

This is probably the title

Arvindh Rao

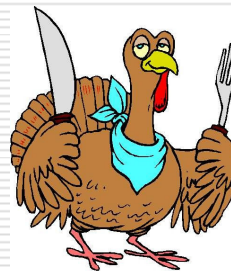
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## Agenda - Housekeeping

- OMG Quant(um) of Solace rocked!
- New Room
- Comp Sci Workshop
- Have a Happy Turkey Day
- $P(x) \leq 1$
- Trading Game



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## Agenda – A (not so) Random Walk

- Buy Low, Sell High = Trading...right?
- Manage your expectations
- Some simple models
- Further Thoughts

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## Words of Trading Wisdom

- The cynic knows the price of everything and the value of nothing  
~ Oscar Wilde
- The idealist knows the value of everything and the price of nothing  
~ no idea who...
- In the markets, Cynics and Idealists die

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## Turbulence and Uncertainty

- How much would you pay for Big AI?
- How much would you pay today if Mike told you that he'd sell it tomorrow for 8? (too much wine mike?)
- Now let's look at stocks...



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## Realistic Expectations

- Let's say Abdul-Aziz is a market maker ← works for NYSE
- Let's say Kwame is a Billionaire and wants to know if he should buy WMT
- Ehud, his advisor, crunches some numbers...

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## What is the *true* value?

- Stock could go up, but it could also go down
- If stock goes up, it goes up by 7→107
- If it goes down, it goes down 1→99
- Question: How likely is each?

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## Probability

- Let  $\omega$  be an event in a Sample Space: ex. all coin tosses are heads
- Probability is a measure  $P(\omega)$  of how likely  $\omega$  will happen
- $0 \leq P(\omega) \leq 1$
- Sum of the probabilities of all possible events = 1
- Only the events in the Sample Space can occur

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## Back at the Stock Exchange

- Ehud says stock's going up and going down is equally likely
- So, his *Expected Value* is:
- $E(\text{Stock Price}) = (1/2)*107 + (1/2)*99 = 103$
- Ehud asks Abdul-Aziz what his "Market is"

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## Bid-Ask

- Abdul-Aziz says my "bid" is 98 and my "ask" is 102
- Since your expected value is 103, you would buy the stock at 102
- A day later, stock goes up to 103
- Booyah!!! Kwame throws a partay.

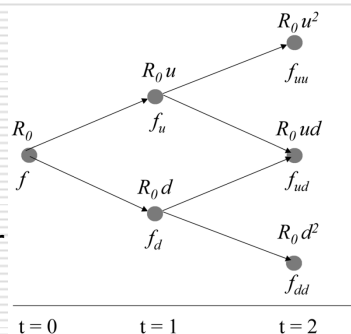
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## Binomial Model

- In the example with Abdul-Aziz, Ehud and Kwame, the stock could only go up or down
- This is called the Binomial model
- The price at any node depends only on the number of times a stock goes up or down



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## Price depends on Probability

- Let's say Ehud thought that  $P(\text{Up}) = .7$  and  $P(\text{Down}) = .3$ .
- $E(x) = .7*(107) + .3*(99) = 104.6$
- What are the outcomes if Ehud waits one more day? (Stock can go up 7, or down 1 each day)
- $E(x) = (106)*.7*.3 + (114)*(.7)^2 + (106)*.3*.7 + (98)*.3^2 = 109.2$

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## Now what about reality?

- Unlike Ehad, we don't *know* the probabilities, or how much stocks go up and down by
- We fall back on using historical data to *estimate* them
- We look at distributions of historical data to estimate:
  - Normal Distribution
  - Exponential Distribution
  - Log-Normal etc.

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## Example:

- Look at Daily S&P 500 Returns when it goes down
  - Average negative return : -1.82%
  - Probability of going down any day : .51
- Look at Daily S&P 500 Returns when it goes up
  - Average positive return : 1.4%
  - Probability of going up on any day : .49

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## Conditional Probability

- What is the probability it goes up tomorrow, given it was down today?
  - Average Positive return given down yesterday: 1.78%
  - Probability of up given down yesterday:  $64/114 = .56$
  
- What is the probability it goes down tomorrow, given it was down today?
  - Average Negative return given down yesterday: -1.92%
  - Probability of down given down yesterday:  $50/114 = .44$

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## SO?

- If you want to make an intelligent trade
  - Find where the market is at
  - Find out your expectation : Binomial Model used widely
  - Check to see if your assumptions are valid
  - If you are confident, enter trade and stick to your guns

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## Some extra thoughts

- When trading, your estimations are up against others
- Your numbers are as good as your assumptions
- Be aware of market environment
- Model can be as sophisticated as you want
- Live to fight another day

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