Bill Ziemba

Understanding the Financial Markets in the Subprime Era

The worst financial crisis in sixty years or a run of the mill recession. Can you tell what it is yet?

This column is an attempt to understand the equity, commodity, currency, real estate, fixed income, and other markets in 2007/08.[1] There is currently a mixture of a sound economic response, but the markets are moving in negative directions in real estate and the credit and equity markets, plus a large fear of the unknown from reported and unreported subprime and other losses.

George Soros thinks it is the worst financial crisis in 60 years. Whether he is right or wrong, it is clear that the subprime, real estate, and credit losses by banks and other financial institutions are large. How large, is to be determined. Numbers as large as $500 billion to $1 trillion or even $2 trillion have been mentioned. Recall that when the Japanese stock and land bubble burst in January 1990 for stocks and, more than a year later, for land, $5 trillion was lost in real estate and a further $5 trillion in equity for a total of $10 trillion. Both were greatly overpriced. Then, Japan had a 10+ year dark period, which they have called the *lost generation*. So these numbers, although large, must be kept in perspective. Presumably, the US authorities will let businesses fail, a key mistake in Japan.

"Hello, I wish to register a complaint ..."

Many influential analysts are somewhat bearish on the stock market and super-bearish on the US real estate and worldwide credit markets. These include Jeremy Siegel and Abby Cohen, who are bearish in the short term but bullish, as they usually are, in the long term. Nouriel Roubini and Bob Shiller are usually bearish, and that continues. Other distinguished analysts such as Larry Summers and Felix Zulauf are bearish and feel that the USA is already in recession.

A major event in January 2008 was the rogue trader losses at Société Générale. This is now discussed. One thing to observe is that in times of uncertainty, there are more rogue traders are revealed. Besides this loss, some $1.4 billion was lost on wheat in two days by a rogue trader at MF Global, causing them to lose a quarter of their worth.

Société Générale

On January 21 (a US holiday) and 22, 2008 (Monday and Tuesday) nights, the S&P 500 futures was some 60 points lower on Globex trading(1,265 area), well below previous lows (1,406 on August 16, 2007; 1,364 on October 17, 2006; 1,273 on March 10, 2008), a new low as we go to press. On both days, the day market recovered, but much damage was done.

Jerome Kerviel and Société Générale lost €4.9 billion trading index futures in the DAX, FTSE, and CAC. By correlation, the S&P 500 fell to new lows. Many were hurt. How did a junior trader hold €50 billion in positions?

The following exhibit is Société Générale's explanation of the incident.

What is a subprime loan and why have they caused so much trouble in so many places?

Subprime loans: loans to borrowers who do not qualify for best interest or with terms that make the borrower eventually unqualified, as with zero downpayment, zero interest.

In general, lending institutions inherently get it wrong. When times are good, they tend to be greedy and try to maximize loan profits, but then they are very lax in their evaluation of borrowers' ability to pay current and future mortgage payments.

- Japan in the late 1980s: real estate and stocks, eventually the 10T was lost.
- US mortgages: in the runup of real estate –

THE GHOST TRADER

Jérome Kervial's job at Société Générale was to take minimal risk; His mission was to balance out positions on his book. But Société Générale says flaws in its control system allowed the trader to leave the bank with a €50 billion exposure.

ROUTINE

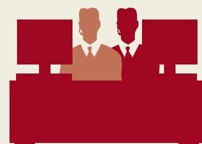
On a normal day, Mr. Kerviel would balance a bet that a stock-market index would rise with with a contract on a futures exchange or another bet that the index would drop.

FICTITIOUS

For almost a year, Mr. Kerviel allegedly made real bets one way and fictitious bets in the other direction. His supervisors would see a balanced book when, in fact, the bank was exposed to hefty, real risk.

DROPS IN OCEAN

Though Mr. Kerviel's positions exceeded his authorized limit, they were scattered on different balance sheets and drawn within the bank's massive volume of dally operations on futures exchanges.



BALANCING TRAILS

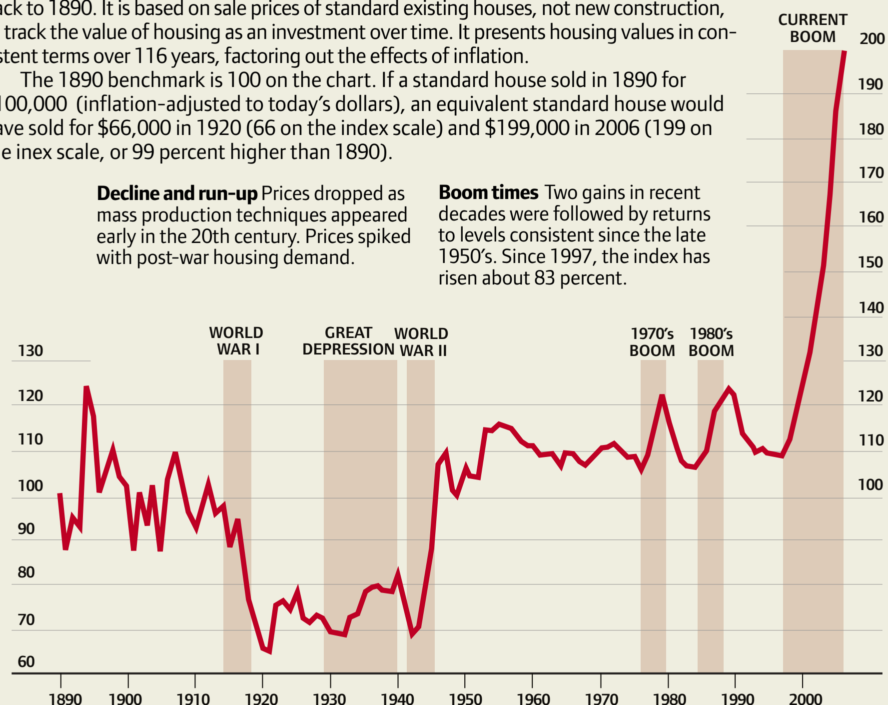
Mr. Kervial allegedly would enter fictitious "forward" contracts, which–unlike contracts with futures exchanges–don't necessarilly generate money flow until the contracts reach maturity.

ELUSIVE ACTION

Mr. Kerviel allegedly knew the calendar of in-house controls, during which supervisors would scan and recreated new ones immediately after to keep his book balanced out. The temporary misbalance didn't trigger an alert.

Sources: Société Générale

Figure 1. A History of home values. Source: Nouriel Roubini, 2006.



The trading losses at Société Généra1 are not unique, but they are among the biggest ever disclosed. Here is how they compare with other examples:

BANK/FUND TRADER	**AMOUNT, IN BILLIONS** YEAR	TYPE OF TRADING	OUTCOME
Société Générale Jerome Kerviel	$7.2 2008	European index futures	The bank is seeking a capital infusion.
Sumitomo Corp. Yasuo Hamanaka	S2.6 1996	Copper futures	Hamanaka pleaded guilty to fraud; Sumitomo paid a $150 million fine.
Barings Bank Nicholas Leeson	S1.4 1995	Japanese stock futures	Barings collapsed and was sold to ING; Leeson went to prison for 4 years.
Daiwa Bank Toshihide Iguchi	$1.1 1995	Bond trading	The bank was banned from doing business in the United States; Iguchi pleaded guilty to fraud.
Allied Irish Banks John Rusnak	$0.7 2002	Currency trading	Rusnak pleaded guilty and was sentenced to 7.5 years in prison.

after the internet bubble and Greenspan, interest rates approached 1 percent. The assumption was that house prices had to rise, as they have year by year (see Figure 2).

Now the lending organizations sell off the mortgages and they are cut and diced, bundled into packages like CMOs and CDOs, and sold to others who have trouble figuring out what is in them but look at the rating agency's stamp of approval.

Figure 1, starting in 1890, shows the buildup to overpriced areas in 2004–5 that led to the drop now that is shown in Figure 2. There have been 12 consecutive months of negative returns. The 10-city, 20-city decline and 10-city composite all declined. Case–Shiller and others predict up to a 25 percent drop in prices from the peak in 2004–5.

CMO, CDO trouble continued

As I have argued in previous columns, one must be diversified and not overbet in all scenarios. But the CMOs, CDOs, and other instruments were extremely leveraged by banks and others.

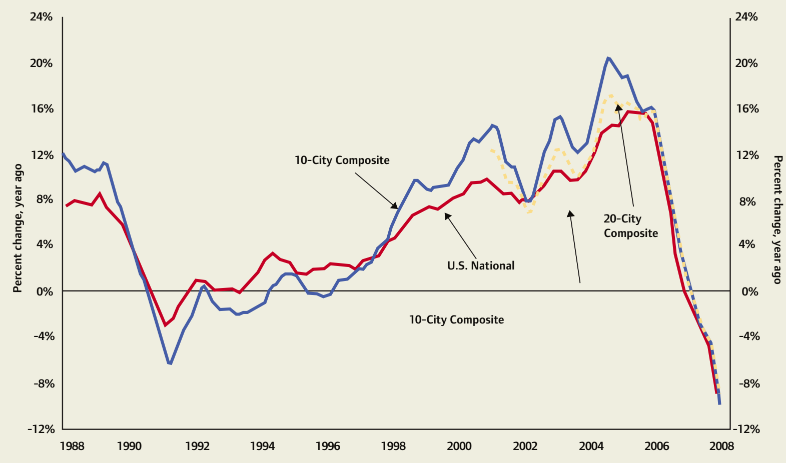


Figure 2. Case–Shiller Home Prices Index, February 28, 2008.

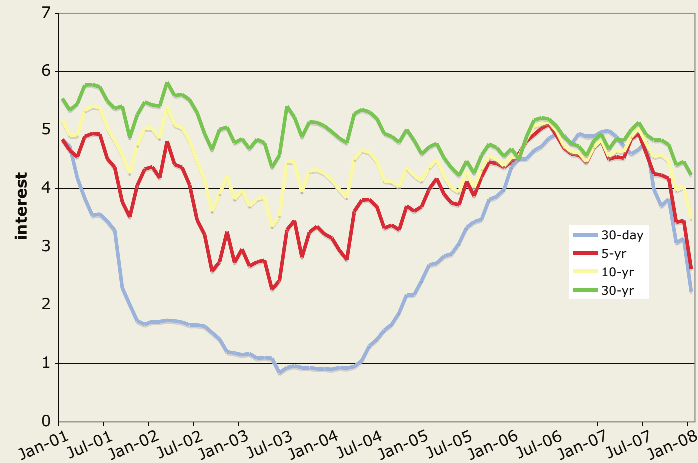


Figure 3. Interest on US Treasuries.

• The rating agencies with conflicts of interest are also at fault because they failed to point out the potential risks. Many risky derivative products were rated AAA, even though they would implode, as they did, if only one variable – housing prices – declined.

• So it was easy and cheap money

The recipe for disaster (See Ziemba and Ziemba (2007) for many examples, including LTCM, Niederhoffer, and Amaranth) is:

• Overbet

• Do not diversity in all scenarios

Then, if you are lucky, you can be OK but if a bad scenario hits, you can be wiped out. US mortgages are in the range of $17 trillion, which is an enormous amount of money, so a small change makes a big impact. The bad scenario was not a small but a large change, so the total losses could easily exceed $1 trillion, as Figure 1 shows. Figure 2 shows data compiled by Professor Shiller from 1980 to the peak in 2004–5. This is one-tenth of Japanese losses in the 1990s. Now, in 2008, it is widely recognized as a crisis. Early warnings of a large real estate decline came from Nouriel Roubini and Robert Shiller in 2006.

Once trouble hits, no one wants to lend, even to good risks. The pendulum has swung to too tight and too high rates. Figure 3 shows the interest rates on US treasuries over time from January 2001 to January 2008.

FED and other injections have been helpful in the first few months of 2008. In Japan in the early 1990s it was similar: expensive money, and you could not get it. Canadian banks get it right more often than US institutions, but then the structure is different. Among other things, mortgage interest is not deductible, except for that portion of a house that's an office. Also, there are fewer exotic mortgages, and higher downpayments are required to obtain a mortgage. US foreclosures in 2008 are for mortgages written in 2006, so this will continue to 2010 unless something changes. Table 1 shows a chronology of the subprime saga from June 2007 to January 2008.

Who will bail out the ailing banks and financial institutions?

The answer to this question is: sovereign wealth funds from oil- and commodity-exporting countries and goods-exporting countries like China (see Ziemba, March 2008). Buffett, Li Kai Shing, and other cash-rich investors will create new businesses and pick up bargains: bottom fishers in markets – when they recognize a bottom.

What do the rational valuation and crash models say now, and how accurate have they been since the 1980s?

My experience is that most *but not all* crashes (fall of 10 percent +) occur when interest rates relative to price earnings ratios are too high. That is, the bond-stock model is in the danger zone. In that case, there almost always is a crash; see Ziemba and Ziemba (2007) for the 1987 US, the 1990 Japan, and the 2000 and late 2001 US, which predicted the 22 percent fall in the S&P 500 in 2002. Interestingly, the measure moved out of the danger zone, then in mid-2001 become even more in the danger zone than in 1999. There were declines of less than 10 percent in 2004, 2005, 2006, 2007, and 2008. Then came the big decline in January through March 2008 to lower and lower prices. This one was not predicted by the bond-stock model, but rather by subprime and credit problems. A confidential option sentiment model I use, which has been very accurate, also did not predict these declines. See Ziemba and Ziemba (2007) for a description of those declines under 10 percent that were not predicted by these measures.

Figure 4 shows the crushing blow in Japan; interest rates increased for eight full months until August 1990. It took years and years to recover from this, despite dropping interest rates after August 1990 for many years. Notice how dropping interest rates too late may not work. Hopefully, Bernanke and the Chinese will not make this mistake in 2007–2009 and will use other fiscal measures.

January barometer gave a big clue in the first week of 2008

Over the years, I have written papers at Frank Russell with Chris Hensel (1995), and later with two MIT students, on the January barometer. This is also discussed in *Wilmott* (Ziemba, January 2008). The main results, with more than 50 years

Table 1. Chronology of the Subprime Saga from June 2007 to January 2008. Source: Credit Agricole S.A. Department of Economic Research (2008).

Phase 1 : Wave of downgrades, the first difficulties for funds and financial institutions

June 2007

- Two Bear Stears managed speculative funds that invested in subprime-asset backed securities are reportedly on the brink of being closed.
- One of the funds is rescued with a $3.2bn loan injection.

July 2007

- Moody's and Standards & Poor's downgrade many mortgage backed securities and put them on the watchlist.
- The value of the two Bear Stearns funds massively invested in subprime mortgages collapses.
- The head of DBS resigns after recent reverses (a hedge fund specialized in subprime assets was closed in May)
- In the US, mortgage lender Countrywide Financial Corp. and the largest US home builder, DR Horton, announce lower profits and a loss in Q2 2007, respectively.
- The German bank 1KB issues a profit warning because of fears over the potential impact of the subprime mortgage crisis.
- American Home Mortgage Investment Corp. announces it is unable to deliver on its loan commitments.

Phase 2 : Things get worse, the first measures, and first support

August 2007

- Detection of additional losses by 1KB leads to a €3.5bn rescue fund set up by its leading shareholder, KfW, and a group of public and private banks. Australia's top investment bank, Macquarie, reports that two of its funds could report heavy losses.
- Oddo closes three of its funds affected by the subprime crisis.
- BNP Paribas freezes three investment funds with real-estate related assets (stating that lack of liquidity makes it impossible to value certain assets fairly).
- American Home Mortgage Investment Corp. files for chapter 11 bankruptcy protection; one of its structures extends the maturity on its asset backed commercial paper.
- BNP Paribas reopens the closed funds.
- The main central banks inject massive funds into the money markets: €94.8bn and then €61 and €48bn by the ECB; $24bn, then $35bn and $2bn by the Fed; and the BoE joins in.
- The Fed cuts its discount rate by 50 bp to 5.75%, announces that it will lend up to 30 days, and injects an additional $6bn.
- The central banks continue their injections.

September 2007

- Bank of England provides urgent financial support for Northern Rock, a bank specialized in mortgage lending; this increases concerns by depositors, who withdraw £3bn over the weekend.
- HSBC closes its US subprime mortgage unit.
- The ECB keeps its key rate on hold, while proceeding to overnight fine-tuning 3-month refinancing operations. The Fed cuts the Fed funds rate by half a point, to 4.75%, and cuts the discount rate by the same amount (to 5.25%).

Phase 3: More-severe stresses, higher loss estimates, resignations, and determined actions by the central banks

October 2007

A flood of poor results in Q3: Deutsche Bank results are affected by the crisis, Merrill Lynch publishes a loss, and its chief executive resigns.

- In the US, a proposed Super Fund set up by banks at the government's request is proposed, at the same time as the "Hope Now" plan based mainly on stopping resets on subprime mortgages originated in the past two years.

November 2007

- More bad news: Merrill Lynch reportedly used speculative funds to conceal losses; Citigroup announces large writedowns ($8bn), and its chief executive also resigns.
- The ECB holds its key rate at 4%; the Fed eases its rules for primary dealers (who can borrow more at its discount window).

December 2007

- Bear Stearns reports its first net loss ever, profits at Morgan Stanley fall by 57% in 2007 and the Chinese sovereign wealth CIC takes a 9.9% stake in the group. Citigroup brings a substantial amount of written down assets onto its balance sheet. After UBS, a Singapore fund invests in Merrill Lynch.
- Early in the month, the major central banks make a coordinated effort to inject $64bn into the market. Given the relative success of the operation, the ECB keeps rates on hold but makes an unlimited liquidity injection to contain pressure on the money market (C348.6bn at 4.21%). Bank of Canada cuts its key rate by 25pb to 4.25% (ending a tightening cycle that began 3 years before); Bank of England does same, bringing its rate to 5.5%; and the Fed cuts by 25pb to 4.25% to counter risks weighing on growth. It conducts two auctions of one-month funds for $20bn each, accepts a broader range of collateral, and longer maturities.
- The proposed SIV Super Fund is abandoned.
- All told, sovereign wealth funds (government bodies, typically vehicles to invest emerging country surpluses) injected $35bn into the global financial sector.

Phase 4 : The central banks offer support, given the risk of contagion to other sectors and the economy as a whole

January 2008

- After UBS, Merrill Lynch and Citigroup, the chief executive at Bear Stearns resigns.
- Slowing growth and worsening credit quality prompt American Express to take an exceptional charge.
- Bank of America, the largest US retail bank, buys Countrywide Financial, the mortgage lender severely affected by the crisis.
- Substantial losses pour Merrill Lynch and Citigroup, of about $10bn each in 4Q2007, when they wrote off $18.1bn and $14.3bn, respectively). While Citigroup manages to report a profit for the year, Merrill Lynch reports a $7.8bn loss.
- Worries regarding monoline insurers. Stock market plunge on January 21.
- The ECB adjusts the amounts of liquidity injected into the market.
- Commencement of an operation allocating $10bn for 28 days to European banks, under a swap agreement with the Fed.
- The first ECB meeting in 2008 leaves rates unchanged.
- The Bush administration announces a fiscal stimulus plan amounting to some $150bn.
- Fed cuts rates by 75bp January 22, between two meetings, to stop equity market panic.

of data for the USA (and other countries), are:

• If January is negative, then the rest of the year is negative or positive about 50 percent of the time; if the returns are positive they are not high, but if the returns are negative they are large negative. The S&P 500 fell 6.1 percent in January 2008, so we expect February and onwards to be rocky. So far, there have been losses in five straight months from November 2007 to March 2008.

• If January is positive, then the probability that the rest of the year is positive is about 85 percent, and the positive returns are high and the negative returns are not very negative.

Some history where the January barometer worked:

• In 2004, the S&P 500 gained 2.00 percent in January and 6.86 percent in the remaining 11 months, for a total gain of 8.99 percent.

• In 2005, the S&P 500 lost −2.53 percent in January and gained 5.67 percent in the next 11

>

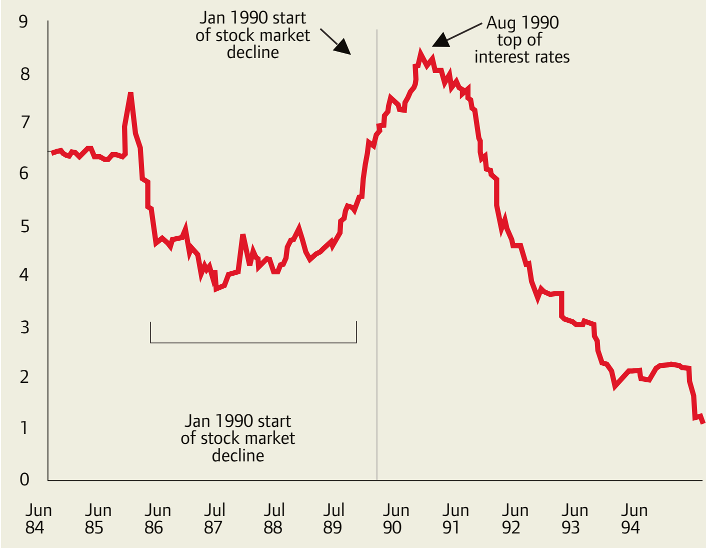


Figure 4. Short term interest rates in Japan, June 1984 to June 1995.

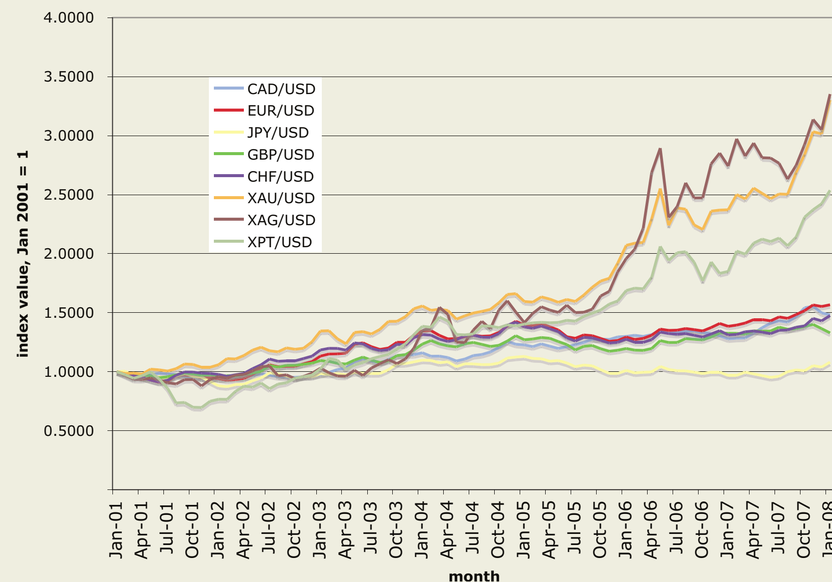


Figure 5. Indices of currencies and precious metals to US$.

months, for a total gain of only 3.00 percent.

• In 2006, it was up 2.54 percent in January, 10.80 percent in the next 11 months, and 13.30 percent for the year.

• In 2007, in January the S&P 500 gained 1.41 percent, and the rest of the year through 24 October the S&P 500 was up a further 5.40 percent, for a total return to date of 6.88 percent.

A related study, which I have not done, would be to look at the first five days at the turn of the year (−1 to +4). But it is known that if these days are negative it is a very bad signal for future returns. These were very very negative.

US dollar decline

The US trade and budget deficit increase and the US dollar decline. Why have the euro, oil, and precious metals been the prime benefactors of the decline? Who can take up the slack now that the euro is possibly peaking, or will the dollar rebound? It looks to be the yen and Swiss franc and continued rises in the precious metals and oil. Declining US interest rates add to the downward pressure (see Figure 3). Meanwhile, oil has risen to $107.90 and may go higher, and gold is nearing $1000 an ounce. So the slowdown is definitely happening, and it remains to be determined whether or not it is a recession. Some think that the likely outcome is a mild recession or something that just misses it – probably 1.5 percent change in GDP during Q1 and Q2 of 2008. But many think it will be much worse than this. See Figure 5 for the currencies and precious metals.

Is stagflation on the way, similar to the 1970s? Then, interest rates got to 20 percent

The effects of an increasing trade deficit from European imports from China and other countries include that the yuan, while increasing against the US dollar, has been falling versus the euro. As we go to press, the Chinese are discussing a one-off revaluation of the yuan to speed up the gradual 5–7 percent drift upwards of the past two years. Since November 2007, this drift upwards has accelerated. Among other things, it would stop the decline of the yuan against the euro. But it would also make US import prices higher. Chinese growth is slowing already.

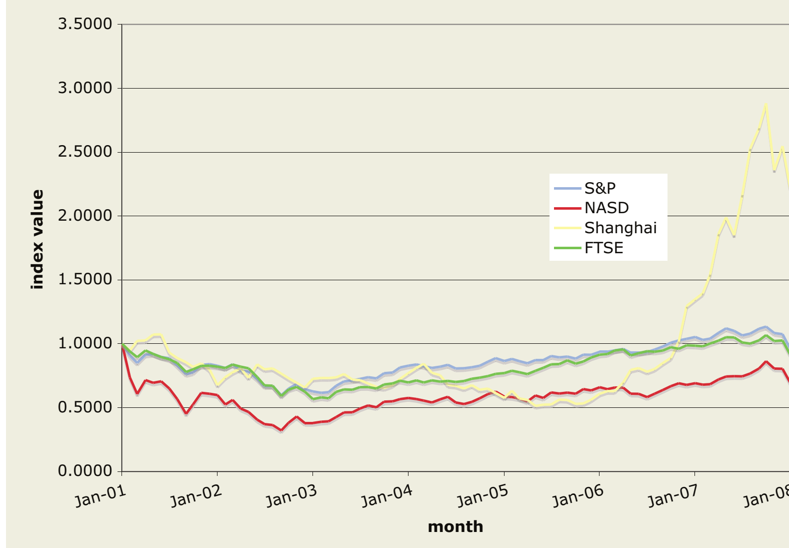
Is stagflation on the way, similar to the 1970s? Then, interest rates got to 20 percent. So there was a weak economy plus high inflation. 2008 looks different, with a weak economy with high commodity prices and a possible mild recession. The 1970s crisis was much worse, with a soft economy with rising prices. So we might expect inflation £5 percent and core inflation £3 percent. For a recession, one would expect 100,000–200,000 job losses per month. February 2008 saw about 63,000 jobs lost, the most in five years. And it would have been over 100,000 without the creation of new government jobs. The USA has never avoided a recession when the number of jobs has declined for two months in a row. So with the loss of 17,000 jobs (22,000 revised) in January 2008, the odds of a recession have risen. January's loss was the first since the loss of 42,000 in August 2003.

What is Warren Buffett thinking and doing?

The sage of Omaha regained the title of the world's richest person as Berkshire Hathaway stock rose 28 percent in 2007. At 22 times trail-

ing earnings and 1.7 times book value, Berkshire Hathaway stock, at $4500 for B shares and $135,000 for A shares, is not cheap but many of us like it as a long-term hold; see Ziemba and Ziemba (2007) for a long-term analysis, which shows that over 40 years Berkshire has had returns about double the S&P 500. As of the beginning of March 2008, Buffett thought the US economy was in recession. Despite the falling US stock market (see Figure 6) with the S&P 500 down 13.28 percent in 2008 to 1273.37 on March 10, he has been buying equities, averaging $75 million, on each trading day. In a CNBC interview, he said that "stocks are not cheap. As a group, they're not at some bubble price. But they go to extremes every now and then when they do go to extremes you have to be prepared to act."

Figure 6. Comparing stock indices 2001 = 1.



Purchases include Burlington Northern, Kraft Foods, Wells Fargo, and Johnson and Johnson. Sales include a $4 billion stake in PetroChina, with a 10-fold gain in five years.

Berkshire holds a $75 billion portfolio, with the largest holdings being Coca-Cola, Wells Fargo, Procter and Gamble, and American Express. While Buffett says he does not like derivatives, his main business is insurance, which is essentially put selling. His style, much like mine, is to try to sell options that expire worthless. Buffett has $4.5 billion in premiums from selling at-the-money S&P puts and on three other foreign equity indices – a dangerous trade usually – but the time to expiry of the non-exercizable puts is 15–20 years. So all he needs to be able use the proceeds for all these years and to expire worthless is for the S&P 500 and others to stay even over this long period. The puts have a notional $35 billion. The buyers, presumably insurers, seek minimum payoffs on special products guaranteed not to lose money. No margin was required, attesting to the great financial strength of Berkshire. Given the recent fall in equity prices, the $4.5 billion is now worth about $5.5 billion, so Berkshire is $1 billion behind; however, in the end the chances are very good that the short puts will go to zero. Other bets include $3.2 billion in junk bond premiums that these bonds do not default. Buffett's game, like mine, is to obtain premiums that are large relative to the risk, and have the risk contained with plenty of cash to weather the storms.

Summary

- All the subprime problems have not yet been dealt with
- No one knows how bad it will get or who next will disclose new losses
- Some measure have been taken:
  - Lower interest rates
  - 1 percent of GDP US tax relief. Stimulus of $165 billion is due to come in about June 2008.
- Accommodative Fed on money supply
- Stocks have low PEs and the bond-stock and option T-measures are good
- Still too much trouble for a large rally: much uncertainty
- January barometer suggests weak 2008
- Oil remains high, at $107.90 per barrel as of March 10, 2008
- Dollar remains weak and is pulling down the US and worldwide stocks
- Gold, silver, and other commodities are strong
- High volatility remains
- Effects of the US presidential election:
  - It will be fought over the economy and the Iraq war
  - If John McCain, the Republican nominee, wins, he has pledged that the Iraq war will continue until it is won, up to 100 years, so there will be large costs in money and lives. The Bush tax cuts, set to expire in 2011, will be extended unless the Democrats have an expanded majority in the Congress.
  - If a Democrat wins, then the Iraq war will be phased down, but how fast troops will leave is not clear, and the Afghanistan war is likely to expand. The tax cuts likely will be allowed to expire or even be reversed. More will be spent on health care.
  - McCain is the Republican nominee, barring his not being able to run. For the Democrats, Barack Obama is the 1.36–1.37 odds-on favorite to get the nomination, with Hillary Clinton at 3.95–4. So Obama is a large favorite, despite Clinton's wins in Ohio and Texas. For the next president, the odds are Obama 2.26–2.28, McCain 2.9–2.92, and Clinton 5.5–5.6 (all on Betfair, March 10, 2008).

REFERENCES

Roubini, N. (2006). Bob Shiller is sharply shrill … and the risks of a housing-led systemic financial crisis. Available at http://www.rgemonitor.com/blog/roubini/archive/2006–08/.

Ziemba, W.T. and Ziemba, R.E.S. (2007). *Scenarios for Risk Management and Global Investment Strategies*, Wiley.

Ziemba, R. (2008, March). Cutting through the hype on sovereign wealth funds. *Wilmott*, 38–43.

Ziemba, R. (2008b). The January barometer. *Wilmott*, 16–18.

FOOTNOTE

1. This column is based on a February 4, 2008 Finance Focus lecture organized by *Wilmott* magazine and 7city and sponsored by d-fine. Thanks to Rachel Ziemba for helpful comments on earlier drafts.

W