Stock Market Anomalies as Mediators Between Prospect Factors and Investment Decisions and Performance: Findings at the Individual Investor Level

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Abstract

While other studies have investigated the direct impact of prospect factors on investment decisions and performance at the individual level, we examine the mediated link between the two, via fundamental, technical and calendar anomalies. The study applies a structural equation model to data for 324 individual investors in Pakistan. Our findings show that two processes, fundamental and calendar anomalies, mediate the relationship between certain prospect factors and investment decisions and performance. Of these prospect factors, regret aversion is the strongest predictor of investment decisions and performance, followed by calendar anomalies. It is also the strongest predictor of investment decisions and performance via fundamental anomalies.

Keywords: Prospect theory, stock market anomalies, investment decision and performance, behavioral finance.

JEL classification: G2, G14, G15.

1. Introduction

While many studies have established a direct link between prospect factors and investment decisions and performance among institutional investors, this study focuses on the mediated link through which this relationship exists for individual investors. Should theory prove inadequate, it is important to test mediation processes empirically by

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introducing the mediator during the research design phase. In newer fields of inquiry, researchers may choose to focus on developing a causal relationship between variables.

In this study, we develop the causal relationships between prospect components and investment decisions and performance. The more established areas of investigation warrant the use of multiple mediators. Accordingly, we apply different mediation mechanisms to better understand these processes (see Farooq et al. 2014; Judd and Kenny 1981). To the best of our knowledge, this study is the first attempt to examine and compare multiple mediators of the relationship between prospect factors and investment decisions and performance at the level of individual investors – a key aspect of behavioral finance.

The literature identifies different classes of anomalies in the securities market that may influence the investment decisions and performance of individuals (see Barber and Odean 2008; Brealey et al. 2012; Daniel et al. 1998). We examine three classes of anomalies – fundamental, technical and calendar – to gauge whether they mediate the relationship between prospect factors and individuals' investment decisions and performance. Specifically, we argue that prospect factors induce these stock market anomalies, which in turn affect the investment decisions and performance of individuals. Our study focuses on three components of prospects: loss aversion, regret aversion and mental accounting.

This study contributes to the literature by using an integrated model to identify the mediated relationship between prospect components and investment decisions and performance. Given that behavioral finance is a comparatively new aspect of financial theory, we aim to gauge whether it is well suited to the proposed model in the context of a non-Western economy – an area that has garnered little attention in the literature. We do not, however, account for the cultural aspects of this relationship.

We start with a conceptual overview of prospect components and stock market anomalies, examining how the first affects the second according to prospect theory and, in turn, how this relationship determines investment decisions and performance among individuals. Next, we present the study's methodology and data, using a structural equation model (SEM) and phantom model to test the multi-mediation relationship. Finally, we present the study's results, followed by a discussion and conclusion.

2.   Literature Review

This section reviews the literature on prospect theory and stock market anomalies.

2.1. Prospect Theory

Prospect theory is a critique of expected utility theory – a descriptive model of decision under uncertainty (Kahneman and Tversky 1979) – on the premise that choice under the latter is inconsistent when prospects are deemed risky. Constructing the expected utility function requires satisfying several axioms: completeness, transitivity, continuity and independence (Barberis 2001).

According to prospect theory, investors focus on changes in wealth rather than total wealth (Levy and Levy 2004). A change in the value of wealth will lead to loss aversion, while risk aversion depends on previous performance (Barberis et al. 2001). Prospect theory accounts for situations in which investors are loss-averse as well as risk-averse. As Figure 1 shows, the value function is normally concave for gains and convex for losses (Kahneman and Tversky 1979). Prospect theory thus explains which factors and effects come into play when gauging the stock market.

Figure 1: Value functions
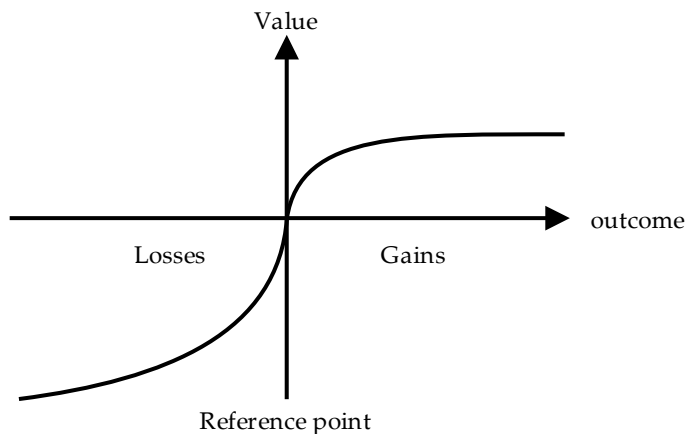
2.2. Stock Market Anomalies

Stock market anomalies affect the performance of the stock market as well as that of individual investors. These anomalies are usually

associated with certain kinds of securities, causing them to under- or over-perform (Thaler 2005). In traditional finance theory, such anomalies describe stock price movements or events that cannot be explained by the efficient markets hypothesis (Silver 2011). In the context of an inefficient market, we look at three classes of stock market trading anomalies: fundamental, technical and calendar anomalies.

Fundamental anomalies are associated with elements of fundamental analysis (Richardson et al. 2010) – factors that determine the intrinsic value of a stock, including economic factors, companies' financial statements and industry trends (Graham and Dodd 1934). Technical anomalies relate to elements of technical analysis (Bako and Sechel 2013), whereby past price and volume are used to predict stock returns (Mizrach and Weerts 2009). This refers particularly to price patterns and volume spikes (Turner 2007), often using predictive charts (Achelis 2001). When stock prices are not fully indicative, investors may attempt to make logical conjectures about the abstraction between stock prices and signals (Brown and Jennings 1989). Finally, the time or calendar element is integral to investment decisions because a security may have different prices at different times. Season, for instance, can influence stock price movements (Thushara and Perera 2013; Thaler 1987).

Under prospect theory, the value function evaluates only a single outcome (Kahneman and Tversky 1979). When individuals result in multiple outcomes, however, the value function interprets these through prospect factors to explain why individuals behave differently in different situations. All three classes of anomalies apply under prospect theory, which thus helps us understand the market conditions under which individual investors behave, depending on a specific prospect.

3. Conceptual Model

This section develops a conceptual model of prospect factors, stock market anomalies and investment decisions and performance, based on which we present the study's hypotheses (see Figure 2).

Figure 2: Conceptual model
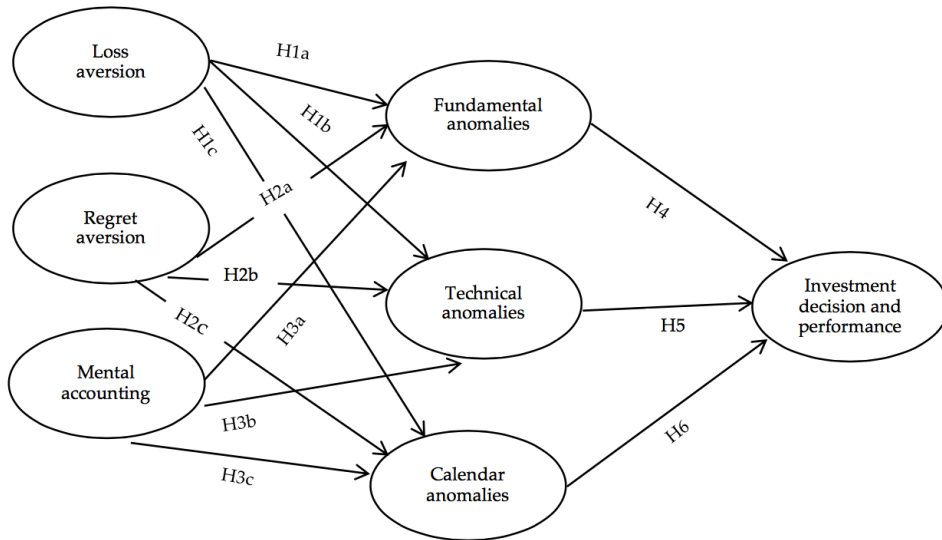
3.1. Loss Aversion and Fundamental Anomalies

Loss aversion refers to an investor's tendency to feel a loss more keenly than a gain (Kahneman and Tversky 1979). Such individuals are likely to sell winning stocks too early by overreacting to an uptrend in stock prices. Similarly, they may end up holding onto losing stocks too long by underreacting to a downward trend in stock prices until that stock recovers (De Bondt 1998; Shefrin and Statman 1985).

Once the stock price rises, less risk-averse investors will invest on the assumption that prior gains will buffer any later losses. A fall in the stock price will make investors more risk-averse if they wish to avoid any further losses (Odean 1999). This variation in preferences indicates that investors gauge their prospects depending on changes in stock price. Based on this, our hypothesis (H1c) is that *the higher the degree of loss aversion, the more strongly it will generate fundamental anomalies in the stock market*.

3.2. Loss Aversion and Technical Anomalies

Prospect theory explains how individuals choose from among different prospects under conditions of uncertainty (Kahneman and Tversky 1979). In the context of loss aversion, they may assign a greater probability to expected losses than to acquired gains, depending on

previous stock performance and other market information (Barberis et al. 2001). This, in turn, will drive their future investment decisions.

On observing a drop in the stock's price below a support level (technical analysis) and fearing any further loss, such individuals will sell the security at equilibrium. Investors heavily rely on technical analysis in this case, which also accounts for technical anomalies in the securities market. Thus, we expect (H1b) that, *the higher the degree of loss aversion, the more strongly it will generate technical anomalies in the stock market*.

3.3. Loss Aversion and Calendar Anomalies

Loss-averse individuals will consciously aim to avoid losses and focus on certain gains instead. They are more likely to sell winning stocks and hold onto loss-making stocks (Weber and Camerer 1998) because they would rather not lose a sure gain in the first case and would prefer to avoid incurring a loss in the second. Moreover, individual investors may choose to invest in small-capitalization stocks, which they perceive as growth stocks (Bauman et al. 1998) that will yield a certain and higher return.

Branch and Chang (1990) find that stocks that performed poorly in December were likely to recover in January, thereby driving individual investors to sell their losing stocks at the end of the year (December) to take advantage of tax losses. The certain gain in January made such individuals more risk-averse. This implies that they are loss-averse in the sense of calendar anomalies. This explanation leads to the following hypothesis (H1a): *the higher the degree of loss aversion, the more strongly it will generate calendar anomalies in the stock market*.

3.4. Regret Aversion and Fundamental Anomalies

Regret aversion stems from having made the wrong choice or carried out the wrong action, or from having missed a good opportunity (Ackoff 1994). Regret-averse individuals behave irrationally in response to a change in stock price, for instance, by selling a stock quickly if its price goes up because they assume the price might fall in the future (Dodonova and Khoroshilov 2005). In contrast, they may hold onto a losing stock in the hope that its price will go up. In both cases, this is done to avoid future regret, where individuals assume that the stock's expected price will revert to its mean. Moreover, regret-averse individuals prefer to invest in 'glamour' companies because they associate 'riskier' companies with having to make more difficult or complex decisions (Pompian 2011). Based

on this, we propose (H2a) that, *the higher the degree of regret aversion, the more strongly it will generate fundamental anomalies in the stock market*.

3.5. Regret Aversion and Technical Anomalies

Regret-averse investors use their past performance in the stock market to make decisions that will minimize the likelihood of regret in the future. This forecasting of stock returns is, therefore, based on previous risk and uncertainty (Azzopardi 2010). The technical analysis entails using past stock prices and volume to project future stock prices (Konstantinidis et al. 2012). In this context, prospect theory suggests that regret-averse individuals do not behave rationally all the time (Ricciardi and Simon 2000). Their technical analysis may, therefore, generate technical anomalies in the stock market. Based on this, we propose (H2b) that, *the higher the degree of regret aversion, the more strongly it will generate technical anomalies in the stock market*.

3.6. Regret Aversion and Calendar Anomalies

Prospect theory shows that regret may be expressed through a change in investors' point of reference (Thaler 1980), whereby they are more likely to act out of fear of loss rather than expectations of gain. Regret aversion can also become a tax-inefficient investment strategy because investors can reduce their taxable income by realizing capital losses. This implies that they will sell their losing stocks at the end of the year for tax reasons and invest in smaller firms that are likely to yield certain gains, thereby avoiding future regret. This tendency to sell losing stocks stems from regret aversion (Odean 1999). Thus (H2c), *the higher the degree of regret aversion, the more strongly it will generate calendar anomalies in the stock market*.

3.7. Mental Accounting and Fundamental Anomalies

Under prospect theory, investors may carry out mental accounting with a view to achieving specific goals. Pompian (2011) explains that investors whose goal is to preserve their wealth are likely to focus on growth firms or dividend-paying companies, even if this means ignoring other stock fundamentals. Grinblatt and Han (2005) show that the disposition effect driven by prospect theory and mental accounting creates a dispersion between the stock's intrinsic value and its equilibrium and the realized momentum in stock price. Such investors will focus on changes in stock price, depending on the objective that drives their mental accounting.

We propose (H3a) that, *the higher the degree of mental accounting, the more strongly it will generate fundamental anomalies in the stock market*.

3.8. Mental Accounting and Technical Anomalies

Thaler (1985) argues that investors frame their financial decisions according to specific prospects. The value they place on different accounts depends on certain points of reference. As mentioned earlier, prospect theory-based mental accounting creates a disposition effect as well as momentum in the market (Grinblatt and Han 2005). Individuals who tend to hold onto losing stocks too long and sell winning stocks too soon (Shefrin and Statman 1985) may assign a different mental accounting process to different asset classes. Some assets may entail risk aversion, while others induce risk taking (Grinblatt and Han 2005).

Since mental accounting does not always entail rational decisions, with investors treating each element of an investment separately (Pompian 2011), they may rely on technical analysis to make investment decisions, thereby creating technical anomalies in the stock market. Accordingly, we propose (H3b) that, *the higher the degree of mental accounting, the more strongly it will generate technical anomalies in the stock market*.

3.9. Mental Accounting and Calendar Anomalies

Thaler's (1985) concept of mental accounting relates to prospect theory in that individuals frame their prospects in accordance with a value function relative to a reference point (Kahneman and Tversky 1979) for each account, while ignoring any possible interaction among these accounts. Thus, they will alter their preferences depending on the situation. Thaler and Johnson (1990) add that, to some extent, investors' preferences reflect integration and segregation outcomes over time.

Investors treat their assets differently because they evaluate their gains and losses separately. Investors who are reluctant to incur any losses may choose to sell their losing stocks in December for tax reasons and then invest in smaller firms – that are likely to provide a high return – in January (Haug and Hirschey 2006). This calendar effect results from investors' mental aggregation and segregation events. Based on this, we hypothesize (H3c) that, *the higher the degree of mental accounting, the more strongly it will generate calendar anomalies in the stock market*.

3.10. Fundamental Anomalies and Investment Decisions and Performance

A fundamental anomaly in a stock market occur when a stock's price does not reflect its intrinsic or fundamental value (S et al. 2014). While there is no conclusive evidence in the literature as to why and how such anomalies appear, Graham and Dodd (1934) have identified several factors that influence stock prices. One of these is that investors may choose growth stocks over value stocks in the belief that the former performs better. This behavior (focusing on growth stocks) then influences investment decisions and performance. Lakonishok et al. (1994) conclude that value stocks are not necessarily neglected because they are associated with greater risk, but because this is an error on investors' part. Their stock selection behavior – classed as a fundamental anomaly – influences their investment decisions and performance. Accordingly, we propose (H4) that *fundamental anomalies affect individuals' investment decisions and performance*.

3.11. Technical Anomalies and Investment Decisions and Performance

Technical anomalies are inconsistent with the efficient markets hypothesis (Pompian 2011). Such anomalies relate to past trends in price and volume in the securities market (Latif et al. 2011) and stem from elements of technical analysis and its impact on investment decisions and performance. Technical analysis is used to predict price movements based on previous trends in price and volume (see Bako and Sechel 2013). As a form of investor behavior, this can give rise to technical anomalies in the market, in turn influencing investment decisions and performance. We propose (H5) that *technical anomalies affect individuals' investment decisions and performance*.

3.12. Calendar Anomalies and Investment Decisions and Performance

Anomalies resulting from a specific period, or calendar anomalies, include the 'January effect' or 'weekend effect' (Taylor 2011; Singal 2006). Fama (1970) argues that a stock's price reflects all the information available. However, it may be difficult to control conditions in an efficient market. Stock prices are subject to a seasonal effect, which makes the market inefficient and compels investors to beat the market at a specific time. Schultz (1985), for instance, presents the tax-loss-selling hypothesis, under which investors sell their losing stocks at the end of the year with the aim of saving the tax amount and investing in a smaller firm that offers a higher return. This behavior has an impact on investment decisions and performance. We hypothesize (H6) that *calendar anomalies affect individuals' investment decisions and performance*.

4. Method

This study was conducted in 2014 using a sample of individual investors in the Pakistani stock market. The sample frame consisted of individual investors who had been trading in the stock market for at least a year. We used simple random sampling to target the unit of analysis. Of a total of 700 responses collected, 373 were usable. Given that the sample targeted real investors, this was considered adequate for analysis.

Three or four items are developed for each construct, except for calendar anomalies, which consist of two items based on an extensive review of the literature on behavioral finance and psychology. The prospect components are measured by three constructs, using a five-point Likert scale: loss aversion, regret aversion and mental accounting, following Waweru et al. (2008) and Babajide and Adetiloye (2012). Stock market anomalies are gauged using three constructs: fundamental anomalies, adapted from Waweru et al. (2008) and modified to include four items; technical anomalies, following Waweru et al. (2008) and Achelis (2001); and calendar anomalies, comprising two items adapted from Keim and Stambaugh (1984) and Wachtel (1942). Three items are used to measure investment decisions and performance, following Le and Doan (2011) and Waweru et al. (2008). This study uses AMOS to apply the widely used CB SEM to test its hypotheses.

5. Data Analysis

An SEM is used to test the study's hypotheses. First, we examine the hypothesized structural model to investigate the direct and indirect impact of the prospect components on fundamental, technical and calendar anomalies and on investment decisions and performance. Second, we apply a phantom model (Macho and Ledermann 2011) to examine the total and specific indirect effects.

Using the instrument developed to measure the constructs, we carry out a confirmatory factor analysis (CFA) to investigate their dimensionality and validity in Pakistan. The study applies seven concepts: loss aversion, regret aversion, mental accounting, fundamental anomalies, technical anomalies, calendar anomalies, and investment decisions and performance.

Table 1 provides a single-factor CFA in which all the items comprising the seven constructs are loaded on a single factor (Anderson and Gerbing 1988). The results show that the indices fit the data poorly.

However, the seven-factor CFA in which the items are loaded on their respective factors yields a good fit.

Table 1: Fit indices of two alternative CFA models

Model	Description	Model fit indices						
		X2	df	X2/df	CFI	TLI	RMSEA	SRMR
Model 1	Single factor CFA	1,753.846	299	5.865706	0.548	0.509	0.123	0.145
Model 2	Seven factors CFA	692.086	271	2.553823	0.869	0.843	0.069	0.094

6. Results

Table 2 presents the mean and standard deviation for each variable and the correlation (all hypothesized and non-hypothesized relationships) between variables.

**Table 2: Descriptive statistics and correlation matrix**

Variable	Mean	SD	1	2	3	4	5	6	7	8
Loss aversion	3.5	0.85	1.000							
Regret aversion	3.3	0.87	0.550**	1.000						
Mental accounting	3.2	0.83	0.427**	0.518**	1.000					
Fundamental anomalies	3.6	0.91	0.345**	0.455**	0.367**	0.238**	1.000			
Technical anomalies	3.5	0.94	0.407**	0.413**	0.394**	0.418**	0.476**	1.000		
Calendar anomalies	3.0	1.06	0.180**	0.234**	0.228**	0.239**	0.260**	0.352**	1.000	
Investment decision and performance	3.5	0.84	0.842**	0.197**	0.175**	0.071**	0.435**	0.289**	0.343**	1.000

Note: ** correlation is significant at the 0.01 level (2-tailed).

6.1. Model Testing

The SEM introduces the three mediators – fundamental anomalies, technical anomalies and calendar anomalies – and helps estimate the direct effect of the three prospect components on all three mediators and their effect, in turn, on investment decisions and performance. We use a phantom model to identify the specific indirect effect of the prospect components on investment decisions and performance via three paths. Figure 3 presents the estimated results for the direct effect of the three prospect components on fundamental anomalies, technical anomalies and calendar anomalies, and the impact of these three classes of anomalies on investment decisions and performance.

Figure 3: Direct causal effect among variables
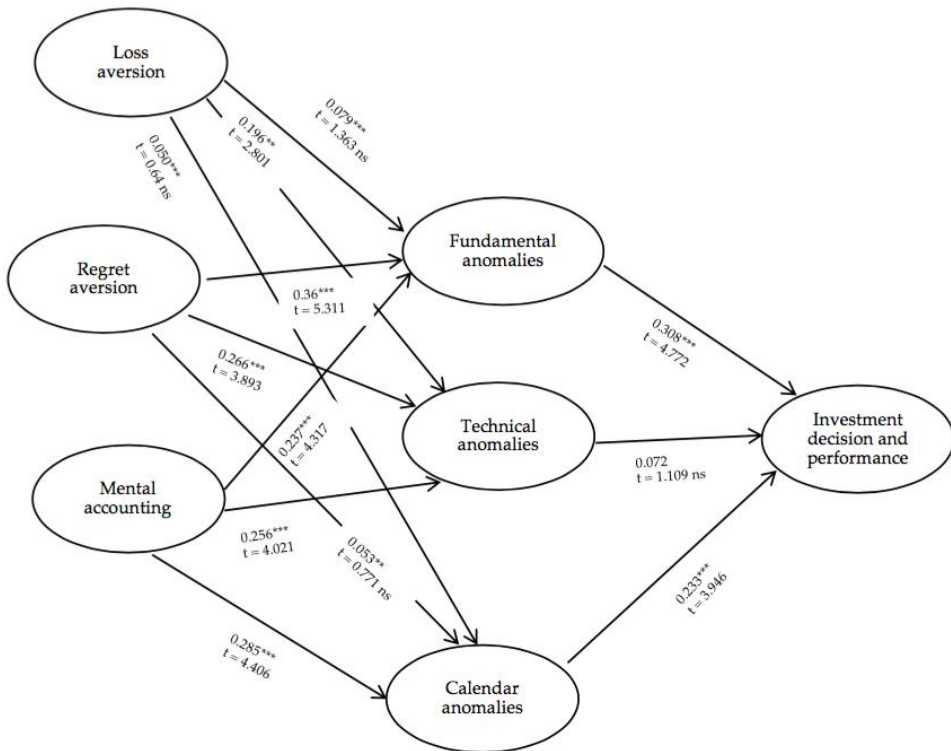
Note: * significant at 0.05, ** significant at 0.01, *** significant at 0.001, ns = not significant.

The results in Table 3 indicate that the model fits the data well. Of the three prospect components, regret aversion has a positive effect on fundamental anomalies and calendar anomalies. We find that, in the context of individual investors, regret aversion is the strongest determinant of fundamental anomalies and calendar anomalies. Moreover, two mediators, fundamental anomalies and calendar anomalies, have a strong, positive effect on investment decisions and performance (Table 4).

Table 3: Model fit

Model	Description	Model fit indices						
		X2	df	X2/df	CFI	TLI	RMSEA	SRMR
Model 1	Multi-mediation	746.31	280	2.6654	0.855	0.832	0.154	0.072

6.2. *Specific Mediation Effects*

Phantom modelling is used to examine the indirect specific effects of the variables concerned. Regret aversion has a positive effect on

investment decisions and performance through fundamental anomalies (indirect effect = 1.416, $p < 0.001$) and calendar anomalies (indirect effect = 0.578, $p < 0.001$) (Table 4).

Table 4: Direct and indirect effects of independent variables on dependent variable

Independent variables	Direct effects				Indirect effect on investment performance		
	Fundamental anomalies	Technical anomalies	Calendar anomalies	Investment decisions and performance	Via fundamental anomalies	Via technical anomalies	Via calendar anomalies
Loss aversion	-1.264*	-1.341*	-1.560*		-0.717*	0.160	-0.470*
Regret aversion	2.497***	2.145***	1.919**		1.416**	-0.255	0.578**
Mental accounting	-0.773*	-1.244*	-1.453*		-0.438	0.148	-0.437
Fundamental anomalies				0.567***			
Technical anomalies				-0.119			
calendar anomalies				0.301***			

Note: The table gives standardized regression weights. N = 324.
* significant at 0.05, ** significant at 0.01, *** significant at 0.001.

7. Discussion

The study's aim is to investigate the effect of prospect factors on investment decisions and performance through the mediation of fundamental, technical and calendar anomalies. The results of the SEM indicate that certain prospect factors are strong predictors of investment decisions and performance via these classes of anomalies. This implies that investment decisions and performance are not a direct consequence of prospect factors. Rather, they are caused by fundamental, technical and calendar anomalies, which are in turn direct outcomes of prospect factors. This multiple mediation mechanism sheds new light on how prospect factors influence investment decisions and performance, with important implications for the role of individual investors.

Of the three prospect components, regret aversion is the strongest predictor of fundamental anomalies. This result validates H4 – that individual investors' behavior induces fundamental anomalies in the stock market – and is consistent with Singh (2012) and Shefrin and Statman (1985). Our findings also show that regret aversion has a strong, positive

effect on calendar anomalies. This validates our hypothesis that investors' behavior generates calendar anomalies in the capital market and is consistent with Shefrin and Statman (1985) and Koening (1999). The impact of regret aversion on fundamental and calendar anomalies reflects how individual behavior can influence the stock market. Under prospect theory, investors assign value in terms of gain and loss – this finding thus deviates from expected utility theory.

In the context of a developing country such as Pakistan, the study shows that investors are more likely to follow behavioral rather than rational patterns when making investment decisions. This, in turn, generates anomalies in the stock market. It also underscores the importance of studying behavioral finance with a view to making better investment decisions.

Surprisingly, loss aversion does not have the same directional relationship with stock market anomalies as regret aversion, even though it is an important dimension of investment prospects. This could be for two reasons. First, Pakistani investors may be less sensitive to the loss aversion impact of investment decisions and performance – especially in this case, where the sample comprises a high percentage of men, who are considered less risk-averse than women. Second, given that Pakistan is characterized by a collectivist culture rooted in strong familial and community networks, investors may be less risk-averse. This inverse relationship does not, therefore, support our hypothesis.

Stracca (2004) and Abdin et al. (2017) argue that behavioral finance provides a mechanism for understanding market conditions and the formation of market beliefs, especially vis-à-vis the rationality assumption. In this context, the study investigates how individual investors' decisions can influence market conditions. It shows that irrational investor behavior can give rise to anomalies in the stock market and highlights the critical role of fundamental, technical and calendar anomalies in measuring investment decisions and performance. Investors tend to remain happy with their investment decisions and performance despite the existence of anomalies because they rely on prospect components in an efficient way. This is a useful finding from a theoretical as well as practical perspective.

8.   Study Limitations and Avenues for Further Research

A key limitation of the study is that we consider only pre-identified antecedents of prospect constructs. Our findings suggest that these three

dimensions explain only a portion of the variance in outcome variables. However, perception can vary across the dyad (John and Reve 1982). This implies that other prospect factors could be added to the model to determine their effect on stock market anomalies and, in turn, on investment decisions and performance. Examples include endowment and optimism (Pompian 2011). The study also focuses on individual investors alone, implying that future research could focus on institutional investors or mutual fund managers. Moreover, it does not address the moderating effect of assured variables such as age, gender, nature of employment and work experience. Incorporating these would enrich the research model.

Finally, while we have used a three-item scale to measure each construct, except for calendar anomalies, which consists of two items, future research could enhance the strength of the model by adding the number of items for each construct. Thus, certain paths that did not emerge as significant in this model could be specified further, with modified or additional constructs and their items. We have used the minimum number of items for each construct to avoid respondent bias as well as data collected from a sample of bona fide investors. Moreover, while we have relied on a single method, the study's model could be tested using more than one methodology, such as self-reporting surveys.

9. Conclusion

The study's results show that investor behavior may be irrational vis-à-vis market conditions (anomalies). Therefore, gauging individual investment decisions and performance entails taking into account not only investor behavior, but also market conditions. While the literature presents a range of findings on the direct relationship between prospect factors and investment decisions and performance, we argue that this relationship is mediated by stock market anomalies. Knowledge of such anomalies is critical to developing an effective behavioral model of investment decisions. This is, therefore, one of the first efforts to examine the behavior of Pakistani investors in this context, thus addressing a key gap in the behavioral finance literature.

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