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The perceived dangers of following the herd

In recent years, concerns have been raised that risk management techniques such as value at risk could induce similar trading patterns across banks and thereby increase the volatility of financial markets. Are these claims justified?

The past decade has witnessed a revolution in financial risk management. Quantitative techniques such as option pricing, delta hedging and value at risk (VAR) have become widespread tools within financial institutions. Concerns have been raised, however, that these techniques could induce similar trading patterns, or "herding," across banks, when external shocks hit the financial system. This raises the prospect of systemic risk, which arises when such disruptions could cause multiple failures in financial institutions. This article examines whether the generalised use of risk management systems can actually increase systemic risk.

VAR is a remarkably simple concept. It summarises the downside risk of a portfolio into one single number. VAR is forward-looking because it takes into account the current positions. For instance, JP Morgan Chase revealed in its latest annual report that its aggregate trading VAR is about $72m. Thus, under normal market conditions, meaning 99 per cent of the time, the bank should not lose more than $72m on its proprietary trading operations in one day. Because this is a dollar measure, it can be compared to the bank's equity, which was around $100bn at the time of the report. Based on this information, shareholders can then decide whether the trading risk is acceptable or not. Over time, the use of VAR has expanded to setting trading limits and even deciding the amount of economic capital necessary to support a business.

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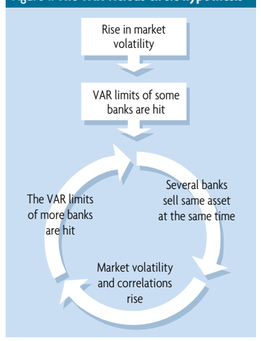
Commercial banks are currently subject to minimum capital requirements to cover their credit and market risk. Under the Basel Accord, the charge for market risk is effectively based on the banks' own internal VAR models, subject to some conditions. So, capital requirements for market risk have become risk-sensitive. This approach was put in place in January 1998, a year that also happened to be a tumultuous one in financial markets. The Russian default created a flight to liquidity, which led to the near-failure of the hedge fund, Long-Term Capital Management (LTCM). The ensuing market turmoil raised apprehensions of an imminent implosion in the financial system. So, this was an episode of systemic risk.

The vicious circle hypothesis

Some observers claimed at the time that the application of strict VAR limits led to position-cutting, which put additional downward pressures on prices. The argument is that a shock in volatility, such as the Russian default, increases the risk and VAR of outstanding positions. Faced with the choice of putting in extra capital or reducing positions, a number of banks sell the same assets at the same time, pushing down prices, and creating higher volatility and correlations. In turn, this exacerbates the initial effect, forcing additional sales. This VAR "vicious circle" hypothesis is described in Figure 1.

The troubling conclusion is that VAR tools increase volatility and are inherently dangerous. If so, the generalised use of risk management systems could cause higher volatility in times of stress, perversely making financial markets less safe than before.

Figure 1: **The VAR vicious circle hypothesis**



Herding

This vicious circle hypothesis is a form of "herding" in capital markets. Herding implies that investors within a group tend to buy (or sell) when similar participants buy (or sell). Herding can have other causes, however. For instance, it could happen when investors believe others within the same group have superior information.

Herding could also happen mechanistically. For example, price shocks causing losses could force some investors to liquidate their holdings to satisfy margin calls or adhere to trading rules. The herding effect due to VAR belongs to this second category of explanations.

Drawbacks to VAR

VAR is certainly not a perfect risk measure – indeed, its simplicity is also its weakness. Although it represents a cut-off point in the distribution of revenues that will not be exceeded at the prespecified confidence level, it says nothing about the size of losses once VAR is exceeded, in the tail of the distribution. Take again our VAR example of $72m at the 99 per cent confidence level over a one-day horizon. One day out of a hundred, the loss should be worse. It would be useful to know, however, whether the average loss in the tail is $80m or $8bn.

In theory, banks could report their expected tail loss (ETL), along with VAR. In practice, none does so. This is because there are simply too few observations in the tail to draw reliable inference. Or, the true risks may lurk behind scenarios that have not yet been experienced. This is why banks now run stress tests as a complement to VAR. Stress tests can use historical scenarios, such as the October 1987 stock market crash. Prospective scenarios should also be used, ideally taking into account the vulnerabilities of the current portfolio. Stress losses must be greater than VAR because they cover a longer period, typically a week, and extreme movements. Suppose, for example, that the bank reports a stress loss of $700m. As before, this number can be compared to the amount of capital carried by the bank.

Testable implications

The hypothesis for VAR-induced herding across commercial banks probably came from anecdotal evidence but has not been submitted to serious scrutiny. It could, however, be submitted to empirical tests. The argument requires most VAR-constrained traders to start from similar positions. Otherwise, they could simply cross their trades with little effect on prices. As Morris and Shin (1999) have stated, "One theme which has emerged in the subsequent debate on the performance of the risk management systems has been the criticism that many financial entities entered the period of turbulence with very similar trading positions."

Ultimately, positions cannot be directly compared as these data are proprietary and jealously guarded. Commonalities in positions, however, should create commonalities in risk measures and trading revenues. In other words, we should observe high correlations in trading revenues, which could point to potential systemic risk problems. If one bank loses money, it is likely that others will lose money at the same time, creating a domino effect that could imperil the stability of the entire banking system.

Because of their importance, these issues have started to attract increasing academic interest. A forthcoming book published by the National Bureau of Economic Research, a US economic research organisation, focuses on the risks of financial institutions and contains a number of relevant papers. Berkowitz and O'Brien (2005) had access to aggregated daily trading revenues of the seven largest US commercial banks between 1998 and 2003. This represents about 8,000 observations, which were collected in the course of the Federal Reserve's examination of these banks. Note that these data are confidential, cannot be redistributed and have been scaled to preserve the anonymity of the banks. The authors assess similarities in the banks' exposures to common risk factors, such as interest rates, credit spreads, equity and currency equity returns. They also report the correlation coefficients between trading revenues of these banks. A correlation of 1 implies perfect correlations, which means that the positions are basically identical. On the other hand, a correlation of 0 implies independence in trading revenues. In practice, the average correlation across trading revenues is only 0.09. This suggests that these banks have fairly different positions.

This dataset, however, does not provide disaggregated data within business lines, which are typically split into four different segments: fixed income; equities; currencies and commodities. In research conducted by the author in 2005, quarterly data for a sample of 11 US commercial banks between 1995 and 2003 were studied. This represents 385 quarterly observations on disaggregated trading revenues.

The paper finds substantial diversification across business lines. On average, the banks' diversified VAR is 40 per cent lower than the sum of VARs across the four segments. Suppose the VAR for fixed-income trading is $63m; for currency trading, $26m; for equities trading, $33m; and for commodities trading $18m. Adding these up gives $140m. It is unlikely, however, that the worst loss would occur at the same time in all four markets. The effects of diversification reduce this to $100m. In addition, the average correlation between the aggregate trading revenues of these banks is only 0.16. This suggests that positions across banks are fairly heterogeneous, which does not provide support for the VAR-induced herding story.

There are other reasons to doubt the vicious cycle hypothesis. The example of JP Morgan Chase is informative, as it is typical of the industry as a whole. Different types of businesses carry different risks and require different levels of economic capital. Banks decide which line of business they want to enter or expand from an examination of the trade-off between risk and expected returns. Proprietary trading, for example, has been a very profitable activity for JPM. The board decides how much economic capital should be carried on its balance sheet to support this activity and this choice is a function of its risk appetite. More capital is safer, but lowers the return on equity. The point is that, ultimately, the bank chooses its own economic capital. If this is well in excess of regulatory capital, then the regulatory VAR constraint is not binding and irrelevant.

Furthermore, an exogenous sharp increase in VAR requires banks to use fast-moving VAR models, such as time-series models that closely track volatility changes. Such models, however, are not allowed by the Basel rules, which require a minimum window of one year for measuring risk. As a result, an exogenous shock, such as the Russian default, will increase VAR only slowly. This is as it should be, because volatility shocks are mean-reverting. In other words, the one-day volatility forecast can bounce around a lot, but the ten-day average volatility forecast is much more stable. The longer horizon is more relevant, however, because the bank must carry enough capital to cover losses over at least a ten-day period. So, the smoothness in VAR models required by the Basel rules is justified.

Overall, we seem to have no evidence linking the VAR capital charge of commercial banks to herding in financial markets. Perhaps other players, such as investment banks or hedge funds, could be implementing fast-moving VAR models that cause limits to be hit, leading to global price effects. This remains to be examined, however. Again, herding requires these investors to start from similar positions.

Implications for Basel II

So far, the discussion has focused on market risk. A more important aspect of this debate, however, is its implication for credit risk. Regulators are moving towards risk-sensitive capital requirements for the credit risk charge. Under Basel II, to be implemented after 2006, the credit risk charge will reflect the probability of default. During a recession, however, defaults increase in frequency, which should increase the credit risk charge at precisely the time when the bank's available capital decreases as a result of credit losses.

The concern is that the design of such capital requirements might create negative effects during a recession by inducing banks to tighten credit as credit risk and the probability of default increases. This prospect of procyclicality is an important issue facing bank regulation today. This is particularly important because credit risk accounts for a much greater proportion of the capital requirement of a commercial bank than market risk. Thus, a flaw in the design of the credit risk charge will be much more harmful than for the market risk charge.

There is no easy solution to this problem. In the case of a recession, an increasing credit risk charge does reflect the greater risk. There is great benefit from highlighting this fact. Shareholders should know when there is more risk. To decrease procyclicality, perhaps the capital charge could involve a multiplier that changes over time, allowing lower capital ratios in times of recession. Alternatively, perhaps commercial banks will anticipate these effects, building greater capital reserves in good times.

Conclusions

VAR has undeniably brought transparency to market risk and has become used widely to measure, control and manage financial risk. While no risk measure is perfect, this is certainly better than the alternative, which is not to measure risk at all.

Increasingly, the VAR approach is used as the basis for risk-sensitive capital requirements. This is certainly better than the alternative of standardised capital requirements, such as the 1988 Basel rules. These early rules did not link capital requirements to the actual risks assumed and led to undesirable behaviour. Now, banks are penalised if they assume too much market risk. This provides the correct incentives to pay attention to risks.

Generally, VAR systems have helped financial institutions to improve risk management practices. No doubt this helps to explain the resilience of the banking system, even during the recent recession and ever-bigger corporate and sovereign defaults. A nagging concern, however, is whether the generalised use of these techniques could increase volatility in financial markets.

In particular, some observers have inferred a causation effect from VAR to the 1998 episode of systemic risk. Until recently, this link has not been subject to close scrutiny. Notably, the VAR vicious cycle hypothesis must imply commonalities in positions across VAR-constrained institutions. These common positions should be revealed by high correlations across trading revenues. Recent empirical tests, however, indicate that these correlations are generally low. There is a fair amount of diversification across banks and within banks across business lines. There is also no evidence that the post-1998 period has witnessed an increase in volatility, even though VAR systems are now widely used. Thus, arguments that bank trading and VAR systems contribute to volatility have no empirical support.

More generally, the topic of systemic risk is of great importance and should attract the attention of researchers. Real progress is only feasible, however, when based on empirical data. Disclosure is important for the stability of financial markets, as recently advocated by the Counterparty Risk Management Group II in its report *Towards Greater Financial Stability*. Disclosure is also important because it furthers our understanding of the dynamics of financial markets.

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