1. Behavior Finance
   1. The Behavioral Finance Perspective
      1. Traditional finance vs. behavioral finance

* Traditional finance: Individuals are assumed to be risk-averse, self-interested utility maximizers. At the market level, prices incorporate all available and relevant information.
* Behavioral finance: Includes behavioral economics, investor psychology, behavioral science, experimental economics and cognitive psychology.
  + 1. Decision Making process
* Normative Analysis

Concerned with the rational solution to the problem at hand. It defines an ideal solution that actual decisions should strive to approximate.

Traditional finance assumptions about behavior as normative

* Descriptive Analysis

Concerned with the manner in which real people actually make decisions.

Behavioral finance explanations of behaviors as descriptive.

* Prescriptive Analysis

Concerned with practical advice and tools that help people achieve results more closely approximating those of normative analysis

Efforts to use behavioral finance in practice as prescriptive.

* + 1. Traditional finance perspectives on individual behavior

Rational investors are

* Make decisions consistent with utility theory.
* Revise expectations consistent with Bayes’ formula.
* They are self-interested and risk-averse, to have access to perfect information, and to process all available information in an unbiased way.
  + 1. Decision Theory (contrast to prospective theory)

Decision theory is focused on making the ideal decision when the decision maker is fully informed, mathematically able, and rational.

* Initial analysis focused on selecting the highest probability **weighted payoff**.
* Later evolution separated expected value, which is just the market price of an item paid by anyone vs. expected utility.
* Risk is defined as a random variable due to the one outcome that will occur from any probability-weighted analysis.
* Uncertainty is unknowable outcomes and probabilities.
* Subjective analysis extends decision theory to situations where probability cannot be objectively measured.
  + 1. Risk Averse

Expected utility theory generally assumes that individuals are risk-averse.

* Someone who is indifferent between 2 investments is called risk-neutral.
* Someone who prefers to invest in the uncertain alternative is called risk-seeking.
* Someone who prefers to invest in certain alternative is called risk averse.
  + 1. Challenges to traditional finance and the REM
* Decision making can be flawed by lack of information or decision-making process.
* People may prioritize short-term goals over long-term goals.
* Lack of perfect knowledge is the most serious challenge to REM.
* Wealth utility functions may not always be concave and people can sometimes exhibit risk seeking behavior.

Attitudes toward risk

We observe that people are not always risk-averse.

For example, people buy lottery tickets and insurance, in which expected utility is low.

For example, people exhibit risk averse when there is gain, while exhibit risk seeking when there is loss.

* + 1. Bounded Rationality

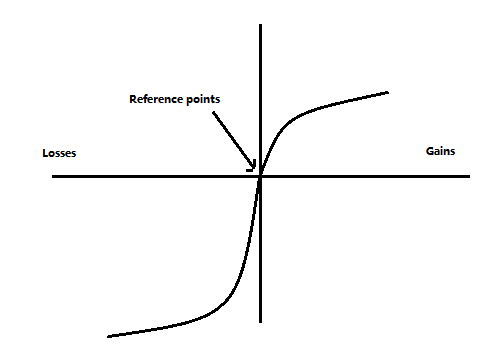
People are not fully rational when making decisions and **satisfice** when arriving at their decisions.

* Satisficing is finding an acceptable solution as opposed to optimizing.

Decision makers may choose to satisfice rather than optimize because of the high cost and time to find the optimal solution.

* When aspirations are reached/not reached, people tend to adjust the aspiration upwards/downwards.
* Decisions are made progressively until the goal is achieved; it’s a divide-and-conquer procedure.
  + 1. Prospect Theory

Prospect theory assigns value to gains and losses, instead of final wealth. The value function is defined by the deviations from a reference point and is normally concave for gains (risk averse), convex for losses (risk seeking), and steeper for losses than for gains (loss aversion).



Depending on the number of prospects, there are 6 operations in the editing process:

1. Codification: Investors identify and code outcomes as gains/losses and assign a probability.
2. Combinations: Investors combines those with identical values.
3. Segregation: The investors separates the certain and uncertain components of a gamble to gain better insight.

For example: (75% wins $100 + 25% wins of $150) = (100% wins $100 + 25% wins another $25).

1. Cancellation: Removes any outcomes common to two proposals.
2. Simplification: The investor will tend not to think in precise numbers. ($24.99 ~= $25)
3. Detection of dominance: Discard from consideration any proposal that is clearly dominated.

For example: 50% wins $500 dominates 50% winds $400.

* + 1. Studies Challenging the Effective Market Hypothesis

Fundamental Anomalies

* Size effect: small cap stocks outperform large cap stocks.
* Value effect: value stocks outperform growth stocks.

Technical Anomalies

* Moving Averages
* Trading Range Break (Support and Resistance)

Calendar Anomalies (January Effect)

* + 1. The Behavioral Finance Perspective

4 behavioral finance models that attempt to explain the behavior of individuals and markets.

* Consumption and savings
* Behavioral asset pricing
* Behavioral portfolio theory
* Adaptive markets hypothesis
  + 1. Consumption and savings

People may be affected by the following bias when establishing consumption and saving plan.

* Framing
* Self-control
* Mental accounting: People tend to classify their wealth into current income, currently owned assets or the PV of future income.
  + People will be more likely to use current income to meet current spending needs.
  + Any excess current income over current spending is saved and becomes currently owned assets. People are less likely to spend it.
  + Individuals are least likely to spend out of wealth classified as future income.
    1. Behavioral Asset Pricing

The behavioral asset pricing model adds a sentiment premium to the discount rate.

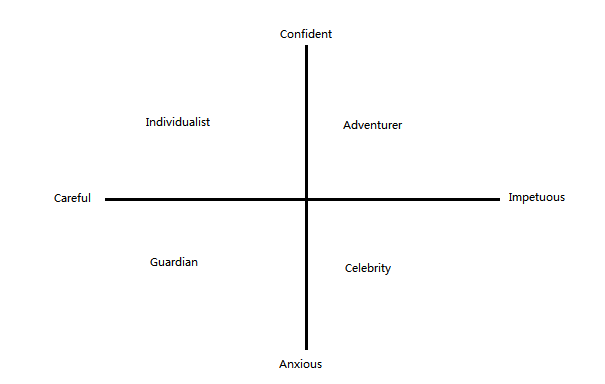
* + 1. Behavioral Portfolio Theory
* Based on empirical evidence and observation, individuals construct portfolio by layers. Allocation of funds to an investment of each layer depends on:
  + The importance of each goal to the investors.
  + Asset selection will be done by layer and based on the goal for that layer. The higher the goal is; the higher-risk assets will be selected.
  + The number of assets in a layer will reflect the investor’s risk aversion. Risk-averse investors will hold larger numbers of assets in each layer.
* If an investor believes they hold an information advantage, more concentrated positions will be hold.
* If an investor is **loss-averse**, the investor will hold larger cash positions to avoid the possible need to sell assets at a loss to meet liquidity needs.
  + 1. Adaptive Markets Hypothesis
* The relationship of risk and return is not stable. The market risk premium changes over time as the environment changes.
* Active management can find opportunities to exploit arbitrage and add value.
* No strategy works all the time.
* Adaption and innovation are essential to continued success
  + 1. Traditional Finance vs. Behavior Finance

|  |  |
| --- | --- |
| **Traditional Finance** | **Behavior Finance** |
| Unlimited prefect knowledge | Capacity limitations on knowledge |
| Optimize to achieve utility maximization | Satisfice |
| Rational decision making | Cognitive limits on decision making  (Bounded Rationality) |
| Risk aversion | Reference dependence to determine gain/loss |

* 1. The Behavioral Biases of Individuals
     1. Representativeness bias
* Definition: People tend to classify new information based on past experiences and classification.
* Consequences
  + Attach too much or too little importance to new pieces of information and have excessive turnover.
  + Make decisions based on simple rules of thumb and classification without thorough and more difficult analysis
* Solutions
  + Starts with a better understanding of the laws of probability and statistical analysis.
  + Ask questions to assess the probability, so that risk will be considered and diversification will occur.
    1. Illusion of control
* Definition: People tend to believe that they can control or influence outcomes.
* Consequences
  + Trade more than is appropriate as they believe they can control the outcome of a trade or are overconfident in their analysis.
  + Fail to diversify.
* Solutions
  + Participants should seek out opposing viewpoints to consider alternative outcome.
  + Keep records to document the thinking behind ideas and review results to see if they are correct or not.
    1. Conservatism bias
* Definition: People maintain their prior views or forecasts by inadequately incorporating new information.
* Consequences
  + Fail to update a view and therefore hold an investment too long.
  + Hold an investment too long to avoid the mental effort of updating a view.
* Solutions
  + The conservatism bias may be corrected by properly analyzing and weighting new information. People start with becoming aware of this bias. The more difficult the thought process, the more likely this bias will occur.
    1. Confirmation bias
* Definition: People look for confirming evidence while ignoring contrary evidence.
* Consequences
  + Consider positive but ignore negative information and therefore hold investments too long.
  + Under diversify as they become overly convinced their ideas are correct.
  + Set up decision process or data screens incorrectly to find what they want to see.
* Solutions
  + Starts with seeking out contrary views and information
    1. Hindsight bias
* Definition: People may see past events as having been predictable and reasonable to expect.
* Consequences
  + Overestimate the rate at which they correctly predicted events.
  + Be overly critical of the performance of others.
* Solutions
  + People should maintain and review complete records to determine past errors/successes.
    1. Frame bias
* Definition: A person answers a question differently based on the way in which it’s asked.
* Consequences
  + Choose suboptimal risk for their portfolio or assets based on the way a presentation is made.
  + Fail to properly assess risk and end up overly risk-averse of risk seeking.
  + Become overly concerned with short term price movement and trade too often.
* Solutions
  + People should not base their decision on realizing gain/loss. Instead a more appropriate analysis might compare current price to intrinsic value analysis.
    1. Anchoring and adjustment
* Definitions: When required to estimate a value with unknown magnitude, people generally begin by envisioning some initial default number (anchor) which they then adjust up or down to reflect subsequent information and analysis.
* Consequences
  + People will stay anchored to an initial number and do not adjust for new information.
* Solutions
  + Starts with asking questions such as “Am I becoming dependent on previous price?”, etc.
    1. Availability bias:
* Definitions: People estimate probability based on how easily the outcome comes to mind.
* Consequences
  + Choose a manager/product based on advertising or recalling they have heard the name
  + Limit investment choices to what they are familiar with, resulting in 1. Under diversify; 2. Inappropriate asset allocation
* Solutions
  + Maintain a carefully researched and constructed IPS; all decisions should be based on appropriate research and analysis.
    1. Mental accounting bias
* Definitions: People treat one sum of money differently from another equal-sized sum based on which mental account the money is assigned to.
* Consequences
  + Ignores the correlation between layers of the portfolio and results can be suboptimal from a traditional perspective.
  + Fail to lower portfolio risk by adding assets with very low correlation.
  + Overemphasis on income generating assets, resulting in lower total return.
* Solutions
  + Examine the entire client assets as a whole and consider correlation among all parts of the portfolio.
    1. Loss aversion bias
* Definitions: People tend to avoid losses as opposed to achieving gains.
* Consequences:
  + To avoid the pain of loss, an investor will tend to hold on losers too long but sell winners too quickly.
  + Trade too much by selling for small gains which increases transaction costs and lower returns.
  + Bearing too much risk by continuing to hold assets that have lost value.
  + If an initial decline in value occurs, then taking excessive risk in the hope of recovering.
* Solutions:
  + Maintaining a disciplined research process based on future prospects, not gain/losses.
    1. Overconfidence bias
* Definitions: People demonstrate unwarranted faith in their own intuitive judgments.
* **Prediction overconfidence** leads to underestimating risk and setting confidence intervals too narrow.
* **Self-attribution bias**, the combination of **self-enhancing bias** and **self-protecting bias**. By self-enhancing bias, people take all the credit for their successes. By self-protecting bias, they place the blame for failure on someone or something else.
* Consequences:
  + Underestimate risk and overestimate return
  + Under diversification
  + Excessive transaction turnover
* Solutions:
  + Establish long-term financial goals with a budget to assure adequate savings.
  + Maintain an IPS and Strategic asset allocation.
    1. Self-control bias
* Definition: People fail to act in pursuit of their long-term goals because of a lack of self-discipline.
* Consequences
  + Insufficient savings to fund retirement records.
  + Taking excessive risk to compensate for insufficient savings accumulation.
  + Overemphasis on income producing assets to meet shorter term distribution needs.
* Solutions
  + Establish an appropriate investment plan hand a budget to achieve sufficient savings.
    1. Status quo bias
* Definition: People do nothing instead of making a change.
* Consequences
  + Holding portfolios with inappropriate risk.
  + Not considering other, better investment options.
* Solutions
  + Need to educate people regarding reasonable risk/return combinations and the danger of overconcentration.
    1. Endowment bias
* Definition: People value an asset more when they hold rights to it than when they don’t.
* Consequences
  + Holding things too long because you are familiar with and provide some sense of comfort.
  + Fail to sell an inappropriate asset resulting in inappropriate asset allocation.
* Solutions
  + Ask question such as ‘Will I make the same investment with new money today?”
  + Establish a disciplined diversification program or IPS.
    1. Regret aversion bias
* Definition: People fear that some decision will turn out poorly.
* Consequences
  + Excess conservatism in the portfolio because riskier assets do at times underperform.
  + This leads to long-term underperformance and a failure to meet goals.
  + Herding behavior is a form of regret-aversion where participants go with the consensus or popular opinion. People tell themselves they are not to blame if others are wrong too.
* Solution
  + Communicate on the benefits of diversification, the outcomes consistent with the efficient frontier tradeoff of risk/return, and the consequences of not meeting long-term investment.
    1. Behaviorally modified asset allocation

|  |  |  |
| --- | --- | --- |
|  | Cognitive bias | Emotional bias |
| High wealth/low living risk | +/- 5~10% per asset class | +/- 10~15% per asset class |
| Low wealth/high living risk | +/- 0~3% per asset class | +/- 5~10% per asset class |

* 1. Behavioral Finance and Investment Processes
     1. Ballard, Biehl, and Kaiser Five Way Model



* + 1. Value vs. Growth – Bias

Halo effect, the investor transfers favorable company attributes into thinking that the stock is a good buy. A company with a good record of growth and share price performance is seen as a good investment with continued high expected returns. This is a form of representativeness bias.

1. Applications of Economic Analysis to Portfolio Management
   1. Capital Market Expectations
      1. 9 Problems in Producing Forecasts
2. Limitations to using economic data

* The time lag between collection and distribution is often long.
* Data revisions are not made at the same time as the publication
* Data definitions and methodology change over time.
* Data indices are often rebased.

1. Data measurement errors and biases

* Transcription errors
* Survivorship bias
* Smoothed data for illiquid assets

1. Limitations of historical estimates

* Regime change results in non-stationary data
* Arguments for long time spans of data:
  + Statistics requires it
  + Increases the precision of population parameter estimates
  + Parameter estimates will be less sensitive to the time span chosen
* Arguments for shot time spans of data:
  + Regime change and non-stationary data
  + Long-term data not available
  + Asynchronous data

1. Using ex post data to determine ex ante risk and return.

If the analyst is unaware of risk faced by investors in the past, they may underestimate expected risk and overestimate expected return.

1. Data mining and Time period bias

To avoid these biases:

* Examine the economic basis for the variables
* Scrutinize the modeling process for susceptibility to these biases
* Test the discovered relationship with out-of-sample data

1. Conditioning information

* Relationships between variables and economic conditions can vary.
* Analysts should account for current conditions in their forecasts.

1. Misinterpretation of correlations

* Causality (Misinterpretation of reason & result)
* Nonlinear relationships, third variables

1. Psychological traps
2. Model and input uncertainty

* Analyst cannot be sure that his predictive model is the correct one, or that his data are correct.
  + 1. Statistical tools for setting capital market expectations

1. Projecting historical data

* Definitions: Use historical averages as estimates of expected values. Use geometric mean for multiple periods; use arithmetic mean for a single period.
* Pros: Simple, easy to calculate; can be quite accurate when volatility is low.
* Cons: Can be misleading if historical volatility was high.

1. Shrinkage estimators

* Definitions: Weighted average of historical data and another, analyst-determined estimate.
* Pros: Reduces the effect of historical outliers; Especially important when the data set is small.

1. Time series analysis

Can be used to forecast means, variances. Useful when assets exhibit volatility clustering.

One model used to estimate the volatility for period t:

1. Multifactor models

Can be used to forecast means, variances and variances

Pros: Reduces the forecasting procedure to a common set of factors; Eliminates the noise present in a sample of data and ensures consistent forecasts given a covariance matrix.

Example – 2 Factor Model

* + 1. Discounted cash flow models – Grinold-Kroner Model

i = expected inflation

g = real earning growth rate

* + 1. Financial Equilibrium Approach

Equity risk premium assuming full integration

Equity risk premium assuming full segmentation

p = 1

Equity risk premium = integration degree% \* (ERP of full integration) + (1 - integration degree%) \* (ERP of full segmentation)

Covariance between the two markets:

* + 1. Economic analysis

Cyclical Analysis: Inventory Cycle

* Measured using inventory to sales ratio
* Typically lasts 2~4 years
* Due to inventory management practices, the overall trend is lower
  + 1. Emerging market economies

6 questions to ask before investing in emerging markets\

1. Does the country have responsible fiscal and monetary policies?

Above 4% deficit to GDP ratio means credit risk.

1. What is the expected growth?

Because of higher risk, expected growth should be at least 4%. Growth less than 4% means the economy growing slower than population.

1. Does the country have reasonable currency values and current account deficits?

Volatile currency discourages foreign investment; Current account deficit greater than 4% is problematic.

1. Is the country too highly levered?

Foreign debt greater than 50% is problematic.

1. What is the level of foreign exchange reserves?

Should be enough to pay foreign debt due within one year.

1. What is the government’s stance regarding structural reform?

Commitment to responsible fiscal policies, competition, and privatization encourages growth.

* + 1. 3 Approaches to Economic Forecasting

1. Econometrics (Economic models)

Pros:

* Once established, they can be reused to forecast future conditions.
* Can be made quite complex to model read world conditions.
* Can provide precise quantitative forecasts of economic conditions.

Cons:

* May be difficult and time intensive to create.
* Proposed model may not be applicable in future time period.
* Better at forecasting expansions; not reliable for forecasting recessions.

1. Economic indicators

Pros:

* Available from outside parties
* Easy to understand and interpret
* Can be adapted for specific purposes
* Effectiveness has been verified by academic research

Cons:

* Inconsistent: economic relationships change through time.
* Forecasts from leading indicators can be misleading.

1. Checklist approach

Pros:

* Simple to understand
* Can be changed over time

Cons:

* Requires subjective judgment
* May be time intensive to create
* May not be able to model complex relationship
  1. Equity Market Valuation
     1. Cobb-Douglas Production Function

The change in TFP is the Solow residual and can be determined by rearranging the above equation.

* + 1. Changes in TFP

An economy’s TFP can change over time due to:

* Changes in technology
* Changing restrictions on capital flows and labor mobility
* Changing trade restrictions
* Changing laws
* Discovery of natural resources
  + 1. H-Model for Emerging Markets
    2. Top-Down and Bottom-Up Approaches to Forecast EPS

There are 2 reasons why forecasting EPS with the 2 methods can yield different results.

1. Problems associated with the models used in top-down analysis

* Econometric models can be slow in capturing structural changes.
* Misspecification: Variables that explained financial relationships in the past might no longer be appropriate.

1. Manager bias incorporated into bottom-up analysis.

* A bottom-up analysis is usually based on manager expectations.
* Most managers expect their firms to outperform the industry average, aggregating individual manager expectations can lead to significantly overestimated industry expectations.
* On the other hand, they tend to be more pessimistic as the market begins to recover.
  + 1. The Fed model

The Fed model compares the expected operating earnings yield on the S&P 500 to the yield on long-term US Treasury bond:

Fed model ratio = S&P yield / Treasury yield

S&P yield = aggregate expected operating income / current price of the S&P

If model ratio > 1, equities are undervalued.

Criticisms:

* Ignores the equity risk premium; in other words, ignores the risk of equities.
* Ignores earning growth
* Compares a real variable (S&P yield) to a nominal variable.
* Rather than assume the 2 yields should be equal, analysts watch the ratio of the earning yield and treasury yield. When the ratio is above its long-term average, the difference between the 2 yields is historically high.
* Equity prices would be expected to increase, resulting in lowering the ratio of the 2 yields.
  + 1. The Yardeni model

d = a weighting factor

LTEG = long-term earnings growth

The earning yield from the model is compared to the market earning yield.

This model assumes that all earnings are paid out as dividends and there’s no growth.

* + 1. 10-year moving average price/earnings ratio

P/10-year MA(E) = current S&P 500 / 10 year average earnings

Both the numerator and denominator are adjusted for inflation using CPI.

To use this, analyst compares its current value to its historical average.

Criticisms:

* By using 10-year average earnings, it captures the effects of business cycle, but it is backward-looking. Using current or expected earnings could provide more useful information.
* It does not consider the effects of changes in accounting rules.
* Empirical studies have found that very high or low ratios have persisted, limiting its usefulness in forming short-run expectations.
  + 1. Asset Based Models

Tobin’s q = asset market value / asset replacement cost

= (market value of debt + equity) / asset replacement cost

Equity’s q = market value of equity / (market value of assets – market value of liability)

Critic:

* Both ratios are mean reverting
* Empirical studies have found that very high or low ratios have persisted, limiting its usefulness in forming short-run expectations.
* Replacement cost can be difficult to estimate.