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## **Book Review of Steven Gjerstad & Vernon Smith**

### **Rethinking Housing Bubbles. The Role of Household and Bank Balance Sheets in Modeling Economic Cycles**

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The view that liquidity problems in money markets have been the main cause of the financial-economic crisis 2007/2008 has been popular among academics and policy makers, especially in the early stage of the crisis. This book stresses the role of the housing bubble, fueled by unusual credit growth, the subsequent collapse of the housing market and the negative consequences for the balance sheets of households and banks as one of its main causes. The book also argues that these problems in the housing markets could have been foreseen well before the crisis. Policy measures have focussed too much on liquidity provision in tight money markets and on fiscal stimulus, rather than addressing insolvencies in these balance sheets. The authors collect empirical evidence from many earlier recessions and crises, particularly the Great Depression and the Great Recession, to strengthen this view. Moreover, the book emphasizes evidence from laboratory experiments how easily speculative bubbles form and subsequent crashes lead to collapse in speculative asset markets for durable goods. After an introductory Chapter summarizing the main arguments, the book builds up this story in nine Chapters 2-10, with a final Chapter 11 summarizing what we have learnt.

Chapter 2 is one of the most fascinating chapters of the book discussing bubbles and crashes in laboratory market experiments that have made Vernon Smith famous and earned him his Noble Prize in 2002. Observations in these laboratory experiments are linked to the financial-economic crisis. There are two very different types of markets that are directly relevant to the stability and instability of the macro economy: markets for nondurable consumer goods versus speculative asset markets of durable goods, such as the housing or the stock market, where future price expectations play an important role in their valuation. Laboratory market experiments have shown that markets for perishable consumption goods are rather stable and quickly converge to the efficient rational expectations market equilibrium (Smith, 1962), while speculative asset markets are rather unstable and exhibit persistent deviations from fundamental value and are prone to large bubbles and dramatic crashes (Smith et al., 1988). These bubble experiments have been repeated in many different settings and experimental designs and bubbles and crashes appear to be very robust. In particular, it has been shown that more liquidity or inflow of cash leads to larger bubbles and crashes. A key feature of such laboratory asset markets is that individual behaviour is *not* independent, but subjects may collectively coordinate on momentum trading destabilizing markets and leading to temporary bubbles followed by sudden market crashes. This challenges the view that price crashes are

”fat left tails” events and supports the alternative view that price changes are not independent but become strongly amplified by collective behavior.

Chapter 3 emphasizes the pivotal role of the housing market bubble 1997-2006, in which the inflation-adjusted house price index almost doubled (p.53, Figure 3.1), and the subsequent crash in 2007-2010 in which house prices almost fell back to the 1997 level. The housing market bubble and crash were pivotal in generating the Great Recession and explaining its long duration and persistence. The widespread belief that residential real estate was a secure investment and policies that attracted an unusual flow of foreign investment in the US to create an unusual flow of mortgage credit into the housing market pushed up housing prices creating the instability. The housing bubble was part of a positive feedback loop pushing up prices to a level that could not be sustained. At that point mortgage fund growth and house prices increases ceased and borrowers began to default. Mortgage funding then began to decline and house prices dropped. The positive feedback loop that had prevailed during the bubble turned into a self-reinforcing negative feedback loop during the crash, very similar to what has been observed in the laboratory asset markets. The collapse of the housing bubble severely damaged household balance sheets, transmitted large losses to lenders, suppressed aggregate demand and caused widespread unemployment. The severely damaged balance sheets of households, financial institutions and the government will require years to resolve.

These insights from the Great Recession are used to reevaluate the origins of the Great Depression (Chapter 4) and postwar U.S. recessions (Chapter 5). Influential interpretations of the Great Depression argue that it was mainly caused by a largely independent monetary collapse due to a decline in the stock of money (e.g. Friedman and Schwarz, 1963) or by an exogenous productivity shock according to the real business cycle literature. In contrast, it is argued that the Great Depression shares many features with the Great Recession and is consistent with a demand shock initiated by a decline in house prices against fixed mortgage debt leading to balance sheet solvency problems of households and financial institutions. This in turn amplified downturns in consumer durables expenditures and nonresidential fixed investments. This point is illustrated, for example, in Table 4.1 and Figure 4.1 (pp. 92-93) showing that residential construction was collapsing by -10% from 1925-1929 before the crisis, seriously reducing household wealth and solvency, leading to a collapse of residential lending. Another illustrative Figure 4.4 (p.100) shows the dramatic booms and bust in real estate transfers in Miami (and Orlando), where the number of transactions increased by a factor of five in only 14 months from July 1924 to September 1925, before collapsing by 75% by early 1926 (before the devastating hurricane in September 1926). The bust of the housing market was transmitted into the financial sector, as it led to increased default on mortgages and foreclosures causing balance sheet and solvency problems of banks and financial institutions similar to the Great Recession. Chapter 5 argues that almost all

postwar U.S. recessions followed a similar pattern. A substantial decline in housing led 11 out of the last 14 recessions (Figure 5.10). During postwar recessions, the average decline in housing was -32.5% and consumer durables typically fell soon after housing.

Chapter 6 addresses the question what may have triggered or sustained the housing bubble 1997-2006. Four trigger events are identified: (i) the bipartisan Taxpayer Relief Act of 1997, exempting home resales from capital taxes up to 500,000, (ii) government housing programs, such as Fannie Mae, Freddie Mac and Ginnie Mae, with target goals up to 50% to direct funding to low-income borrowers, (iii) laws intended to help poor own homes by requiring mortgage-lenders to be performance-rated on their efforts to lend to borrowers with income below 80% of the median family income, and (iv) the U.S. trade deficit, resulting in a large inflow of foreign investment capital beginning in the early 1990s. Moreover, three primary sources that sustained the bubble are identified: (1) a continuing large inflow of foreign capital, (2) the unprecedented ease in monetary policy 2001-2003, with exceptionally low interest rates, leading to an increase of home purchase loans and a surge in loans to refinance existing mortgages, and (3) uncollateralized Credit Default Obligations widely thought of as providing “insurance” against mortgage default.

Chapter 7 further expands on the role of financial innovations, such as mortgage backed securities (MBS) and CDO's, in amplifying the housing price run-up, the burst of the bubble and the development of the banking crisis. The chapter opens with some quotes from policy makers and economic advisors (including Bernanke, Summers and Greenspan) expressing their faith in financial innovation and financial institutions. The MBS market grew to unprecedented levels and, together with derivatives “insurance”, became the financial engine that maintained house price momentum in between 2002-2006. The authors raise the fundamental question, reminiscent of Knightian uncertainty, whether one can insure against business risk of loss at all. Their answer is essentially “no”. Moreover, even if this hurdle is crossed, derivatives were flawed in their basic property rights structure in not being collateralized; unlike other securities, these instruments could be purchased with large amounts of “other people’s money” and high leverage. Mortgage markets were flawed by an unsustainable, inherently unstable chain from mortgage origination –badly incentivized with upfront origination fees– through mortgage securitization insured by uncollateralized derivative instruments and rated by agencies whose models had a built-in allowance for price appreciation. This chain remained suspended by exuberant expectations until its collapse in 2007. Figure 7.1 illustrates that housing prices peaked at 2006, the bank stock index peaked early 2007, reflecting the developing bank balance sheet crisis, and the Dow Jones index peaked in October 2007, shortly before the National Bureau of Economic Research (NBER) declared the recession began in December 2007.

Chapter 8 describes policy responses to the crisis. Policy makers were initially

surprised by the magnitude of the crisis as evidence e.g. by a quote from Ben Bernanke, May 2007: “We believe the effect of the troubles in the subprime sector on the broader housing market will likely be limited, and we do not expect significant spillovers from the subprime market to the rest of the economy or to the financial system”. This changed on August 9, 2007 when BNP Paribas announced it would suspend redemptions from three funds that were heavily invested in U.S. subprime securities, and the LIBOR-OIS interest rate spread tripled from 13 basis points to 40. The next day the FOMC announced a liquidity provision to promote trading in the federal funds market at rates close to the FOMC target rate. This signalled the start of a shift from conventional monetary policy of controlling inflation and short term interest rates, to unconventional monetary policies and quantitative easing (QE) programs for buying specified amounts of (troubled) financial assets from commercial banks and other financial institutions, thus raising the prices of those financial assets and lowering their yield, while simultaneously increasing the monetary base. As is well known, there have been three QE programs. The first QE1 starting October 2008 led to a \$1.3 trillion jump, from \$800 billion to \$2.1 trillion, in the Fed’s asset holdings (mortgage, commercial paper and federal housing agency debt) within 3 months. A second round QE2 starting in November 2010 and a third round QE3 announced in September 2012 further raised the Fed’s balance sheet of financial assets to more than \$4.5 trillion, when purchases were halted by the end of October 2014. Chapter 8 also stresses a key difference between stock market and housing market crashes. Stock market crashes are different because they only affect those who invested directly in those stocks through margin calls and therefore only have a minimal effect on lenders and the credit system. In contrast, a housing market crash affects households’ balance sheets and subsequently also bank’s balance sheets and thus damage the credit system and the economy.

Chapter 9 addresses what might be done in the context of the U.S. experience. A list of proposals for “regulation” as incentive-compatible property rights are discussed, such as tighter mortgage regulations with meaningful down payments (up to 20%) to avoid easy credit and no upfront origination fees but rather a time distribution, registration and margin-collateral requirements for derivatives to regulate financial innovation, the Volcker Rule, i.e. no proprietary trading for commercial banks, which supposedly contributed significantly to the crisis, and mortgage reevaluation and debt reduction programs for home owners that are “under water”. The authors argue (p240) that “monetary policy had a part in the current crisis and needs to be reformed based on fundamental rethinking”. They suggest that monetary policy should, for example, take housing cycles into account and can not ignore the large inflow of capital from foreign countries, which fueled the housing bubble. Also the provision of ample liquidity following a crash is questioned as it creates an environment in which the financial sector can prosper for a long time, largely at the expense of savers. Modern tax policies based on the “spending” tax proposals

of Irving Fisher in the 1930s and 1940s are also discussed. In particular, the authors argue to remove tax-and transactions-costs barriers to the formation of new businesses as these are the main driver of job creation.

Chapter 10 inquires about what might be learned from economic crises in other countries, such as Sweden, Finland, Iceland, Thailand and Japan, who suffered from financial crises in the 1990s. These other countries provide further evidence that these downturns are associated with rapid collapses of fixed investment and also indicate which policies are associated with rapid and sustained recovery and which lead to prolonged stagnation. Notoriously, monetary policy does not have its normal effect during a balance sheet crisis, and many economists argue for government stimulus spending for recovery. The authors provide evidence that fiscal stimulus has not been part of the recovery process in many countries that experienced robust recoveries following a balance sheet crisis. In fact, most countries that recovered rapidly reduced both government expenditures and government deficits; Japan increased both and then logged nearly two decades of poor performance.

Chapter 11 summarizes “What have we learned?”. One of the main lessons is that unusual credit flows frequently produce asset bubbles; when those assets are highly leveraged, immobile and illiquid, borrowers and the financial system suffer severe balance sheet deterioration in a collapse. In the U.S. balance sheet crises have occurred as a consequence of a decline of housing prices against fixed mortgage debt. Many household balance sheets have therefore turned into negative equity, and banks suffer parallel balance sheet damage as the underlying value of the collateral decreases with housing prices. A decline in residential construction is a good predictor of the onset and depth of a recession and the recovery of residential construction is a good predictor of the strength of the general recovery. The book argues that these features are not taken into account in standard macroeconomic modeling. Economic modeling should pay more attention to balance sheet dynamics and its consequences for economic cycles and macro models that incorporate interactions among real sector activity and a financial sector that is engaged with households in important ways. The empirical and laboratory evidence presented in the book forms a good empirical basis on which such modeling should be based.

This book was a pleasure to read and is highly recommended to anyone interested in financial-economic crises. It offers many intuitive stories of potential causes of the crisis, particularly the pivotal role of the housing market with historical data from the Great Recession, the Great Depression, earlier U.S. recessions and crises in other countries, all nicely illustrated by clear time series plots and graphs and backed up by tables. The book also offers stimulating ideas for behavioral agent-based modeling of the crisis supported by insights and data from laboratory experiments. I would like to conclude this review by discussing some of the recent related theoretical, empirical and experimental research.

Chapter 2 discusses some models that fit the evidence from the laboratory

experiments. Gjerstad and Dickhaut (1998) developed a model for the double-auction market for a perishable consumption good with heuristic learning by buyers and sellers about the prices that are likely to be accepted by the other side of the market and showed that, in artificial-intelligence simulations, when traders follow strategies based on these beliefs, market prices converge to the competitive equilibrium. Gjerstad (2007) also showed –by mixing algorithmic traders and human traders in the same market experiment– that these heuristic traders can perform as well as or even better than human buyers and sellers. The bubbles and crashes observed in the laboratory asset market experiments with long-lived durable goods are well described by early models of interactions between fundamentalists and momentum traders (e.g. Caginalp et al., 1991, 1994). Fundamental-value traders have long-term rational expectations, whereas momentum traders are driven by myopic rational expectations. Momentum trading can not be sustained in the long run, but may realize short run profits in excess of fundamental traders. There is now a large literature on heterogeneous agents models in economics and finance (see LeBaron, 2006 and Hommes, 2006 for extensive reviews). In particular, Brock and Hommes (1997) developed a heterogeneous expectations framework where agents switch between different forecasting models based upon their (recent) relative success. Brock and Hommes (1998) applied this heterogeneous expectations framework extending a standard asset pricing model with fundamentalists versus chartists and strategy switching based upon (short run) realized profits. This model generates bubble and crash dynamics, with bubbles amplified by trend-extrapolating chartists rules. Behavioral switching models with mean-reverting fundamentalist rules versus trend-extrapolating rules have also been estimated on stock market data (Boswijk et al., 2007, Hommes and in't Veld, 2014) and housing market data (Bolt et al., 2014). Bubbles are triggered by shocks to fundamentals, e.g. a new internet technology at the start of the dot com bubble or low interest rates at the start of the housing bubble, which then become strongly amplified by coordination on trend-following strategies. The burst of a bubble may be triggered by bad news about fundamentals, strongly amplified by coordination on downward trend-following behavior. Bolt et al. (2014) use the behavioral switching model to detect bubbles in house prices in eight different countries, including U.S, UK, Netherlands and Japan, and argue that such models may be useful as early warning signals for bubble formation.

Finally, I would like to discuss an important puzzle pointed out by the authors: “It is a puzzle why people in laboratory asset-market experiments, as well as their “sophisticated” counterparts in economies today, become entangled in self-sustaining expectations of escalating prices; however they do so reliably (Chapter 11, p.270)”. Recent learning-to-forecast laboratory experiments measuring individual expectations and their aggregate behavior have shown that non-convergence of markets crucially depends on (strong) *positive* feedback. Positive/negative expectation feedback means that the realised market price increases/decreases when the average

price expectation increases/decreases. Negative feedback is typical of supply-driven perishable commodity markets, where higher expectations leads to more production and therefore a lower realized market price. A classical example here is the hog cycle or cobweb model. Positive feedback is characteristic of speculative markets for durable goods, such as stock or housing markets, where optimistic expectations lead to increased demand and thus to higher market prices. Heemeijer et al. (2009) and Bao et al. (2012) show that while negative feedback markets converge quickly to the fundamental equilibrium price and adjust quickly to a new fundamental after a large shock, positive feedback markets usually fail to converge, but under-react to the shocks in the short run and over-react in the long run causing bubbles and crashes and persistent deviations from fundamental value. Anufriev and Hommes (2012, 2013) fit a behavioral heuristics switching model (a generalization of the Brock and Hommes (1997) heterogeneous expectations framework) explaining both stable and unstable market behaviour. Under negative feedback (or weak positive feedback) trend-following rules perform poorly and agents learn to coordinate on adaptive expectations stabilizing the market. In contrast, in (strong) positive feedback systems trend-following forecasting rules perform relatively well and coordination on trend-following rules amplifies price oscillations. Hommes (2013) stresses the genericity of the strong positive feedback argument by arguing that this type of aggregate behavior may arise for any near-unit root market system, because of coordination on *almost self-fulfilling equilibria* with a majority of agents using trend-following behavioral rules.

Steven Gjerstad and Vernon Smith have written a beautiful book providing many stimulating ideas for modeling financial-economic crisis. Laboratory experiments are very helpful and important to guide such models. After years of skepticism, macroeconomists now also become interested in laboratory experiments to study how group behavior at the aggregate level emerges through interactions of individual decision rules in a macro environment and how policy can manage instabilities in such laboratory macro-systems. (see e.g. Duffy, 2014 for a recent and up to date collection of experiments in macroeconomics).

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