MF731 Homework1
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1. Case Study: Long Term Capital Management:

LTCM focused on the small imperfection of market, caught the tiny arbitrage opportunities and used its large amount of capital as well as respectively long-time period to accumulate the returns. LTCM didn't focus on the potential of a certain corporation, it managed their fund from a large picture, based on the mathematical theories. Also, LTCM had a really high leverage ratio, which enlarge any tiny changes they obtained from the market. Therefore, the major sources of risk which LTCM faced is the market risk.

In my opinion, the manager investing derivatives in different regions and using VaR are typical ways to had fully hedged risk just from the perspective of mathematics. All of their strategies were based on the assumption that history would repeat itself, however, the real world is not just math and models, the action of people and unexpected event would also happen. In this case, the Russian default and financial crisis in Asian Tiger were the unexpected things.

I think the downfall of the LTCM was not only due to the events and competitors, it depended too much on existing theory. Just like I wrote before, mathematical models are really great things in finance to help us measure the risk and invest. But all the models are assumed to be in an ideal market. However, the behavior of people can't be measured based on existing theories. In this case, the Russian government announcing default and people's behavior on buying the bonds of developed country can't be predicted. Before a more complete theory proposed in the future, good investors should have their own estimation on the real market, not just believe on the mathematical tools blindly.

2. BASEL:

(a)

15.2: The existence of deposit insurance protects the depositor from losing deposit, which will make the bank tend to take more risk because they don't worry about failing to pay back the deposit. Therefore, more risk leads to larger probability for bank to go bankrupt. From the perspective of regulator, it's necessary to build regulation to control the basic capital bank holds.

15.5: Yes, the financial institution is still exposed to credit risk. Although the current value of the swap has negative value, but there might be positive in a certain moment in the future. It's possible for counterparty to default. Under Basel I, the requirement of interest rate would be 0.5%.

15.11: In Basel I, the requirement of borrowing money for highly creditworthy companies and lower creditworthy ones are same. Banks tend to issue debt securities for them because the return of banks are relatively low for lending money to those good companies. In Basel II, the required capital is connected to the credit of companies. Then bank are willing to lend money to good corporation again.

15.15: The standardized approach uses external ratings in assessing corporations. In the IRB approach, the capital required is the VaR minus the expected loss. Under

foundation IRB, bank supply PD while LGD, EAD and M are supervisory value set by Basel Committee. Under advanced IRB, bank supply their own estimate of PD, LGD, EAD and M.

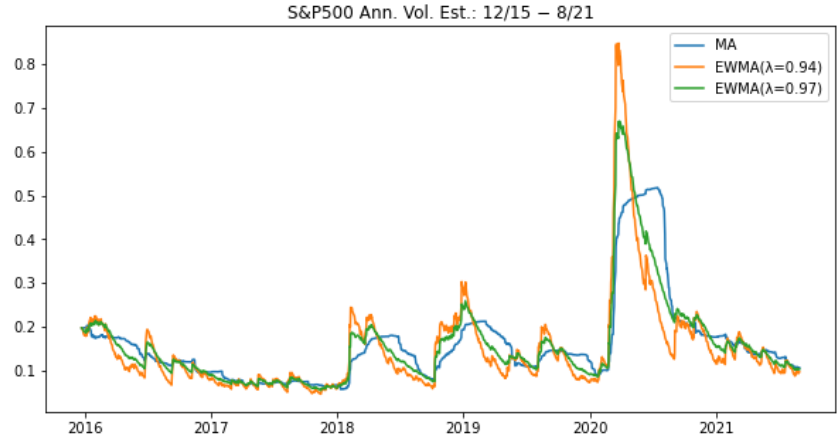
(b)

16.1: The three major components of Basel II are the calculation of a stressed VaR, a new incremental risk charge and a comprehensive risk measure for instruments dependent on credit correlation.

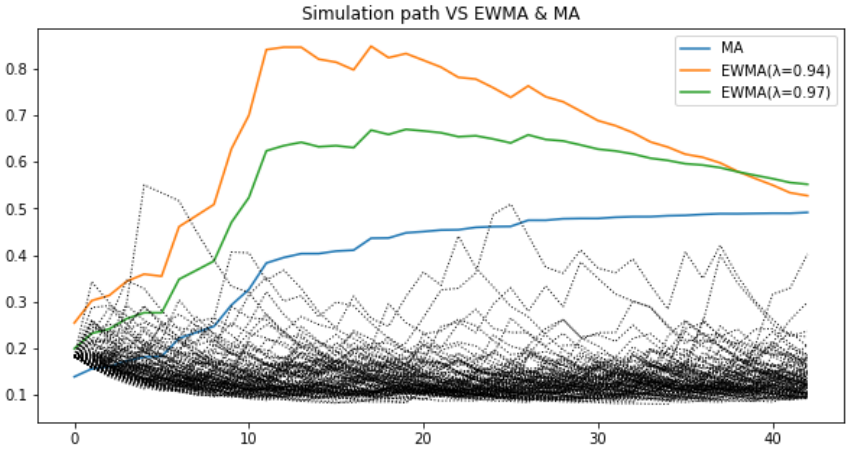
16.2: The six major components of Basel III are: (1) capital definition and requirements, (2) capital conservation buffer, (3) countercyclical buffer, (4) leverage ratio, (5) Liquidity risk, (6)counterparty credit risk.

3. Moving Average (MA), Exponentially Weighted MA and Garch Volatility Estimates:

(a) (For the details, see the code file ***problem3.ipynb***)



(b)



From the plot we can see that the simulation paths are around the MA and EWMA but much lower during 10~20. Maybe at that time the covid-19 situation in US reach a climax and there's abnormal volatility in US market.