The Behavioral Finance Perspective

This is the first release of our notes for the Level III exam. Please share any feedback you might have with us at support@ift.world.

1. Introduction

The curriculum for the Level I and Level II exams has discussed investment decisions and market behavior from the perspective of traditional finance, which assumes that individuals make perfectly rational economic decisions and markets are perfectly efficient at incorporating all available information into prices. The Level III curriculum asks candidates to put themselves in the position of advising individual (and institutional) investors on asset allocation decisions. As long as the traditional finance assumptions hold, the advisor will make forecasts for various (efficient) capital markets and investors will choose the mean-variance efficient portfolio that matches his or her return objectives and risk tolerance level. But what if these assumptions do not hold?

In this reading, we are introduced to behavioral finance, which has developed as an alternative to the traditional finance perspective by challenging the assumptions on which traditional finance is based. At the individual level, behavioral finance micro (BFMI) examines how individuals actually do make economic decisions – as opposed to how they are assumed to do by traditional finance theory. At the market level, behavioral finance macro (BFMA) examines whether capital markets are actually efficient. Ultimately, behavioral finance is not able to offer a complete alternative to the traditional finance perspective on how investors and markets behave, but it provides important insights and critiques that portfolio managers and other financial professionals must consider.

Sections 2 and 3 cover BFMI critiques of the traditional finance perspective on how individuals make investment decisions. Section 4 examines BFMI's alternatives to traditional finance with respect to how individuals build an investment portfolio and the BFMA's challenges to traditional finance with respect to how markets behave.

2. Behavioral Versus Traditional Perspectives

There are three approaches to study how individuals make economic decisions and how markets behave:

1. Normative, which tells us what *should* happen in an ideal world
2. Descriptive, which studies what *actually does* happen in the real world
3. Prescriptive, which attempts to explain how we can move from what happens in the real world to what we would like to see happen in an ideal world

Traditional finance is a normative approach that tells us how we can expect individuals to make economic decisions in an ideal world. The assumptions that provide the basis for the traditional finance perspective are reviewed in section 2.1.

Behavioral finances is a descriptive approach that examines how individuals actually do make economic decisions in the real world. In section 2.2, we learn how behavioral has challenged the traditional finance assumptions outlined in section 2.1.

Section 2.3 provides a very brief overview of Neuro-economics, which is a prescriptive approach that studies how the human brain functions in an attempt to explain and bridge the gap between how individuals should make economic decisions according to traditional finance and the sub-optimal decision-making that behavioral finance researchers have observed.

Section 2 – and in particular sections 2.1 and 2.2 – cover:

LO.a: Contrast traditional and behavioral finance perspectives on investor decision making

2.1 Traditional Finance Perspectives

Traditional finance makes six assumptions about how individuals make investment decisions. Specifically, individuals:

1. Maximize the present value of their expected utility subject to a budget constraint
2. Update probability calculations using Bayes' formula
3. Are perfectly rational
4. Are self-interested
5. Have perfect information
6. Are risk averse

2.1.1 Utility Theory and Bayes' Formula

The level of satisfaction that individuals derive from goods and services is known as utility. According to utility theory:

1. Individuals approach decisions with the overall objective of maximizing the present value of the utility they expect to receive within the constraints established by their budget. This implies that individuals limit their consumption based on their current income and are disciplined savers in order to maximize their utility in retirement.
2. Individuals follow four axioms (completeness, transitivity, independence, and continuity) when making any decision. While the details of each axiom are not important, they can be thought of as logical functions used to build a spreadsheet model.
3. Individuals approach decisions knowing a complete set of mutually-exclusive possible outcomes and have assigned a probability to each of them.

Traditional finance assumes that individuals act according to the utility theory model described above and, when given new information, use Bayes' formula (which is covered in the Level I curriculum) to update the probability of possible outcomes. As shown in Example 1, these assumptions may be reasonable for an individual picking colored balls out of urns, but it is extremely unlikely that these assumptions hold for individuals making economic decisions – or any other decision in the real world.

2.1.2 Rational Economic Man

The model for individuals who make economic decisions according to utility theory and use Bayes' formula to update probabilities is called Rational Economic Man (REM). REM has perfect information and is perfectly self-interested and perfectly rational in pursuit of its utility-maximizing objectives. In short, REM is the embodiment of the traditional finance assumptions about how individuals make economic decisions.

2.1.3 Perfect Rationality, Self-Interest, and Information

Traditional finance assumes the individuals (represented by REM):

1. are perfectly rational, which means that their decisions are entirely logical and never influenced by logical flaws or human emotions.
2. are perfectly self-interested, which mean that they consider only their own utility and never the well-being of others.
3. possess perfect information, which means that consumers will use all available information when making purchasing decisions.

As will be discussed in section 2.2.1, behavioral finance challenges each of these assumptions.

2.1.4 Risk Aversion

According to utility theory – and, by extension, traditional finance – individuals are assumed to be risk-averse, which means that they receive diminishing marginal utility from each additional unit of wealth. Graphically, risk aversion is represented by the concave utility function in Exhibit 2 (Panel B). The implication is that an individual will derive less pleasure when his net worth increases from $40 million to $41 million compared to the pleasure he received when his net worth increased from $1 million to $2 million. An individual who receives the same amount of pleasure from these increases in net worth is called risk-neutral and has a linear utility function (See Panel A in Exhibit 2). An individual who derives *more* pleasure from the increase in net worth from $40 million to $41 million compared to the increase from $1 million to $2 million is called risk-seeking and has a convex utility function (See Panel B in Exhibit 2).

2.2 Behavioral Finance Perspectives on Individual Behavior

As mentioned in the introduction to section 2, the traditional finance perspective is normative – it tells us how individuals *should* act in an ideal world. Behavioral finance is a descriptive perspective that challenges the assumptions of traditional financing by studying how individuals actually make decisions in the real world.

2.2.1 Challenges to Rational Economic Man

Recall from section 2.1.3 that traditional finance assumes that individuals are perfectly rational, perfectly self-interested, and possess perfect information. Behavioral finance challenges each of these assumptions.

Traditional finance assumption	**Behavioral finance challenge**
Individuals are perfectly rational	We can observe that individuals commit cognitive errors and are subject to human emotions, which lead to decisions that are not perfectly rational. For example, prioritizing spending on current needs over saving for retirement may not maximize the present value of our utility. (Note that cognitive errors and emotional biases are covered extensively in *The Behavioral Biases of Individuals*").

Individuals are perfectly self-interested	If this were true, people wouldn't donate to charity or exhibit any altruistic behavior. However, if such actions give someone utility, this is consistent with the assumption that individuals are self-interested.
Individuals possess perfect information	This is simply not true. Individuals cannot possibly obtain and process all available information when making economic decisions.

2.2.2 Utility Maximization and Counterpoint

Traditional finance uses indifference curves to analyze the trade-offs that individuals make when seeking to maximize overall utility. For example, a worker chooses the optimal trade-off between work hours and leisure hours that is consistent with maximizing her utility. Behavioral finance advocates that indifference curve analysis is overly-simplistic if it fails to account for external factors such as risk.

2.2.3 Attitudes Toward Risk

As noted in section 2.1.4, traditional finance assumes that individuals are risk-averse and therefore won't take any bet that has a negative expected value. However, we know that this assumption is not reflected in reality because millions of people choose to buy lottery tickets, which have a negative expected value. Additionally, some people purchase insurance to protect against very low probability events.

Traditional finance also assumes that individuals are risk-averse regardless of their level of wealth. However, behavioral finance researchers have observed that people's utility functions may change at different levels of wealth, which means that individuals may be simultaneously risk-averse when considering potential losses and risk-seeking when considering potential gains. The implication of this observation will be discussed further in the context of prospect theory, which is covered in section 3.3.

2.3 Neuro-economics

As mentioned in the introduction to section 2, traditional finances is a normative perspective and behavioral finances is a descriptive perspective. Neuro-economics is a prescriptive perspective that uses techniques such as brain imaging and chemical analysis to study what is happening when people make economic decisions and offer insight into how humans can get closer to becoming Rational Economic Man (REM).

3. Decision Making

Section 3.1 provides a review of the development of the normative decision theory used by traditional finance. However, as we learned in section 2, the traditional finance assumptions about how individuals make economic decisions are not a realistic reflection of how individuals actually behave. Sections 3.2 and 3.3, respectively, cover bounded rationality and prospect theory, which relax the assumptions made by traditional finance in order to provide a more realistic explanation of how individuals make economic decisions.

3.1 Decision Theory

When making economic decisions, people should ideally apply probabilities to various possible outcomes and choose the option that yields the greatest expected value. Over the years, academics have replaced the concept of pursing the expected value with maximizing an individual's self-defined utility.

3.2 Bounded Rationality

This section covers:

LO.c: Discuss the effect that cognitive limitations and bounded rationality may have on investment decision making

The concept of bounded rationality recognizes that, in reality, people do not always use the axioms of utility theory or behave according like the Rational Economic Man. Specifically, bounded rationality relaxes the assumptions that individuals are perfectly rational and possess perfect information. At some point, the cost of continuing to collect and process information becomes prohibitive and people rely on heuristics (also called "rules of thumb") to make decisions that are not necessarily optimal, but meet certain criteria. This process is called "satisficing" – a combination of the words "satisfy" and "suffice".

For example, investors do not have the cognitive ability or access to information needed to exhaustively research every possible investment, but will satisfice by choosing a portfolio that meets their return objectives without exceeding their risk tolerance level.

3.3 Prospect Theory

This section covers:

LO.b: Contrast expected utility and prospect theories of investment decision making

As discussed in section 2.1.4, utility theory assumes that individuals are always risk-averse. By contrast, prospect theory assumes that individuals establish a reference point and evaluate economic decisions based on whether the choice is framed as the prospect of a gain or a loss. The concept of reference dependence is incompatible with expected utility theory.

3.3.1 The Evaluation Phase

Prospect theory suggest that, having established a reference point, individuals are not risk-averse (as suggested by expected utility theory), but rather loss-averse. According to expected utility theory, risk-averse individuals will never take a gamble that offers a negative expected value, which is something only a risk-seeking individual would do.

In a series of experiments, Kahneman and Tversky show that individuals are risk-averse when facing the prospect of a high probability gain, but become risk-seeking (i.e. take negative expected value gambles) when faced with the prospect of a high probability loss. Similarly, individuals are risk-averse when facing the prospect of a low probability loss, but become risk-seeking when offered the prospect of a low probability gain. The explanation offered for this apparently irrational behavior is that individuals overweight low probability outcomes and underweight high probability outcomes.

This behavior can be demonstrated in a series of four examples that follow the format used in section 2.1.4.

Example 1: High probability gain (risk averse)

Prize 1 ($8,999 gain with certainty) vs. Prize 2 (90% chance of $10,000 gain, 10% chance of $0)

The risk averse individual will opt for the certain gain of $8,999 despite the fact that Prize 2 has a higher expected value. Greater weight is given to the 10% probability of a $0 gain than the 90% probability of a $10,000 gain, so the certain gain of $8,999 is preferred.

Example 2: High probability loss (risk seeking)

Greater weight given to the 10% probability of $0 loss, so the gamble is taken rather than suffer a certain loss of $8,999.

Example 3: Low probability gain (risk seeking)

Greater weight given to the 10% probability of a $10,000 gain, so the certain gain of $1,001 is turned down.

Example 4: Low probability loss (risk averse)

Greater weight is given to the 10% probability of a $10,000 loss, so the certain loss of $1,001 is taken rather than take the 10% probability of a $10,000 loss.

4. Perspectives on Market Behavior and Portfolio Construction

Sections 2 and 3 have covered the differences between the traditional finance and behavioral finance perspectives with respect to individual investor decision-making. Section 4 discusses the differences between these perspectives at the level of markets and portfolio construction.

The concepts covered in this section address:

LO.d: Compare traditional and behavioral finance perspectives on portfolio construction and the behavior of capital markets

The traditional finance perspective is covered in sections 4.1 (behavior of capital markets) and 4.2 (portfolio construction). The behavioral finance perspective on these issues is covered in section 4.3 (although the studies challenging the efficient market hypothesis presented in section 4.1.3 are consistent with the behavioral finance perspective).

Note: A useful summary of the differences between the traditional and behavioral finance perspectives can be found in *Managing Individual and Investor Portfolios*, sections 3.2.1 and 3.2.2.

4.1 Traditional Perspectives on Market Behavior

The traditional finance perspective on capital market behavior is represented by the Efficient Market Hypothesis (EMH), according to which markets are perfectly efficient at incorporating all available information into prices. Put differently, an asset's intrinsic value is always reflected in its market price. This concept of perfectly efficient markets is captured in the slogan, "the price is right". The random

nature of price movements is taken as proof that prices are always right.

An extension of the EMH is that, because price movements are random, it is extremely difficult for any investor to consistently generate above-market returns. In other words, there is "no free lunch".

4.1.1 Review of the Efficient Market Hypothesis

There are three forms of the EMH, each of which is based on a different assumption of how much information is reflected in market prices.

Form of EMH	**Prices are assumed to reflect**
Weak	• All past price and trading volume data
Semi-strong	• All past price and trading volume data • All publicly-available information
Strong	• All past price and trading volume data • All publicly-available information • All non-public information

4.1.2 Studies in Support of the EMH

Because it is difficult, if not impossible, to test the strong-form EMH, studies have typically tested the weak-form and semi-strong-form EMH.

4.1.2.1 Support for the Weak Form of the EMH

There is considerable academic evidence to support the claim that future price movements cannot be predicted based on past price and trading volume data. If such movements could be predicted, any "free lunch" would be arbitraged away by investors acting in their own self-interest. If we accept the weak-form EMH, it follows that there are no excess returns to be generated from technical analysis.

4.1.2.2 Support for the Semi-Strong Form of the EMH

Tests of the semi-strong-form EMH have tended to be studies of events such as stock splits, which are taken by many investors as a signal that a dividend increase is forthcoming. Findings that price movements follow the announcement of a stock split – rather than occurring after the split actually happens – support the semi-strong-form EMH. If we accept them semi-strong or strong-form EMH, it follows that there are no excess returns to be generated from active management, and there is significant evidence to suggest that this is true.

4.1.3 Studies Challenging the EMH: Anomalies

Because EMH assumes that prices are always right, a major obstacle for studies challenging any form of the EMH is demonstrating what the price *should* be if the market price is actually wrong. Moreover, any price deviation from an asset's intrinsic value (known as an anomaly) must persist for a "lengthy period" in order to be considered statistically significant.

The market anomalies that researchers have offered as challenges to the EMH fall into three categories: fundamental anomalies, technical anomalies, and calendar anomalies.

4.1.3.1 Fundamental Anomalies

A fundamental anomaly exists if an asset's market price fails to reflect what its value *should* be based on its fundamentals. The most notable fundamental anomaly is the apparent underpricing of value stocks compared to growth stocks. While some studies show excess returns generated from investing in value stocks, it may be that this "mispricing" is simply a reflection of the market demanding a higher return in exchange for the higher risk associated with value stocks. The value vs. growth anomaly is covered in more detail in section 7.4 of reading 8.

4.1.3.2 Technical Anomalies

A technical anomaly exists if future price movements can be predicted based on an analysis of past price and trading volume data (for example, moving averages and support or resistance levels). If such opportunities exist, it is possible to generate excess returns from technical analysis and the weak-form EMH does not hold.

As mentioned above, there are several academic studies supporting the weak-form EMH. However, as will be discussed in section 7.2 of *Behavioral Finance and Investment Processes*, other studies have identified a momentum anomaly, which is the presence of (statistically significant) correlations between recent price trends and future price movements.

4.1.3.3 Calendar Anomalies

Calendar anomalies are abnormal returns associated with the time of year, time of month, day of the week, etc. The best known example of a calendar anomaly is the persistent abnormally high returns observed in the month of January. Interestingly, the January effect persists despite being well-known. Another calendar anomaly is the "turn-of-the-month effect", which is an observation of abnormally high returns on the first four days as well as the last day of each month.

4.1.3.4 Anomalies: Conclusions

As noted above, in order to show that a market price is wrong, it is necessary to show what it *should* be. Ultimately, the conclusion reached in the curriculum is that markets are neither perfectly efficient, nor are they riddled with anomalies.

However, not all markets are equally efficient. While markets for large-capitalization stocks may close to perfectly efficient at incorporating information into prices, markets for small-capitalization stocks are considered to be less efficient, and markets for alternative assets are even less efficient. A market that is less efficient offers more opportunities to earn excess returns.

4.1.3.5 Limits to Arbitrage

Traditional finance assumes that if market anomalies existed, they would be arbitraged away. However, there may be practical limitations on investors' ability to take advantage of arbitrage opportunities, such as bans on short sales. Additionally, a fund manager who has taken a position based on the belief that an asset is mispriced may need to limit his investors' ability to withdrawals while waiting for an apparent mispricing to correct to reflect an asset's intrinsic value. Even if the market price is "wrong", irrational pricing can persist for extended periods.

4.2 Traditional Perspectives on Portfolio Construction

According to traditional finance, individuals are assumed to be Rational Economic Men (REM). With

respect to asset allocation, this means that each individual holds the mean-variance efficient portfolio that fits with their personal risk tolerance, return objectives and portfolio constraints such as time horizon and liquidity needs (which are covered extensively in *Managing Individual Investor Portfolios*).

4.3 Alternative Models of Market Behavior and Portfolio Construction

The concepts covered in this section address:

LO.d: Compare traditional and behavioral finance perspectives on portfolio construction and the behavior of capital markets

The traditional finance perspective on portfolio construction was covered in section 4.2. Behavioral finance challenges this perspective with the behavioral approach to consumption and savings (section 4.3.1) and behavioral portfolio theory (section 4.3.3).

As noted in section 4.1, the traditional finance perspective on how capital markets behave is captured by the Efficient Market Hypothesis. Behavioral finance challenges this perspective by noting market anomalies (which were covered in section 4.1.3). Additionally challenges to this perspective include the behavioral approach to asset pricing (section 4.3.2) and adaptive market hypothesis (section 4.3.4).

4.3.1 A Behavioral Approach to Consumption and Savings

According to traditional finance, specifically expected utility theory, people act rationally by living within a budget that limits their current consumption within a budget and follow a disciplined savings plan that allows them to maintain their current standard of living after retirement.

Behavioral finance challenges this assumption of rational, disciplined savers by noting that, in reality, people have difficulty deferring current consumption and saving for the future. As noted in *Lifetime Financial Advice: Human Capital, Asset Allocation, and Insurance*, section 3:

"The evidence is that most investors do not save enough (Benartzi and Thaler 2001). A large proportion of investors do not even fund their 401(k) plans enough to use the match that their employers provide. If an employer provides a 50 percent match, then for each dollar an investor puts into her or his 401(k) plan, the employer puts in 50 cents. This immediate 50 percent "return" should not be given up by any rational employee, but it often is."

This tendency to spend now is called self-control bias, and will be discussed further in *The Behavioral Biases of Individuals*, section 4.3.

Behavioral finance further suggests that individuals fail to view their money as a single pool with an overall risk tolerance and return objective, but rather that they treat money differently based on its source and intended use. This tendency is known as mental accounting bias, and will be discussed further in *The Behavioral Biases of Individuals*, section 3.2.2.

The combined effects of self-control and mental accounting biases (and, to a lesser extent, framing bias) result in the behavioral approach to consumption and savings, according to which people segregate their money into three categories:

1. Current income, which is mostly (if not entirely) spent on current consumption
2. Currently owned assets, some of which may be liquidated for current consumption

3. Present value of future income, very little (if any) of which is spend on current consumption

Treating money differently based on its source or intended use, rather than taking a holistic perspective, is inconsistent with traditional finance and can result in a portfolio that is consistent with behavioral portfolio theory, which is covered in section 4.3.3.

4.3.2 A Behavioral Approach to Asset Pricing

According to the capital asset pricing model, which has been covered extensively in the Level I and Level II curriculum, assets are priced using a discount rate that combines the risk-free rate and a risk premium that reflects an asset's riskiness relative to the market. Mathematically, this risk premium is the asset's beta measure multiplied by the overall market risk premium.

The behavioral approach to asset pricing proposes a discount rate that includes a market sentiment premium, rather than a market risk premium. Mathematically, the market sentiment premium is derived from the dispersion of analysts' forecasts for a security. A low level dispersion indicates overconfidence and uniformity among analysts, which causes artificially high (or low) valuations. This is an example of herding behavior, which is associated with regret aversion bias (see The Behavioral Biases of Individuals, section 4.6).

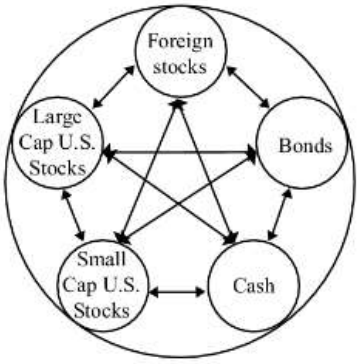
4.3.3 Behavioral Portfolio Theory

While traditional finance assumes that investors hold the mean-variance optimal portfolio, behavior finance argues that what investors actually do is build portfolios in layers, each of which is associated with a different goals. The layer associated with an essential goal, such as maintaining one's current standard of living, is filled with low risk investments, while the layers associated with more aspirational goals contain higher risk investments.

The difference between the mean-variance optimal portfolio recommended by traditional finance and the behaviorally-modified portfolio behavioral portfolio theory suggests investors actually hold is summarized in Exhibit 6, which appears in *Behavioral Finance and Investment Process*, section 4.6.

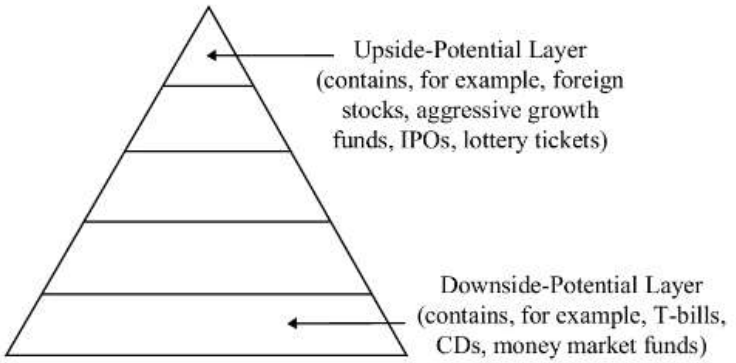
Mean–Variance Portfolio

Mean–variance portfolios are constructed as a whole, and only the expected return and the variance of the entire porefolio matter. Covariance between assets is crucial in determination of the variance of the portfolio.



Behavioral Portfolio

Behavioral portfolios are constructed not as a whole but layer by layer, where each layer is associated with a goal and is filed with securities that correspond to that goal. Covariance brtween assets is overlooked.



Source: Statman (1999).

Note that the layered portfolio suggested by behavioral portfolio theory is consistent with the segmentation of money suggested by the behavioral approach to consumption and savings discussed in section 4.3.1.

4.3.4 Adaptive Markets Hypothesis

According to the adaptive markets hypothesis (AMH), fund managers are engaged in a kind of Darwinian competition and must adapt their investment strategies or risk failing. AMH allows that excess returns are possible in the short-term if a manager can exploit market anomalies, but concedes that it is impossible for a manager to outperform the market in the long-run. Ultimately, the objective of all managers is to survive by adapting to changing market conditions.