



# Simple Equity Trading

Creating an Equity Trading Strategy  
that Maximizes Risk-Adjusted  
Economic Value

# Trading “Bio Small” Stock

- Can trade the stock of a publicly-traded Biotech firm, “Bio Small”
- Shares are currently trading at 13.
- Expected Volatility of 30%
  - Based on data and trader’s experience and knowledge

# Upcoming FDA Ruling

- Ruling to allow (favorable) or disallow the sale of one of Bio Small's new drugs will be handed down in 3 months.
- Trader believes that the stock could be mispriced by the market and represent an arbitrage opportunity
  - Trader believes that the market views the chance of a favorable outcome of this ruling as 50%, and the outcome will add or subtract \$3
  - Trader has knowledge that leads him to believe that the probability of a favorable ruling is 55%.
- Although the FDA will make no public announcements before 3 months, trader will obtain further information and update the probability of favorable ruling
  - Probability of favorable ruling will increase or decrease each month by 3% with a 50/50 chance
  - If the Market goes up by one standard deviation more than average that month, the probability that the trader will obtain knowledge that increases the favorable probability increases to 55%.

# Trading Realities

- The trader has experience with this market and illiquid equity markets in general
- Block Trading – Large trades of this stock are in blocks of 100K shares
- Trading Cost is \$10 per trade
- Illiquid Market

# Illiquid Market

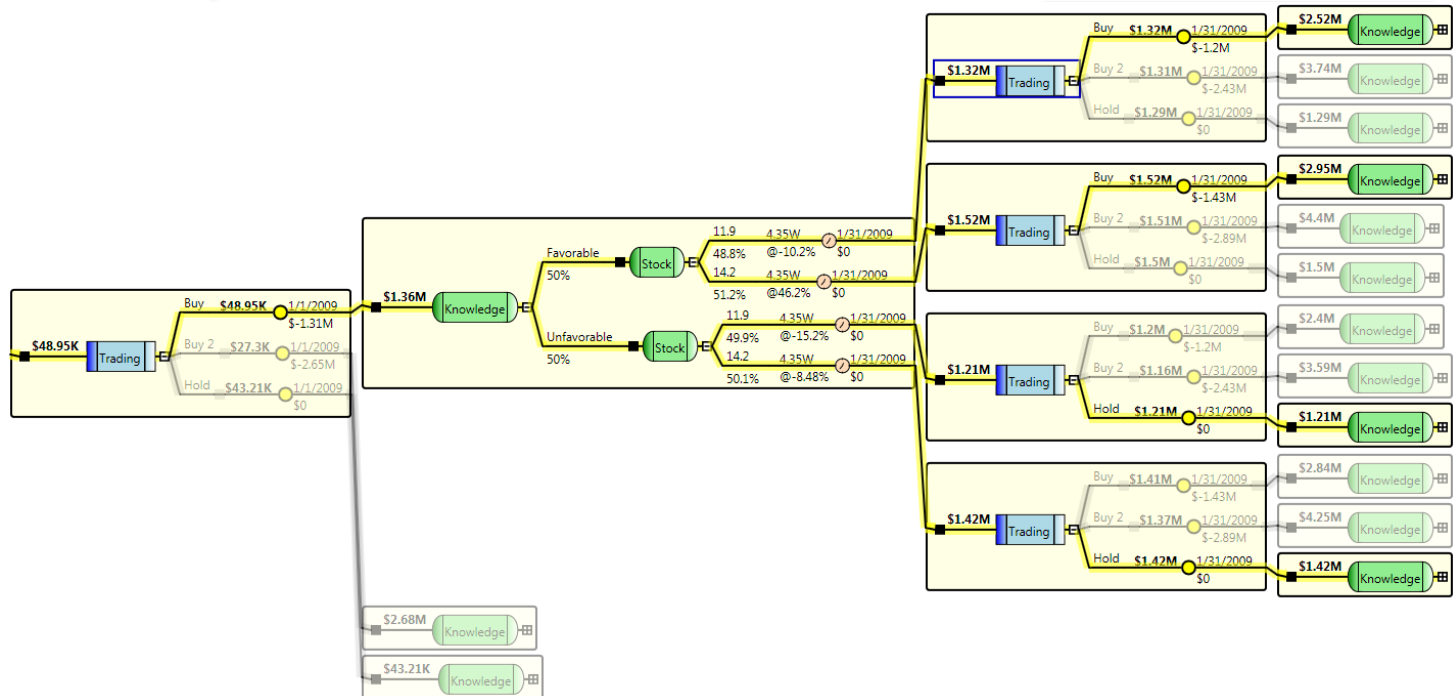
- Bid/Ask Spread is 2%
- Only one block can be traded at the bid or ask price
- After a trade, the bid/ask spread temporarily increases by an additional 2%
  - That is, a second block can be traded but only after a 2% temporary increase/decrease in price
- No reasonable price can be had by buying or selling more than 2 blocks per month

# Trading Model Details

- Monthly option to buy 1 or 2 blocks or do nothing (short sell option available)
- Bio Small stock price and information regarding the FDA ruling are modeled as uncertainties
- Desire trading strategy that maximizes risk-adjusted economic value

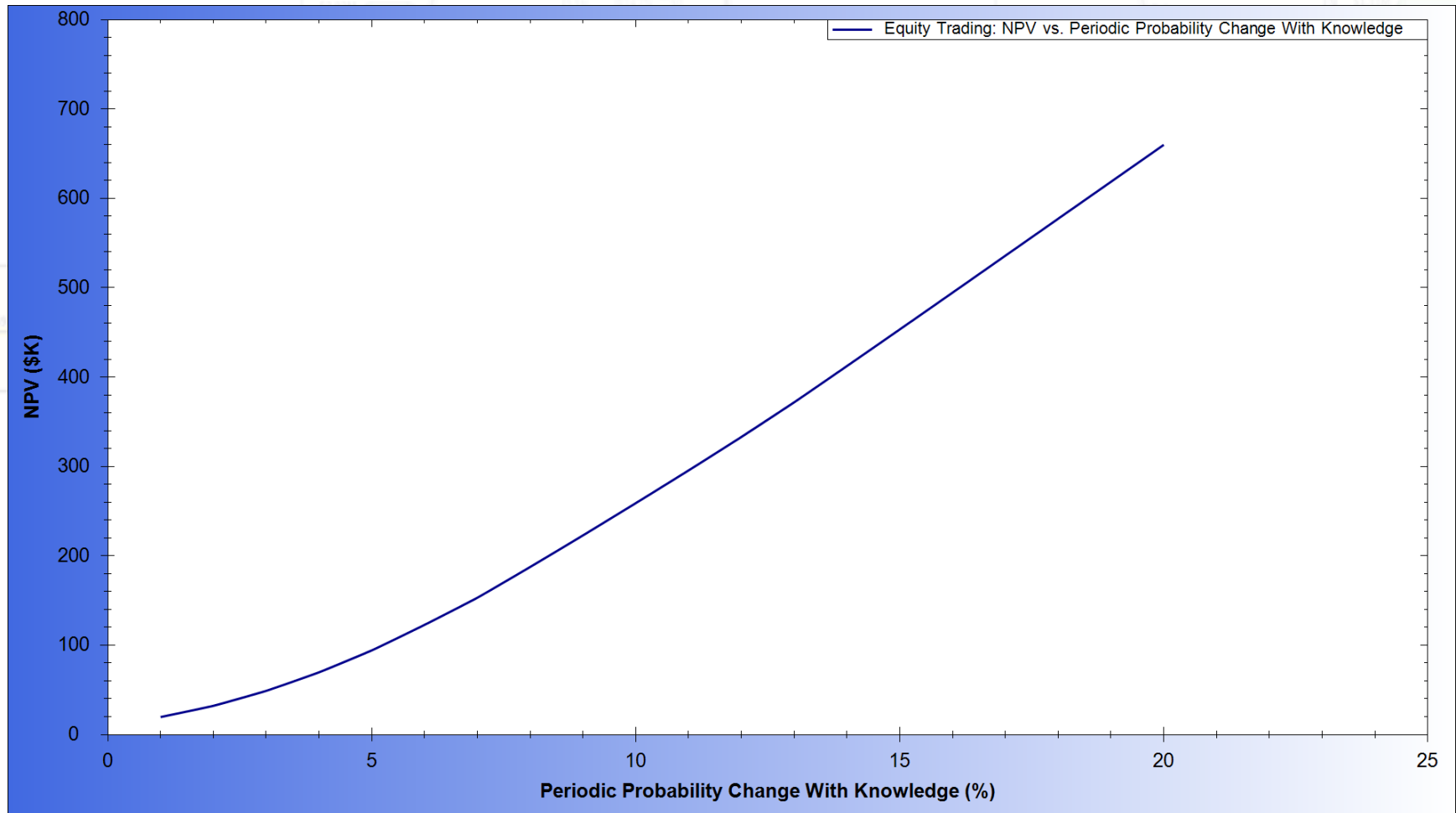
# Model Feedback Sample: Screen Shot – Start of Decision Tree

- Useful for investigating model in detail
- Highlights optimal-choice paths
- In the tree below, the left-most blue rectangle represents the first trading decision
- Today's optimal choice is to buy one block, resulting in an NPV of \$48.95K



# Model Feedback Sample: Queries

## NPV vs. Change in Ruling Probability





# Model Feedback Sample: Gradient Analysis

- A sensitivity analysis that calculates a change in risk-adjusted economic value with a change in a model property value
- Generally calculated with the optimal strategy and all the model properties at their original values
- Similar to a Tornado diagram but arguably more relevant
- The table below contains the gradient analysis of the three model properties that were given in terms of money.
- Notice that the NPV decreases with a larger initial price of Bio Small shares. The stock price matters because it changes how great the \$3 effect of the ruling is in percentage terms of the stock price.

Model Property	$d(\text{NPV}) / d(\$)$
Stock Price Increase with Favorable Ruling	\$45,627
Bio Small – Initial Price	(-\$6760)
Fixed Trading Cost	(-\$5.58)

# Model Feedback Sample: Gradient Analyses of Percentages

- The table below contains the gradient analysis of the model properties that were given in terms of percentages.

Model Property	$d(\text{NPV}) / d(\%)$
Bid/Ask Spread	<span style="color: red;">(-\$39.43K)</span>
Periodic Probability Change with Knowledge	\$17.30K
Initial Probability of Favorable Ruling	\$17.00K
Market Probability of Favorable Ruling	<span style="color: red;">(-\$14.26K)</span>
Bio Small – Volatility	\$13.20K
Bid/Ask Spread Increase with Trade	<span style="color: red;">(-\$5.19K)</span>
Probability of Favorable Knowledge with 1 Dev Market Rise	<span style="color: red;">(-\$0.61K)</span>
Risk Free Rate	<span style="color: red;">(-\$0.50K)</span>
Bio Small – Expected Growth Rate	\$0.09K

# Strategy that Maximizes Risk-Adjusted Economic Value

- Today's optimal choice is to buy one block.
- To continue to get most accurate optimal strategy over time, automatically or manually update new information into software.
- Full three-month strategy is dynamic and complex, strategy at one month is roughly:
  - If a favorable FDA ruling looks more likely:
    - Buy an additional block
  - If a favorable FDA ruling looks less likely:
    - Hold

# Model Feedback Sample: Queries

- The NPV and optimal trading strategy are sensitive to the current situation. For example, the initial trading choice (wait, buy 1 block, buy 2 blocks) changes depending on the probability of a favorable FDA ruling. A break-even analysis tells the trader at what initial probabilities to make various trades.

Favorable Probability Range	Optimal Initial Trading Choice
> 58.75%	Buy Two Blocks
53.75% - 58.75%	Buy One Block
< 53.75%	Wait

# Strategy Comparisons

- Useful for calculating risk-adjusted economic value added by analysis.
- Table below compares optimal strategy to a “Rule-of-thumb” strategy of buying one block when trader’s probability of favorable FDA ruling is higher than the Market’s and selling one block when trader’s probability is lower.
- The comparisons are in terms of risk-adjusted economic value, in both absolute and percentage terms.

Strategy	NPV	\$ increase to optimal	% increase to optimal
<b>Optimal Strategy</b>	\$48.95K	\$0	0%
<b>Rule-of-thumb Strategy</b>	\$30.41K	\$18.54K	60.97%

# Other Modeling Details

- Modeled time points for months: 1,2,3.
- All uncertainties approximated periodically with 2 possible outcomes.
- For Global Markets proxy, used historical data averages of S&P from 1926-2007 to get stable 'Price of Risk' and Volatility. Then set Risk Free Rate to solve for Average Growth Rate.
  - Risk Free Rate: 3.0%
  - Average Growth Rate: 9.2%
  - Volatility: 17.7%