Section 2

4. Different strategy we could use to execute the allocation and they have their own pros and cons. We can allocate CAD$1 billion in cash, i.e. invest in S&P 500 index through investing in S&P 500 ETFs or individual company stocks. We can also allocate CAD$1 billion to derivative products such as futures contracts and options on S&P 500 index.

Allocating in cash will increase the investment portion in Equities and has increasing correlation with US stock market. Risk is then tied to the US stock market. During stressed market or volatile market, it’s more challenging to execute trades at a desired price, potentially leading to increased transaction cost or delays in liquidating positions. Investing CAD$1 billion in cash also ties up liquidity, increasing the limit on the flexibility to other investments.

Allocating in derivatives such as futures contracts and options is considered as a leveraged approach. Futures contract can hold larger position with a smaller initial margin. For example, we can use 5% of the contract value CAD$50 million as initial margin to control the entire CAD$1 billion position. It allows for dynamic portfolio construction without tying up as much liquidity as cash investments. But leveraging can magnify profits and losses.

Section 3

7.

Database normalization is the process of structuring a [relational database](https://en.wikipedia.org/wiki/Relational_database) in accordance with a series of so-called [normal forms](https://en.wikipedia.org/wiki/Database_normalization#Normal_forms) in order to reduce [data redundancy](https://en.wikipedia.org/wiki/Data_redundancy) and improve [data integrity](https://en.wikipedia.org/wiki/Data_integrity).

The main goal of data normalization is to achieve a standardized data format across your entire system. This allows the data to be queried and analyzed more easily — leading to smarter business decisions.

Example, when analyzing the correlation between SPX, USDCAD FX and CL1M crude oil future price during GFC period, one needs to plot the historical time series of the three risk factors during GFC period. As they have different scale magnitude, one needs to normalize the three risk factors to achieve better comparison for the three risk factors on the same plot with similar scale.