LLSMS2226: Credit and Interest Rate Risk
Ethics in Modelling

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1 Introduction

The aim of this work is to provide a short explanation of what caused the 2008 crisis. The explanations of the tools used and the reasons of their spectacular development.

Based on those information an opinion on the use of mathematics in finance will be exposed.

2 What did happen during the crisis ?

In the 90s several opportunities were to find. Indeed, trillions of dollars were ready to be invested into lending. This lending was to lend to borrowers all around the world. It included mortgages, corporations that needed financing, car buyers making a loan and also credit card owners that were running on balance on it. So, the financial world was just begging to put a number on the correlation between assets to be able to price.

A man succeeded to do this. This man was David X. Li. He is a mathematician from China who went to the Nankai University. After his studies he left the country to go to North America. There, he followed another master, in actuarial science. He then got a PhD in Statistics.

Li solved the problem in a very clever way. Indeed, He came up with a way to model default correlation and this without even looking at historical default data. Therefore, he used the market of CDSs (Credit Default Swap). He used the data that was created by this market. This was an ingenious was to by-pass the problem. Instead of having to assemble enormous quantities of data about the actual defaults, he could just use the historical prices from de CDS market. So, the model he created was based on prices on not on real world default data anymore. This was of course an important shortcut. Thanks to those prices he calculated the sum of all the correlation of a pool of loans. Only the end result, end sum, was important.

The formula of Li:

$$\Pr[T_A < 1, T_B < 1] = \Phi_2(\Phi^{-1}(F_A(1)), \Phi^{-1}(F_B(1)), \gamma)$$

But this approach backfired quickly. Indeed, the Wall Street immediately saw a whole new world which was revealing to them. The started to create big pools with enormous quantity of loans in it. Those are called Collateralized Debt Obligations or more famously "CDOs". They made tranches based on correlation. Those tranches divided the pool and allowed the creation of "safe" bonds with a risk-free triple A credit

rating. The investors in the first tranche were then first in line to get paid off. Thus, everything could be transformed into triple A bonds. This is what happened this technique was used by Wall Streets to create a bunch of brand-new triple A rated investments.

But in Li's formula, correlation was assumed to be a constant rather than something unpredictable. Peoples taught their CDOs were risk-free. In 99% of the case, they were but in 1% they lost everything. Another problem was also that the Li's solution looked at the CDSs prices to compute the correlation. But the CDS market was still a very young market. On the top of that the CDS appear during the soaring in prices of the house market. Thus, the default correlation was very low, and this biased the CDOs of course.

After the soaring of the house prices, the housing market dropped which caused the spark which embraces the markets.

A lot of people try to warn about this problem, for example Paul Wilmott. Managers didn't listen because they were making too much money, but they also didn't really understand the main problems of this equations.

3   Too much maths in finance ?

I see here two main problems emerge.

Firstly, Li's formula can be seen as an instrument. This instrument had a problem in his conception. This made a lot of issues arise. Thus, the newly created instrument was badly used by Walls Streets. I think the quants cannot be blamed for that.

In addition, there is a need for those products. For example, some international firms use derivative securities to hedge against currency risk.

Since there is demand and even need for those securities it cannot be denied. The mathematics in finance did not create derivative securities. It helped putting a price and trade them and even understand them.

Thus, those problems could and should be solved by building up a new model, which fills up the needs of everyone.

Secondly, at the time nobody cared what actually was included in the pool since it was too far away from the underlying bond. They only relied on Li's copula formula. This shows that not enough care was put in the analysis of the new equation of Li. And since the quants aren't the one making decisions. Reasonable decisions based on a good analysis could not be made.

Indeed, managers are taking the decisions, but they did not want to listen. They trusted the models blindly and this created the 2008 crisis. Thus, I think neither the quants, neither the mathematics in finance can be blamed for the crisis. I think if more care is put into the choice of managers, which understand the risk and challenges of models it will prevent future crisis's.

4 References

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