

During the current financial crisis, the functioning of the financial markets has been significantly impaired. This commentary presents and discusses two indices of financial stress, one international and one Swedish, which illustrate the impact on the financial markets during the current crisis. The capital markets form the starting point for the analysis, and the indices employ three broad stress indicators. The stress indices indicate that the degree of financial stress has declined sharply in 2009, but that it is too early to conclude that a stabilisation has taken place.

How has the stress on the financial markets developed? – An index-based discussion

Mia Holmfeldt, Anders Rydén, Lena Strömberg and Maria Strömqvist¹
The authors work in the Financial Market Division of the Financial Stability Department.

The capital market as a starting point

The present financial crisis has led various authorities across the world to adopt extraordinary measures. Central banks and governments have launched comprehensive support packages and liquidity support measures to ensure the functioning of the financial markets. In this commentary, we present an index that can be utilised as an uncomplicated measurement of financial stress. The index can be used as support for a discussion of how the function of the financial markets has changed during the most recent crisis, in relation to historical development. In this commentary, financial stress is defined as constituting deviations from the historical average. The focus is primarily on situations in which the index lies above the historical average, which is the case in periods of financial turbulence. However, there can also be negative repercussions for the markets if the index lies well below the historical average, as this may indicate that risk premiums are unusually low, which may lead to excessive risk-taking.

The financial system is particularly important as it provides fundamental services to the real economy. For example, companies and households must have access to funding to be able to produce and consume goods, which in turn forms the basis for economic growth. The market that makes this funding possible is the capital market. As the capital market is central to the financial system, it also forms a natural starting point for a financial stress index. The capital market can be divided up into the stock market and the credit market (consisting of the longer bond market and the shorter money market).

In order to create a general stress index that is easy to interpret, we have decided to proceed from only a small number of broad indicators, all with the same weight in the index. The advantage of weighing together the submarkets into one index is that this provides a collective overview of the level of stress on the market, as the factor-specific risk is reduced in the index. A further justification for giving all the submarkets the same weight is that this makes the index easy to interpret, thus forming an instructive and practicable basis for discussion. Basing the index on broad indicators allows us to ascertain the degree of financial stress on the capital market, to identify the submarket driving the index and, if necessary, increasingly focus the analysis on this market.

The index is divided along geographical lines, with one index for Sweden and one index for the United States, representing international conditions. The reason we have chosen the US market is that the focus for this commentary is the current financial crisis, which began and had its epicentre in the US market and subsequently spread to other financial markets.

¹ We are grateful for the assistance provided by Johanna Eklund and Johannes Forss Sandahl during the course of the project.

How is the stress index constructed?²

The stress index aims to identify the degree of financial stress by using daily historical data from the period 1 January 1997 to 25 September 2009. In general, the stress index is based on deviations from the historical average. The index uses ten years of data to calculate an historical average, from August 1997 to August 2007. During this period, Sweden and large parts of the rest of the world experienced both upturns and downturns in economic activity, which is a prerequisite if the historical average is to be representative.³ The following period up to and including September 2009, with the financial crisis, is then compared with this historical average.

All the stress indicators have then been standardised to make it possible to compare them with each other.⁴ The normalised stress indicators are then weighed together to form an equally-weighted index. The level of the index will thus be interpreted such that when the value is zero the index is equal to its historical average and the financial stress level should consequently be regarded as normal. This does not mean, however, that there can not be individual markets that experience stress at the same time as other markets are stable. It is therefore of interest to also investigate the level of the components of the index to gain a clearer picture of the situation.

The two markets and their stress indicators

The stock market and its volatility

The stock market is an important source of funding for companies, either through IPOs or new issues. The stock market also provides updated information in the form of transaction-based prices. Market information can often be important for the valuation of other instruments, for example credit derivatives. This link between the stock market and the credit market shows that disruptions on the stock market can affect other important markets. There are several ways of measuring disruptions on the stock market. One of the most common measures is volatility⁵, which we have chosen to use as a stress indicator.

The credit market

The credit market is that part of the capital market that concerns borrowed capital. This market can be divided into two parts on the basis of the maturity of the loans, the short-term money market and the long-term bond market. The stress indicators on the credit market are calculated as the difference between a high-risk and a (relatively) risk-free asset. They thus represent a risk premium, that is the extra return that an investor requires over and above the risk-free interest in order to take a risk. An increase in risk premiums may be the result of an increase in the perceived risk or a decline in the propensity to take risk, that is the investors require a higher return to take the same risk.

The money market and the TED spread

The money market constitutes an important source of short-term funding for banks and disruptions to this market may therefore rapidly lead to consequences for the financial system. We have chosen to use the TED spread as a measure of stress on the money market. The TED spread is the interest rate differential between an unsecured interbank loan (Libor)⁶ and a Treasury bill. The spread thus shows the extra return that an investor requires to lend to a bank rather than buying a Treasury bill.

² An example of another index constructed to measure financial stress is the IMF's "Global financial stability map" in IMF (2009).

³ A notable feature of this period is, however, that the risk premiums were, in an historical perspective, unusually low between 2004 and 2007.

⁴ The standardisation has been performed by subtracting the historical average from the observations and dividing by the historical calculated standard deviation.

⁵ For the international market we used the implied volatility index VIX. VIX measures the expected 30-day volatility in the S&P index by using option prices. As there is no equivalent VIX index for OMX on the Swedish market during the period, we instead use historical volatility as a measure of stress in the Swedish index. Historically speaking, however, implied and historical volatility tend to follow each other fairly closely.

⁶ London Interbank Offered Rate. The interest rate on interbank loans in Sweden is designated Stibor (Stockholm Interbank Offered Rate) but the term Libor is used in the commentary to generally represent the interbank rate.

This spread can be broken down into two different components that both relate to the expected average policy rate during the maturity of the loan (OIS).⁷

The first component consists of the spread between the Libor and the OIS. As the Libor is unsecured, there is a risk that investors will lose their investments. There is also a risk that investors will need the money they have invested before the loan matures. The spread between the Libor and the OIS therefore compensates the investors for these credit and liquidity risks.

The second component in the TED spread is the spread between the OIS and Treasury bills. Normally, both of these interest rates are considered to be risk free. The difference between them is usually primarily due to supply and demand and the flight-to-quality. In periods of uncertainty investors want high-quality collateral which increases the demand for, and thus the price of, government securities. Consequently, this also increases the difference between the expected monetary policy interest rate and the interest rate for Treasury bills. One example of this is that the interest rate for US Treasury bills was negative during the most acute phase of the financial crisis in 2008.

As both the Libor-OIS and the OIS-T-bill spreads tend to increase during periods of uncertainty, the TED spread constitutes an informative measure of the degree of financial stress.

The bond market and the bond spread

On the bond market, companies and banks borrow money for longer periods than one year. Together with bank loans, the bond market represents the companies' most important source of credit. The effective functioning of this market is therefore of great importance to individual companies and banks, and thus to the economy as a whole.

In the case of the bond market, we have also chosen to represent the degree of stress in terms of the market's risk premium. In the international index we use the differential between the interest rates for corporate bonds and Treasury bonds⁸, while for Sweden we use the differential between the interest rate for covered bonds and that for Treasury bonds. The credit risk relating to covered bonds can, unlike that for corporate bonds, be regarded as low. Covered bonds are, however, a central asset class in the Swedish financial system and the spreads for these bonds tend to covary with the spreads for products that carry a higher degree of credit risk. Covered bonds can thus be regarded as a good indicator of credit risk premiums in the Swedish stress index.

How has the stress on the financial market developed? Analysis based on the stress indices

International stress index

Figure 1 shows the international index and its three stress components. In the figure, the stress index (the green line) is the total of the three stress components (equity volatility, the TED spread and the bond spread) whose contributions to the total index are also shown.

The international index covers a number of periods of increased global financial unrest, for example the LTCM crisis in connection with Russia's financial collapse in the autumn of 1998, the dotcom bubble of 2000, the terror attack in the USA on 11 September 2001 and the Worldcom scandal in 2002. From the middle of 2003, the index reflects the period of calm with low uncertainty and abnormally low risk premiums that prevailed until the autumn of 2007, when the current financial crisis began. The index peaked after Lehman Brothers went bankrupt in September and began to return to lower levels in early 2009. It is, however, still at levels that correspond to those in previous periods of financial stress.

⁷ Overnight Indexed Swap. The OIS is an interest rate swap in which the flexible element is tied to a one-day interest rate.

⁸ Merrill Lynch BBB rated Corporate Bond Index

In the autumn of 2007, all of the components increased (in relation to their historical values). All of the components have contributed to the increase in the index during the current financial crisis, but the predominating factor has varied over time. Initially, the index was mainly driven by the increasing TED spread, while the bond spreads and volatility on the stock market remained at relatively low levels. However, as the crisis worsened and in connection with the bankruptcy of Lehman Brothers the bonds spreads and equity volatility began to rise. The crisis, which was initially an acute liquidity crisis, gradually became more of a crisis in the real economy with increased credit risk. Figure 1 shows that the level of the bond spreads continued to be high, while equity volatility declined at a faster rate.

The TED spread was the predominant factor until November 2008 when it began to fall back to levels close to the historical average. There are several possible explanations of why it is the TED spread that has fallen. One explanation may be that several guarantee and support programmes have been launched for the US money market at the same time as the supply of Treasury bills has increased, and this may have contributed to lower risk premiums.⁹

The international stress index is now at a relatively low level. Of the three indicators included in the index, it is only the bond spreads that are at a level that is associated with high financial stress according to the index. This indicates that the financial markets are working better and thus that the financial crisis is no longer as severe. It should be pointed out, however, that the measures taken by the authorities, such as loans at long maturities from the central banks and government guarantee programmes for the financial sector, are contributing to this development. It may be sensible, therefore, to interpret the current low level of the index with a certain amount of caution.

Swedish stress index

Figure 2 shows the Swedish index and its components. As in the case of the international index, the stress index (the green line) is the total of the three stress components (equity volatility, the TED spread and the bond spread) whose contributions to the total index are also shown.

The development of the Swedish stress index is largely in line with that of the international index, especially during the current financial crisis. The correlation between the two indices averages 0.87 during the crisis period, compared to a correlation of 0.68 before the crisis. The positive correlation is due to the fact that the financial markets are integrated with each other and the increase in the correlation is due to the increase in the systematic risk (market risk) during financial crises.

During the current crisis, all of the components in the Swedish stress index have contributed to the substantial increase in the index. Initially, it was only the TED spread that contributed to this increase, while there were only moderate increases in equity volatility and the bond spread. However, as the crisis worsened the bond spread and equity volatility began to increase.

In contrast to the international stress index, where the TED spread has recently fallen below the historical average, the TED spread in Sweden is still at a relatively high level. It is interesting to note, however, that the Swedish spread between the OIS and Treasury bills is down to levels that can be regarded as normal historically. Consequently, it is therefore the Libor-OIS component in the TED spread that is contributing to the high level. Soultanaeva and Strömquist (2009) show that during the spring and summer of 2009 it was the credit risk premium that was the driving element of the spread between the Libor and the OIS.

The fact that the Libor-OIS component is higher for Sweden than for the USA indicates that Swedish banks are regarded as having a higher level of credit risk than their US competitors. There may be several explanations for this. One possible explanation is that Sweden entered the financial crisis later than the USA. The Swedish banks may thus have a larger percentage of their loan losses ahead of them. This applies in particular to the risk of future loan losses for Swedish banks in the Baltic region.

⁹ The supply of US Treasury bills increased from over USD 1.1 billion in July 2008 to over USD 2 billion in July 2009 (UST 2009).

At present, the overall Swedish index is at a level approximately in line with one standard deviation. There have been times, for example at the turn of the millennium, when the index was at higher levels than this. This has been for relatively short periods however. Figure 2 clearly shows that the current financial crisis has been much more severe than previous crises. It is therefore possible that it will also take longer for the situation to stabilise and before we can say that the crisis is over.

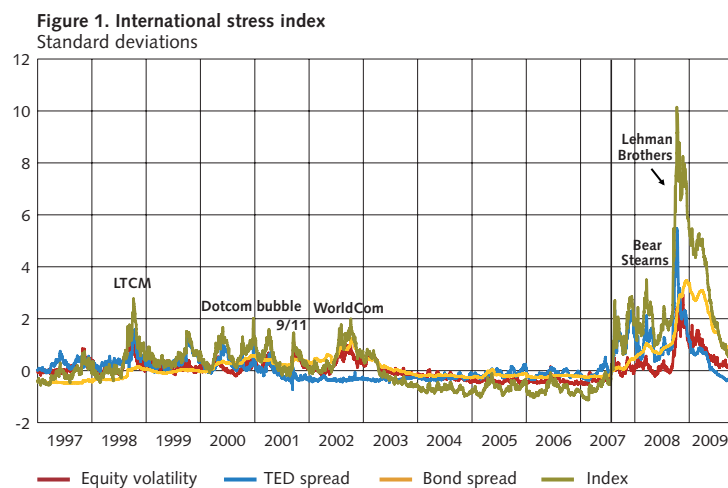
Stress levels falling

The stress index is intended to act as an overall and simple measure of the degree of financial stress. The index has been constructed on the basis of three components that represent three important parts of the financial system: the stock market, the money market and the bond market. Two indices have been calculated, an international index relating to the US market and an index that is specific to the Swedish market. The index period runs from January 1997 up to and including September 2009.

In the autumn of 2007, both the international index and the Swedish index rose to record levels. Initially, both of the indices were driven by the high TED spreads (in relation to their historical averages). In the Swedish index this is still the case. In the international index, on the other hand, the bond spread has predominated since December 2008.

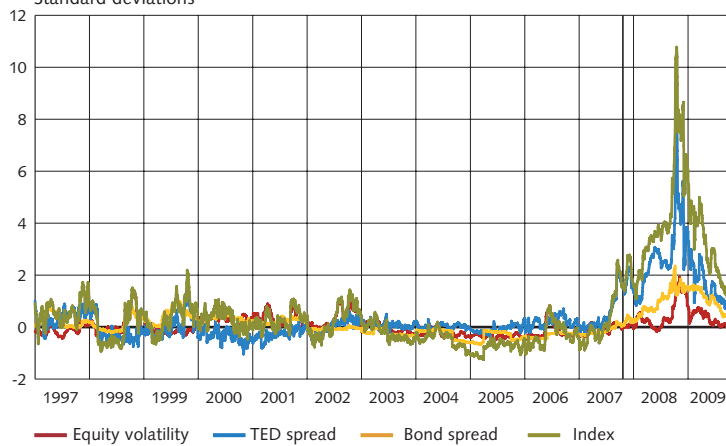
Both the Swedish and international indices are currently back to the levels they were at before Lehman Brothers went bankrupt. Although the indices show that the degree of financial stress has fallen significantly recently, the levels are still somewhat higher than the historical average. The historical average is, however, only a level that is used for comparison, it can not be ruled out that in the future the stress indices will stabilise at a level above the historical average despite the fact that the markets are once again working effectively. So, although the trend is positive, in the sense that the stress indices have fallen steadily recently, it is still too early to conclude that the situation has stabilised. Furthermore, a range of support measures are helping to reduce the level of stress on the financial markets, which means that this level may increase again when these support measures are phased out.

Figures



Source: The Riksbank.

Figure 2. Swedish stress index
Standard deviations



Source: The Riksbank.

References

IMF (2009), Global Financial Stability Report, October.

Soultanaeva, A. and Strömqvist, M. (2009), "The Swedish money market risk premium – experiences from the crisis", Sveriges Riksbank Economic Review, no. 3, forth coming.

U.S. Department of the Treasury, (2009), Monthly Statement of the Public Debt, UST.