**Black Scholes Option Pricing Model**

## Algebraic Manipulation

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# Normally Distributed Returns

Skipping the formal proof, we can also obtain the **Conditional Expectation**:



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* The logic can be understood as follows:
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## Using Historical Data

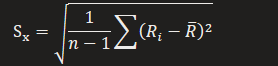
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* We can follow the three step process to determine the parameters from historical data:

Most likely, the data will be given in **monthly format**. We will first need to convert the data into a **continuously compounded format**,



Next, we can calculate the Sample Mean and Sample Standard Deviation using the **Calculator Function**,





Lastly, we convert them to **ANNUAL format**,





## Relation to Forward Prices

* Logically speaking, we would only enter a forward contract if we **expect** a positive payoff from it
* Thus, Expected Stock Price should always be **larger than the Expected Stock Price**

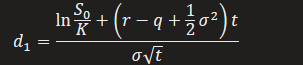


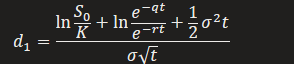


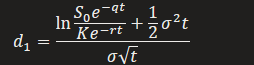


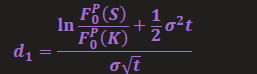


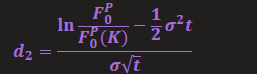
More generally, we can express it in the form of **Prepaid Forward Prices:**











|  |  |
| --- | --- |
| **Call Option** | **Put Option** |
|  |  |









