The Free Energy Principle in Financial Markets: In Praise of "Noise Trading"

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Abstract

Individual investors frequently deviate from the principles of neoclassical finance by engaging in practices such as stock picking, trend following, and market timing. Such behavior is often deemed suboptimal. This article proposes an alternative perspective using Karl Friston's Free Energy Principle. It suggests that these seemingly suboptimal actions are integral components of a broader process aimed at balancing action with perception. Active and frequent engagement with financial markets entails leveraging the informational and risk-balancing nature of such markets to receive feedback, facilitate learning, and adjust internal models to align with the external environment. The market-driven alignment between action and perception fosters a more adaptive interaction between individuals and their environment.

Keywords: Financial Markets; Noise Trading; Free Energy Principle; Beliefs; Markov Blankets,
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1. Introduction

The neoclassical view of finance posits that individuals interacting with financial markets have neatly specified utility functions, levels of risk aversion, and time preferences (Merton 1973; Sharpe 1964). With these stable preferences in mind, such investors carefully choose combinations of securities that offer the highest returns considering the assumed risk levels. A direct implication of the Efficient Market Hypothesis (Fama et al. 1969; Fama 1970), another cornerstone of neoclassical finance, is that individual investors, typically without the informational advantages that large financial institutions have, should ignore short-term market movements. Instead, they are advised to focus on building and maintaining a diversified portfolio over the long term (Siegel 2021; Ellis 2002).

This view of investor behavior in financial markets is contested by empirical findings that show individual investors often shun broad diversification and gravitate towards stocks that capture public attention—such as those frequently covered in the news, those experiencing high trading volumes, or those with significant one-day price changes (Barber and Odean 2008; 2000; De Bondt 1998). Widely cited surveys in the field also indicate that these investors follow naïve patterns of trading, underestimate stock volatility (De Bondt 1998), tend to sell winning stocks while holding losing ones (Barber and Odean 2013). Furthermore, even when individuals do hold diversified portfolios, their holding periods are typically short-lived, averaging less than two years (Vlastelica 2017). This divergence from the neoclassical ideal has prompted substantial research into how behavioral biases prevent investors from making choices that truly reflect their preferences (Barberis 2013; Barberis and Huang 2001; Barberis and Thaler 2003; Thaler 1999). In this context, financial losses incurred due to insufficient diversification, trend-following, and excessive trading are seen as the market's method of penalizing investors for not accurately adhering to their stated preferences.

In this paper, I propose adopting Karl Friston's Free Energy Principle (Kirchhoff et al. 2018; Parr, Pezzulo, and Friston 2022; Friston 2010) as a comprehensive framework that can illuminate the complex interactions between individuals and financial markets. Within this framework, trading in financial markets does more than merely mirror individual preferences; it also provides a venue for discovering, refining, and harmonizing these preferences with the external environment. The FEP is based on the observation that surviving entities, including the human brain, manage to endure over time despite the overarching principle of increasing entropy, as described by the second law of thermodynamics. To do so, they engage in a process of actively constructing explanations of their own sampling of the world. They not only explain their sensory input, but also explain which input to sample.

As these entities maximize the evidence of their own existence, they behave as if they are minimizing one parameter, “free energy”, in their interactions with their environment. Here, “free energy” refers to a concept from information theory that parallels the thermodynamic notion of energy that is available to perform work. In this context, an entity that is minimizing free energy is essentially about refining it model of its environment, hence reducing the long-term average of 'surprisal'—encountering an improbable sensory state given a model of the world (Friston 2010).

The Markov Blanket, the statistical boundary between an entity and its environment, is an essential feature of the free energy minimization framework (Parr, Pezzulo, and Friston 2022; Kirchhoff et al. 2018). Within this framework, a system can be partitioned into internal states, external states, and the Markov Blanket itself, which comprises both sensory and active states. Sensory states are responsible for receiving information from the external world, while active states enable the system to affect the environment. By taking deliberate actions, an entity can effectively manipulate its sensory inputs, which in turn recalibrates its internal model of the world. This interaction between action and perception underlies adaptive behaviors, allowing the entity to maintain or improve its alignment with the environment. Over time, these adjustments contribute to a more accurate or efficient interaction with the environment, illustrating a dynamic interplay where action changes perception, which then influences future actions.

After introducing the FEP and the Markov Blanket in Section 3, I argue in Section 4 that financial markets serve as a critical tool for decision-makers to knit their Markov Blankets, and hence manage their external environment's risks and dynamics effectively. This functionality is enhanced by the diversity of standardized, accessible, and regulated financial assets, which provide ample opportunities to balance risk with returns. Furthermore, I suggest that while traditional finance views excessive engagement with financial markets as a result of succumbing to behavioral biases, it should instead be seen as part of a broader strategy to minimize free energy. That is, excessive trading is better understood as a way to solicit sensory feedback through changes in invested wealth, thereby helping to regulate the action-perception loop effectively.

My proposition in this article is that adopting a holistic view provides a comprehensive framework that explains various empirical features of investor behavior. I argue that this framework explains how risk preferences vary over time. I also argue that the FEP-based framework integrates two traditionally distinct functions of market prices. Firstly, this framework enables prices to act as indicators of existing preferences, as individuals express their views and expectations through their trading actions.

Secondly, this framework supports the idea that prices also play a formative role in shaping investors' perceptions and decisions. Specifically, the feedback from investment returns leads investors to continually update and refine their internal models of the world and their risk preferences in it.

This iterative process involves adjusting their risk preferences based on the outcomes they experience, thus leading to a dynamic interplay between perception and financial reality. I argue that the dominance of one of the two effects – the revelation effect and the shaping effect – over the other depends on the extent to which they help decision-makers reduce free energy. This dual functionality of prices—not only reflecting but also moulding investor behavior—highlights the complex interdependencies within financial markets, illustrating how market dynamics extend beyond mere transactions to influence broader economic and cognitive processes.

I present recommendations for future research, emphasizing the distinctive potential of the FEP-based approach compared to other perspectives on the feedback effects of financial markets. I argue that effectively balancing action and perception through trading activities could positively influence other decision-making realms, suggesting that the insights gained from financial trading have far-reaching implications beyond the financial markets themselves. This broader applicability warrants further exploration to understand how principles derived from financial decision-making can be generalized to other fields and decision-making processes.

On a practical note, I advocate a less condemnatory view of active engagement with financial markets by individuals. In his review of the behavior of individual investors, De Bondt (1998, p. 842) reports a common perception "It is part of Wall Street folklore that small individual investors are 'dumb'". The practice of "dabbling" in financial assets, when done responsibly without leading to financial ruin, can have positive spillover effects, helping individuals refine their preferences and their models of the world, its risks, and their place in it. Within this view, the losses incurred from noise trading can be treated as a premium for free energy minimization.

2. Markets, Prices, and Noise

The recognition of the informational role of market prices is a dominant feature of financial research starting from the second half of the twentieth century. In a noted criticism of the mechanical view of Marshall and Walras, which exclusively focuses on the market-clearing role of prices, Sanford Grossman argues that such models "do show how people use the information contained in prices. No one learns anything from prices; people are merely constrained by prices. In their framework, prices determine the costs and benefits of various activities, and thus provide incentives to economize on the use of (or to increase the production of) relatively scarce resources. In some ways, these models treat people like rats in a maze" (Grossman 1989, p.1).

Price signals, according to Hayek (1945), serve as messengers of dispersed knowledge, reflecting the myriad individual decisions, values, and circumstances of countless market participants. They encapsulate a vast array of information that no central planner could possibly possess or comprehend. In this view, prices are not merely numerical indicators of value, but rather encoded messages that convey valuable insights into the underlying conditions of the economy. One of the key insights of Hayek's emphasis on price signals is that they enable efficient resource allocation without the need for centralized coordination. Through the mechanism of prices, producers and consumers receive signals about relative scarcities and surpluses, guiding them in their decisions about production, consumption, and investment. Prices adjust dynamically in response to changes in supply and demand, signaling to market participants where resources are most urgently needed and where they can be most productively employed. In his *Law, Legislation and Liberty*, Hayek (1976, p.187) describes the challenges of entrepreneurial decision-making:

"Much of the knowledge of the individuals which can be so useful in bringing about particular adaptations is not ready knowledge which they could possibly list and file in advance for the use of a central planning authority when the occasion arose; they will have little knowledge beforehand of what advantage they could derive from the fact that, say, magnesium has become much cheaper than aluminum, or nylon than hemp, or one kind of plastic than another; what they possess is a capacity of finding out what is required by a given situation, often an acquaintance with particular circumstances which beforehand they have no idea might become useful".

Furthermore, Hayek (1948) recognized that prices also serve a crucial role in transmitting knowledge over time. Through the process of entrepreneurial discovery and competition, market participants continually assess and reassess the value of goods and services, driving innovation and adaptation. Prices act as signals not only of current conditions but also of future expectations, guiding investment and innovation towards areas of potential opportunity.

The strongest empirical manifestation of the informational role of prices is seen in Eugene Fama's Efficient Market Hypothesis, which, in its semi-strong form, suggests that the prevailing stock prices reflect all available information about the firm (Fama 1970). The strong ability of prices to reflect such information has led to a growing literature suggesting that firm insiders, by monitoring their firm's stock price, can also learn from outsiders. Chen et al. (2007) underscore the influence of informed trading on investment decisions, demonstrating a positive relationship between a firm's price informativeness and the sensitivity of investments to stock prices through analysis of firm-level data. Fresard, (2012) expands on this by illustrating how corporate managers glean valuable information from stock prices not only to guide investment decisions but also to determine optimal cash reserve levels. Additionally, Cesari and Huang-Meier (2015) demonstrate how corporations learn from stock returns to establish and adjust dividend policies.

Kau et al. (2008) provide evidence suggesting that managers tend to listen to the market, as they are likely to respond to a negative reaction to a takeover announcement by cancelling the deal. In turn, Luo (2005) finds that merging firms extract information from stock prices when determining whether a deal will eventually be closed. This finding is particularly noticeable in the acquisitions made by small acquirers and in M&As in non-hi-tech sectors, which represent cases in which the market has more information than the companies' insiders.

Studies such as Foucault and Fresard (2014) and Yan (2024) go a step further. They propose that when firms have difficulty obtaining relevant information from the pricing of their own shares, they may turn to the stock market valuation of their peers to guide their investment strategies. For example, Foucault and Fresard (2014) demonstrate that firms with low price informativeness and limited managerial knowledge can gather essential investment-related insights from the market valuation of their peers. Similarly, Yan (2024) suggests that privately listed firms can still derive valuable information from the valuation of their publicly traded counterparts.

A direct implication of this emphasis on the informational richness of stock prices is that individuals who do not possess new information should refrain from active engagement in financial markets. Instead, they should invest in a diversified index. This approach aligns with Jack Bogle of Vanguard's advice: "Buy everything and hold it forever" (Bogle 2001) and supports the classical Ellis (1975, 2002) argument that long-term investments in stock indexes benefit uninformed investors by enabling them to succeed in what he calls the “loser's game”. Additionally, the mean-variance framework, which assumes that individuals have clearly defined risk preferences, helps investors determine the optimal balance between a market (tangent) portfolio and risk-free securities (Levy and Roll 2010).

Despite the enduring performance of the long-term passive investing strategy, it does not seem to be followed by investors: retail hold exchange-traded funds (ETFs) for less than two years (Barrot, Kaniel, and Sraer 2016; Vlastelica 2017). There is also evidence that retail investors engage in suboptimal practices such as drifting away from diversification and focusing on attention-grabbing stocks, trend following, and speculation (Barber and Odean 2008; George and Hwang 2004; Barberis and Thaler 2003; Barber and Odean 2000). The mainstream financial literature labelled such behavior as “noise trading” (Mendel and Shleifer 2012; Sias, Starks, and Tiniç 2001; Shleifer and Summers 1990; DeLong et al. 1990).

In the presence of a strong arbitrage structure, such noise-trading behavior would have limited influence on prices. At best, such noise trading creates the temporary disequilibria that create profit opportunities for more informed and sophisticated investors that can gain new information and reap gains at the expense of their noise trading counterparts (Grossman and Stiglitz 1980). In this context, the losses that investors incur due to lack of diversification, trend-following behavior, and excessive trading can be seen as the market's way of disciplining participants for not accurately revealing their preferences and for their lack of understanding of market dynamics.

In the sections that follow, I advocate for a comprehensive method to examine how less informed individuals interact with financial markets. I suggest that the trading behavior of retail investors, often considered suboptimal, is actually part of a broader balancing strategy. These individuals use the financial markets, which are highly effective at mirroring external information, to align their actions with their perceptions of the world and its risks. Moreover, active trading is not just a reflection of pre-set preferences but also a proactive measure. It generates feedback that helps reconcile individuals' internal and external views of the world, leading to a clearer understanding of their risk preferences.

3. The Free Energy Principle: Unifying Action and Perception in Financial Markets

The Free Energy Principle (FEP) is a theoretical framework in neuroscience and theoretical biology that offers a unified explanation of how living beings adapt and survive in their environments. Proposed by Karl Friston, the FEP suggests that all living organisms act to minimize the surprise or the free energy of their sensory inputs given their model of the world (Friston 2010). This concept of free energy is borrowed from statistical thermodynamics but is used in a slightly different sense; here, it represents a measure of how likely observed states are, given a particular model of the world—essentially, how unexpected these observations are given what the system assumes about its environment.

At the core of this theory is the idea that biological systems maintain their states and resist a natural tendency toward disorder. According to FEP, organisms strive to stay in a limited number of states that are congruent with continued existence or survival

(Parr, Pezzulo, and Friston 2022). This is achieved by minimizing free energy, which can be understood as a proxy for surprise or uncertainty. The less surprise an organism encounters, the better it is at predicting and adapting to its environment, thereby ensuring its survival.

An essential component of FEP is the concept of the Markov blanket (Kirchhoff et al. 2018). A Markov blanket is a statistical boundary that separates any system from its environment. For any given system, the Markov blanket includes all the variables that shield internal states from external states. These blankets can be thought of as dividing the system into internal states, external states, and blanket states, which include sensory states that are influenced by external states and active states that can influence external states (Clark 2017). The states within the Markov blanket interact with each other, but their interaction with external states happens only through this blanket. This concept helps us understand how organisms perceive and act upon their environments without being overwhelmed by external variability (Kirchhoff et al. 2018).

The interplay between internal, sensory, and active states within the Markov blanket is where the emphasis on action as a tool becomes crucial. According to FEP, action is not merely a response to sensory inputs but is a method by which organisms actively reduce their free energy. Actions adjust the external world to align with the organism's predicted states, which are based on its model of the world (Parr, Pezzulo, and Friston 2022). By acting upon their environments, organisms affect what they sense back, thus continually updating their internal model and reducing surprise. This dynamic process where perception and action are intertwined helps the organism maintain a homeostatic balance and adapt to new circumstances.

This idea of action triggering sensory information is a significant shift from traditional views where sensory information passively received triggers action. Instead, FEP posits that organisms are proactive: they engage in actions that ensure the sensory inputs they receive are as predictable as possible (Clark 2017). In essence, organisms do not just passively adapt to the world but actively configure it to be more predictable, thereby minimizing their free energy. By emphasizing proactive actions that align sensory inputs with internal models, FEP provides a framework that links biological, psychological, and social phenomena under a common principle, highlighting the intricate dance between an organism and its environment in the pursuit of minimal surprise. This theory, extensively discussed in Friston's works and further elaborated in the broader academic discussion, continues to influence various fields, from neuroscience to psychology to artificial intelligence, providing a robust model for understanding how systems maintain their integrity in a complex world.[1]

The FEP extends beyond individual organisms. It has been applied to understand social and cultural dynamics, where groups of individuals, through shared beliefs and communicated behaviors, strive to minimize shared free energies. This application could potentially explain how cultural norms and societal structures evolve to reduce collective surprises and maintain social homeostasis (Parr, Pezzulo, and Friston 2022). This framework has also been applied in various domains, including neuroscience, physiology, and evolutionary biology, shedding light on topics such as synaptic plasticity, neuronal dynamics, and evolutionary fitness.

[1] The reflexive nature of our lives, as suggested by the FEP, indicates that we create the context for our decisions while simultaneously making decisions based on that context.

The emphasis on the interaction between environmental and cognitive factors in shaping behavior is not new to economic thought. In his famous scissors analogy, Simon (1990) famously argues that “Human rational behavior is shaped by a scissors whose blades are the structure of task environments and the computational capabilities of the actor” (p. 7). Under FEP, these cognitive limitations shape the predictions that the brain makes. The brain uses these simplified models to anticipate and respond to sensory input, just as Simon's cognitive blade helps us make "good enough" decisions. Likewise, in FEP, the environment provides the sensory input that the brain uses to compare against its predictions. This is akin to Simon's environmental blade, which shapes the decisions we make by presenting certain options and constraints. Indeed, an argument can be made that FEP presents a formalized and generalized framework for Simon’s scissors analogy. More importantly, the scope of FEP, with its emphasis on free energy minimization, extends beyond human decision-making and applies to realm of all entropy-resisting entities (Parr, Pezzulo, and Friston 2022).

In robotics and artificial intelligence, the FEP serves as a guiding principle for designing autonomous systems that can perceive, learn, and act in uncertain environments (see Friston et al., 2015). By minimizing prediction errors and maximizing expected rewards, robots and AI agents can navigate complex tasks such as object recognition, path planning, and decision-making (Linson et al. 2021). This approach has implications for fields such as autonomous vehicles, healthcare robotics, and industrial automation. In the field of machine learning, the FEP has inspired the development of novel algorithms and models. This approach has been applied in various machine learning tasks, including probabilistic modeling, Bayesian inference, and deep learning, leading to advances in natural language processing and reinforcement learning (Parr, Pezzulo, and Friston 2022).[2] However, the applications of the FEP to explain behavior in financial markets remains to be examined.

The starting point in applying FEP to investment behavior is the recognition that active trading in financial markets is a practice that can extend far beyond simple profit-seeking behaviors. Through such interactions, individuals actively engage in knitting their Markov blankets, shaping the boundary that mediates the exchanges between their internal states and the external world. This process aligns with the Free Energy Principle, where the goal is to minimize free energy, a concept that encapsulates the balancing act between predictions based on internal model, which covers a comprehensive view of the world and the risk preferences within it, and the external cues received from the market environment.

In financial markets, prices are critical sensory data that reflect the perceived riskiness of the external environment. By actively trading, individuals interact with these price signals, effectively testing and adjusting their internal models against the reality presented by the market. Each buying or selling decision is influenced by an individual's predictions of future market behaviors, which are themselves shaped by the array of external data inputs filtered through their Markov blankets.

When an individual trades, they are essentially placing a bet that their model of the world and their risk preferences in it, as encapsulated within their Markov blanket. This active engagement where each decision to buy or sell adjusts the sensory states at

[2] From the perspective of the Free Energy Principle (FEP), the rapid changes in governance and legal systems observed in the aftermath of large-scale events like wars and revolutions, such as the occupation of Japan and Germany after World War II, can be seen as a collective cognitive adjustment. These events significantly reshape a nation's physical and economic environments, creating a need for a swift reorganization of societal structures. The FEP suggests that such abrupt shifts in governance are a manifestation of the collective cognitive model's effort to minimize the discrepancy between prior expectations and the new environmental realities. In essence, the collective consciousness of a nation undergoes a rapid recalibration to align with the drastically altered circumstances, indicating that centuries of gradual evolution can indeed be condensed into a few transformative months under extreme conditions. I thank the anonymous reviewer for raising this point.

the boundary of the Markov blanket, continuously informs and reforms the individual's internal model and risk attitudes within it. This dynamic interplay aims to reduce the discrepancy between the predictions made by the internal model and the actual outcomes, thereby minimizing free energy.

Nassim Taleb's concept of "skin in the game" is particularly relevant in explaining why financial markets are superior to other mechanisms for reflecting the risks and opportunities in the business environment . This principle underscores the importance of having personal investment and risk in outcomes, which is foundational in financial markets where participants use their own capital. In financial markets, investors, traders, and fund managers demonstrate "skin in the game" by making investment decisions with their own or their clients' money at stake. This personal financial risk ensures that their decisions are closely aligned with the real and perceived conditions of the market. When decision-makers stand to gain or lose based on their judgments, they are incentivized to undertake thorough analysis and make decisions that reflect genuine market risks and opportunities.

Moreover, financial markets aggregate these risk-aware decisions from a multitude of participants, creating a comprehensive and dynamic reflection of the economic and business landscape. Each market participant responds to information, adjusts to economic indicators, and reacts to geopolitical events, thereby continuously updating the collective market understanding and pricing of assets. This leads to efficient price discovery, where asset prices integrate and reflect all available information and collective sentiment about future risks and rewards. This dynamic adjustment process, powered by the vested interests of diverse market participants, ensures that financial markets are particularly adept at signaling changes in the economic environment, making them effective tools for gauging and reacting to business conditions in real time.

This adjustment is crucial because financial markets are complex adaptive systems that offer participants standardized and regulated tools, allowing investors to always deals with prices that are in flux, influenced by global events, economic reports, and shifts in investor sentiment. In the context of FEP, initiating a trade consists of altering the exposure to the external world, as mediated through the Markov Blanket. If such change in exposure fails to lower the variational free energy, the feedback from prices, and help the trader readjust her model of the surrounding environment and the risk preferences within such model.

Indeed, the FEP helps explain how risk preferences can change over time while maintaining stable features. In her review of the empirical literature on the stability of risk preferences over time, Schildberg-Hörisch (2018) concludes:

> *"This evidence about the stability of risk preferences can be interpreted as the glass being half-full or half-empty. It is half-full in the sense that the available empirical evidence implies that individual risk preferences do represent a persistent characteristic of an individual that is at least moderately stable over time: correlations over time in panel data are nearly exclusively positive, typically significant, and of medium or large size. It is half-empty because the correlations of risk preferences over time are low enough to cast doubt on the empirical validity of the strict stability definition typically put forward in economics."*

The application of the FEP framework accommodates this empirical fact by recognizing that, when minimizing free energy, it's essential that changes to the Markov blanket are minimal. The rationale for minimal changes is based on the goal of maintaining an optimal balance between the complexity and accuracy of the internal model. Excessive adjustments to the Markov blanket could lead to overfitting—where the internal model becomes too finely tuned to the current environmental conditions, potentially reducing its generalizability and predictive power in new or changing contexts. Minimal necessary changes ensure that the internal model stays robust, avoiding the pitfalls of reacting to every minor fluctuation in environmental input, which could lead to unnecessary metabolic costs and cognitive overload.

Thus, by making only essential adjustments, the Markov blanket facilitates a more stable and efficient way to manage the interactions between internal and external states. This approach helps in maintaining a sustainable and effective strategy for minimizing free energy, thereby enhancing the organism's ability to predict and adapt to its environment without compromising the integrity or utility of its internal model.

It is worth noting that the emphasis on small adjustments in Markov Blankets can still leave room for intertemporal trade-offs in shaping one's Markov blanket. FEP can be seen as accommodating the types of investment strategies advocated by Nassim Taleb (Taleb 2013; 2007) and Mark Spitznagel (Spitznagel 2021; 2013). These strategies, which intentionally avoid the instantaneous and automatic alignment between the investment approach and the current environment, involve investing in seemingly suboptimal assets, such as out-of-the-money put options. This approach may appear to leave the investor in a position of ignorance or underperformance compared to others who are more finely tuned to the prevailing market conditions.

However, when these strategies succeed, they do so in a significant way, generating outsized returns that provide the investor with a greater capacity to realign their portfolio with the environment after a major market disruption. This approach aligns with the Free Energy Principle in that it embraces a form of strategic uncertainty—investors deliberately maintain a buffer against overfitting their strategies to the current environment, thereby preserving the flexibility to adapt more effectively when the environment undergoes a sudden change. In this sense, the principle supports the idea of accepting short-term misalignment or underperformance as a trade-off for the potential to capitalize on significant, unpredictable market shifts, ultimately offering a more resilient long-term investment strategy.

The application of the FEP to financial markets also offers a framework allowing two potentially conflicting views of prices to co-exist. The first is 'discovered preference' approach by Plott (1996) which explains that individuals develop an understanding of their desires through reflection and practice. Essentially, this hypothesis captures the idea that individuals with established preferences may utilize market mechanisms to discover their true preferences through trial and error. Therefore, according to this hypothesis, if preferences meet standard theoretical criteria, anomalies are likely the result of individual errors, which are expected to decrease with market experience. Under this premise, genuine preferences of subjects would only become evident in subsequent market trials. Furthermore, if this hypothesis holds true, errors made by subjects may be either symmetric or asymmetric. The second approach to prices is the 'shaping' approach formulated by (Loomes, Starmer, and Sugden 2003). This hypothesis suggests that individuals with initially vague preferences may use market prices to fully define their preferences. It posits that market participants adjust their bids toward the price observed in previous market periods, even when individuals' values are not inherently connected to the market price.

The Free Energy Principle (FEP) framework helps determine the effectiveness of two distinct approaches by assessing their ability to reduce variational free energy. The "discovered preference" approach is effective if initiating a trade—changing exposure to the world based on an internal model to align financial market exposure with this model—sufficiently minimizes the variational free energy for the decision-maker.

Alternatively, the "shaping approach" gains superiority if adjusting risk preferences or significantly revising the internal model of the world results in lower variational free energy.

4. Adaptive and Spillover Effects of Free Energy Minimization

The emphasis on the feedback effects of markets is not unique to the framework provided by FEP. Additional theories also emphasize the mechanism. The most noted of these in the Adaptive Market Hypothesis (AMH) (Lo 2017) which blends traditional finance theories with concepts from evolutionary biology. At its core, the AMH suggests that market efficiency varies over time, influenced by the changing dynamics of market participants, the flow of information, and the broader economic environment.

A central tenet of the AMH is its emphasis on learning and adaptation processes within the market. Market participants learn from past experiences, adjust their expectations, and modify their behaviors based on new information, leading to a continuous cycle of adaptation. This process of learning and adaptation, driven by the mechanisms of competition, innovation, and natural selection, can lead to periods of relative market efficiency, where prices reflect all available information, as well as periods of inefficiency, where opportunities for above-average returns exist due to mispricings. Additionally, the AMH underscores the importance of market ecology, the idea that a diverse array of investment strategies and behaviors coexist and interact within financial markets, contributing to the market's adaptability and resilience. Through this lens, the Adaptive Market Hypothesis provides a more nuanced and dynamic framework for understanding financial markets, one that accommodates the complex interplay between human behavior, market structure, and economic forces.

Despite the prevailing focus on feedback and adaptability in financial markets, the application of FEP arguably spans a broader domain than the Adaptive Market Hypothesis (AMH). While feedback and adaptability are crucial for driving market efficiency, these concepts within the FEP framework retain their significance and influence even in highly efficient markets. In contrast to the AMH, which primarily addresses the adaptability and functioning of financial markets, the implications of feedback and adaptability under the FEP could reach far beyond the ecology of such markets. By engaging with financial markets and meticulously shaping their Markov Blankets, individuals have the opportunity to refine their internal models of the world, including its risks and their own preferences. Such active trading engages the cognitive, emotional, and psychological dimensions of human behavior. This forces individuals to confront their biases, reassess their assumptions, and continuously learn from the outcomes of their actions. This not only refines their financial strategies but also promotes a deeper cognitive processing regarding decision-making and risk assessment, skills that are transferable across various aspects of life that might be deemed more relevant from the perspective of the decision-maker.

One crucial area where the influence of FEP becomes evident is in personal finance management. Engaging in financial markets requires a careful evaluation of risks and rewards, which encourages traders to constantly update their beliefs against market realities. This practice of aligning financial predictions with actual outcomes cultivates habits of meticulous financial planning. Traders learn to apply the same rigorous standards to their personal finance, managing spending, saving, and investing more

Moreover, trading under the influence of FEP enhances emotional regulation and resilience. Financial markets test one's ability to maintain composure and adhere to rational strategies amid volatility. Traders learn to manage their emotional responses to market ups and downs, which is beneficial in personal areas such as health management, where managing stress and maintaining a balanced lifestyle are crucial for long-term well-being. Finally, the skills honed in the fast-paced world of trading are also applicable in crisis management situations, including personal and community crises. The ability to assimilate changing information swiftly, update predictions, and take decisive action is essential in any high-stakes environment.

In conclusion, trading in financial markets, viewed through the lens of the Free Energy Principle, is not merely a financial endeavor but a comprehensive cognitive training ground. It refines skills in financial management, strategic planning, emotional resilience, and ethical awareness, which are transferable to managing marriage, housing decisions, and crisis situations. This broad application of trading skills leads to more informed, sustainable decisions, enhancing personal and societal outcomes across various life domains.

5. Conclusion and Implications for Personal Finance

Trading in financial markets serves as a platform not only for financial gain but also for profound introspection and self-discovery. As individuals navigate the complexities of market dynamics, they gain valuable insights into their risk tolerance, decision-making tendencies, psychological biases, and long-term aspirations. Contrary to the neoclassical view that assumes stable preferences and rational decision-making, empirical evidence highlights the prevalence of behavioral biases among investors, leading to suboptimal choices such as lack of diversification and excessive trading. However, viewing these behaviors through the lens of Karl Friston's Free Energy Principle offers a new perspective. By actively participating in trading activities, individuals interact with prices, which to a large extent, reflect the external environment, thereby providing valuable feedback for updating internal models and minimizing prediction errors. By embracing trading as a journey of self-discovery, individuals can cultivate not only financial acumen but also a deeper understanding of themselves, fostering better decision-making in all facets of life.

Still, the practically oriented reader might wonder how such an approach would be put in practice to enhance the personal investment experience. A potential application of this approach for investors, and their advisors, to allocate an albeit small part of their portfolio for the practice of experimenting with active trading in financial assets. On the face of it, it might look as if this recommendation leads investors to fall in the trap of mental accounting, often viewed as a behavioral bias where individuals categorize and treat money differently depending on its source or intended use, and eventually leading to suboptimal financial decisions. However, the consensus regarding the negative consequences of such practices has been broken. Das et al. (2010) offer a different perspective by not simply dismissing mental accounting as a wealth-limiting bias. Instead, they investigate how mean-variance analysis can be adapted to accommodate the distinct goals of investors who maintain separate investment accounts. This approach considers the psychological tendencies behind mental accounting and seeks to optimize investment strategies within that framework.

Building on this concept, the development of Goal-Based Portfolio Theory (GBPT) has provided a more refined approach, focusing on achieving specific financial objectives rather than merely optimizing risk and return. GBPT involves identifying and prioritizing individual goals, assigning each a specific risk tolerance and time horizon, and then tailoring investment strategies to meet these goals (Brunel 2015; Parker 2022).

Therefore, my recommendation for investors to engage in active trading with a small portion of their portfolio should be considered within a broader context. While these trades are less likely to generate high risk-adjusted returns, they can provide valuable insights into the investor's risk attitudes and tolerances in response to changes in the macroeconomic environment. This understanding helps balance their expectations with the realities of the market, supporting the development of credible and sustainable long-term strategies to which the largest portion of the portfolio can be allocated.

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