Spiral Theory™

An Essay by Thomas J. Anderson
Author of The Value of Debt®
December 2024

Executive Summary

Spiral Theory™ introduces a transformative approach to financial decision-making by emphasizing the critical role of managing the quantity of money. It rests on a singular yet powerful insight: that investors can strategically adjust the money they control through leverage, and this choice profoundly influences outcomes. Whether the objective is to increase returns or reduce risk, debt decisions become the fulcrum for shaping financial success or failure.

While it may seem intuitive that more money reduces risk, Spiral Theory reveals that these outcomes are not passive but actively shaped by leveraging strategies. Managing the quantity of money through debt decisions provides a structured framework that integrates seamlessly with the principles of Modern Portfolio Theory. Without such an overlay, decisions regarding leverage often lack clear boundaries, leading to abstract or arbitrary outcomes.

Spiral Theory proves, with 99.99685% confidence, that leveraging the quantity of money can either materially improve or significantly undermine financial outcomes with the same degree of certainty. This precision underscores the importance of treating leverage as an integrated tool for managing risk and enhancing returns, not as a peripheral consideration.

Key Insights of Spiral Theory:

1. **Quantity of Money as a Missing Dimension**: Dynamically adjusting portfolio scale through leverage fundamentally reshapes long-term outcomes.

2. **Volatility as a Resource**: When managed strategically, volatility becomes an asset that increases the probability of achieving financial objectives.

The societal benefits of this transformation include reduced retirement shortfalls, improved institutional outcomes for endowments and pensions, and greater confidence and wealth for retirees. The practical implications of Spiral Theory are profound. Research that accompanies this essay involving 27,402 individuals revealed that 81.5% are unlikely to achieve financial independence under traditional work, savings, and consumption patterns. Yet, applying these principles could shift over 80% of individuals to financial independence.

Simply put, the strategic use of leverage, when properly constrained and understood, could save the average individual over a dozen working years. This framework not only enhances individual and institutional financial strategies but also redefines the concept of risk by contextualizing it within the broader goals of financial independence and wealth optimization. Spiral Theory represents a critical evolution in how all investors can understand and apply leverage to achieve financial success making personal finance more like corporate finance.

Spiral Theory™
Superposition and the Gaussian Normal Paradox:
Portfolios in Two States of Risk, Like Schrödinger's Cat

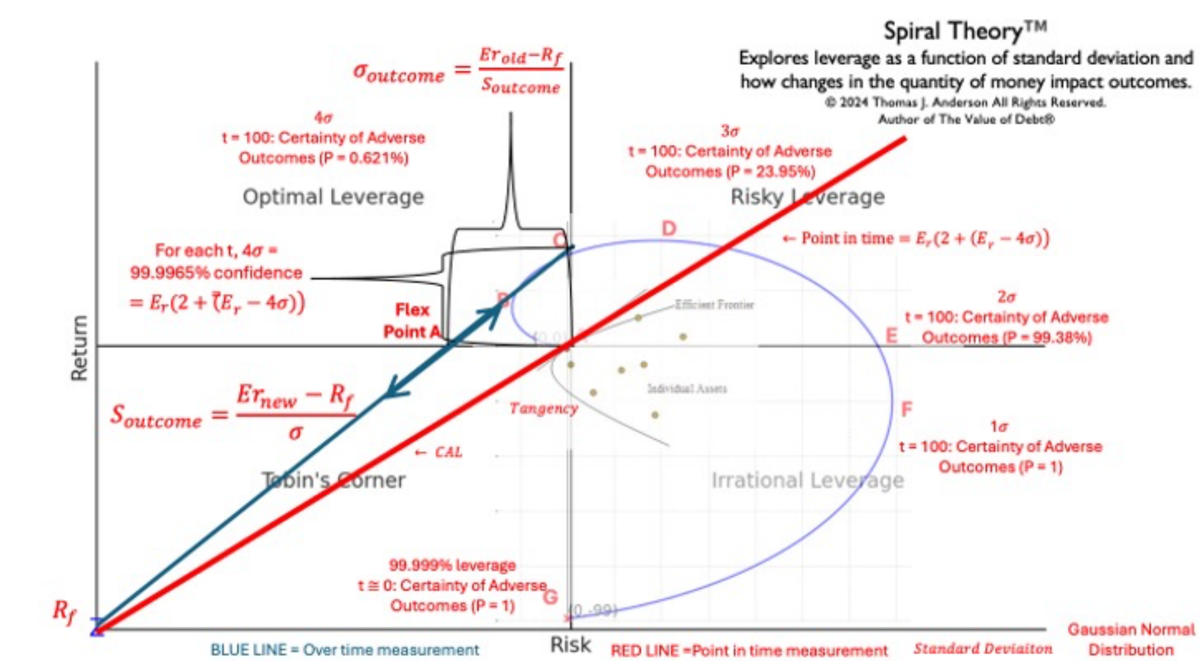
Spiral Theory offers a fresh perspective on a longstanding problem in financial theory. While Modern Portfolio Theory (MPT) effectively measures point-in-time risk and return, it does not account for the quantity of money or the effects of changes in that quantity over time. This omission is not a flaw but a limitation of the model's scope, leaving investors with an incomplete framework for decision-making.

Spiral Theory retains MPT's foundational elements while introducing a single key insight—a paradox. Under the assumptions of a Gaussian normal distribution, a portfolio can simultaneously appear to have two measurements of risk, with this perspective shifting over time. This paradox mirrors Schrödinger's cat, where a system exists in multiple states until observed, offering a novel way to view risk.

Rather than replace or disrupt MPT, Spiral Theory augments it with a simplified, accessible framework to reconcile point-in-time and over-time risk. Central to this framework is the investor's ability to leverage their portfolio, conceptualized as a costless perpetual American call option. By strategically exercising this option, investors can systematically reduce risk or enhance returns over time by dynamically adjusting their quantity of money. These dynamics, however, fall outside MPT's focus as the quantity of money is not factored into the model.

To ensure compatibility with established theories, Spiral Theory adopts a Game Theory lens rather than modifying Portfolio Theory directly. This preserves the integrity of foundational models while illustrating how leveraging decisions shape outcomes over time. Importantly, the lens of Game Theory enables observation of a portfolio's simultaneous high-risk and low-risk states.

The paper suggests a visual overlay to illustrate the impact of various leverage strategies on portfolio outcomes and decisions. This tool complements the Capital Allocation Line (CAL), enhancing understanding of the relationship between leverage, risk, and outcomes without altering the CAL's established properties.



Superposition & The Gaussian Normal Paradox:
Because of the assumption of a Gaussian Normal Distribution, a portfolio with leverage can simultaneously exist in two states.

Introduction & Foreword

Spiral Theory™ builds upon the foundational principles of MPT, preserving constructs such as the Efficient Frontier, Tangency Portfolio, and CAL. It focuses on a singular idea: that **investors can adjust their quantity of money through leverage, and this choice profoundly impacts outcomes—both positively and negatively**.

Before delving into details, we must address a fundamental disconnect. Academia often prioritizes theory over outcomes, while individuals prioritize outcomes over theory. This paper aims to bridge that gap: to persuade academics that outcomes matter without undermining theoretical rigor, and to show individuals the importance of understanding the theoretical frameworks that shape their decisions.

This work does not seek to disrupt the established theoretical framework but to extend it. To academics, I ask that you assume fluency in underlying theories and models. If there is disagreement, I encourage you to "win" the theoretical argument, then consider the merits of these ideas. By focusing on outcomes alongside theory, academia could drive meaningful societal change without disturbing its foundational principles.

To the pragmatic reader: theory assumes rationality, yet human behavior often diverges from it. Where academics may see the difference between 99.0% and 99.99685% confidence as meaningful, most of us focus on the remaining uncertainty. Still, a framework offering a 99.99685% chance of improving outcomes warrants serious consideration.

A Game Theory Perspective

While Spiral Theory contributes to Portfolio Theory, it is best understood initially through the lens of Game Theory. Consider the Martingale strategy in gambling: systematically increasing wagers after losses. This approach does not alter the game's odds but changes outcomes by adjusting the quantity of money. Casinos counter this through safeguards like table limits and card-counting bans.

Unlike gambling, investing offers a positive expected return—it is not a zero-sum game. **This paper explores whether outcomes can be meaningfully influenced by strategically adjusting the quantity of money, even if the underlying odds remain unchanged**.

A key determinant of financial outcomes is the quantity of money. If the goal is $1 million, someone with $999,999 is undeniably closer than someone with $1. Similarly, if the objective is $50,000 in annual income, having $10 million is far more advantageous than $1 million.

However, more money magnifies both gains and losses. A 10% loss for someone with $999,999 equates to roughly $100,000, while for someone with $1, it's just a dime. Despite this magnification of losses, having more money reduces the risk of achieving financial goals. This principle—that more money improves outcomes—is intuitive and foundational in both academic models and everyday reasoning.

But if having more money improves outcomes, the question arises: how can individuals increase the quantity of money they control? One well-established method is borrowing. Borrowing enables investors to create additional money temporarily, providing opportunities to enhance returns—or magnify losses.

To explore this further, consider the following game.

Game 1: Spiral = Maximize Money

Game 1, what we will call Spiral, serves as a simplified simulation to explore how leverage decisions influence financial outcomes under varying probabilities. Players start with the same amount of money. The expected return is set at 9%, the standard deviation is 17% and the distribution is Gaussian normal (a standard bell curve).

Anyone can borrow any amount of money at 0% interest or store any amount at 0% interest. Players must make their leverage decision at the beginning of the game. Following each turn their leverage ratio will be updated to reflect the leverage ratio they initially set. The game will do all the math for players along the way.

Random cards will be drawn representing a return from the distribution. Cards will be assigned a rarity event "good" and "bad" grouped by standard deviation 1 through 6. The "rarity event" simulates tail-risk scenarios. If you choose to borrow and a card falls within a "bad" rarity event, you instantly lose. The game will consist of 100 turns. The player with the most money at the end wins.

Spiral Cheat Sheet

First, should one borrow? The expected return is 9%, with a normal distribution of returns. The probability of a positive return in any given game is ~100% (actual probability: less than 0.00001% chance of a negative return). This means players can be more than 99.99999% confident they should borrow to maximize their outcomes. The question becomes: how much should they borrow?

σ	Probability	Outside Probability	Each Tail Probability	Odds of Bad Event Happening in Game	Odds of Bad Event Not Happening in Game
1σ	68.27%	31.73%	15.865%	~1 (effectively certain)	~0
2σ	95.45%	4.55%	2.275%	~89.99%	~0.66%
3σ	99.73%	0.27%	0.135%	~12.64%	~87.36%
4σ	99.9937%	0.0063%	0.00315%	~0.316%	~99.68%
5σ	99.999943%	0.000057%	0.0000285%	~0	~1 (effectively certain)
6σ	99.9999998%	0.0000002%	0.0000001%	~0	~1 (effectively certain)

Figure 1: A Normal Distribution "Cheat Sheet"

Tail events at 5σ or 6σ are so rare that their likelihood is negligible for practical decision-making, even over long time horizons. These levels of borrowing are statistically safe. Conversely, 1σ and 2σ events are virtually certain to occur over 100 turns, making them unsafe levels of borrowing.

Key Insights:

- Borrow a little (up to 4σ event): You have a 99.68% chance of not losing the game over its duration.
- Borrow a lot (up to 2σ event): You face an 89.99% chance of losing the game.
- Between 4σ and 2σ: Outcomes depend largely on luck.

The rational leverage ratio for players lies somewhere between borrowing a little (4σ) and borrowing a lot (2σ). This range balances confidence in success with the inherent risks of leverage.

Prescriptive Approach

If we shift from a game-theory mindset to an outcome-optimization approach (akin to doctors optimizing treatment):

1. **Borrow with 99.99999% confidence.**
   - Leverage just enough to stay within the safest range of returns.
   - Practically, this corresponds to borrowing levels associated with extremely low risk.
2. **Borrow up to 4σ with 99.99685% confidence.**
   - This level provides 99.99685% confidence per turn and 99.68% confidence of avoiding loss over the entire game. To put this in perspective, the odds of being in a fatal car crash over the same period are higher than the odds of losing in this game.

The game reveals that rational leverage lies in a range that balances statistical confidence and potential risk. Borrowing safely maximizes outcomes while minimizing ruin, offering insights into leveraging effectively in both theoretical and real-world financial contexts.

Outcomes

What are the expected outcomes of the game, using the assumptions and the prescriptive approach?

The Leverage Ratio (Lr) and Expected Return (Er) can be calculated as follows:

$$Lr = 2 + (E_r - 4\sigma) = 2 + \big(.09 - 4(.17)\big) = 1.41$$

$$Er_{new} = Er(Lr) = 9\%\ x\ 1.41 = 12.69\%$$

Under these assumptions, the prescriptive approach generates an additional 3.69% expected return (12.69% - 9%). Does this matter? Let's examine two players:

- Player 1 begins with $10,000 and chooses no leverage. By the end of the game, they finish with $55.2 million.
- Player 2, who follows the prescriptive approach, finishes with $1.543 billion.

Who Took More Risk?

From a point-in-time perspective, portfolio theory would assert that Player 2 took on 41% more risk to achieve 41% more return. Their portfolio had a higher standard deviation at every step, and by traditional measures, their strategy was inherently riskier. Critics might say, "Player 2 did well, but they took significant risks."

However, from a game theory perspective, Player 2's actions represented a calculated risk, supported by over 99% confidence that their strategy would yield significantly better outcomes. In this view, Player 2 faced only a 032% chance of failure—a level of risk that most (though not all) would consider negligible. To provide context, the probability of loss with this strategy is statistically lower than many everyday risks. It highlights the robustness of this approach and understanding this level of statistical confidence underscores the strategy's strength in achieving better outcomes over time.

Player 2 simultaneously took on higher risk (as measured by a linear perspective) while achieving better statistical odds of meeting any financial goal. This duality reveals a paradox: from one perspective, Player 2's strategy was riskier ('they drove a car!'); from another, it was far safer (and they arrived faster—with airbags for protection).

We can graph this game to analyze the different perspectives on risk and outcomes. The rules of the game are as follows:

1. The expected return is 9%, and the standard deviation is 17%. For simplicity, we designate this point as the Tangency Portfolio.
2. The distribution of returns follows a Gaussian normal curve (a standard bell curve).
3. Players can borrow or lend any amount of money at a 0% interest rate, with no cost or constraints.

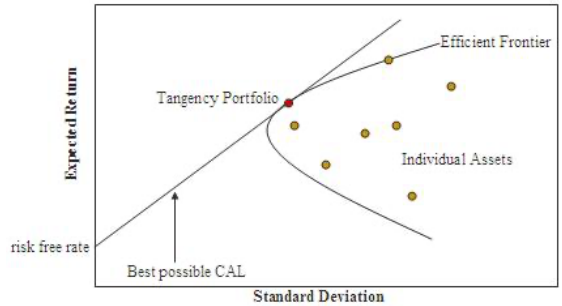


Figure 2: The Rules of the Game, Visualized

Perspective 1: Linear Measurement of Player Risk

The point-in-time model offers a straightforward, linear relationship between risk and return. This perspective is mathematically correct and widely used in traditional portfolio theory. The key choices are:

1. **Choice A**: Hold all money in the risk-free asset (0% return, 0% risk).
2. **Choice B**: Allocate 50% to the risky portfolio and 50% to the risk-free asset (5% return, 10% standard deviation).
3. **Choice C**: Hold all money unleveraged in the risky portfolio (9% return, 17% standard deviation).
4. **Choice D**: Leverage the risky portfolio, resulting in a linear increase in both risk and return.

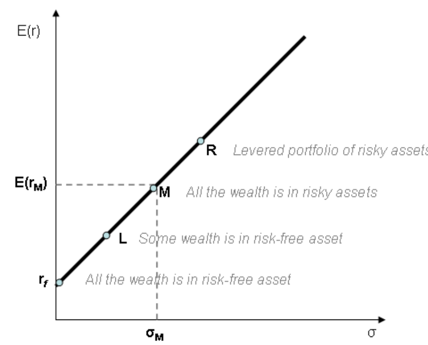


Figure 3: Measurement of Risk in the Game

This representation is valid, and the math behind it is indisputable. It provides a clear view of the relationship between leverage and the trade-off between risk and return, measured solely at a point in time.

Perspective 2: Spiral Measurement

The Spiral perspective introduces a dynamic, over-time view of risk. This perspective categorizes leverage into zones based on probabilities and outcomes over the duration of the game:

1. **Optimal Leverage**: Low levels of borrowing that do not materially increase risk.
2. **Risky Leverage**: A zone where outcomes are determined largely by luck, with probabilities of loss increasing.
3. **Irrational Leverage**: A zone where the probability of loss approaches or reaches 100%.
4. **Tobin's Corner**: A combination of cash and the risky asset, representing a conservative strategy. Later we will discuss why it is labeled Tobin's Corner instead of "No Leverage".

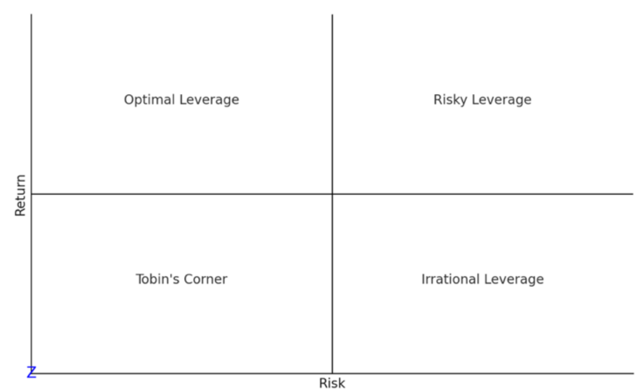


Figure 4: Leverage & Risk Quadrants

In this perspective, movement through these zones can be visualized as a spiral. Key leverage points (A–F) represent increasing risk:

- **Point A**: No leverage.
- **Point B**: Minimal probability of loss but still negligible change in return.
- **Point C**: Nominal change in the probability of loss, meaningful increase in return.
- **Point D**: Nominal change in return for increase in risk.
- **Point E**: High risk, same expected return.
- **Point F**: Increasing certainty of loss, representing the irrational zone.

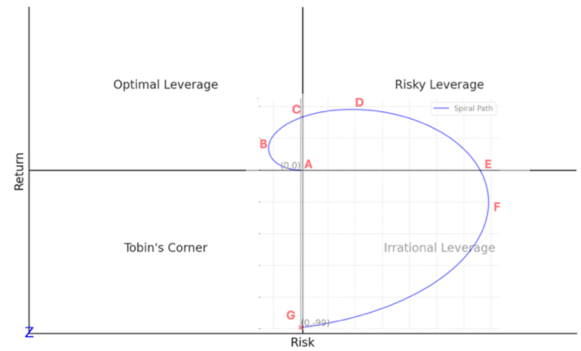


Figure 5: Probability of winning the game.

Working backward, any leverage beyond Point F is irrational, as loss is guaranteed. Between Point C and Point E lies the "risky leverage zone," where outcomes are driven by probabilities. This perspective also illustrates that Player 2 is indifferent to probabilities of loss between 0% and 0.316%, which explains why the line goes vertical at that threshold. Above Point A represents success; below Point A represents loss.

The Tug of War: Good Side vs. Bad Side

Two areas of conflict emerge in this visualization, representing a "tug of war" between the perspectives:

1. **The Good Side (Left Side)**: At low levels of leverage, returns rise while risk remains negligible. This reflects a zone of increased efficiency where borrowing enhances returns or reduces risk within safe thresholds. From the Spiral perspective, this player perceives a 99.68% chance of better outcomes, rather than a 41% increase in risk, as the linear model might suggest.

2. **The Bad Side (Right Side)**: At extreme levels of leverage (e.g., 99.9%), the probability of loss is 100%. This is the zone of destruction, where irrational leverage guarantees failure. From the Spiral perspective, this player sees a low expected return (loss) with no risk of that outcome changing. Conversely, the linear model suggests both high risk and high expected return, emphasizing the potential for exceptional outcomes at a point in time. The linear view might "scream" that such moves could yield exceptional returns despite the certainty of loss over time.

This comparison highlights the importance of perspective when defining and assessing risk. Both perspectives are valid, but they serve different purposes. The Spiral view emphasizes long-term probabilities and dynamic adjustments, while the linear model focuses on point-in-time risk and return. Recognizing these differences allows for a more nuanced understanding of leverage and its role in financial decision-making.

This paradox is largely unexplored in portfolio theory and is rarely communicated to clients. If asked, "Do you want higher risk?" most people would say no. If asked, "Do you want debt?" most people would say no. If asked, "Do you want better outcomes?" the answer is unequivocally yes. This reframing reveals how traditional metrics of risk can obscure meaningful improvements in financial outcomes.

Overlapping Perspectives: Linear vs. Spiral

Under identical assumptions—normal distribution and the standard deviation as a measure of risk—these two perspectives yield different views of the same game. By overlaying these approaches, we can observe the differences:

Red Line: Represents the CAL, a traditional, linear measurement of risk and return.

Blue Line: Represents expected outcomes under the Spiral perspective, accounting for the asymmetric risks introduced by leverage over time.

The blue line reflects the reality that the same Gaussian distribution that creates a linear risk-return relationship in the CAL also generates asymmetric risk when viewed through the Spiral framework.

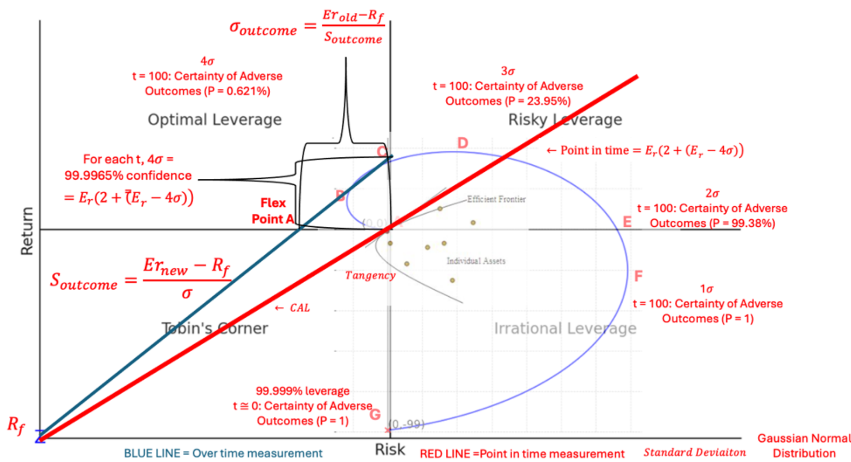


Figure 6: Superposition and the Gaussian Normal Paradox: Portfolios in Two States of Risk, Like Schrödinger's Cat

This insight challenges conventional definitions of risk in both theory and practice. **Representing Player 2 as riskier is both statistically true and contextually misleading**. By reframing risk through this lens, we create space for new approaches to decision-making that consider both outcomes and probabilities.

The Intercept and Optimal Decision Making

Notice the intercept of the red and blue lines. The overlay highlights that Point C represents the rational limit of leverage, from both perspectives. While leverage at Point C may appear risky at a point in time, it offers the highest probability of success over time, balancing risk and reward effectively within the assumptions of a Gaussian normal distribution.

In our game, we benefit from knowing the expected return, the risk (standard deviation), and that returns follow a Gaussian normal distribution. While these conditions are idealized and not true in the real world, they emphasize a critical point. This duality suggests not that both measurements *can* co-exist, that these worlds *should* co-exist. Standard deviation remains the correct measure of risk, but its interpretation requires two distinct lenses:

1. A point-in-time lens, which measures volatility at a single moment.
2. An over-time lens, which considers the effects of compounding and the isolation of low-leverage strategies from extreme volatility.

Spiral Theory provides financial decision-makers with a framework to contextualize the potential risks and benefits of leverage while remaining *fully aligned with the principles of MPT*.

Without this overlay, decisions regarding leverage often lack clear constraints and remain abstract or arbitrary.

Real World Implications of Game 1: Spiral

Impact of Skew and Fat Tails: In a normal distribution, a three-standard-deviation (3σ) event is 43 times riskier than a four-standard-deviation (4σ) event, which is 109 times riskier than a five-standard-deviation (5σ) event. However, real-world distributions often exhibit fat tails, where 3σ events occur more frequently than predicted. This increases the risk around 3σ while making 4σ events relatively safer than assumed in a normal distribution.

This is not true for every distribution but is true for many observed distributions. Empirical testing often reveals that leveraging up to 4σ is safer than anticipated, while leveraging beyond 4σ becomes significantly riskier. Furthermore, adding leverage following a 1σ decline can reduce overall risk by leveraging mean reversion, a concept to be explored further.

Could U.S. equities decline by 4σ? Certainly. Could a globally diversified, market-cap-weighted portfolio of 8,000+ equities experience a 4σ event? Historically, it hasn't, and whether it could is debatable. Could a portfolio constructed as an individual's tangency portfolio experience such an event? That too is debatable and dependent on assumptions. While these extreme events are possible, they remain exceedingly rare.

All available historical data suggests that globally diversified portfolios using low leverage in line with these ratios generally perform well. This approach is not a free lunch but a calculated risk that balances opportunity and safety. For those who find extreme events plausible, there are several options:

- Reduce leverage to zero, wait for a 4σ event, and act opportunistically.
- Hedge the risk with options.
- Recalculate the framework using 5σ assumptions.

Margin Calls: In the real world, the risk of margin calls and their associated advance rates often reduces the leverage investors are comfortable taking by 30% to 40%. This conservatism accounts for unpredictable shocks and the need to avoid forced liquidation during market declines.

Cost of Funds: While the theoretical model assumes borrowing at the risk-free rate, real-world borrowing costs are higher. For example, if the risk-free rate is 2% and the after-tax cost of borrowing is also 2%, the spread could narrow by 400 basis points.

For an unhedged global equity portfolio with an expected return of 9% and a cost of funds of 4%, the effective leverage adjustment at 4σ becomes approximately 25%. This modifies the expected spread to:

$$9\% - 4\% = 5\%$$

$$5\% \; x \; 25\% = 125 \; basis \; points$$

In our game, real-world adjustments could reduce Player 2's outcomes to $172.9 million—a meaningful drop from $1.543 billion but still over three times better than Player 1. The key takeaway is that Player 2 still wins. Additionally, many real-world factors could push the spread higher, such as access to low-cost, potentially tax-deductible permanent debt like a mortgage. These factors underscore the enduring advantage of Player 2's strategic use of leverage, even with practical constraints.

Hedging: One compelling real-world tactic is hedging with deep out-of-the-money options. These options often trade at low prices, implying the market assigns an extremely low probability to extreme tail events within a specific time frame. If the cost of such a hedge is less than the added expected return from leverage, the result is a form of arbitrage. In many cases, only a partial hedge is necessary, reducing costs while preserving most of the additional returns.

The Option Value Paradox

While the spiral math is intriguing, it is not essential. Spiral Theory could just as easily be called Line Theory; what matters is the process of converging to Point C. At Point C, the focus shifts to the left-hand side of the CAL, creating what can be termed a "Shadow CAL."

According to the Separation Theorem, a levered portfolio can coexist with cash. When borrowing and lending occur at the risk-free rate, the cash and borrowing effectively cancel each other out. Point B, to the left of Point C, represents a portfolio with lower leverage and, consequently, reduced risk.

As we move further down the Shadow CAL, an intriguing phenomenon arises: the portfolio appears to become less risky than itself. While this may seem paradoxical, it becomes clear when analyzed through the lens of option pricing theory.

Just as an option's value is derived from the underlying asset's volatility and the flexibility to act strategically, an unlevered portfolio contains untapped potential, akin to a compressed spring waiting to release its energy. **Portfolio A represents a portfolio without leverage, while Flex Point A represents the same portfolio with the option to leverage.** This option doesn't initially increase returns (which remain unchanged) but instead the value can be quantified as a measurable reduction in risk.

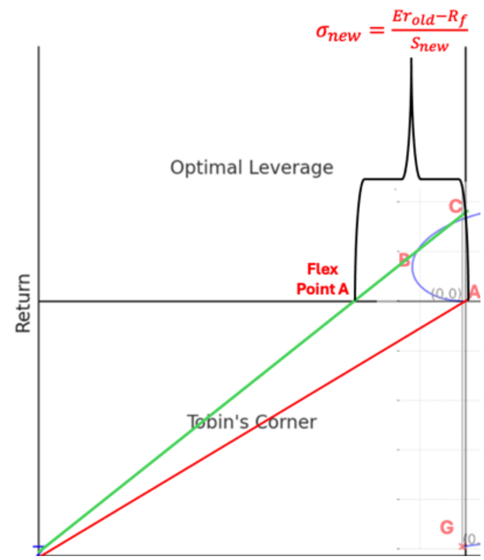


Figure 7: Point A is in fact Flex Point A. The option value can be quantified as a reduction in risk.

What is the value of an American Perpetual Call Option with no carrying cost? It is worth something between zero and infinity—but it is undeniably positive. The complex options math simplifies to an intuitive multiplier of "1." In dollars, this means the option to buy a quantity of $1 + (E_r - 4\sigma)$ is directly multiplied by 1. As a percentage of risk reduction, the value of this option can be calculated by rearranging the Sharpe ratio formula:

$$\sigma_{new} = \frac{Er_{old}-R_f}{S_{new}}, \text{ and whereby } \sigma_{new} - \sigma_{old} = implied\ risk\ reduction$$

Key points:

- **An American Perpetual Call Option with no carrying cost is *highly* valuable**.
- Spiral Theory <u>*can be viewed as a shift in the supply curve*</u> whereby an unlevered portfolio is equivalent to having $1 + (E_r - 4\sigma)$ more dollars with 99.99685% confidence. In the Spiral Game this is 41%.
- Choosing not to lever is mathematically the *same* as holding Portfolio A alongside $1 + (E_r - 4\sigma)$ in the risk-free rate.
- The Shadow CAL reflects the option value inherent in an investor's ability to safely adjust their quantity of money.

<u>*An unlevered portfolio with the ability to leverage holds intrinsic value because it offers an option that can be exercised strategically*</u>. Preserving this option indefinitely is insufficient; it must eventually be exercised to **increase return** <u>*or*</u> **reduce risk**. We explored increasing return; how could one reduce risk?

Game 2: Flex = Minimize Risk

If leverage can increase returns, we can make a hypothesis that leverage can also reduce risks. Over a decade ago, while working on *The Value of Debt in Retirement,* I set out to examine a provocative hypothesis: that debt could reduce risk. To test this, the study analyzed every rolling 30-year period from 1946 to 2013 (a total of 39 periods), evaluating 10 different withdrawal rates across five portfolio compositions, including one levered and one unlevered household. This created a robust dataset of 100 portfolio combinations (10 portfolios × 10 withdrawal rates) evaluated over 39 periods, resulting in 3,900 unique data points. These data points were aggregated into a concise table presenting the probability of success for each portfolio and withdrawal rate combination. Thank you to Professor Charles Cuny of Washington University in St. Louis for his collaboration in this initial study and contributions to this theory.

Table D.3 Returns without and with Debt, 1946–2013

Annualized Withdrawal Rate as a % of Initial Portfolio Value

Portfolio Allocation	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%
100% Stocks										
30 years - No Debt	100	95	74	62	54	44	41	33	23	13
30 years - With Debt	100	100	87	74	72	59	59	51	52	49
75/25 Stocks/Bonds										
30 years - No Debt	100	95	69	54	46	41	28	18	5	0
30 years - With Debt	100	100	87	72	59	54	51	43	41	39
50/50 Stocks/Bonds										
30 years - No Debt	100	87	56	46	33	15	13	3	3	0
30 years - With Debt	100	95	77	59	51	46	39	28	23	18
25/75 Stocks/Bonds										
30 years - No Debt	100	72	31	18	15	13	8	3	0	0
30 years - With Debt	100	80	54	36	21	15	13	13	10	10
0/100 Stocks/Bonds										
30 years - No Debt	95	31	18	13	13	8	3	0	0	0
30 years - With Debt	46	31	21	15	13	13	10	8	5	3

Figure 8: Table D3 From Appendix D of The Value of Debt in Retirement

This analysis culminated in a straightforward conclusion, summarized in a chapter and detailed further in Appendix D of the book. Originally labeled Table D.3 in the appendix, it presented the findings clearly: portfolios were listed on the left, withdrawal rates across the top, and probabilities of success within the table cells.

The results were striking: **debt consistently improved outcomes**. From this data, one could reasonably conclude that any investor holding a portfolio containing equities could enhance their probability of success by incorporating debt.

For some, this conclusion is so compelling that it is almost unsettling, prompting a fundamental question: If the standard linear model asserts that debt increases risk (as measured by standard deviation), **why do outcomes consistently improve with the use of debt**?

Retirement models are *particularly sensitive to the quantity of money*. As individuals approach and enter retirement, they can make decisions that directly impact their quantity of money—decisions that point-in-time models fail to account for. The data is simple, clear, and intuitive: having more money consistently leads to better outcomes, particularly in retirement.

Goal of Game 2

Efficient Market Hypothesis, Random Walk Theory, and other models, demonstrate that one cannot arbitrage volatility effectively. A buy-and-hold strategy is typically the better approach. However, volatility drag presents a meaningful challenge to accumulators, retirees, pension funds, and endowments alike. Geometric Mean is a well-known, predictable, and costly risk that *impacts all investors* who are not 100% in the risk-free rate. Neither individuals nor institutions have an effective tool to address this issue, as diversification by purchasing the risk-free rate also comes at considerable cost.

Volatility drag is the phenomenon where: $Geometric\ Mean \approx Arithmetic\ Mean - \frac{\sigma^2}{2}$

For example, an investment might have an average return of 9% and a standard deviation of 17%, but the investor experiences an expected return of only 7.56%.

In both natural and human-made systems, flexibility is essential for resilience. From the expansion of lungs to a spider web absorbing impact, dynamic balance ensures stability. Human constructs, such as gyroscopes and bridge expansion joints, similarly rely on adaptability to withstand stress and maintain equilibrium. The principle is clear: tactical leverage is preferable, but the challenge lies in implementing it through a rules-based framework that avoids the pitfalls of selective timing.

This raises fundamental questions: Can a risky asset transform into a certain asset over time? Can an asset be simultaneously risky at a point in time yet certain over a longer horizon? Game Theory offers a compelling lens to explore these possibilities, providing a structured approach to illustrate what may be achievable through strategic, dynamic adjustments.

Playing the Game

Players start with the same amount of money. The expected return is set at 9%, the standard deviation is 17% and the distribution is Gaussian normal (a standard bell curve). Anyone can borrow any amount of money at 0% interest or store any amount at 0% interest.

Players may change their leverage decision at any time. Random cards will be drawn representing a return from the distribution. The game will consist of 100 turns. The player who ends up with a return on their money closest to an arithmetic average 9.00% wins.

The goal of this strategy is to use leverage to function like the keel of a boat—providing stability while enabling the portfolio to lean into and embrace volatility. The strategy itself is surprisingly simple and revolves around a dynamic framework:

1. When to borrow: $If: R_{actual} < \ E_r$ purchase. $Purchase\ amount = \ (E_{r-}\ R_{actual}) * Capital\ Base$
2. When to repay: $If: R_{actual} < \ E_r$ repay. $Repayment\ amount =$ Borrowed Amount
3. As a result, given time and volatility: $R_{actual} = \ E_r$

The Game Flex illustrates the theoretical existence of a costless arbitrage where returns self-correct over time—essentially functioning as costless time travel, shifting returns between periods. During negative return periods, borrowing is used to invest at below-expected prices. During positive return periods, the portfolio repays debt and builds cash from excess returns, stabilizing and restoring equilibrium. This makes Flex a sophisticated and more powerful form of rebalancing, leveraging market fluctuations to enhance long-term outcomes.

Flex also bridges the insights of Fama and Shiller, providing a practical framework that integrates market efficiency with the predictable patterns of volatility. By doing so, it introduces a new dimension to the practical implementation of MPT, addressing both the theoretical and real-world challenges of risk and return.

Conceptually, this approach resembles a Martingale strategy but with a critical distinction: it operates within a positive expected return environment, rather than a zero-sum or negative-sum framework. Over time, this strategy suggests the CAL could become vertical, enabling long-term capital to achieve the tangency portfolio's expected return without risk, provided short-term cash needs are isolated. While point-in-time risk persists, its significance diminishes over time. Mathematics supports this insight: given sufficient time, actual returns converge with expected returns. Flex reduces reliance on probabilistic Monte Carlo simulations, introducing a more deterministic path for achieving target returns.

Debt Can Improve Outcomes: An Understated Fact

Two foundational principles anchor the framework Spiral and Flex illustrate:

> **Separate Risks**: Modigliani-Miller demonstrates that portfolio risk and financing risk are independent. Borrowing affects the investor's overall exposure without altering the intrinsic risk-return characteristics of the portfolio. This principle applies equally to institutional and individual investors, emphasizing the importance of evaluating leverage risk separately from portfolio risk.
>
> **Non-Linearity**: Borrowing introduces risk, but its relationship with leverage is not linear. Low levels of leverage add minimal incremental risk, while excessive leverage amplifies tail risk exponentially. This insight has profound implications for portfolio construction and the formation of a Shadow CAL.

With these principles in mind, Spiral and Flex reframe debt as a tool, allowing investors to navigate risk and opportunity more effectively.

Propositions:

1. **Strategic Borrowing Improves Outcomes**: Compared to a debt-free portfolio, judicious use of debt increases the likelihood of achieving financial goals, expanding the realm of possibilities for portfolio construction and introducing the concept of a Shadow CAL.

2. **Borrowing Introduces Asymmetric Risks**: While debt offers significant benefits when applied prudently, excessive leverage magnifies tail risk, reinforcing the need for optimization in long-term strategies.

Why This Works:

The standard model overlooks the quantity of money and the compounding effect of money on money. Controlled leverage introduces point-in-time risk, but with proper management, it produces a positive expected outcome, resulting in a larger quantity of money over time.

A higher quantity of money improves outcomes in two key ways:

1. **Risk Mitigation**: More money buffers against adverse events, reducing the impact of unfavorable outcomes.

2. **Goal Probability**: More money increases the likelihood of achieving financial objectives.

Time magnifies the benefits of controlled leverage. Properly managed, leverage compounds returns and mitigates volatility drag, producing outcomes that standard models fail to capture.

Spiral Theory distinguishes between portfolios that can be levered and those that cannot. If a portfolio cannot accommodate leverage, Point C and the superior CAL do not exist—an essential insight for portfolio construction.

By integrating leverage into financial planning, Spiral Theory bridges the gap between risk and opportunity, offering a flexible framework for navigating market fluctuations and enhancing long-term outcomes.

What is at Stake & Why This Discussion is Critical

In the game Spiral, the riskiest investors could capture an additional 369 basis points annually with 99.99685% confidence. While real-world factors may adjust this figure, the existence of a Shadow CAL from an outcomes perspective remains evident.

The implications of leverage are intriguing, but an even more nuanced insight applies to typical individuals and institutions. An unlevered portfolio holding X% in risky assets could instead hold X%*$(2 + (E_r - 4\sigma))$ in risky assets with 99.99685% confidence that the risk remains unchanged.

For most investors, X is not 100%. This suggests that an individual currently following a 70/30 asset allocation model could confidently shift to 100% equities—without requiring leverage.

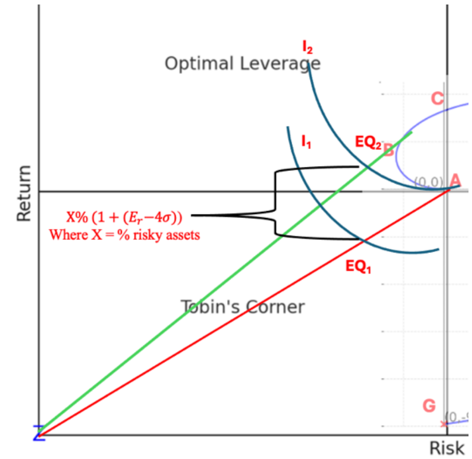


Figure 9: A shift in supply = a shift in demand = a new equilibrium of preferences and outcomes

Premature overdiversification has been identified as a significant driver of wealth accumulation gaps. By reframing the quantity of money an investor has available for deployment, both supply and demand equilibria shift, enabling better financial decision-making. *Tobin's Corner is about this shift rather than "no leverage"*.

Investors often measure progress in terms of years required to achieve a financial goal, such as retirement. This timeline is directly influenced by expected returns. The reduction in time (Δt) required to reach a financial goal can be expressed as:

$$\boldsymbol{\Delta t = t1 \cdot \left(\frac{\ln(1 + Er)}{\ln\Big(1 + Er\big(2 + (Er - 4\sigma)\big)\Big)} \right) - 1}$$

Where:

- t1: The original time horizon to reach the goal.
- Er: The expected return without leverage.
- σ: The standard deviation of returns.

This adjustment in perspective underscores how **the strategic use of leverage can save the average individual a dozen or more working years**. Higher measured risk, when understood through Spiral Theory, can lead to better statistical odds and faster achievement of financial goals.

What of the game Flex? The volatility of the tangency portfolio often necessitates shifting down the CAL to mitigate risk. Flex challenges this notion, suggesting that with leverage, the CAL could be more vertical than previously believed. Imagine the profound implications if investors could confidently move from the 4% rule to the 6% rule—reducing the quantity of money required to achieve financial independence. With more efficient accumulation and optimized utilization of resources in the distribution phase, the societal impact could rival that of agricultural breakthroughs like dwarf wheat.

As you explore Spiral Theory further, feel free to apply as many haircuts as you like—strip it down to its core. Yet, in doing so, you will uncover the forces that build it back up: strategic ways to influence the quantity of money through everyday decisions, methods to protect those decisions through hedging, and approaches to generate additional income. Regardless of how you analyze it, the insights reveal something between 2X and 10X more impactful than traditional rebalancing—a fundamental shift in the strategic use of debt for both institutional and individual investors.

Conclusion & An Urgent Call to Action

The games Spiral and Flex are designed to illustrate that portfolios can simultaneously exhibit high risk and achieve 99%+ better outcomes. To many academics, this concept may seem redundant, unnecessary, or unoriginal. They may assert that the outcomes of Spiral and Flex are already embedded in their models.

I understand this perspective, but I challenge it. If one could cure cancer with 99.9965% confidence yet describe it as "risky" and bury the cure in the back corner of a library, society would rightly be outraged. Academics, in all disciplines—including social sciences—carry a societal duty to clearly communicate the possibility of better outcomes, particularly when those outcomes are achievable.

At present, debt is widely viewed as synonymous with increased risk and reduced returns: a lower CAL when factoring in the cost of funds, suitable only for the riskiest of investors operating beyond the tangency portfolio. Milton Friedman argued that a model's value lies in its ability to predict outcomes and guide decisions. Current financial models treat debt as a liability or an afterthought, yet the reality is that debt can either improve or destroy outcomes, depending on its application.

Just as Copernicus redefined our understanding of the universe, Spiral Theory invites us to reconsider the role of leverage. Systematically applying modest, low-cost leverage, tailored to individual risk tolerance, during both the accumulation and distribution phases, can significantly enhance the probability of achieving financial goals for individuals and institutions alike. This insight is not only compelling but intuitive, unifying and reframing conclusions from my earlier works into a cohesive and robust mathematical theory.

Yet, despite its logical appeal, this concept remains hidden within MPT and absent from mainstream investment strategies and conventional wisdom. Consider the once-controversial medical practice of handwashing and sterilizing surgical equipment. What was once theory is now unquestioned standard practice. Similarly, no financial institutions or planning tools explicitly advocate for the use of debt as a systematic tool to achieve financial goals. If Spiral Theory is correct, this oversight amounts to statistical malpractice.

Flying from New York to Australia in under a day might seem inconceivable—until one understands the principles of flight. It took nearly 300 years to progress from Bernoulli's Principle to the Wright Brothers to supersonic jets. However, I hypothesize that these ideas will transform the investment industry far sooner for three reasons:

1. **They build on, rather than disrupt, the theoretical foundation of existing work.** Adjacent theories, such as those from Modigliani, Miller, Fama, Shiller, Black, Scholes, and Merton, are incorporated seamlessly.

2. **The data is compelling**: some debt improves outcomes, while excessive debt worsens them. Optimizing the timing and scale of leverage further enhances results, requiring little additional math to demonstrate.

3. **The need is urgent**: a survey of 27,402 individuals revealed that 81.5% will not achieve financial independence based on their current work, savings, and consumption patterns. Yet, with the application of these theories, over 80% could achieve financial independence. The societal impact of such a shift would be profound.

The strength of these theories lies not in rigid rules but in a flexible framework that leverages market forces for improved outcomes. Friedrich Hayek might argue that when necessity meets the means for action, individuals make better decisions—not from obligation, but because truth spreads, evolves, and becomes the norm. Better outcomes are not just needed—they are achievable. As Hayek would affirm, when necessity and opportunity align, progress becomes inevitable.

Shall We Play a Game?

Explore further. Play Spiral. Play Flex. Challenge the assumptions with AI.

Available in ChatGPT 4.0.

Note: As of this writing, ChatGPT 4.0 may require a subscription. Interestingly, the free version cannot perform the necessary math and simulations. While the AI may make mistakes, challenging it often prompts self-correction.

https://chatgpt.com/g/g-6753686a22f08191a74c46fb1342029d-spiral-theory-the-game

Acknowledgements

This work would not have been possible without the mentorship, sharp criticism, tough love, and guidance of several key individuals, both past and present: Michael Gibbs, Charles J. Cuny, Mahendra Gupta, Laurence Siegel, Jeffrey Jaffe, Chris Merker, Steve Vanourny, and Francis McMahon. To each of you, thank you.

I only recently learned that Mahendra and Charles were PhD candidates together at Stanford a "few" years ago. The fact that you both engaged with this work—even in its rough, early form—and continued to challenge and support me means more than you know. This refined version is, in many ways, a reflection of your insights and guidance.

Much of the inspiration for this work came from three of my children—John, Rosemary, and Reid—high schoolers who not only understood the essence of these ideas but also contributed to designing an effective plan to communicate them. They lent the perspective that two seemingly contradictory perspectives can coexist—a concept central to this work. Thanks for the cat.

Finally, I would like to acknowledge the broader academic influences that have shaped my thinking over the years. If Milton Friedman had not mentored Gary Becker, who in turn mentored Michael Gibbs, this journey—and these theories—might never have come to fruition. The ripple effect of their work and the academic community they cultivated stands as a testament to the enduring impact of great teachers and scholars.