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# Northfield News

\*\*\* SPECIAL EDITION \*\*\*

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## Northfield Research and the Global Financial Crisis

By Dan dibartolomeo

Over the last month, global financial markets have been in the midst of a crisis of extreme proportions. Given that Northfield is in the business of dealing with matters of investment policy and risk, one might think we would be extremely busy dealing with our clients concerns about what to do in response to the crisis. Interestingly, the volume of inquiries from our nearly three hundred client firms around the world has been quite low. We attribute this lack of questions to two factors: first, our clients are inordinately busy trying to address the crisis on their own, and secondly Northfield has done a pretty good job of making the analyses we provide both relevant and understandable.

Given the extraordinary circumstances in which we all find ourselves, it seems worthwhile to review a few of the related research efforts and product enhancements that we have provided, *but which not all clients may be familiar:*

1. In changing portfolios to reflect variations in risk levels, the benefit of our actions must be weighed against the related trading costs. We feel so strongly about liquidity's being an overlooked aspect of portfolio management that we are *going to pro-*

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## Putting the Crisis in Perspective for Investors

By Dan dibartolomeo

One of the most difficult tasks for the asset management community in the current crisis is communicating to clients who are not investment professionals, exactly what is going on in financial markets and how things came to be as they are.

On September 30<sup>th</sup>, I received a question from a friend in Vermont on the nature of the financial crisis. I wrote a series of emails in response which have been consolidated below. I hope it will give our readers a few ideas of how they can communicate with their own constituencies.

### Question

If you have a moment, here's a question I keep returning to every time I hear pundits and prognosticators say the cause of the fiscal crisis is the sub-prime lending mess and/or the lack of liquidity in the market. This logic leads one to believe that solutions include purchasing bad assets or infusing capital into the system some other way. But, isn't the mortgage mess really just a symptom of the American tendency to live beyond one's means? The solutions mentioned above don't address what strikes me as a deeper, broader, and more culturally engrained problem – that we aren't able to pay for everything we want and then purchase. Following that logic, the term "crisis" is a misnomer as it implies a sudden (often unexpected) problem that can be remedied in a relatively

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brief period of time. Seems to me that the real way to solve this problem is for both the government and individual citizens to reduce the amount of debt they carry and to be realistic about their capacity to repay future debts they are willing to incur.

### Answer

I agree most people live beyond their means, but that's not the cause of the immediate crisis.

The immediate issue has to do with liquidity. Let's say you own a house that is valued at \$300K so that is what you think it's worth. Implicit in the valuation is the idea that when you decide to sell, you give the selling process the normal amount of time to find a buyer (typically several months). Let's also assume you have \$200K mortgage, which at 2/3 the valued value is lower than the typical mortgage.

Now let's assume that one of your children is kidnapped and the kidnapers demand a \$50K ransom within 24 hours. One way you could try to come up with the cash would be to sell the house, but given that you need to find a buyer, do the paperwork and get the cash in hand in 24 hours, you're going to have a very tough time finding a buyer for the house at \$300K. In order to get a quick sale, you have to offer a lower price to induce a buyer to come forward immediately to snatch up the bargain. If you can find a buyer in 24 for at least \$250K, you're OK. You lose some equity in the house, but you get your child back which is what you care about. But if you can't find a buyer in 24 hours for at least \$250K, you're stuck.

The US banking system has been in a similar position for many months. The banks hold lots of shares in packages of bad loans and an even larger number of loans that might go into default in the future. The value of these loans is certainly less than their face value, but how much less depends a lot on how fast you try to sort the problem out. If the banks could sort this out slowly over a period of years, they can hold the questionable loans and collect most of the money that they are owed. *There would be some big losses but nothing catastrophic.*

On the other hand, if depositors panic and withdraw their money from a particular bank, that bank has to sell the loans to other banks and investors at a big discount to come up with the cash needed. If our bank sells the loans off at a big enough discount in order to get immediate cash, the banks will lose so much money that the bank's reserves are wiped out, and the bank is out of business. *If the banks go out of business or are impaired, there will be no new mortgages so real estate prices drop even more, making the whole thing worse.*

The real problem is that when banks buy shares in packages of loans (called mortgage backed securities or MBS) instead of making individual loans one by one, they really don't make an effort to evaluate the creditworthiness of the loans. Instead, they depend entirely on the credit rating of the MBS which is assigned by a credit rating agency like Moody's or Standard and Poor's. Both Moody's and S&P did a horrible job of rating the credit worthiness of MBS over the past ten years. The problem is that since MBS shares are spread around among thousands of banks and investors, no one wants to pay the rating agency to do their work. *Instead, the mortgage broker representing the borrowers ends up paying for the rating, so the rating agencies have a huge business incentive to be optimistic.* Imagine if you went to a store and applied for a credit card, and the store relied on a credit report that you yourself provided on your creditworthiness!

Moody's did most of the rating of MBS and there were two major technical problems with their approach. The first was that almost all the data they had to study on residential mortgage defaults came from government records from the 1970s onward. There weren't any computerized records of earlier events. However, there has been no three month period in the last thirty five years when the average house price in the US has gone down. *All the analysis that was done assumed that house prices never go down. This is just wrong.* There were certainly periods prior to the 1970s when this happened like the Depression of the 1930s, and there have been many periods when particular regions of the country had house price declines (New England houses went down an average of 14% from 1981 to 1984). Over the past two years, house prices in Miami are down 30% (but are still 90% higher than in the year 2000!).

The second problem in the rating methods had to do with the idea of diversification. It was assumed that if the loans were from different geographic areas and types of houses, the lender was not putting all their eggs in one basket and hence it was safer than holding loans from just one type of property in one geographic area. *All else being equal this is true.* However, Moody's used a method called "diversity scores" to rate how well the risks were spread out in a particular group of loans. The diversity score method was deeply flawed and always has been. In 1998, I wrote a research paper on corporate loan packages pointing out those flaws, but it never got much attention. Here it is if you want to read it: <http://www.northinfo.com/documents/55.pdf>.

The longer term issue of how we got into this mess is really pretty simple. There are two root causes. The first is that in the US, different kinds of financial institutions

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(banks, investment houses, insurance companies) are all subject to regulation by different government agencies that have inconsistent rules. For insurance companies, the rules vary greatly state to state, with many states (including Vermont) being relatively lax. With the inconsistencies in the rules, there are lots of loopholes so that *if a particular kind of institution can't do a transaction because it is too risky, some other kind of financial institution probably can do it*. It got so lax that mortgage fraud via “cash back under the table” deals was commonplace. The overlapping rules also create an environment where financial institutions can play one regulator off another.

The second cause of the problem is more in line with your thinking. As a society and a government, we've put a lot of emphasis on the ability to have material prosperity. A lot of this was just terribly frivolous, but not all. Federal legislation encouraged mortgage providers such as Fannie Mae and Freddie Mac to effectively act as cosigners on mortgage loans for people with poor credit. It was considered a societal achievement that lots of relatively poor people were able to buy homes in recent years. This has contributed to decreased crime rates and improved schools in bad neighborhoods. Imagine if your home state of Vermont decided as an environmental measure to try to encourage people to ride buses instead of driving. *To do this, we remove the speed limit for buses on the interstate highways as of May 1*. Given that buses could now go from Burlington to Boston in two hours (at 100 MPH), lots of people would ride the buses. The environment truly benefits as the number of cars declines, and the bus companies are very profitable, so they make large contributions to political candidates to show their support. *Everybody will be happy until the weather gets snowy, when bus after bus crashes killing all the riders*.

Once regulator authorities decided to allow Lehman Brothers to go bankrupt, as opposed to arranging a “shotgun” wedding as they did with Bear Stearns and Washington Mutual, banks around the world *finally realized that their common practice of lending to each other with little regard to the creditworthiness of other banks was unsound*. Clearly, the government wanted to send a message to Wall Street investment banks that they could not expect to always be rescued from their own greed and stupidity. Inter-bank lending dried up and all banks were temporarily forced to cut back on making loans as they were no longer assured of being able to borrow from other banks whenever they were short on cash. You can think of the world banking system as a car engine with no oil. *Without the lubrication of inter-bank lending, the whole system froze up*. The rescue plan put in place by various governments around the world involves purchasing shares in banks so

everyone is confident that banks will be in financially sound condition, so that conditions normalize over time. Some countries like the United Kingdom are putting massive money into this effort, as their real estate prices have risen the most in recent years, so they are in the greatest danger of property price declines creating a serious general recession.

One other thing I should mention is that even with the additional financial strain of this mess, the national debt of the US, while huge is still well below average in terms of countries around the world. Even with some kind of big bailout for the mortgage crisis, the US national debt is only around 40% of annual GDP. Almost every European country is above that, and many like Italy are close to 100% (there are arguments that everyone in Italy cheats on taxes, so the situation is not as bad as it looks officially).

The other bright side of the situation is that large US corporations are swimming in cash. The long term historic average is that big companies keep about 8% of their assets in cash and equivalents. Today, US corporations have an average of over 20% of their assets in cash and equivalents. As such, corporate reliance on bank loans is very low, so problems in the banking sector shouldn't impact large companies (and employment) very much from tight credit. Of course, companies may suffer substantially from decreased demand from consumers who are less able to buy on credit.

The bigger long term problem for the US is that because of the cost of imported oil and manufactured goods, an unusually large fraction of our national debt is held by foreign citizens and countries. They do this because US government bonds are still safer than anything else available. If foreign citizens thought the US was no longer safe (very unlikely) interest rates could go up a lot in the US.

Our other big problem in the US is that the current scheme for Medicare and Medicaid is financially unsustainable, since it commits the federal government to pay for at least 80% of whatever health care costs eligible citizens choose to incur. There are no limits on how much an individual can spend as long as they are willing to handle the co-payment expenses (which are zero in many cases anyway). Hopefully, we'll end up with Federal government doing what states like Massachusetts and Vermont are already doing: getting every person enrolled in private health insurance, even if the government has to pay the premiums. At least the insurers and HMOs have procedures in place to control spending.

## Short Term Risk from Long Term Models

By Anish Shah

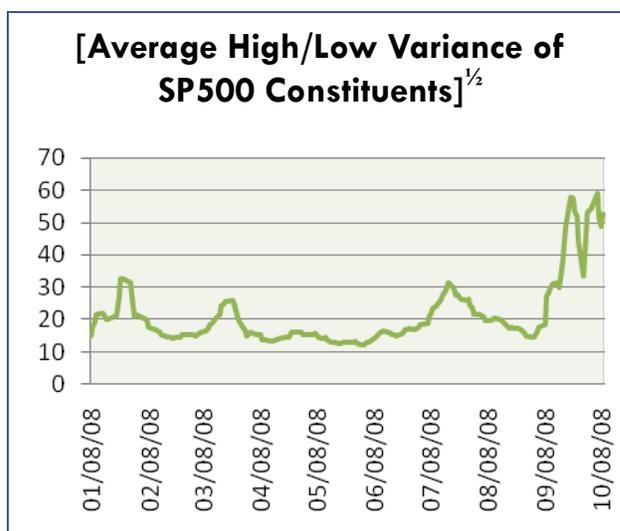
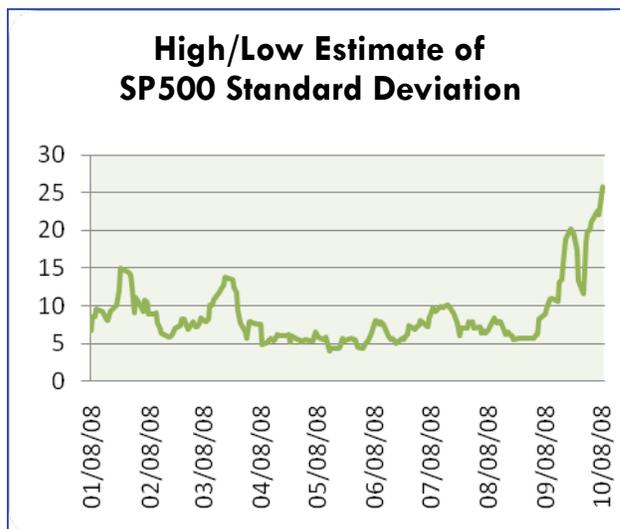
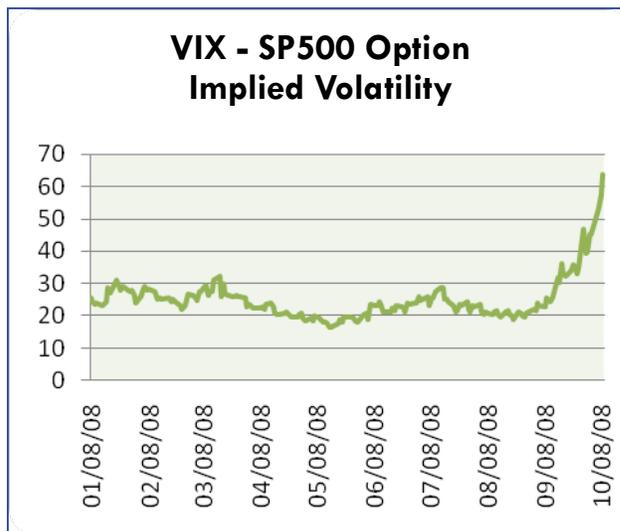
Forecasting long term behavior requires intentionally restraining news. A priori, one cannot know whether events are transient (more likely) or shifts in regime (less likely), so a sane model integrates innovations cautiously. For a long term investor, reacting to every passing bump is an exercise akin to driving cross country in a go-cart – the turnover would be battering.

Being well informed, however, is certainly advantageous. Indeed, the levered investor's longevity hinges on skillfully navigating passing bumps. Newsletter readers may be familiar with Northfield's US short term model<sup>1</sup>, in daily production since 1998. The model fuses instantaneous, forward-looking information - option implied volatility levels - to a blind-factor model to predict near term risk. Eighteen months ago, Northfield began research on short term versions of our full suite of models. The results for the Global equity and Everything Everywhere **multi-asset class** models are in testing; the others are soon to follow.

Can shortening a model's horizon be as simple as applying the usual process but on a recent history of daily data? Econometric issues are tricky but probably surmountable – daily returns exhibit serial correlation and require preprocessing, as we have done in our US short term model; correlation between markets trading at different times, e.g. Tokyo and New York, cannot be inferred directly and must be modeled; daily returns are non-normal, necessitating a change in the regression likelihood function. To forecast trending volatility, GARCH could be added. So why isn't this a good idea?

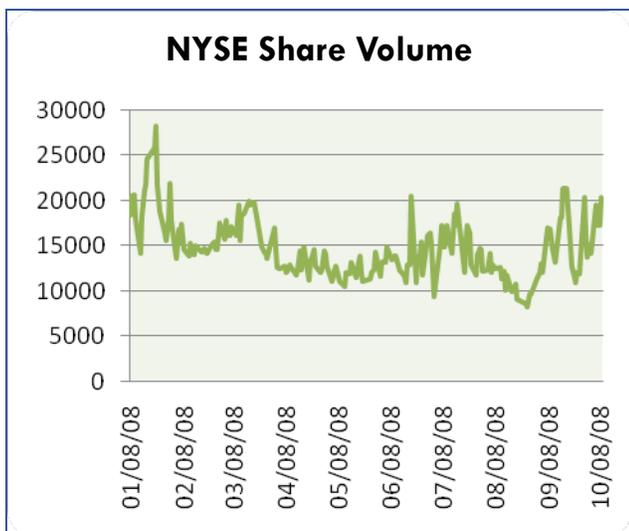
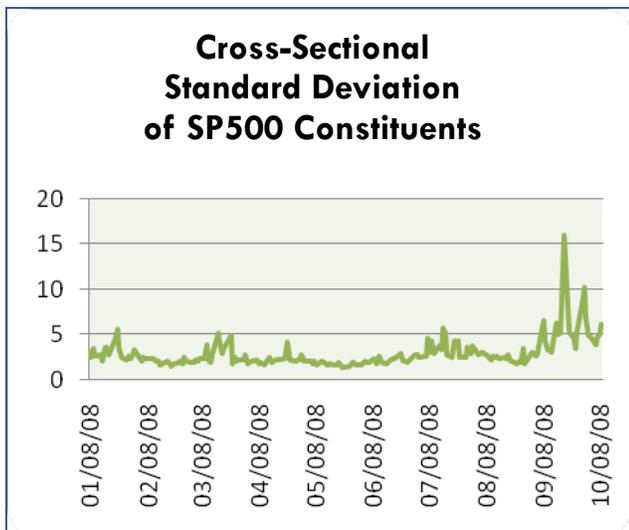
The richest information about current conditions isn't in the history of daily returns. It is in responsive live indicators: implied volatility, volatility estimated from intraday high/low prices, cross-sectional spread, trading volume. Available instantaneously or over a short (1 day) interval, these reflect market conditions and sentiment as of today.

A few examples:

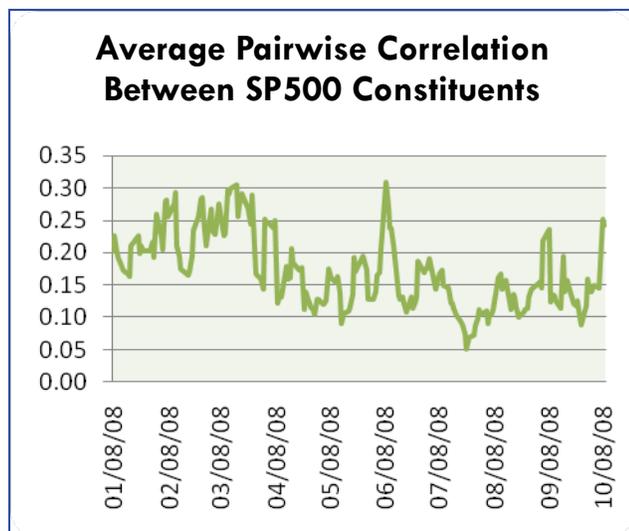


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(Short Term Risk, continued from page 4)



The average pair-wise correlation is easily backed out<sup>2</sup> from the variance of the index and the average variance of the constituents:



The question then is how to integrate the information into a model. The general framework, designed and used by Northfield, is described in technical detail, including an example, in a presentation on our website.<sup>3</sup> The process takes 4 steps:

- 0) Start with any risk model.
- 1) Add free parameters to the model to make it flexible. (Picture the seat adjustments in a car.)
- 2) For each market indicator,
  - a. Calculate its level today relative to the average over the model's estimation history. e.g. VIX at 60 today is 3 times its 5 year average of 20.
  - b. Find a related quantity that can be predicted by a risk model. e.g. VIX maps to the standard deviation of the S&P 500 portfolio.
- 3) Fit the free parameters to make the relative increases in the predictions match the relative increases in the market indicators. e.g. Since VIX is 3x its typical level, the parameters are fit such that the predicted standard deviation of the S&P 500 is, more or less<sup>4</sup>, 3x what it was under the original model.
- 4) Scale to account for statistical differences between daily and monthly returns.

The advantages of this approach are threefold: 1 – The model is in tune with the most current market information. 2 – Retaining the factors of the long term model keeps results comprehensible and intuitive. 3- The common structure shared by long and short term versions of a model opens the door for interpolating intermediate horizons.

As previously mentioned, Northfield is currently testing short-term versions of our global and EE models. The models will be available to clients once this has been completed to our satisfaction.

**Endnotes**

<sup>1</sup>The Short Term US Equity Model booklet is online at <http://northinfo.com/documents/5.pdf>

<sup>2</sup> $\text{var}(\text{index}) = \sum_{\text{constituents}} w_i^2 \text{var}(\text{constituent } i) + 2 \rho \sum_{i < k} w_i w_k \text{stdev}(\text{constituent } i) \text{stdev}(\text{constituent } k)$

<sup>3</sup><http://www.northinfo.com/documents/286.pdf>. The framework has expanded since the time of the presentation to include market indicators that aren't covariance measures, e.g. trading volume.

<sup>4</sup>The fit is inexact for two reasons: 1 – It involves a set of market information, e.g. VIX suggests the volatility of the S&P500 is 3x while the cross-sectional volatility of the Wilshire 5000 suggests it is 2x. 2 – The framework is Bayesian, and parameters can have a prior distribution.

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vide our monthly updated global equity liquidity model to all clients at little or no cost starting in January of 2009. The methodology for this model was presented in our September 2008 newsletter, <http://www.northinfo.com/documents/311.pdf>.

2. We have tried to do a good job of educating our clients on the extent to which extremely large magnitude returns ought be expected over short horizons in financial markets, particularly when liquidity is limited. Our March 2008 newsletter focused on this issue, <http://www.northinfo.com/Documents/285.PDF>. Also included are some very simple and pragmatic approaches to thinking about the “worst case” boundaries of portfolio risk.
3. Much of the seeds of the current crisis lie in the failure of both fixed income investors and the rating agencies to rationally consider that residential real estate prices can go down as well as up. A bright light was shown on this issue at our 2007 Key Largo conference in a presentation by Jonathan Reiss on real estate derivatives, <http://www.northinfo.com/documents/263.pdf>. He showed that house price futures contracts were predicting declines of up to 30% in some US cities during 2008. It is perplexing how the implications of this for mortgage-backed securities could be ignored by investors and the rating agencies.
4. One technical aspect of the debacle in the credit ratings of mortgage backed securities that has come up and been publicly criticized is the “diversity scoring” methodology used by Moody’s to assess the potential for correlated defaults within pools of loans. In 1998, Northfield was contracted by a client to evaluate Moody’s rating methods for collateralized securities based on pools of corporate loans. The study was very critical of the diversity scoring approach, and has been on our website for ten years, <http://www.northinfo.com/documents/55.pdf>. While it seems impolite to say “we told you so,” we do believe this is illustrative of Northfield’s often overlooked expertise in fixed income investing. Many of our clients are unaware that we produce an excellent model for

analyzing the risk of multi-asset class portfolios, including bonds, derivatives and hedge funds; we call it “Everything, Everywhere” or EE for short.

5. Since 1999, Northfield has produced a very short horizon risk model for US equities. The model incorporates information from option-implied volatility in a unique way. The insights from this model proved very useful during the aftermath of the September 11<sup>th</sup> tragedy, and we expect it will be equally valuable in the current crisis. A technical paper on our approach was published as a chapter in the textbook, *Linear Factor Models in Finance*, edited by John Knight and Steven Satchell in 2005. Copies of this chapter are available on request from Northfield, and an abbreviated version appeared in our newsletter in 2002, <http://www.northinfo.com/Documents/13.pdf>.
6. The current crisis again illustrates that *simply observing variations in returns over time is a woefully inadequate way to evaluate the risk of illiquid securities*. We have tried to make this point on a number of levels. For example, at our 2007 hedge fund seminar, Anish Shah presented the way in which historic volatility values for hedge funds can be adjusted to remove the damping influence of illiquid holdings, <http://www.northinfo.com/documents/235.pdf>.
7. On page 4 of this special newsletter issue is an article by Anish Shah describing the method by which we are able to adjust our existing risk models to provide short horizon risk forecast. To the extent that risk levels are changing rapidly, we are now able to deliver forecasts that are much more responsive to current market conditions. The relevant research work began in 2006 and was first presented at our 2007 client conference in Key Largo, and subsequently presented at our 2008 London seminar, <http://www.northinfo.com/documents/286.pdf>. Short horizon risk forecasts will be made available to clients around the end of 2008.

We hope this review encourages our clients to communicate their questions and concerns to us, and to take full advantage of many research papers, educational events and enhanced services we will continue to provide.

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