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Title: The lice thing wasn't on anybody's radar

Head paragraph: Mathematical Finance Inventions drove the worlds' upswing. Its shortcomings have send the world into a crisis.

People who listened to the full-bodied promises of financial mathematicians could have come to the conclusion that there is no more risk in money investing. The art of calculus has undergone such tremendous improvements that the tranching and packaging of any risk of financial markets was possible – thereby combining that risk with other risks so clever that never all will occur jointly. Practically, the financial world was seen as safe.

But now erverybody knows: This hope was delusive. It seems the abilities of mathematical finance have been overestimated by large – and this overestimation was one of the most important causes for the world economy being in its worst recession since the Second World War. According to famous economics historian Charles Kindleberger, overrated innovations are a central precondition for the emergence of a bubble. In the 17th century, this innovation was trading with the South Seas region, in the 19th century it was steel, and it was the internet in the 20th century. This time it was modern assets with collateralized sub-prime credits in the real estate markets, says economist Gunther Schnabl of Leipzig, who assessed risk models. Moreover, these new assets only were able to evolve because banks and rating agencies relied on those new risk models which said: Never ever will all borrowers default once at a time. But everybody knows: The models overestimated their safety.

In fact, mathematics has brought several financial risks under control in the past. It all started back in the 1950s with Harry Markowitz and his theory of portfolio selection. After some calculus he enriched the world with an idea: The one who wants to secure his money has to diversify it. Later on, economists used mathematics to enable investors to protect for the future – for example by having the option to sell their Volkswagen shares at a specific price

later on. Such option investments were considered as pure gambling until Fischer Black, Myron Scholes and Robert Merton invented a formula to assign reasonable prices to such options.

However, in the new model of recent years there remained much more risk than many people expected. This has several reasons: The models were wrong. Too few data existed to test the models. And nobody cared about the shortcomings.

That the models are wrong has been stated by critics for several years – even back in the days when everything seemed fine. The American Nassim Taleb created a whole book called "The Black Swan" and travels from speaking event to speaking event with the accusation that bankers have systematically underestimated the risks of financial markets. For example, they did not take into account that stock prices have repeatedly big outliers. They still used the Gaussian "Normal Distribution", although it was for sure and well-known that this distribution does not mirror actual returns appropriately (see Figure).

But according to statistician Svetlozar Rachev, Taleb is wrong with that. Rachev is doing research on price movements at the University of Karlsruhe and delivers the results to banks and asset management companies. "They have reacted to new insights a long time ago and have used better models", says Rachev. The only thing that was lacking in the risk models of the banks was a reliable understanding of different risks' interdependency.

The problem with that is easily demonstrated with a school children example: That Anna would have lice is for itself relatively improbable. The same holds true for Tom, who sits next to her. But given that Anna has lice, we can expect Tom to scratch his head shortly thereafter, too. This is similar to American home loans. If some home owner defaults on his credit, it is probable that his neighbor does so. This is a systemic risk, and this type of risk wasn't taken into account properly in the models, says Rachev. The reason for this is obvious: There are perhaps about 17.000 numbers in such a model. "Even today this poses a challenge for IT"

tells risk expert Uwe Gaumert of Bankenverband (German Banks Association): "Especially if all assets of a big bank need to be calculated."

Therefore, banks used simpler models and thought this would suffice as an approximation. It did not suffice. Perhaps risk managers or controlling personnel could have seen this in time, but there still was problem number two: The lack of enough data.

Normally the mathematicians calculating the models need the historic data from the past. Then they looked at what happened to the assets in recent declines of home prices and asked what would happen in their portfolio if they would fall again. This time, this did not work. First, the assets did not exist very long and therefore there was not enough insight into their prices' behavior. And second, there was a lack of data concerning declining house prices. The latter problem is because the last decline in house prices in America was in the 1930s, and only few data from that time exists. Risk managers did a work around on this problem by simulating an arbitrary decline in prices and testing the assets on that decline. These tests are called "stress tests". Apparently, the tests weren't stressful enough.

So, the bankers had shortcomings in their risk models. Now mathematicians know that this is not completely avoidable, as a model is always just a simplification of reality. This is why they keep urging that when one uses a model, he should not rely on it blindly. But this is just what happened in many cases: risk managers accepted the numerical output of their models widely without re-examination. This is happening quickly according to Burkhard Schwenker, Head of consultancy company Roland Berger: "One easily forgets the assumptions that are the basis for the models." (reference to interview on the right). Blinded by the numbers, nobody in the banks was thinking about whether it is a good idea to give credit to unemployed home-builders.

Models of mathematical finance have caused problems some time before. They were the baseline of hedge fund "LTCM" at which star economists Myron Scholes and Robert Merton were engaged as well. The fund failed in spectacular fashion. Back then, the financial

mathematicians refined their formulas instantly. But they did not prevent the current crisis therewith.

And again, risk managers are putting big effort into incorporating the now known risks into their formulas. But even the new formulas will cover only the risks that people can imagine – and everything else is omitted.

If one wants to be safe, one needs to try to omit mistake number three: To rely to heavy on the models. Sometimes one needs to ask what is behind the formula.