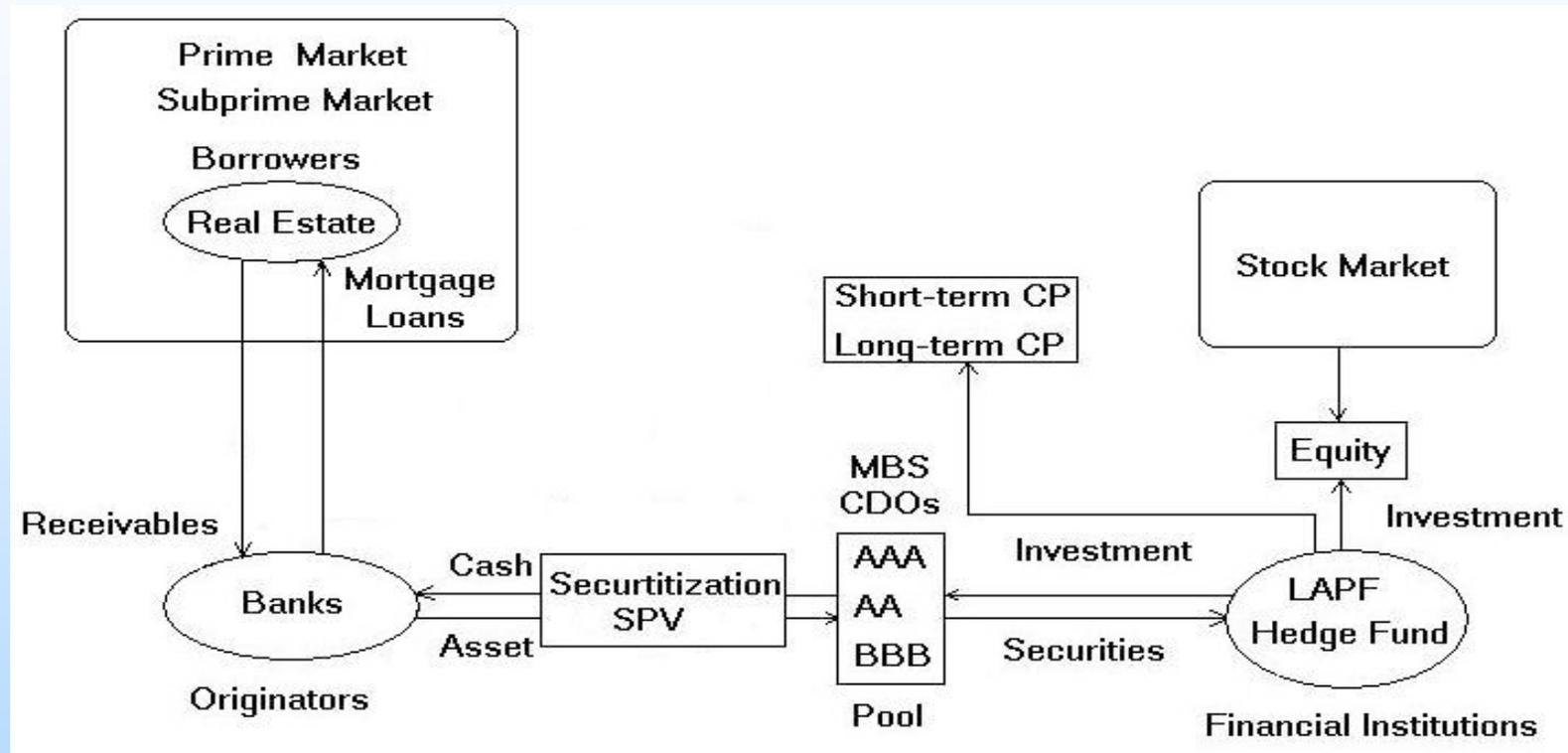
Some comments on the problem modelled – the major facts at the root of the crisis

**The major facts of the beginning of the crisis (August 2007):**

- a) the investors bought securities that used shaky subprime mortgages as collateral (ABS);
- b) the collateralised-debt obligations (CDO), guaranteed by chunks of securities of varying risk levels, became scarcely tradable;
- c) the investors reacted towards the banks that sold those securities by dumping their shares;
- d) the banks reacted by demanding more collateral to their borrowers in the real sector of the economy and by becoming more cautious in lending to each other (the interbank spreads grew wider and wider). The crisis effects were therefore transmitted

Some comments on the problem modelled – the explicitly modelled causal links

## The model representation



The banks bundle their mortgages and sell them to Special Purpose Vehicles

The SPVs look for funds by issuing securities sold to the Financial Institutions

The yield of these instruments is too low once their riskiness is correctly factored and the Financial Institutions become insolvent

Some comments on the main problem modelled – securitisation I

**Securitisation: selling “packages” of loans to outside investors**

**Initially encouraged by regulators as a means to spread risks: banks shifted loans off their balance sheets and investors bought ABSs yielding more than government bonds**

**Banking regulations (Basel I) required banks to set aside capital against the risk of borrowers making default. Securitisation and Structured Investment Vehicles were a way to get around these measures. Basel II rules were cleverer but “came too late”**

**The volume of outstanding ABSs in the US amounted to 0.5 \$trn in 1997 and became five times as large in 2007**

Some comments on the main problem modelled – securitisation II

**The financial system was assumed to become in this way more resilient, since credit risk were sold and spread among many investors**

**Things turned out to be different with the subprime crisis, since the risk of poorly monitoring loans quality for lack of incentives became reality**

**This is the backdrop for the model, that delves into this setting and tracks the agents' insolvency patterns**

**The excesses of unbridled securitisation are widely analysed in their causes and consequences**

Some comments on the future developments of the model I

### **Some extensions could be useful**

- **New calibrations exercises with 2008 data featuring less tight monetary conditions**

**(The Fed's and the ECB's repeated and coordinated interventions created this new setting)**

*An explicit role for regulatory authorities is in the authors' plans in the next model developments*

- **A sensitivity analysis on the tolerable securitisation levels, given all the needed assumptions**
- **A link of this micro-based model of the financial sector to the real sector of the economy (trying to assess the effects of the crisis on the lending activity)**

Some comments on the future developments of the model II

- A differentiation of the banks' and financial institutions' behaviours into two classes, one being more risk-averse than the other

*A way of doing this classification*

*A financial analyst (Avinash Persaud) defined two classes of financial institutions:*

1. *“risk absorbers” (insurers, pension funds and banks) which take a long – term view of the credit and “hang on to it even if the price falls”*
2. *“risk traders”, whose driver is the current price*

... going back to the art of agent-based model building (Windrum et al., 2007, JASSS) I

## **Models can be validated in basically three ways**

### **1. The history-friendly approach**

**Parameters, interactions and decision rules are constrained in order to stick to an empirical “history”**

### **2. The indirect calibration approach**

**At first a set of stylised facts is isolated and reproduced**

**In the second step the model is streamlined so as to be as close as possible to the available empirical evidence**

**Empirical data are then fed back on the stylised facts in order to restrict the parameter space**

... going back to the art of agent-based model building (Windrum et al., 2007, JASSS) II

### **3. The Werker-Brenner approach**

*perhaps the most comprehensive approach*

**Step 1: empirical knowledge is an input for the calibration of the initial conditions and the restriction of the space parameter**

**Step 2: empirical validation of the output of the various model specifications derived in the previous step. The space parameter is further shrunk even by the help of Bayesian techniques**

**Step 3: a final calibration exercise ends the process, helped by metadata such as interviews with experts**

Calibration and validation

*Some open points*

**Is the previous taxonomy of any relevance for the practitioners ?**

**What calibration approach was actually used in the paper ?**

**What are the data patterns the model attempts to reproduce ?**

**Is there a place for adaptive behaviour models in future model developments in order to get a better fit of the data ?**

Thank you for your  
attention