

What Happened to the U.S. Economy in 2008?

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In 2008, the U.S. real GDP suffered the longest and sharpest drop since 1974. (See Figure 1.) In both cases, a major cause of the drop in real output was residential construction. (See Figure 4) And in both cases, the decline was aggravated by a sharp decline in the stock market which both made consumers feel poorer and apprehensive and made it difficult for firms to raise capital for new investment on favorable conditions.

Real Stock Prices Predicted by Real GDP

S&P500 in constant prices, 1995.1 = 100

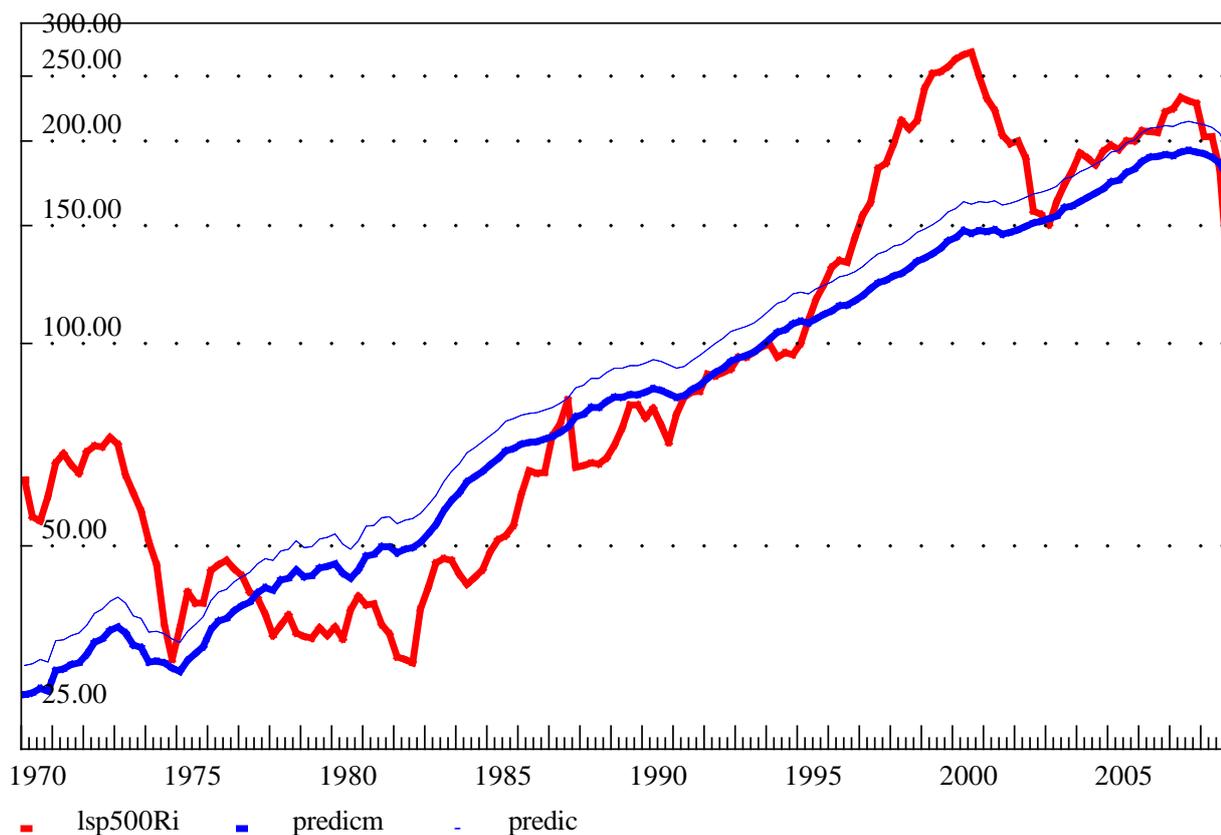


Figure 1: Relation of the Stock Market to Gross Domestic Product. The red, volatile line is the S&P500 stock index divided by the food deflator; the light blue line is the regression of this line on GDP in real food dollars. The heavy blue line is the light blue line shifted down slightly to coincide with the red line in the 1992-1993 period.

The similarity of the two recessions is striking in view of the differences in the structure of the home finance industry and in the stock market over the 34 years between the two. To understand the events of 2008, it is important to know about an important technical innovation in the stock market and to examine the history of home financing in the USA over the last fifty years. I will deal first with the changes in the stock market and then turn to the even more profound changes in the financing of residential construction.

Changes in the Stock Market

In 1973 there appeared in the *Journal of Political Economy* an article entitled “The Pricing of Options and Corporate Liabilities” by Fischer Black and Myron Scholes. Few academic articles have had so profound an effect on the economy. Back in the 1950's when I was studying economics and corporate finance, “puts and calls” -- that is, options -- were hardly mentioned. There was no formal exchange for trading them. Today whole courses are centered around them. Stochastic differential equations were unheard of; partial differential equations were the private preserve of physicists and engineers. Today, they are necessary tools for any student of corporate finance and need to be understood by any economist working in an economy with an important stock market.

A “call” option is a contract which gives you, the owner, the right -- but not the obligation -- to *buy* something from another party, the counterparty or writer of the option, at a specified price on a specified date or over a specified period. The specified price is called the “strike” or “exercise” price. The specified date or the end of the specified period is called the expiry. If the option can be exercised only on the expiry date, it is called a European option; if it can be exercised at any time up to the expiry date, it is called an American option. (Paul Samuelson claims to have introduced the terminology -- which has nothing to do with where the options are used -- as a deliberate swipe at some European economists who regarded American economists as far less sophisticated than themselves.) The “something” which is traded may be a bale of cotton, a bushel of wheat, a foreign currency, a stock index (that is, an amount of money equal to the value of the index), or a stock. We will only be concerned with the last. A “put” option gives the owner the right -- but not the obligation -- to *sell* something to the counterparty at the strike price on the expiry date (or before it, in the case of the American option). The option differs from the forward contract in that the owner of the call is not obliged to buy the stock on the expiry date; if the stock's price has fallen below the strike price, he would be foolish to exercise it. So he lets it expire worthless. Conversely, the owner of the put option will choose to sell only if the market price has fallen below the strike price.

Under ideal assumptions, the Black-Scholes formula shows the fair market price for the option at any date before expiry and it shows a way for the writer of the option to hedge it in such a way that he is certain to earn on it exactly what he would earn if he had the initial price invested in a risk-free asset. The assumptions include (a) that it is possible to buy and sell the underlying stock instantaneously in any desired amount (including selling it short) without affecting the price and at zero transaction cost, (b) that the movements of the stock price follow a lognormal distribution with known variance, and (c) that the value of the option is differentiable with respect to time and twice differentiable with respect to the price of the stock, and (d) that it is possible to borrow and lend at a risk-free, constant rate.

Options are important for the stock market because they give portfolio managers a way of buying something resembling insurance. Suppose a manager has a portfolio consisting of 10,000 shares of a stock currently selling for \$100 per share, so that the portfolio is worth \$1,000,000. Though she thinks the stock may appreciate, she is also apprehensive that it could fall and wants to insure that 30 days from now the portfolio will be worth at least \$900,000. She needs to buy a *put* with a strike price of \$90 and a expiry 30 days from now. She calls her investment banker and asks what the put will cost. He consults the history of the stock and finds that the standard deviation of its day-to-day changes is 1.8 percent. He plugs this information, together with the strike price, the current price, and the days to expiry into the Black-Scholes formula and informs the manager that the price will be just 62 cents per share. That is 62 cents per share to insure against all losses of over \$10 per share. The manager likes the deal, and the investment banker writes the put. (The 62 cents is the Black-Scholes value of the option; the banker may charge 68 or more cents to compensate him for his trouble.)

Writing the put leaves the investment bank exposed to fluctuations in the price of the stock. It

wants to hedge its position, which it can do by selling the stock short, that is agreeing to sell in the future shares which it does not yet own. There are various ways it can do this, for example, through futures contracts. How much does it want to sell short? Again, the Black-Scholes formula gives the answer: an amount called delta, which depends on the volatility of the stock, the current price, the strike price, and the time until expiry. In our example, the formula requires that investment bank to sell short 1214 shares immediately. Thus, the graph below, showing the bank's position in the stock, begins at -1214.

Position in Futures

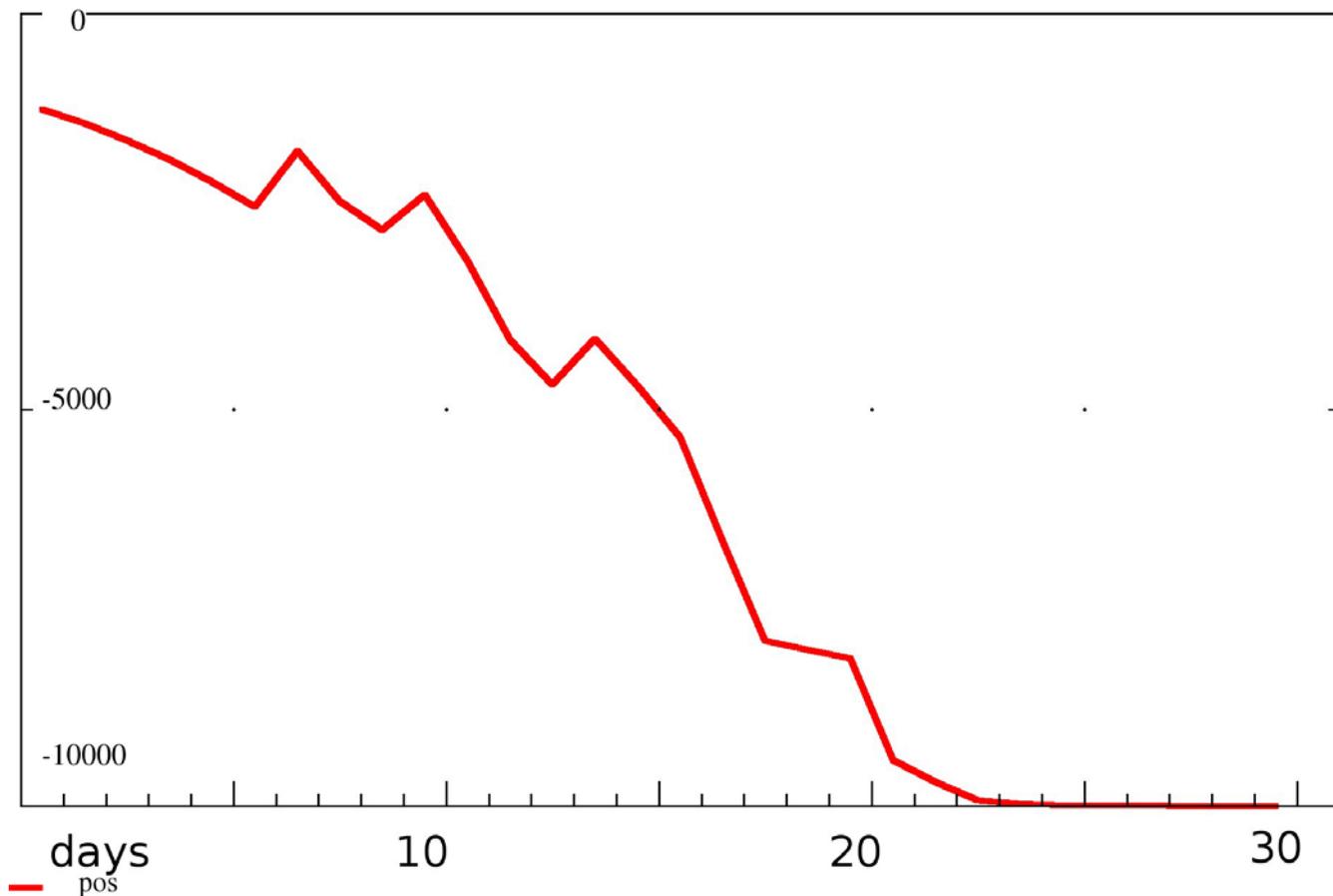


Figure 2: Short position of the investment bank

Now let us suppose that the portfolio manager's worst fears are realized and the stock follows the downward path shown in Figure 3. The bank's short position then, following Black-Scholes delta hedging, follows the path shown in Figure 2. After the 11th day, the put is “in the money”, that is, the current price is below the strike price. By the 23rd day, the put is almost completely hedged. On the expiry date, the portfolio manager will exercise the put and sell her entire portfolio to the investment bank, which will use it to make good on its short sales. Will the bank have lost money? Not much, if any. In practice, the writer of the put usually adjusts the position daily, not instantly, so there may be some small loss in a declining market.

The next month, the portfolio manager may want to do the same thing again, but now she has

studied up on Black-Scholes and does the hedging herself. She, of course, does not have to go into the futures market; instead of selling the stock short, she just sells the stock.

Price of Stock

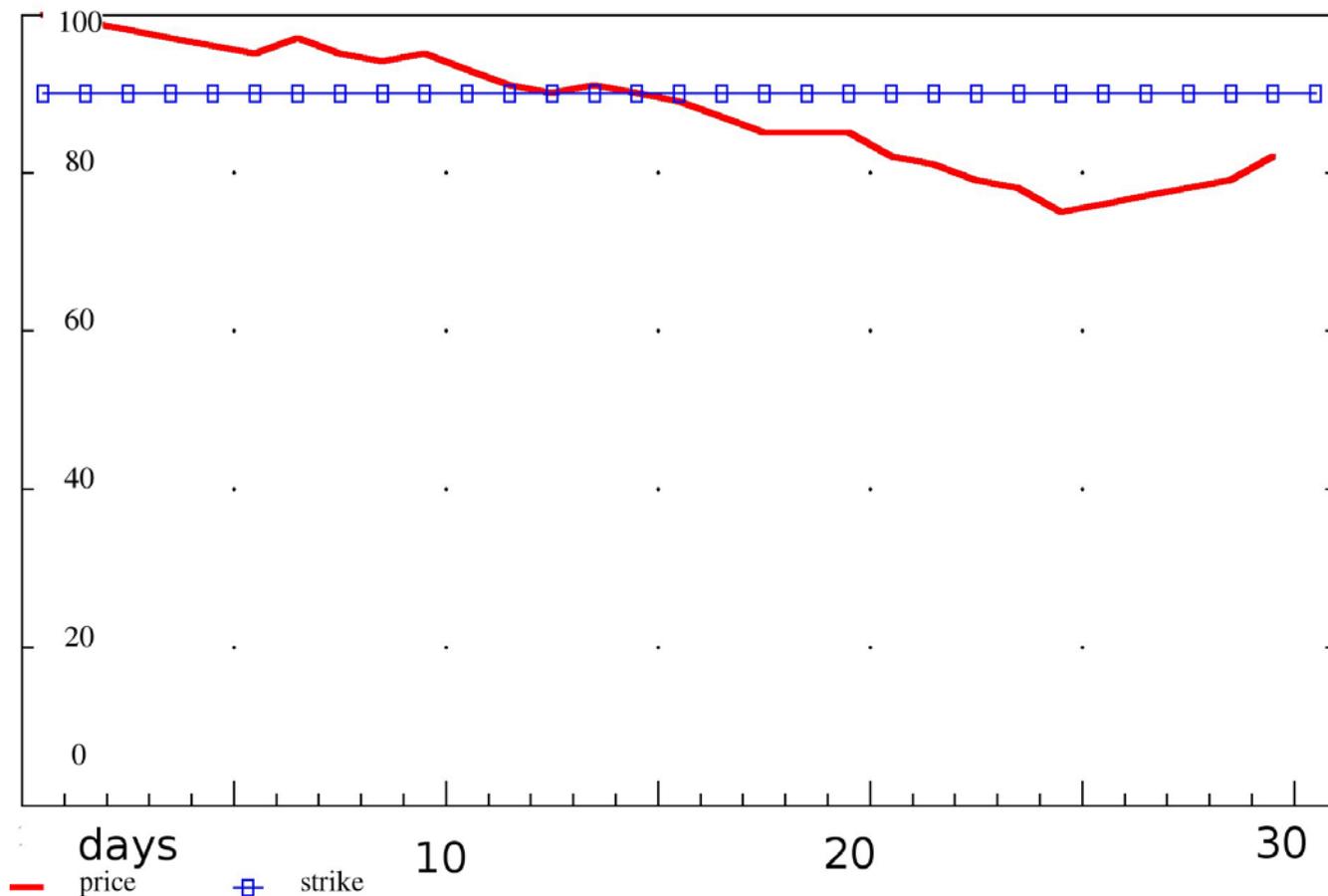


Figure 3: Course of the Stock Price

The point of this story for the economist – and for the general public -- is that, if a stock starts down, anyone who is delta hedging that stock by the Black-Scholes formula will start selling the stock. The sale may be in the stock market or in the futures market; the effect on the price is more or less the same: it drives the price down further.

In the old days of buying and selling stocks on the basis of their perceived long-run value, a drop in the price might be seen by many owners as an opportunity to pick up a bargain, and the price would come back up. In a world in which stocks are just molecules bouncing about in Brownian motion, trading programs will call for selling a falling stock. As more and more wealth is being managed in this way, the assumption that the individual trader does not perceptibly influence the market breaks down because there are many traders following the same or very similar strategies. And the strategies amount, simply put, to selling in a falling market and buying in a rising market. And that is precisely the behavior that makes markets unstable.

The Black-Scholes approach to option pricing brought a whole new breed to Wall Street. Many had Ph.D.'s in physics or mathematics or theoretical economics. Known as Quants, they brought the ability to put a price on increasingly hard to evaluate contracts. Among these are the credit default

swaps (CDS) in which A agrees to pay B X dollars if C defaults on a particular obligation which B pays A Y dollars if C does not default. Losses on CDS's were a major cause of trouble for Wall Street firms in the current financial crisis.

Evolution of the Financing of Home Building

Residential Construction

billions of constant dollars in prices of 2000

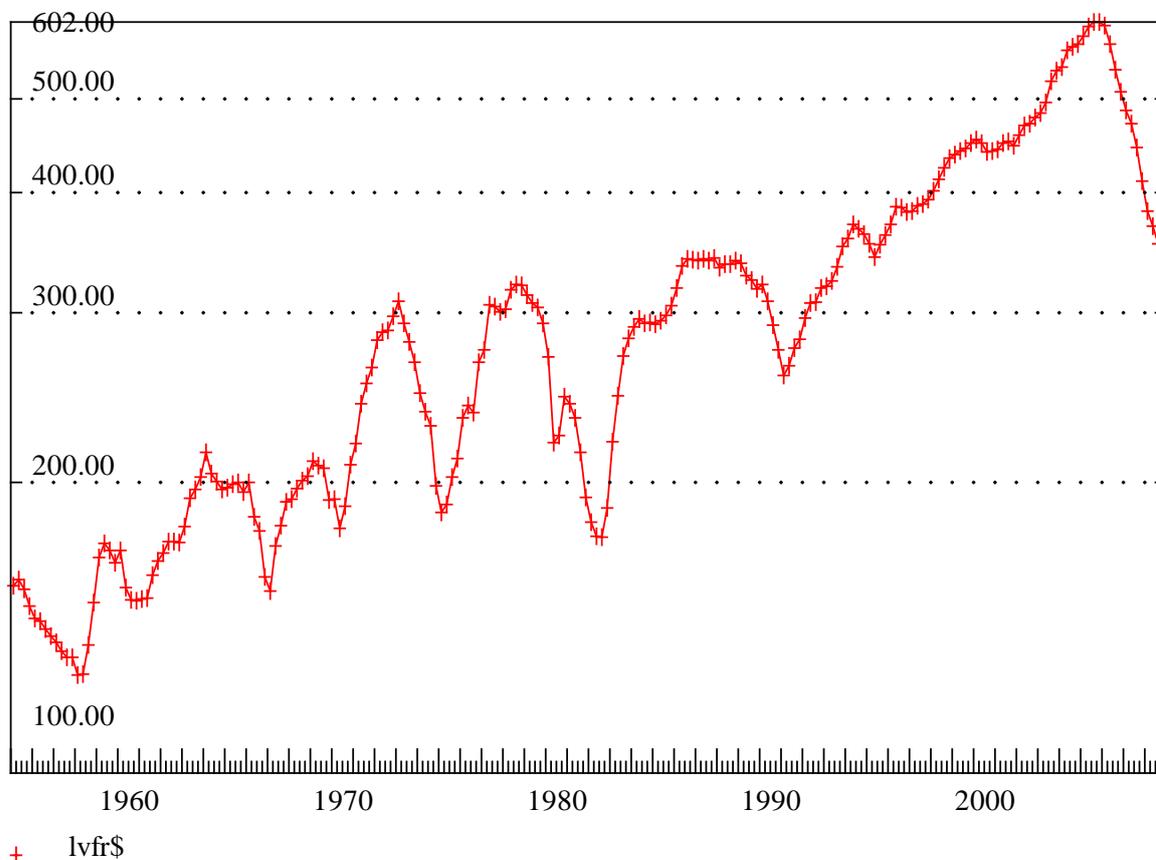


Figure 4: Residential construction in constant prices of 2000

In 1974, home building was largely financed by local "Savings and Loans" associations, S&L's. These small, local institutions owed their existence to a regulation of the Federal Reserve Board called Regulation Q, which set a maximum rate that commercial banks could pay on savings accounts. A corresponding regulation of the Home Loan Bank Board, the regulator of the S&L's set a rate half a per cent higher than the Regulation Q rate. The entire arrangement is generally referred to as "Regulation Q." Because of that half a percent, the S&L's could attract depositors -- provided that the rates on Treasury bills were low enough. But in 1974, inflation was rapidly rising as a result of the rapid increase of the money supply beginning in 1970. (The Federal Reserve chairman, Arthur Burns, was a great admirer of Richard Nixon, and undertook an easy money policy to have the economy booming at the time of the election in November of 1972. That easy money turned into inflation in 1973 and 1974.) Money moved out of saving accounts and directly into Treasury bills. With no money to lend, the S&L's and the commercial banks stopped lending for home building, which contracted rapidly. By now, however, the Fed was concerned about inflation and accepted the unemployment as necessary to reduce inflation.

The Fed then moved to a policy of targeting nominal interest rates, which led first to low nominal rates and a new housing boom in the late the 1970s. But resurgent inflation again pushed up interest rates above the Regulation Q limits, and money began to move out of the saving institutions. The new Fed chairman, Paul Volcker, stopped targeting nominal interest rates, and they soared in 1980 and 1981, but slowly inflation came down. The S&L's and the banks secured the passage of the Garn-St. Germain Depository Institutions Act of 1982 which eliminated Regulation Q and other regulations. In signing it, President Reagan said it would create more housing, more jobs, and more growth for the economy. "All in all," he said, "I think we've hit the jackpot."¹ In fact, he had signed the death warrant of the S&L industry, which, ironically, had lobbied heavily for the passage of the bill.

There had been a reason for limiting the interest rates banks and S&L's could pay on deposits. The deposits were insured by the U.S. government. An ambitious, adventurous S&L could attract more deposits by offering a higher interest rate than its competitors. How could it earn the higher rate? By making more risky loans. The greater risk did not trouble the depositors, because they were insured. Conservative, careful competitors of this rogue S&L, seeing their deposits leaving, were forced to increase their interest rates, and, against their better judgment, make more and more risky loans. The S&L's were also caught by low, fixed rates on their outstanding loans while having to pay the new, higher rates on deposits. By the mid 1980s, the S&L's were beginning to fail in droves. Their number fell from 3,234 in 1986 to 1,645 in 1995. Their federal guarantee corporation (FSLIC) went bankrupt. The Tax Reform Act of 1986 added fuel to the conflagration by disallowing the pass-through of losses of real estate developments to passive partners as deductions on their income tax. The change was made retroactive, destroying the value of some recently-built real estate. The result was a collapse of non-residential construction and attempts to sell off existing buildings.

In this chaotic situation, the Congress passed the Financial Institutions Reform, Recovery, and Enforcement Act of 1989, which created the Resolution Trust Corporation to salvage what could be saved of the failed S&L's and rearranged the federal oversight of the industry. The bailout cost the American taxpayer about \$125 billion. The act also mandated that Fannie Mae (Federal National Mortgage Association) and Freddie Mac (Federal Home Loan Mortgage Corporation) support "Affordable Housing". The moral hazard of this bailout and the consequences of pushing Fannie and Freddie into low-cost housing became evident only in 2007 and 2008.

Beginning in 1991 and extending over the next 16 years to 2007, it would appear from the course of residential construction that the U.S. had solved the problem of financing of home construction that had plagued it for the previous 30 or more years. Residential construction grew smoothly and rapidly. The bursting of the dotcom bubble in about 2000 that undid the stock market had almost no effect on residential construction. In fact, it was a combination of innovations in mortgage finance that made this boom possible – and built in the inevitable burst.

In the old system of financing home buyers, local people put their savings into a local S&L, which lent the money to local home buyers. In the new system, which began emerging in the 1990's, many of the former employees of the now-defunct S&L's became independent mortgage brokers. A home buyer would go to one of these brokers and fill out the paperwork. The broker would take the loan application to a firm such as Countrywide or Ameriquest to place it. These firms would put the application through a cursory examination and, if it met minimal standards, fund the loan. If the loan met "prime" standards, the mortgage would then be sold to Fannie Mae or Freddie Mac; these government sponsored enterprises (GSE's) raised the money to buy the mortgages by issuing their own bonds with the implicit (but not explicit) guarantee of the U.S. government. Fannie Mae had been doing this with mortgages originated by banks since 1938. It

1 Muolo, p. 52

was privatized in 1967; Freddie Mac was created the next year, and privatized a few years later.

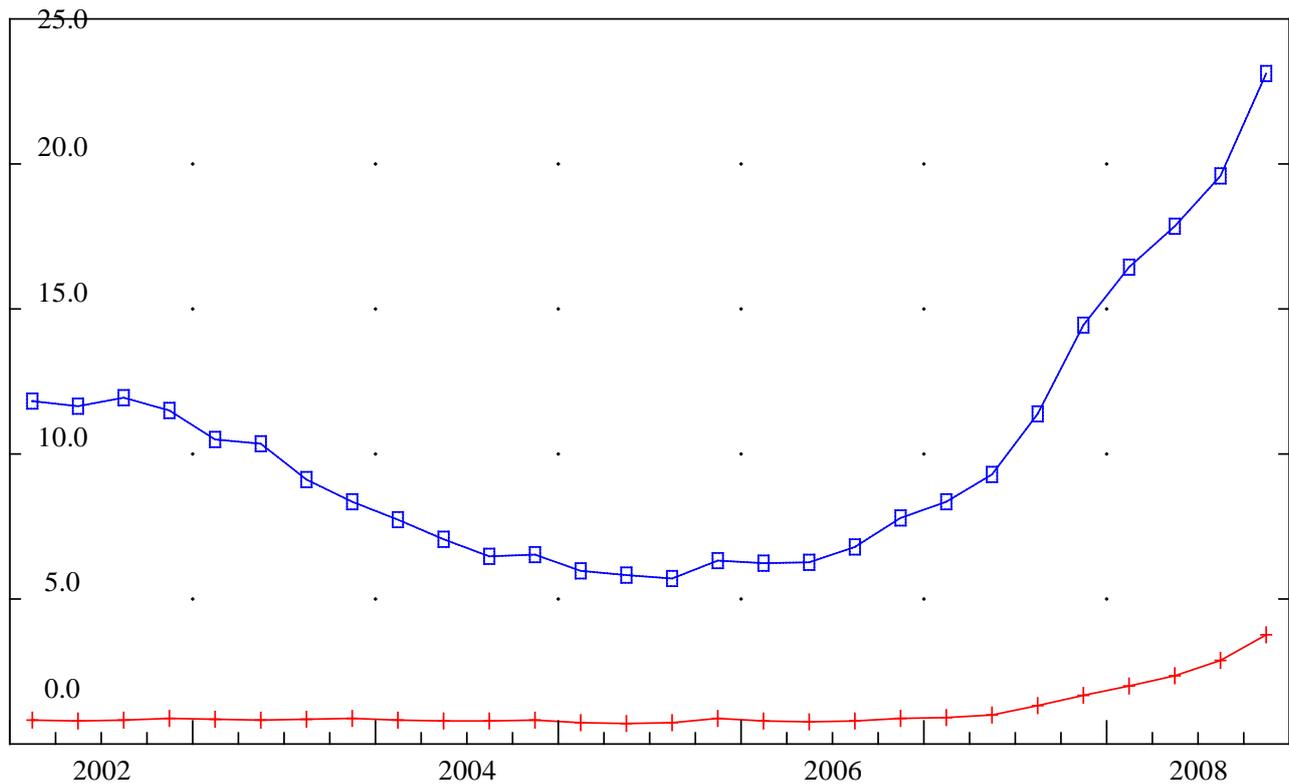
The new development in the 1990's was in what happened to the loan applications that did not meet the prime standards, the subprime loans. Previously, they were simply not funded. In the 1990's, firms such as Ameriquest and later Countrywide, began to sell them to Wall Street firms such as Bear Stearns and Lehman Brothers and others. The Wall Street firms then packaged a large number of mortgages into a bundle and sold off "tranches" or "slices" of the income from the mortgages. The tranches differed in their riskiness. One way of dividing the income was between a Principal Only (PO) tranche and the Interest Only (IO) tranche. The IO tranche was decidedly the more risky because it included the risk that the principal would be paid off ahead of schedule and the interest payment fall to zero. Another form of tranches worked like a system of pools in a fountain, one under another. Water flows from the fountain into the top pool; when it is full, the water spills over into the second pool, and so on. In the case of the mortgage pool tranches, as income from the mortgages poured in each quarter, all of it would go into the first tranche until it was full; then it would go into the second until it was full, and so on. Once a quarter, the tranches would be emptied, that is, paid out to the investors. Thus, the owner of the first tranche has a very safe income stream and the owner of the last has a very risky asset. But precisely who owns a particular mortgage is no longer clear.

A key point here is that Wall Street firms could sometimes not sell the most risky tranches and ended up with them in their own portfolio.

Fannie Mae and Freddie Mac were, however, from 1995 onward, under increasing pressure from their overseer, the Department of Housing and Urban Development (HUD) to increase support of "affordable housing" -- that is, low cost units often being bought by subprime borrowers. They were allowed to count towards the HUD-set quotas purchases of tranches from subprime loans.

Mortgage Delinquency Rates

Prime and Subprime



+ DelPrimeSeries DelSubprimeSeries

Wall Street was hungry for these high-yield subprime mortgage packages. Anecdotal evidence indicates that review of the loan applications became increasingly lax, more or less at the insistence of the Wall Street firms. The examiners report pressure to “make it pass.” Loans were devised that seem to have been designed to fail. Sometimes they began with very low, “teaser” interest rates and principal payments which would then increase after two years, frequently beyond the ability of the borrower to pay. Other loans allowed “negative amortization” as an option. Even so, serious delinquency rates (over due by 3 months or in foreclosure) fell from the end of burst of the dotcom bubble from around 12 percent to about 6 percent in 2005 and moved up only slightly in 2006.

After years of rapid growth in residential construction, it was hardly surprising that the market for houses began to show signs of saturation in 2006, and the rate of construction of new houses fell modestly, as it had done many times before.

By itself, this drop in residential construction was nothing out of the ordinary. But by 2007 there was a new factor. The serious delinquency rate on subprime mortgages rose back up to 12 percent by the fourth quarter, and continued on upward to 23 percent by the fourth quarter of 2008. Even the prime delinquency rate was up to about 4 percent by then.

Such delinquency rates seem to have beyond the worst fears of Wall Street and the GSE's. Here is a quick chronology of the carnage, based largely on Wikipedia articles. Bear in mind that each of the events mentioned here had an understandably negative effect on the stock market, and every negative impact was magnified by the program trading described in the preceding section. And as the stock market fell, people felt poorer and cut back on consumption. Retirees with savings invested principally in the stock market saw their savings cut in half, and reduced expenditures as much as possible.

2008 January 11

Countrywide Financial, the largest mortgage originator accounting for some 20 percent of the market, desperately short of liquidity because of losses in subprimes, asked to be bought by Bank of America. The price was \$4.1 billion, a fraction of the market value of Countrywide a year earlier.

2008 March 14

Bear Stearns, one of the nation's largest investment banks and deeply involved in the securitizing of subprime loans, received from JP Morgan Chase, in conjunction with the Federal Reserve Bank of New York, a 28-day emergency loan to prevent the potential market crash that would result from Bear becoming insolvent. The loan called attention to Bear's weakness and destroyed confidence in the firm as a counterparty. Fed chairman Bernanke and Treasury Secretary Paulson told Bear's CEO Alan Schwartz that he had to sell the firm over the weekend. Two days later, Bear Stearns signed a merger agreement with JP Morgan Chase in a stock swap worth \$2 a share or less than 10 percent of Bear Stearns' market value. The previous month, Bear's stock had been as high as \$93 a share. The sale price was later revised upward to \$10 to quiet the fury of Bear's stockholders.

2008 September 7

Fannie Mae and Freddie Mac were placed into the conservatorship of the Federal Housing Finance Agency (FHFA). They owned or guaranteed about half of the U.S.'s \$12 trillion mortgage market. They had, however, very little capital, very little cushion, that is, to absorb losses before becoming insolvent. The problem was with the risky tranches of income from subprime mortgages, the very investments HUD had pressured Fannie and Freddie to make.

2008 September 15

Lehman Brothers, which had been involved in securitizing of subprime mortgages, filed for bankruptcy protection. It had been unsuccessful in selling the riskiest tranches of its subprime packages, and when the delinquency rate rose, it became insolvent. This was the largest bankruptcy in U.S. history. The following day, the British bank Barclays announced its agreement to purchase, subject to regulatory approval, Lehman's North American investment-banking and trading divisions along with its New York headquarters building. On September 20, 2008, a revised version of that agreement was approved by the courts. Lehman, however, remained under bankruptcy protection, and it was by no means clear that its contracts in credit default swaps and repurchase agreements would be honored. As a result, no firm on Wall Street knew how much it or any other firm might be affected by the Lehman bankruptcy. As a result, they all became very protective of their own liquidity and uninterested in making loans.

2008 September 16

The **American International Group (AIG)**, the world's largest insurance company, had engaged in credit default swaps (CDS) related to subprime securities. It was even short on CDS, meaning it had sold some it did not own. As a result of the Lehman failure, the price of CDS soared, and as a result of losses on them, AIG's credit ratings were downgraded below "AA" levels, precipitating a liquidity crisis for the firm. The Federal Reserve Bank on September 16, 2008, created an \$85 billion credit facility to enable the company to meet collateral and other cash obligations, at the cost to AIG of the issuance of a stock warrant to the Federal Reserve Bank for 79.9% of the equity of AIG. In November 2008 the U.S. government revised its loan package to the company, increasing the total amount to \$152 billion. AIG is attempting to sell assets to repay the loans. So far the U.S. government has given the company over \$170 billion.

As a result of these failures, banks became doubtful of the credit worthiness of many borrowers

and fearful for their own solvency. Lending was drying up, spreading the economic crisis far beyond the subprime market.

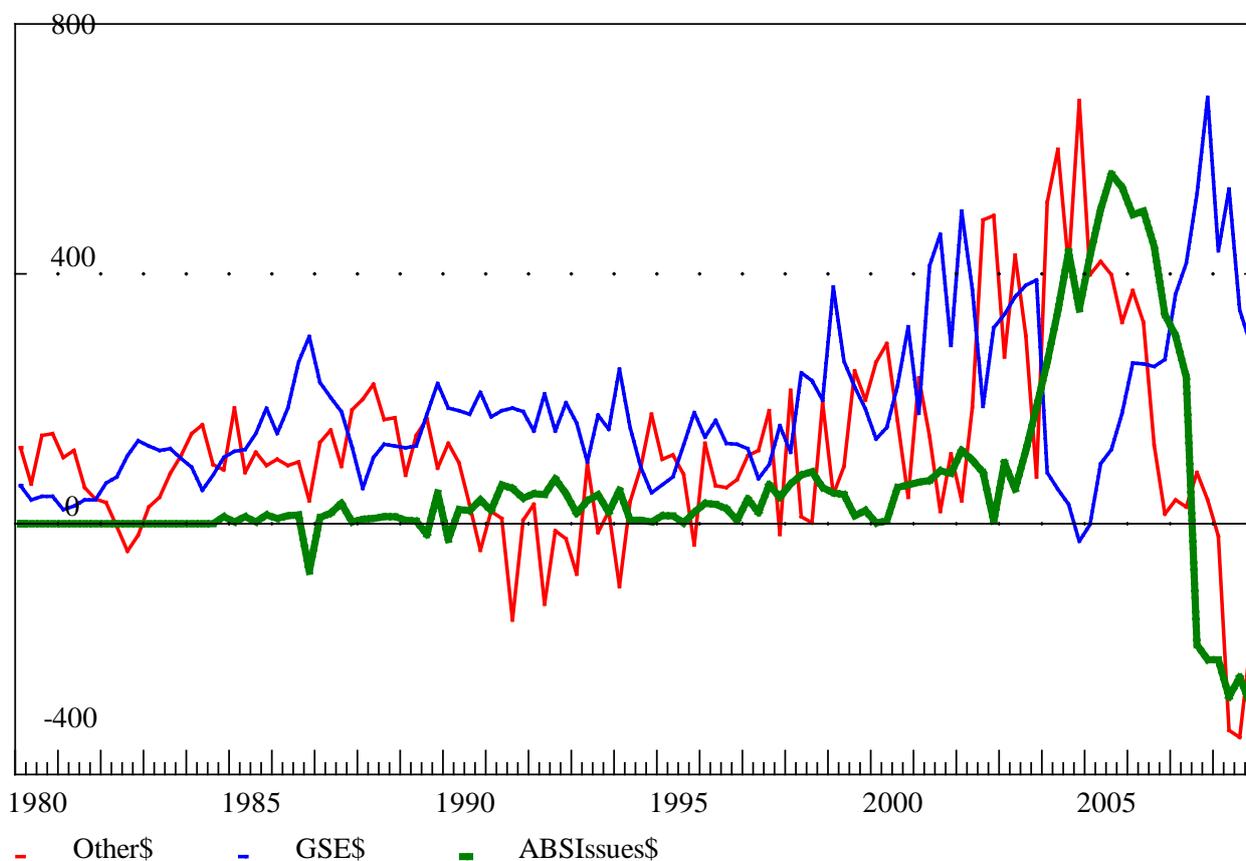
2008 October 13

To relieve banks' fear of insolvency, Treasury Secretary **Henry Paulson** compelled the ten largest banks to accept a \$125 billion equity investment by the government plus a three-year guarantee of new commercial bank debt issues. This guarantee is estimated by Veronesi and Zingales² to have been worth \$99 billion. From the changes in the credit default swap rates and the stock prices of the banks from the day before the announcement to the day after the announcement, these authors find that virtually all of the benefit went to the bond holders of the banks, but that the total benefits were less than the cost to taxpayers.

The subsequent months have not shown a marked upturn in bank lending. Net mortgage lending by banks, credit unions, insurance companies and finance companies (the red, solid line in Figure 3) remains negative – that is, the origination of new mortgages is less than the paying off of the old mortgages. The issuers of asset backed securities (ABS) – mostly subprime – also have sharply declining outstanding balances (the green dotted line). Only GSE-backed mortgages had a growing outstanding balance at the end of 2008. Subprime lending in 2008 was \$64 billion, less than one-tenth of what it was two years earlier.

Funding Sources of Home Mortgages

Billions of constant 2000 dollars



The lack of investor confidence engendered by the subprime crisis was not helped by what was

2 Veronesi, Pietro and Luigi Zingales, "Paulson's Gift" quoted from a preliminary draft.

happening on the stock market, where the the fourth quarter of 2008 saw the sharpest drop since 1929.

In summary, America has obviously not yet learned how to pay for its homes. Financing of residential construction has been the single most important source of cyclical instability over the last 50 years. The current measures, which are very close to nationalization of the industry, are clearly a temporary stop gap. The Obama administration has indicated that it will call for sweeping regulatory reform where the criterion for being regulated is not the legal form of the company – bank, insurance company, hedge fund – but the size and importance to the whole financial structure.

Suggestions for new regulations

The main purpose of this paper has been to review in historical context what happened in 2008. It would be disappointing, however, if the review did not yield some suggestions about what must now be done.

The best hope for emerging quickly from the recession is to allow writing down of home mortgages based on a widely-accepted index of home prices. This is what would have been done when S&L's kept the mortgages they issued. With today's securitized mortgages, it is no longer clear who has the authority to write them down. An act of Congress defining the right of homeowners to have their mortgages written down to no more than the current value of the house as determined by the original purchase price and the index of house prices in the postal code (5-digit zip code) would be a great help in preventing owners from simply walking away from their homes. Likewise, simplified bankruptcy for financial institutions which would leave intact their contracts, wipe out their equity holders, and convert bond holders into shareholders would yield a banking system well capitalized and ready to make loans.

In looking beyond the present situation, the first principle for designing regulation is that it has to be simple rules that can be applied by civil servants paid a tenth or less of what the people they regulate are paid. Here are some such simple rules.

1. Regulation Q should be re-instated but with a rate that moves automatically with the 90-day Treasury Bill rate. The purpose of Regulation Q was to prevent banks, whose deposits are government insured, from competing for depositors by paying higher and higher rates, with the higher rates being made possible by more and more risky loans. It was effective for this purpose. The removal of Regulation Q led directly to the Savings and Loan crisis and indirectly to the present problems. The problem with Regulation Q was that the rates which could be paid did not move in parallel with market interest rates, such as the Treasury Bill rate. The re-instated Regulation Q should have that parallel movement automatically built in.
2. All new mortgages which are to be securitized should be required to explicitly state who has the authority to reduce the outstanding principal should the property fall in value below that outstanding amount. For existing mortgages, the borrower should be given the right to have the principal marked down to the current value of the house as determined by the original purchase price and the Case-Schiller index of house values in the relevant ZIP code. *Such provisions, which at first sight seem to favor the borrower, actually benefit principally the lender.* The borrower can simply move out and stop paying if the house value declines below the outstanding principal. The lender is then left with a rapidly deteriorating asset, which is likely to fall another 30 – 40 percent before a new buyer can be found.
3. Mortgages in which payments automatically rise independent of market interest rates should be illegal. The target here is “teaser” mortgages, not adjustable rate mortgages where the rate depends

on market interest rates.

4. Commercial banks used to be clearly separate from investment banks, stock brokers, or hedge funds. The demarcation lines have become increasingly unclear as illustrated by the Bank of America acquisition of Merrill Lynch. There would seem to be good reason to keep the government insured commercial banks clearly distinct from the riskier parts of finance. There needs to be a clearer and narrower delineation of the activities commercial banks can engage in.

5. A new form of bankruptcy for financial institutions needs to be created. It would wipe out existing stockholders and convert bond and commercial paper holders to stockholders. (Existing stockholders would be given a week or two to pay off their share of the indebtedness and keep their share of the stock if they so desire.) Counterparty obligations and credit default swaps, however, would remain in place. Such a form of bankruptcy for Lehman would have prevented the bankruptcy from spreading panic throughout the financial system.

6. In the securitization of mortgages, either the most risky tranches must be sold first or all tranches placed before any sale is final. Inability to sell the riskiest tranches was an important element in the fall of Lehman.

It should not be impossible to design a stable financial system. But we have not yet done so.

References

Paul Muolo and Mathew Padilla, *Chain of Blame*, (John Wiley, Hoboken, 2008)

Pietro Veronesi and Luigi Zingales, "Paulson's Gift" . Preliminary draft, November 5, 2008.