

## **Hermann Remsperger: Heavy tails and stable Paretian distributions in finance and macroeconomics**

Welcome address by Professor Hermann Remsperger, Member of the Executive Board of the Deutsche Bundesbank, at the Bundesbank Conference Centre in celebration of the 80th birthday of Professor Benoît B Mandelbrot, Eltville, 9 November 2005.

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Ladies and gentlemen, dear Professor Mandelbrot,

I have the great pleasure of welcoming you to the Bundesbank Conference on “Heavy tails and stable Paretian distributions in finance and macroeconomics” on the occasion of the 80th birthday of Professor Benoît Mandelbrot.

Nowadays, it is common knowledge that prices in financial markets do not always behave in the manner that normal distribution would predict. At the same time, modelling financial markets is one of the most important tasks a central bank has.

A thorough understanding of financial markets is necessary for appraising the transmission of monetary policy and thus maintaining price stability as well as for preserving financial stability. Either way, extracting market expectation is always an important part of the exercise.

Ultimately, we would like to estimate a distribution of all the relevant economic variables. But the complexity of the real world does not allow a meaningful estimation of the economic system as a whole. So far, we have been restricted to concentrating mainly on estimating the conditional expected value, knowing that information on dependencies and higher moments would be desirable.

Models of the monetary transmission channels would suggest that the central bank sets the short-term interest rate, which, in turn, influences interest rates over the entire maturity range, the exchange rate and, possibly, other asset prices. Through the different spending components, these financial variables affect output and prices.

Furthermore, the banking channel has to be taken into consideration. That means that the effect on the availability and terms of bank loans and subsequent impacts must be observed. This is especially true in a bank-dominated financial system such as the German one.

Standard models used to assess the impact of monetary policy decisions, like the expectation augmented Phillips curve, need to model inflation expectations. It is normal practice to deduct a certain formation of expectations from economic theory, which produces an estimation model. Lucas' rational expectations are probably the best-known example.

A different approach for extracting expectations concentrates merely on reading financial data – without the underpinning of a comprehensive economic model. Prices of financial instruments can reveal some expectations. And innovative products are widening the scope of this approach. Inflation-linked swaps, for example, allow the computation of an inflation curve similar to the yield curve, providing information on the expected path of inflation.

Market participants' beliefs will be reflected in investors' attitude towards risk. A widely regarded measure is the Bank for International Settlements' risk appetite indicator, which is derived from the differences between two distributions of returns: one implied by option prices, the other based on actual returns estimated from historical data.

Here, there is the question of finding an appropriate model and a fitting distribution. I shall return to the question of distributional assumptions in a few seconds.

Risk indicators may help us to determine, for example, whether historically low spreads on emerging market bonds at one period of time or low corporate bond spreads in another reflect market participants' increased willingness to take risks. Taking risks without an appropriate premium, might endanger the ability of some entities to honour their obligations.

This leads us directly to the field of financial stability which is a major concern for a central bank, both from a monetary and a real economy perspective. A stable financial system is of utmost importance for monetary policy, ensuring that monetary impulses have a reliable and predictable impact on the economy as a whole.

The various transmission channels in the financial sector are vital for the economy as a whole. A stable financial system is able to absorb financial or business cycle shocks even if and when they exceed the capacity of the individual market participants.

On the other hand, major price shocks or a credit crunch could harm the economic allocation mechanism which may cause severe real losses in production and growth. Moreover, the threat of crisis-driven excessive price movements on capital markets may push up risk premiums to very high levels. And this may further disturb the allocation mechanism.

With regard to Professor Mandelbrot's achievements in the analysis of financial markets, let me now comment a little further on the close relationship between risk models for the analysis of financial stability and the distributional assumptions for financial data. The crucial question is: which distributions fit financial data?

Since the work of Bachelier in 1900, the normality assumption seems to have been the dominant assumption for the last century, and that is still the case today, at least for many practitioners. But, in the early 1960s Professor Mandelbrot observed the behaviour of changes of speculative prices, which is much more erratic than the normality assumption would imply.

In 1963, Professor Mandelbrot wrote in the *Journal of Business* that "the empirical distributions of price changes in a speculative market are usually too peaked to be viewed as samples from Gaussian population. ... there are typically so many outliers. ... I replace the Gaussian distribution throughout by L-stable (stable Paretian) laws."

It is only from this point of view that we are able to understand what Noah and Joseph have to do with financial markets, as Professor Mandelbrot explained yesterday in his lecture in Frankfurt.

Studying Mandelbrot influences our understanding of financial markets. He warns that a restrictive distributional assumption for financial data – namely, the normality assumption – may lead to the underestimation of risk in the financial markets.

This conference will discuss new theoretical developments in Professor Mandelbrot's approach and present new applications in the fields of risk analysis, exchange rates and portfolio management.

Therefore, the conference will make a contribution to the ongoing development on Professor Mandelbrot's view on financial markets. Moreover, the conference aims to bring these highly academic issues closer to practitioners.

I wish every participant an exciting and stimulating time during the conference.