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Short-term predictability of Islamic stocks following price shocks: Evidence from four emerging markets

António da Costa Carvalho

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António da Costa Carvalho

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Júlio Fernando Seara Sequeira da Mota Lobão, Ph.D.

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Abstract

This study examines the short-term predictability of Islamic stocks following significant one-day price shocks in four emerging markets: Indonesia, Malaysia, Pakistan, and Saudi Arabia, spanning 2015 to 2024. The main objective was to examine whether price shocks lead to predictable return patterns, which challenges the weak form of market efficiency, and to compare the behaviour of Shariah-compliant and conventional stocks using both individual stocks and stock indices representing each category.

This research was motivated by Islamic Finance's rapid growth and its policy and investment implications, especially given the evidence on the influence of religion on financial agents' decisions. It also addresses a notable gap in top-tier research comparing Islamic and conventional stock reactions to large price shocks, being, to the best of our knowledge, the first of its kind.

Daily returns are used to identify shocks defined as deviations of one, two, or three standard deviations from a rolling 50-day average, and to compute cumulative abnormal returns (CARs) over the subsequent 10 trading days. For indices, abnormal returns are measured directly against that pre-shock average; for individual stocks, CARs are estimated via the Single-Index, Three-factor, and Four-factor models, selecting the best fit using the Akaike Information Criterion (AIC).

Findings reveal statistically significant underreaction after positive shocks and overreaction after negative shocks for both asset types, consistent with explanations coming from Behavioural Finance and the Uncertain Information Hypothesis (UIH). However, two-sample t-tests on post-shock CARs revealed limited significant differences between Islamic and conventional instruments, implying that both classes of equities have similar levels of efficiency, though an example of an exception is the difference in the size of the underreaction following smaller positive shocks on individual stocks.

These findings add to the existing literature by offering new and needed evidence of short-term inefficiencies in Islamic equity markets. They may have implications for investors, particularly in designing short-term investment strategies that could potentially allow them to "beat the market".

Keywords: Price shocks, Islamic stocks, Stock market efficiency, Underreaction, Overreaction, Indonesia, Malaysia, Pakistan, Saudi Arabia.

JEL Codes: G12, G14, G15

Resumo

Este estudo analisa a previsibilidade de curto prazo das ações Islâmicas após choques de preço significativos de um dia em quatro mercados emergentes: Indonésia, Malásia, Paquistão e Arábia Saudita, no período de 2015 a 2024. O principal objetivo é avaliar se estes choques geram padrões de retornos previsíveis, desafiando a forma fraca da eficiência de mercado, e comparar o comportamento das ações Islâmicas e convencionais, tanto a nível individual como através de índices bolsistas representativos de cada categoria.

A investigação surge na sequência do rápido crescimento das Finanças Islâmicas e das suas implicações ao nível das políticas públicas e das estratégias de investimento, especialmente tendo em conta a influência da religião nas decisões dos agentes financeiros. Além disso, preenche uma lacuna significativa na investigação de topo, ao comparar as reações de ações Islâmicas e convencionais a grandes choques de preço, sendo inovadora na área.

Utilizam-se retornos diários para identificar choques, definidos como desvios de um, dois ou três desvios-padrão relativamente à média móvel de 50 dias, e calcular os retornos anormais acumulados (CARs) nos dez dias úteis subsequentes. Nos índices, os retornos anormais são medidos diretamente face à média pré-choque; nas ações individuais, os CARs são estimados pelos modelos de Índice Único, Três-Fatores e Quatro-Fatores, selecionando-se, para cada ação, o mais adequado pelo Critério de Informação de Akaike (AIC).

Os resultados revelam uma sub-reação estatisticamente significativa após choques positivos e uma sobre-reação após choques negativos em ambas as classes de ativos, alinhados com explicações provenientes das Finanças Comportamentais e a Hipótese da Informação Incerta (UIH). Contudo, testes t de duas amostras aos CARs após o choque revelam escassas diferenças significativas entre instrumentos Islâmicos e convencionais, sugerindo níveis de eficiência semelhantes entre eles, embora um exemplo de exceção seja a diferença na dimensão da sub-reação após choques positivos de menor dimensão em ações individuais.

Estes resultados contribuem para a literatura existente, ao fornecer novas e importantes provas de ineficiências de curto prazo nos mercados de capitais Islâmicos e podem ter implicações para os investidores, nomeadamente na elaboração de estratégias de investimento de curto prazo que lhes possam permitir "bater o mercado".

Palavras-Chave: Choques de preços, Ações Islâmicas, Eficiência do mercado acionista, Sub-reação, Sobre-reação, Indonésia, Malásia, Paquistão, Arábia Saudita.

Códigos JEL: G12, G14, G15

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1. Introduction

Islamic Finance and, in particular, Islamic investing, is based on compliance with several principles, often known as the Shariah rules (or law). The five Islamic Finance fundamentals are the prohibition of interest (*riba*), excessive uncertainty (*gharar*), speculation (*maysir*), risk and return sharing, and investments in unethical industries (Hayat & Kraeussl, 2011; Foglie & Panetta, 2020). Note, however, that investments in some of those industries are permitted if the company's income from interest or unacceptable activities remains below a specified threshold (usually around 5%). Also, these impure profits must then be purified, often through charitable donations (Guyot, 2011).

The most significant difference between Islamic and conventional stock markets is the application of those Shariah rules. These principles lead to sectoral restrictions, concentrating Islamic investments in sectors such as innovation, telecommunications, raw materials, and real estate, while excluding the financial sector, because of the *riba* prohibition (Foglie & Panetta, 2020). Still, one similarity remains between Islamic and conventional stock investments: the desire to purchase shares to be sold later at a higher price (Hassan et al., 2018; Foglie & Panetta, 2020).

According to estimates, Islamic Finance has grown by over 160% over the last decade and is expected to reach $6.7 trillion in assets by 2027 (Islamic Corporation for the Development of the Private Sector (ICD) & Refinitiv, 2023). This was key to justify this research, which is, to the best of our knowledge, an unprecedented study in the short-term comparison between Islamic and conventional stocks after price shocks.

In essence, this dissertation investigates the existence of short-term abnormal returns, either in the form of price reversals or momentum, in Islamic (Shariah-compliant) stocks following one-day price shocks, compared to their conventional counterparts. The main research question is whether short-term predictability exists in the behaviour of Islamic and conventional equities (both stock indices and individual stocks) after a price shock, and what form this predictability takes. Also, the study aims to determine whether these patterns differ significantly between Islamic and conventional stocks and if these effects occur consistently during the study period. The behaviour of Shariah-compliant stocks will be analysed in relation to conventional stocks, using data from Indonesia, Malaysia, Pakistan, and Saudi Arabia. This type of analysis is well-established in the literature, where research typically focuses on either individual stocks or indices to evaluate post-shock reactions.

This research has important implications for both market efficiency and investors. First, it challenges the weak form of market efficiency, according to which current stock prices already reflect all past public information (Fama, 1970). If past information, such as price patterns, can predict future price movements, it suggests that markets may not be fully efficient, and opportunities might exist to earn excess returns. Secondly, for investors, if the Efficient Market Hypothesis is rejected, it opens the possibility of developing active trading strategies based on identified patterns to potentially outperform the market, rather than relying on passive investment strategies that simply track the overall market.

Moreover, the importance of comparing the behaviour of Islamic and conventional stocks can be explained by the role of religion in explaining agents' financial decisions. In terms of investor decisions, Stulz and Williamson (2003) demonstrated that cultural and religious differences have a significant influence on investor protection, specifically on creditor rights. Kumar et al. (2011) found that regional religious composition, used as a proxy for gambling propensity, significantly influences various market outcomes, such as institutional investment choices, employee stock option grants, IPO performance, and the lottery stock premium. There has also been evidence suggesting that religion appears to have a significant impact on the decisions of corporate-level financial agents (Hilary & Hui, 2009; Callen & Fang, 2015). Notably, Lobão (2023) hypothesises that investors in Islamic and conventional assets may react differently to price clustering due to symbolic meanings rooted in Islamic culture. His argument is based on the significance of the number seven in the pilgrimage to Mecca and the Quran (Schimmel, 1993), as well as patterns in restaurant pricing in Islamic countries (Wagner & Jamsawang, 2014). Additionally, Zaremba et al. (2018) found that only a small number of the anomalies they analysed were profitable in Islamic stock markets, suggesting higher efficiency in Islamic securities. This possibility contrasts with the findings of Tee et al. (2019), who report more substantial momentum returns for Islamic stocks compared to their conventional counterparts, and with the study by Cheema and Nartea (2018), which reveals no significant difference in longer-term momentum returns between the two, indicating similar levels of efficiency.

As mentioned, there is a lack of research, especially in top-tier financial journals, examining how Islamic stocks behave compared to conventional stocks after significant price changes. While some studies explore Islamic stock reactions to specific events, like those by Syafitri et al. (2022) and Narayan and Bannigidadmath (2015), or focus on general stock behaviour in Islamic countries' exchanges after price shocks (e.g., Mazouz et al., 2008; Polat et al., 2016),

there is a noticeable gap in understanding the potential short-term differences between Shariah-compliant and non-compliant stocks following such price movements. This dissertation aims to address that matter.

This dissertation is structured into five main sections. The first is the introduction, which outlined the research idea, its relevance, and the fundamental concepts of Islamic Finance. This is followed by a literature review, divided into two subsections. The third section details the data and methodology used in the analysis. The fourth section presents the results, organised according to the two primary focuses of the study: stock indices and individual stocks. Finally, the fifth section offers the conclusions arising from the findings. Note that some tables generated from the analysis are included in the Annexes, which appear after the references used throughout this work.

2. Literature review

This literature review is divided into two main parts. The first explores findings from various studies on the relative efficiency of Islamic stocks compared to conventional ones. The second focuses on the evidence of post-shock reaction of stocks in the short-run across different markets.

2.1. Efficiency of Islamic stocks

Over time, the Efficient Market Hypothesis (EMH) has been a highly scrutinised aspect of the financial literature. Most studies focus on the notion of informational efficiency, which implies that prices rapidly reflect all the available information in the market (Fama, 1970). Within this framework, it is impossible to predict how prices will evolve in the future, i.e., returns of investments in financial assets (e.g., stocks) should follow a random walk. In efficiency tests' literature, there is a distinction between three forms of informational efficiency: weak, semi-strong, and strong (Fama, 1970). In the weak form, current prices reflect past public information, e.g., past financial information about companies. In the semi-strong form, current prices reflect all past and present public information, such as acquisition plans revealed on a given day. In the strong form, current prices reflect all public and private (available only to insiders) information. In this setting, private information is often considered to be transmitted to the market through insider trading, which is illegal in most jurisdictions (Fama, 1970).

Over recent years, more papers have been dedicated to testing the existence of anomalies (persistent and predictable realisation of abnormal returns that deviate from the prediction according to a given asset pricing model) in Shariah-compliant stock markets. However, there is still a relatively low number of studies focusing on Islamic stocks compared to conventional stocks.

Zaremba et al. (2018) analysed over 1500 stocks from eight Middle Eastern countries, including Saudi Arabia, and replicated 167 equity anomalies documented in the financial literature. Their research shows that only 27 of those are profitable in the Middle Eastern markets, suggesting that many anomalies observed for conventional stocks do not hold for Islamic securities. However, there is conflicting evidence in the literature on the relative informational efficiency of Islamic stocks in comparison to conventional stocks. Guyot (2011) finds that Islamic indices are generally as efficient as conventional indices, with some even exhibiting higher levels of informational efficiency, using Dow Jones Islamic and

conventional stock indices in several markets. However, Sensoy et al. (2014), using similar indices yet a more comprehensive data period, concluded that conventional equity markets generally outperform Islamic markets in terms of weak-form efficiency and that the 2008 global financial crisis further extended the efficiency gap between the two. Additionally, Al-Khazali et al. (2015) found that conventional indices generally exhibited higher efficiency by testing the martingale difference hypothesis (MDH) and the random walk hypothesis (RWH). Still, Islamic indices showed significant improvement in efficiency over time, especially in bearish and crisis periods (Al-Khazali et al., 2015).

The existence of time series anomalies in financial markets questions informational efficiency in the weak form. This area of study focuses on the predictability of future prices based on past prices, i.e., it analyses whether current prices contain information that can predict future prices.

One of the most well-known time series anomalies is the momentum effect, first identified by Jegadeesh and Titman (1993). This phenomenon corresponds to the empirical observation that prices across various markets tend to continue moving (due to underreacting to new information) in the same direction in the short term. Zaremba et al. (2018) found significant momentum profits for Islamic stocks, using a highly comprehensive dataset including eight Islamic markets. Further research confirmed their results, with evidence of a portfolio of Islamic winner stocks (within the Dow Jones Islamic US Index) outperforming conventional winner stocks and the S&P 500 (Narayan & Phan, 2016). However, when controlling for risk factors, most of the return differences became statistically insignificant, suggesting that these higher returns are primarily a result of exposure to particular market risks (Narayan & Phan, 2016). Tee et al. (2019) perform similar tests on the Malaysian market and confirm the existence of stronger momentum returns for Islamic stocks compared to their conventional counterparts, highlighting the possibility of Shariah-compliant stocks being less efficient than conventional ones. They conclude that momentum returns remain significant after controlling for risk factors (confirming that they are a product of asset mispricing), although they are only present during favourable market conditions. Still, there is no clear consensus in the literature surrounding the momentum effect in this specific type of asset. For instance, Cheema and Nartea (2018) present contrasting evidence on the differences in momentum returns between Islamic and conventional stocks in the Malaysian market. Their work finds no significant difference in momentum returns between both portfolios when controlling for market conditions,

information uncertainty, and idiosyncratic volatility, suggesting similar levels of efficiency between both classes of equities.

Another of the most significant time series anomalies is the mean-reversion effect, defined by De Bondt and Thaler (1985) as the existence of price overreaction and mean reversion in the long term (at horizons of several years). According to this effect, past loser securities tend to outperform past winners in the long run. Zaremba et al. (2018) confirm the existence of a long-term mean reversion of Islamic stocks for a wide range of periods and markets, consistent with research focused on conventional markets.

In addition to time series anomalies, event studies have also been conducted to analyse the behaviour of Islamic stocks. These studies examine how markets react to public information and whether abnormal returns occur around the time such information is released. These events can range from market-wide developments (e.g., changes in macroeconomic indicators) to company-specific announcements, such as dividend declarations or merger news. In a semi-strong informationally efficient market, prices should adjust quickly and accurately to new information, avoiding patterns of overreaction or underreaction.

Regarding the impact of news on prices, there is evidence of the predictive ability of both positive (especially these) and negative news on Islamic stocks, among others, in the Asia-Pacific region (Narayan & Bannigidadmath, 2015). In particular, a strategy based on this effect would yield greater profits for investors in Islamic stocks in comparison with conventional ones (Narayan & Bannigidadmath, 2015), which hints at the possibility of these market segments being less efficient than the overall market. Also, Narayan et al. (2017) found that only around 45% of Islamic stocks were significantly influenced by financial news. However, the ones sensitive to news exhibited significant potential for generating abnormal returns. Regarding other firm-specific events, Ardiansyah and Qoyum (2012) concluded that dividend announcements do not significantly impact stock prices, indicating that the market does not fully incorporate this information.

As for market-wide episodes, there appears to be a significant impact of short- and medium-term (limited impact in the long-term) fluctuations in economic policy and oil prices on Islamic stock returns (Ftiti & Hadhri, 2018. Regarding the effects of terrorist attacks on returns in Islamic stock markets, Guyot (2011) highlights the sensitivity of Islamic indices to geopolitical events, particularly those related to terrorism.

A recent branch of the literature has focused on the impact of COVID-19 on Islamic Stock markets. Irfan et al. (2021) found that both the Indian and Indonesian Islamic stock markets

reacted significantly negatively (displaying negative cumulative abnormal returns) to the COVID-19 announcement by the World Health Organization (WHO). Also, Saleem et al. (2021) analysed the impact of COVID-19 on several global Islamic stock markets. Their findings show that, although short-term reactions to the pandemic announcement varied across these markets, most Islamic stock indices experienced significant long-term impacts and increased volatility. However, some contrasting evidence has also been presented on this matter. In particular, for the Indonesian Islamic Stock Market, stock returns and abnormal returns showed no statistically significant change following this event, although there were notable changes in stock prices and trading volumes (Cipto et al., 2024).

Continuing the analysis of anomalies on Islamic stocks, seasonal (or calendar) anomalies correspond to recurring patterns in security prices and/or volumes in specific periods, typically in particular months.

Within calendar anomalies, although some research denies the existence of the January effect for Shariah-compliant stocks (Jebran & Chen, 2017; Ghallabi et al., 2024), others have found that Islamic stocks outperform in January compared to other months (Narayan & Phan, 2016; Hasan et al., 2021). Also, Jebran and Chen (2017) found a pattern of higher returns on Fridays and lower returns on Mondays for Islamic stocks on the Pakistan Stock Exchange, and similar conclusions were reached by Ghallabi et al. (2024). This aligns with the majority of research on Western markets but contrasts with the results of Hasan et al. (2021) that show significantly lower returns on Sundays (which capture this weekend effect better in Islamic markets) for Shariah-compliant stocks, yet no abnormal returns on Mondays for this asset class. Other studies have explored the impact of Ramadan on Shariah-compliant stock returns, with most finding higher returns during the holy month in Islamic-majority markets and specific indices (Al-Hajieh et al., 2011; Halari et al., 2015; Munusamy, 2019; Ghallabi et al., 2024). However, some research finds no significant effect (Jebran & Chen, 2017; Hasan et al., 2021), though overall evidence supports the presence of a Ramadan effect.

Cross-sectional anomalies, such as size and value effects, explain return differences based on firm characteristics, but evidence for these effects in Islamic stocks is still limited.

Empirical research suggests that the size effect, initially observed in conventional markets, also applies to Islamic stocks. Zaremba et al. (2018) and AlKhazali et al. (2022) confirm that small Islamic stock indices tend to offer higher returns and risk, particularly in Asia/Pacific and European markets, while large-sized portfolios performed better in Dow Jones and U.S. Islamic indices. Regarding the value effect, Zaremba et al. (2018) found that the B/M ratio

predicted returns in conventional but not in Shariah-compliant stocks. Similarly, Narayan and Phan (2016) observed that small-cap, growth-oriented Islamic stocks generated the highest momentum profits, especially in volatile, low-volume environments, supporting the presence of size and value-related patterns in Islamic markets.

Although investor behaviour in Islamic stocks has received limited attention, several studies have identified patterns such as herding. Medhioub and Chaffai (2018) found significant herding in the Saudi and Qatari markets, especially during downturns. In contrast, Chaffai and Medhioub (2018) observed herding only during bull markets in the GCC (Gulf Cooperation Council) region. Sectoral differences were also noted, with herding varying by market conditions (Medhioub & Chaffai, 2019). Event-driven herding in Islamic markets has been linked to crises like the COVID-19 pandemic and spillover from conventional markets (Bougatef & Nejah, 2022; Loang & Ahmad, 2023). Other studied behavioural aspects include investor sentiment, which has been shown to affect Islamic stock prices in the short and medium term (Ftiti & Hadhri, 2018) and to influence anomalies and mispricing (Cheema & Fianto, 2024). Jaziri and Abdelhedi (2018) also found that religious holidays impact investor sentiment and returns. Additionally, Lobão (2023) reports mild levels of price clustering in Islamic equities in Indonesia, Malaysia, and Pakistan, while Cheema and Nartea (2018) attribute observed momentum effects to investor overconfidence, a widely studied behavioural bias that strongly influences investor decisions.

2.2. Short-term predictability of stocks following price shocks

Over the past decades, numerous works have examined how stocks react to significant price changes - a focus that this study will also adopt. This area of research holds important implications for the Efficient Market Hypothesis (EMH), particularly by challenging the weak form of informational efficiency, which asserts that past prices cannot be used to predict future movements. If short-term predictability exists following significant price changes, it suggests that the direction of price movements after positive or negative shocks can, in fact, be anticipated. The rationale behind this type of study is to examine how markets react to events that are indirectly captured through significant price changes, which serve as proxies for the actual underlying events. The core assumption is that unusually large price variations reflect the market's response to some form of positive or negative news or development.

In the maiden paper on this area, Bremer and Sweeny (1991) used the daily closing prices of stocks listed in the Fortune 500 from 1962 to 1986. The authors defined a large price change

as a decrease in daily returns greater (in absolute value) than 10%. They found significant positive abnormal returns, i.e., price reversals in the days following the price shocks (Bremer & Sweeney, 1991).

Several aspects surrounding this group of studies lack consensus, which is relevant to explaining the discrepancies in results. This makes it difficult to draw general conclusions about the expected behaviour of equities following price shocks (Amini et al., 2012). Still, works focusing on various markets and assets consistently show that returns are somewhat predictable, proving that this is a genuine market phenomenon and not a mere product of data mining.

One of the main methodological dimensions that varies between studies is the definition of a large price change or price shock. Some papers use a fixed percentage threshold, such as 10% (e.g., Peterson, 1995) or extend the analysis to returns of various magnitudes (Amini et al., 2010). Others define price shocks endogenously, based on the distance between a particular stock's return and its average, measured in standard deviations (Pritamani & Singal, 2001; Lasfer et al., 2003). Also, while the majority of works used daily price data, others have focused on weekly (e.g., Gutierrez & Kelley, 2008), monthly (e.g., Himmelmann et al., 2010), or intraday (Zawadowski et al., 2006) returns.

Most research on the reaction of stock prices following one-day price shocks is based on the US market. Although there are mixed conclusions, studies that consider shocks as daily price moves of over 5% (or 10%), for both alternatives to analyse equities' behaviour (individual stocks and indices), generally found evidence of price reversals, i.e., positive/negative abnormal returns following negative/positive price shocks (Bremer & Sweeny, 1991; Liang & Mullineaux, 1994; Madura & Richie, 2004). As for large price changes defined using different methods, such as the ones considering standard deviation-based measures, there is evidence of both price reversal (Atkins & Dyl, 1990; Brown et al., 1993) and continuation conditional on news announcements (Pritamani & Singal, 2001).

In other markets, Bremer et al. (1997), using daily return data of individual stocks listed in Japan's Nikkei 300 and defining price shock as daily returns greater than 10% in absolute value, found significant and positive abnormal returns following large negative price changes (price reversals) and no significant change in returns following positive shocks. Also, Rezvanian et al. (2011), using Chinese stock indices and defining price shocks as daily returns exceeding 5%, found price reversals characterised by positive abnormal returns following negative shocks and negative abnormal returns following positive shocks.

Although in lower numbers, studies focusing on emerging markets are closer to our analysis, and their results are likely to be more relevant in this context. For both individual stocks and indices, most evidence points to the existence of price reversals (although there are some instances of continuation for small and moderate shocks) following price shocks (Amini et al., 2012). For example, Mazouz et al. (2008) focused on stock index returns from several emerging markets including Indonesia, Malaysia and Pakistan, and, by defining four thresholds (3%, 5%, 10% and 15%) for the absolute abnormal returns to be considered as a large price change, found interesting differences. They concluded that market reactions differed by country and estimation method: with OLS, small shocks typically led to continuation, while large shocks resulted in overreaction after drops and mixed efficiency or overreaction after rises; in contrast, GARCH models displayed efficient reactions to all shocks following drops and efficient responses to large shocks, with continuation for small shocks after rises (Mazouz et al., 2008). Recent studies have examined this phenomenon in the Indian and Turkish markets. For the Indian market, Maher and Parikh (2011) analysed stock indices and defined price shocks as daily returns deviating by more than two standard deviations from a 50-day average. They concluded there was an underreaction (continuation) for small and medium-sized negative shocks. Still, they observed efficient reactions to both large negative shocks and positive shocks of all magnitudes (Maher & Parikh, 2011). However, for the same market, Parthasarathy (2019), using the methodology of Pritamani and Singal (2001), found that abnormal returns in the top 100 NSE (National Stock Exchange of India) stocks following large one-day price changes were not significant, unless after large shocks accompanied by high trading volume (price momentum) or low trading volume (price reversals). As for Turkish securities, there is evidence of price reversals after both positive and negative shocks (following unexpected political/economic events) in the ISE-100 and ISE-All shares' indices (Mehdian et al., 2007), as well as price underreaction in the Turkish Sport Index (Polat et al., 2016) and efficient reactions in the banking sector (Polat et al., 2016).

Over time, the literature has presented various explanations for the differing conclusions on market reactions to price shocks. Some arguments related to market microstructure suggest that the bid-ask bounce could explain price reversals (Cox & Peterson, 1994; Park, 1995), while others point to non-synchronous trading effects, where closing prices may reflect trades happening at different points during the trading day/period due to lower trading volumes towards the end of the day, triggering price reversals (Lo & MacKinlay, 1990).

However, these arguments tend to lose relevance when examining this anomaly across a broader range of markets (Amini et al., 2012).

Other explanations focus on risk, such as the Uncertain Information Hypothesis (Brown et al., 1988), which suggests that investors initially underreact or overreact (depending on the content) to unexpected news due to uncertainty or caution, with prices gradually adjusting as that uncertainty diminishes. In the context of price shocks, positive shocks may cause an initial underreaction followed by a price rise as confidence improves. In contrast, negative shocks might see an exaggerated initial drop that is later corrected. This hypothesis predicts positive abnormal returns following large price rises and drops, although the data does not consistently support this (Amini et al., 2012). Another risk-related explanation suggests that excessive price declines followed by reversals could be a reward for investors providing liquidity to the market (Zawadowski et al., 2006).

By far the most common explanation for security price reactions following large price changes is behavioural (Amini et al., 2012). Within these, two contrasting views exist. On one hand, authors argue that the slow incorporation of news into prices leads to underreactions and price continuation (Lasfer et al., 2003; Mazouz et al., 2008). On the other hand, some studies propose the existence of overreaction to extreme price changes, based on the overweighting of current information, as an explanation for the more common reversals following large price changes (De Bondt & Thaler, 1985; Park, 1995; Madura & Richie, 2004).

3. Data and Methods

3.1. Data

In terms of data, this study uses daily stock price data from January 2nd, 2015, to December 31st, 2024, for both individual stocks and major indices (the most representative of both the overall market and of Shariah-compliant stocks) in four Islamic markets: Indonesia, Malaysia, Pakistan, Saudi Arabia, which were extracted from LSEG Workspace. This 10-year period aligns with common practice in similar research, such as studies by Atkins and Dyl (1990), Bremer et al. (1997), and Lasfer et al. (2003). Also, daily risk-free rate of return data was downloaded from LSEG workspace and proxied by the yield of the one-month Treasury Bill issued by each of the selected National Governments, as in Mazouz et al. (2009). In contrast, the MRP, SMB, HML, and MOM factors were extracted from Kenneth R. French's Data Library. Note that these four factors were available in the database for emerging markets for each relevant month and year. Consequently, all individual stocks share the same factor values within a given month and year. It is relevant to mention that the entirety of the statistical and econometric analysis was performed using Python libraries such as NumPy, SciPy, Statsmodels and Pandas.

The four markets were selected based on three main criteria: predominantly Muslim population, membership in the Organization of Islamic Cooperation, and the availability of Shariah-compliant stock indices, as supported by Ali et al. (2018) and Lobão (2023). As mentioned, two sets of data will be used to understand the short-term behaviour of Islamic stocks following large one-day price changes (or shocks): stock indices and individual stocks. Table A1 in the Annexes provides an overview of the selected stock indices used in this analysis. Notably, there are differences in the screening criteria for these instruments, as some include all listed companies, while others focus on a specific number (e.g., 30 or 100) of the most liquid stocks within a given market. The sample size in terms of daily closing price data for these indices was 19,580.

The remaining portion will compare the short-term behaviour of a selection of individual Islamic stocks against conventional stocks within each market. The selection process involved choosing the top five companies in each market and Shariah compliance status based on their market capitalisation (measured in USD for consistency) as of 31/12/2024. Also, companies that went public after 02/01/2015 and those with fewer than 1,000 closing price observations during the 10-year study period were excluded from the analysis. The final

list of selected companies is presented in Tables A2 (for Islamic stocks) and A3 (for conventional stocks) in the Annexes. The sample size in terms of daily closing price data for these stocks was 96,220.

These tables highlight a sector, according to The Refinitiv Business Classification (TRBC), concentration among conventional stocks, where 'Banks (NEC)' dominates with eight (out of 20) issuers. In contrast, Islamic stocks have a broader sector distribution with no particular sector dominating. This contrast is particularly marked by the complete absence of Banks (NEC) from Islamic stocks, directly reflecting sectoral prohibitions under Shariah principles. This suggests that conventional stocks in this sample may be biased towards financial institutions, whereas Islamic equities are diversified across different, Shariah-compliant industries.

In addition, as for market capitalisation, there are both between-market and within-market differences in Shariah-compliant status. For example, Saudi Arabia has a much higher mean market capitalisation for Islamic stocks than conventional ones. On the other hand, Malaysia presents the opposite pattern, where conventional stocks have a larger average market capitalisation. Saudi Arabia shows the highest overall market capitalisation, Pakistan has the lowest, while Malaysia and Indonesia have similar levels.

3.2. Methods

From a methodological perspective, this study requires two key decisions: defining price shock and selecting the method(s) for estimating abnormal returns in the days following such an event. The methodological choice is crucial in this study since the heterogeneity in methods is believed to be a significant reason for the conflicting results (ranging from price momentum to reversals) observed in previous research on stock price reactions to price shocks, as per Amini et al. (2012).

In the index portion of this investigation, a price shock is considered to happen when a daily (logarithmic) index return deviates from the average daily return over the past 60 to 11 days by one, two, or three standard deviations. This approach builds upon the method employed by Lasfer et al. (2003), which offers the advantage of defining large price changes endogenously rather than relying on an arbitrary threshold (such as 5% or 10% used in other studies). Also, by extending the analysis beyond their original two standard deviation limit, this study increases the reliability of its findings.

Additionally, the abnormal returns for index i on day t after the shock ($AR_{i,t}$) were calculated following Lasfer et al. (2003), i.e., by subtracting the average return over a 50-day window ending 10 days before the shock ($E(R_{i,t})$) from the index logarithmic return on day t after the shock ($R_{i,t}$), as expressed in equation 3.1:

$$AR_{i,t} = R_{i,t} - E(R_{i,t}) \tag{3.1}$$

The exclusion of the first 10 days before the shock helps isolate potential impacts related to a price run-up, i.e., investors' anticipation of a large price change (Lasfer et al., 2003), contributing to the robustness of the results.

Finally, the CARs (cumulative abnormal returns) for index i over a window of s days after the shock ($CAR_{i,s}$) were computed as in equation 3.2, i.e., as the sum of the daily abnormal returns after the large price change:

$$CAR_{i,s} = \sum_{t=1}^{s} AR_{i,t} \tag{3.2}$$

For individual stocks, the definition of price shocks follows the proposal previously described for stock indices, i.e., daily returns deviating from the average daily return over the past 60 to 11 days by 1, 2, or 3 standard deviations. This ensures consistency across the two main dimensions of this work.

However, there is a pronounced difference in the estimation of abnormal returns for individual stocks. In accordance with Mazouz et al. (2009): the Single Index Model (SI), the Fama-French Three-factor model (F-F-F), and the Carhart-Fama-French model (C-F-F) were used.

Specifically, the first step involved estimating the expected excess return for each model a, stock i, and day t following the price shock. This was achieved by regressing the excess return (Re), defined as the difference between the daily logarithmic stock return and the corresponding risk-free rate of return (approximated by the yield of the one-month Government Treasury bill) for its market, against the relevant parameters for each of the three models, as outlined in equations 3.3, 3.4, and 3.5:

$$Re_{i,t} = \alpha^{Si} + \beta_1^{SI} MRP_t \quad (3.3)$$

$$Re_{i,t} = \alpha^{F-F} + \beta_1^{F-F} MRP_t + \beta_2^{F-F} SMB_t + \beta_3^{F-F} HML_t \quad (3.4)$$

$$Re_{i,t} = \alpha^{C-F-F} + \beta_1^{C-F-F} MRP_t + \beta_2^{C-F-F} SMB_t + \beta_3^{C-F-F} HML_t + \beta_4^{C-F-F} MOM_t \quad (3.5)$$

Where α^a is the intercept of each model, MRP stands for the market risk premium, SMB represents the difference in returns between a portfolio of small stocks and one of large stocks (Fama & French, 1993), HLM represents the difference in returns between a portfolio of high book-to-market stocks and one of low book-to-market stocks (Fama & French, 1993), and MOM represents the momentum factor defined by Carhart (1997). The estimates for the expected excess returns were then stored as $ER_{i,t}^{SI}$, $ER_{i,t}^{F-F}$, and $ER_{i,t}^{C-F-F}$, respectively as expressed in equations 3.6, 3.7, 3.8.:

$$ER_{i,t}^{SI} = \widehat{\alpha^{Si}} + \widehat{\beta_1^{SI}} MRP_t \quad (3.6)$$

$$ER_{i,t}^{F-F} = \widehat{\alpha^{F-F}} + \widehat{\beta_1^{F-F}} R_{m,t} + \widehat{\beta_2^{F-F}} SMB_t + \widehat{\beta_3^{F-F}} HML_t \quad (3.7)$$

$$ER_{i,t}^{C-F-F} = \widehat{\alpha^{C-F-F}} + \widehat{\beta_1^{C-F-F}} R_{m,t} + \widehat{\beta_2^{C-F-F}} SMB_t + \widehat{\beta_3^{C-F-F}} HML_t + \widehat{\beta_4^{C-F-F}} MOM_t \quad (3.8)$$

Then, similarly to what is done in Mazouz et al. (2009), the abnormal returns for model a, stock i on day t after the shock ($AR^a_{i,t}$) were estimated by subtracting the expected excess return ($ER^a_{i,t}$) from the excess return stock i on day t after the shock ($Re_{i,t}$), as formalised in equation 3.9, 3.10, and 3.11:

$$AR_{i,t}^{SI} = Re_{i,t} - ER_{i,t}^{SI} \quad (3.9)$$

$$AR_{i,t}^{F-F} = Re_{i,t} - ER_{i,t}^{F-F} \quad (3.10)$$

$$AR_{i,t}^{C-F-F} = Re_{i,t} - ER_{i,t}^{F-F} \quad (3.11)$$

Finally, the CARs for index i over a window of s days after the shock ($CAR_{i,s}$) were computed in the same manner as for stock indices, i.e., as established in equation 3.2.

Following Mazouz et al. (2009), the best-fitting model for each individual stock was selected using the Akaike Information Criterion. This criterion aims to decide which of the three models better describes stock price changes, with the preferred model being the one with the lowest AIC.

The three models were estimated using Ordinary Least Squares (OLS) models with entity-level fixed effects (Ticker). The selection of a panel data fixed-effects model was guided by

the results of two statistical tests: the Breusch-Pagan Lagrange Multiplier Test and the Durbin-Wu-Hausman Test.

The Breusch-Pagan Lagrange Multiplier Test was first used to determine whether a random effects model or pooled OLS was more appropriate by conducting a test to check whether the variance of unobserved heterogeneity σ_u^2 was significantly different from zero. Since the test was significant at 1% for all three cases, the null hypothesis was rejected, which implied that a random effects model was more appropriate for all three models.

Then, the Durbin-Wu-Hausman Test was employed to select between a fixed-effects and a random-effects model. It tests whether there are significant differences between the fixed-effects and random-effects estimators. As the test was also significant at the 1% level for all three cases, the null hypothesis was rejected, and it was concluded that a fixed-effects model was the better choice for the three models.

This estimation approach differs from the GJR-GARCH method used in Mazouz et al. (2009). In our study, OLS modelling with fixed effects offers several advantages, including ease of implementation and lower computational cost, particularly given the large sample size used in the analysis. Additionally, fixed effects are well-suited for a panel data setting like this one, where multiple price observations exist across different stocks and markets. While one of the key benefits of the GJR-GARCH model is its ability to address heteroscedasticity and autocorrelation, these issues were managed here using clustered Newey-West (HAC) standard errors.

Generally, using different models to estimate abnormal returns reinforces the validity of the analysis. It may help uncover differences in post-shock reaction due to various methods of abnormal return estimation.

Additionally, in the various tables present in this work, statistical significance is represented by the asterisks (*: significant at 10% level; **: significant at 5% level; ***: significant at 1% level). This was assessed by performing OLS regressions, while using the Newey-West standard errors for heteroscedasticity and autocorrelation correction, of each relevant CAR (or difference in CARs, in the case of the two-sample t-tests later described) against a constant and performing a global (the same as individual, in this case) significance F-test. In particular, if the p-value of such test was lower than the defined significance levels of 1%, 5%, or 10%, one would reject the null hypothesis and conclude that a given CAR differed significantly from 0. The described approach is the same as that used to gauge statistical significance on Mazouz et al. (2009) and is done consistently throughout this dissertation.

4. Results

4.1. Stock indices

Table 1 summarises the number of positive (Panel A) and negative (Panel B) shocks in the four selected markets, sorted by market, shock size (deviating one, two, or three standard deviations from the relevant average, as explained before) and then further divided into Shariah-compliant and non-Shariah-compliant indices. It shows a total of 5,499 (2,712 positive and 2,787 negative) shocks across all markets and Shariah compliance status.

Table 1: Frequency of shocks across stock indices

Panel A: Positive shocks

	Shock size								
	1 st. dev.			2 st. dev.			3 st. dev.		
	Shariah	Non-Shariah	Total	Shariah	Non-Shariah	Total	Shariah	Non-Shariah	Total
Indonesia	337	325	662	73	70	143	14	13	27
Malaysia	344	350	694	82	90	172	16	15	31
Pakistan	373	366	739	94	85	179	24	29	53
Saudi Arabia	373	244	617	93	61	154	18	14	32
Total	**1427**	**1285**	**2712**	**342**	**306**	**648**	**72**	**71**	**143**

Panel B: Negative shocks

	Shock size								
	1 st. dev.			2 st. dev.			3 st. dev.		
	Shariah	Non-Shariah	Total	Shariah	Non-Shariah	Total	Shariah	Non-Shariah	Total
Indonesia	370	372	742	95	86	181	22	33	55
Malaysia	368	351	719	80	82	162	21	26	47
Pakistan	340	349	689	97	99	196	34	39	73
Saudi Arabia	391	246	637	121	80	201	49	34	83
Total	**1469**	**1318**	**2787**	**393**	**347**	**740**	**126**	**132**	**258**

Focusing first on the positive shocks, in total, Shariah-compliant indices experienced slightly more shocks (1,427) than non-Shariah-compliant stocks (1,285). As the magnitude of the shock increases, shocks significantly reduce in number, as expected. Although there is a fairly even distribution across the different markets, the table reveals that Pakistan and Malaysia were the most common in positive shocks.

Regarding negatives, Islamic indices also experienced more shocks, totalling 1,469, compared to non-Shariah-compliant indices, which had 1,318. This indicates that, for both positive and negative shocks, Shariah-compliant indices are more susceptible to price shocks. However, in total, negative shocks are slightly (around 3%) more prevalent than positive

shocks. Notably, for extreme (three standard deviation) negative shocks, there are notably more compared to positive ones.

Table 2 provides information on the average, largest, and smallest positive shocks sorted by market, Shariah compliance and standard deviation threshold.

Table 2: Size distribution of positive shocks in stock indices

		Shock size					
		1 st. dev.		2 st. dev.		3 st. dev.	
		Shariah	Non-Shariah	Shariah	Non-Shariah	Shariah	Non-Shariah
Indonesia	Average shock	1.718%	1.344%	2.707%	2.092%	4.418%	3.142%
	Largest shock	12.054%	9.704%	12.054%	9.704%	12.054%	9.704%
	Smallest shock	0.541%	0.488%	0.983%	0.922%	2.235%	1.317%
Malaysia	Average shock	1.080%	0.955%	1.599%	1.342%	2.257%	2.263%
	Largest shock	5.943%	6.626%	5.943%	6.626%	5.943%	6.626%
	Smallest shock	0.272%	0.262%	0.667%	0.467%	1.016%	0.991%
Pakistan	Average shock	1.951%	1.627%	2.907%	2.476%	3.676%	3.061%
	Largest shock	6.465%	5.744%	6.465%	5.744%	6.465%	5.744%
	Smallest shock	0.598%	0.657%	1.176%	1.194%	2.252%	1.866%
Saudi Arabia	Average shock	1.415%	1.664%	2.208%	2.570%	4.385%	3.823%
	Largest shock	18.655%	7.121%	18.655%	7.121%	18.655%	7.121%
	Smallest shock	0.508%	0.610%	1.020%	1.161%	1.686%	2.507%
Total	Average shock	1.546%	1.380%	2.361%	2.073%	3.682%	3.058%
	Largest shock	18.655%	9.704%	18.655%	9.704%	18.655%	9.704%
	Smallest shock	0.272%	0.262%	0.667%	0.467%	1.016%	0.991%

Here, one can observe that Islamic indices experienced larger average positive shocks than their conventional counterparts across all thresholds and markets (with the exception of Saudi Arabia). Additionally, the maximum and minimum shock sizes are larger for Shariah-compliant indices in aggregate terms. However, Pakistan and Saudi Arabia appear to experience more severe extremes in comparison with Indonesia and Malaysia.

As far as negative shocks, Table 3 below also highlights that Islamic indices display slightly more negative mean negative shocks than non-Shariah indices across all shock sizes and markets (again, with the exception of Saudi Arabia).

Table 3: Size distribution of negative shocks in stock indices

		Shock size					
		1 st. dev.		2 st. dev.		3 st. dev.	
		Shariah	Non-Shariah	Shariah	Non-Shariah	Shariah	Non-Shariah
Indonesia	Average shock	-1.756%	-1.366%	-2.815%	-2.357%	-4.415%	-3.287%
	Largest shock	-8.164%	-6.805%	-8.164%	-6.805%	-8.164%	-6.805%
	Smallest shock	-0.575%	-0.341%	-1.201%	-1.071%	-2.040%	-1.578%
Malaysia	Average shock	-1.082%	-1.027%	-1.792%	-1.627%	-2.735%	-2.419%
	Largest shock	-5.548%	-5.405%	-5.548%	-5.405%	-5.548%	-5.405%
	Smallest shock	-0.310%	-0.286%	-0.545%	-0.610%	-1.333%	-0.842%
Pakistan	Average shock	-1.897%	-1.583%	-3.054%	-2.591%	-4.119%	-3.451%
	Largest shock	-7.831%	-7.102%	-7.831%	-7.102%	-7.831%	-7.102%
	Smallest shock	-0.307%	-0.320%	-1.263%	-1.070%	-1.754%	-1.589%
Saudi Arabia	Average shock	-1.493%	-1.900%	-2.588%	-3.240%	-3.802%	-4.635%
	Largest shock	-19.311%	-16.755%	-19.311%	-16.755%	-19.311%	-16.755%
	Smallest shock	-0.342%	-0.425%	-0.779%	-0.929%	-1.242%	-1.790%
Total	Average shock	-1.550%	-1.433%	-2.596%	-2.455%	-3.817%	-3.512%
	Largest shock	-19.311%	-16.755%	-19.311%	-16.755%	-19.311%	-16.755%
	Smallest shock	-0.307%	-0.286%	-0.545%	-0.610%	-1.242%	-0.842%

As in positives, the maximum and minimum shock sizes are larger (in absolute value) for Shariah indices, although there are slight differences on specific markets. Furthermore, when considering their absolute values, negative shocks tend to have a slightly larger average size than positive shocks. Conciliating these results with the ones from Table 1 above, we observe that Islamic indices not only experience somewhat more positive and negative shocks in terms of frequency, but also more severe price reactions when such shocks occur. This holds across all three shock sizes, further suggesting that Shariah-compliant instruments may be more reactive to different kinds of market developments.

Table 4 presents the average post-shock CARs following positive shocks spanning from day 0, i.e., the shock size in abnormal terms, to day 10 after the shock in aggregate terms (i.e., considering all markets), sorted by shock size threshold and Shariah compliance status.

Table 4: Stock indices' reactions to positive shocks

		Shock size					
		1 st. dev.		2 st. dev.		3 st. dev.	
		Shariah	Non-Shariah	Shariah	Non-Shariah	Shariah	Non-Shariah
Total	CAR0	1.566%***	1.389%***	2.386%***	2.089%***	3.720%***	3.062%***
	CAR1	1.692%***	1.544%***	2.520%***	2.264%***	3.442%***	3.211%***
	CAR2	1.755%***	1.599%***	2.631%***	2.476%***	3.788%***	3.598%***
	CAR3	1.820%***	1.633%***	2.799%***	2.555%***	4.034%***	3.429%***
	CAR4	1.919%***	1.736%***	2.879%***	2.732%***	4.044%***	3.536%***
	CAR5	1.950%***	1.740%***	2.988%***	2.792%***	4.049%***	3.729%***
	CAR6	1.987%***	1.773%***	2.982%***	2.813%***	4.145%***	3.808%***
	CAR7	2.024%***	1.795%***	3.059%***	2.923%***	4.062%***	3.839%***
	CAR8	2.113%***	1.853%***	3.097%***	2.945%***	3.851%***	3.734%***
	CAR9	2.138%***	1.976%***	3.195%***	3.064%***	3.908%***	3.704%***
	CAR10	2.239%***	2.052%***	3.330%***	3.176%***	3.816%***	3.868%***

Note: Asterisks indicate significance levels (*10%, ** 5%, *** 1%) based on F-tests for global significance

Examining the results in aggregate, there is clear evidence supporting the hypothesis of price continuation (momentum or underreaction) in the short-term following significant positive price changes for both Islamic and conventional stock indices in these four markets. This is indicated by consistently positive CARs that tend to increase in the days after the shock while remaining statistically significant, meaning they are significantly different from zero. This pattern holds across different shock sizes and for both Islamic and conventional indices. Over the 10 days, the magnitude of the effect is slightly less pronounced for Shariah-compliant indices than for non-compliant ones. Its size is very similar for the first two shock levels but appears to weaken for the larger shock size considered in this study, i.e., at the three standard deviation level. This is represented by a much smaller relative increase in CARs in the days following the shock, although an increase is still present.

Table A4 in the Annexes unveils the short-term price reaction to positive shocks across each of the individual markets. In most cases, the findings align with previous observations, showing a price continuation effect for Islamic and non-Islamic indices across most shock sizes. Still, some exceptions (overreactions) exist in specific markets and types of shocks. During this 10-day period, in terms of average magnitude, the continuation effect is larger for non-Shariah-compliant stock indices in three of the four (with the exception of Indonesia, the one where the difference in average shock size is bigger between the two types of assets – see Table 2) markets, with the difference being maximum in Pakistan.

Table 5 provides the same analysis as Table 4, yet focused on negative shocks.

Table 5: Stock indices' reactions to negative shocks

		Shock size					
		1 st. dev.		2 st. dev.		3 st. dev.	
		Shariah	Non-Shariah	Shariah	Non-Shariah	Shariah	Non-Shariah
Total	CAR0	-1.582%***	-1.474%***	-2.621%***	-2.504%***	-3.832%***	-3.549%***
	CAR1	-1.667%***	-1.529%***	-2.688%***	-2.547%***	-4.031%***	-3.351%***
	CAR2	-1.592%***	-1.507%***	-2.520%***	-2.555%***	-3.692%***	-3.335%***
	CAR3	-1.592%***	-1.513%***	-2.532%***	-2.565%***	-3.746%***	-3.472%***
	CAR4	-1.618%***	-1.555%***	-2.655%***	-2.810%***	-3.866%***	-3.986%***
	CAR5	-1.645%***	-1.533%***	-2.740%***	-2.717%***	-3.999%***	-3.827%***
	CAR6	-1.648%***	-1.526%***	-2.741%***	-2.636%***	-3.913%***	-3.745%***
	CAR7	-1.625%***	-1.513%***	-2.719%***	-2.549%***	-3.839%***	-3.701%***
	CAR8	-1.592%***	-1.564%***	-2.654%***	-2.658%***	-3.476%***	-3.733%***
	CAR9	-1.540%***	-1.517%***	-2.464%***	-2.395%***	-3.030%***	-3.219%***
	CAR10	-1.557%***	-1.573%***	-2.471%***	-2.383%***	-2.878%***	-3.024%***

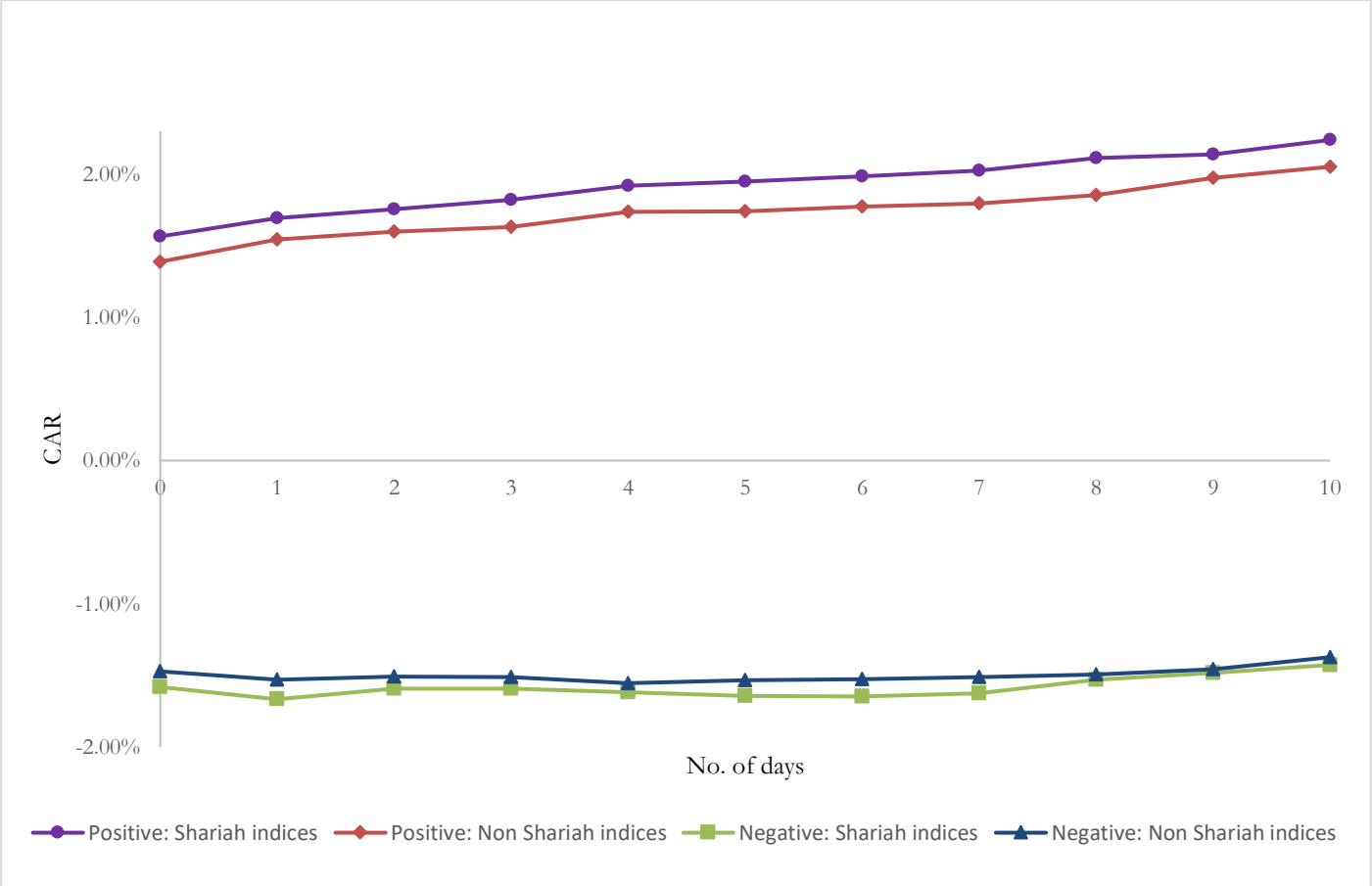
Note: Asterisks indicate significance levels (*10%, ** 5%, *** 1%) based on F-tests for global significance

Here, considering the average across the different markets, the pattern is contrary to the one for positive shocks: overreaction (followed by a partial price reversal) for both Islamic and conventional indices. This is supported by CARs that, although negative, rise in the days following the shock and remain statistically significant. Contrary to positive shocks, this effect is more pronounced for Shariah-compliant indices compared to overall market indices. Interestingly, the degree of overreaction for the 10-day period is much weaker than the underreaction after positive shocks, with even a slight continuation being found for the smallest shock type in non-Shariah indices. Also, unlike positive shocks, the magnitude of the effect follows an increasing pattern according to the size of the shock, becoming noticeable especially at the three standard deviation threshold.

Table A5 in the Annexes examines the market reactions to significant negative price changes across individual markets. Similar to positive shocks, the overall findings align with the aggregate results, showing price reversals for both index types across all three shock levels. Still, some markets present scarce evidence of price continuation.

For a more straightforward interpretation of the results mentioned in the previous tables, Figure 1 presents the aggregate (for the four selected markets) reaction following price shocks, sorted by type of shock and Shariah compliance status. It adequately summarises the behaviour of Islamic and conventional stock indices following price shocks.

Figure 1: Stock indices' reactions to positive and negative shocks



In particular, the figure displays price underreactions characterised by increasing positive CARs over the 10-day window following positive shocks, and partial reversals (suggesting overreactions), where CARs, though initially negative, become very slightly less negative over the same period after significant negative price changes. This pattern of adjustment in CARs happens relatively smoothly and gradually throughout the 10 days, consistent with the findings of Lasfer et al. (2003). Also, note that these post-shock reaction patterns to positive and negative shocks hold consistently over the 10 years of the sample, as displayed in Tables A6 and A7 presented in the Annexes. This subperiod analysis was carried out to better understand the dynamics within the 10-year sample period and was applied to both parts of

this study (stock indices and individual stocks), as done in earlier research (Lasfer et al., 2003; Mazouz et al., 2009).

In terms of effect size for both Shariah and non-Shariah indices, the difference between the much larger magnitude of the underreaction that takes place following positive shocks in comparison with the correction after negative shocks is clearly visible. Note that although the line for Shariah indices' reaction following positive shocks is above that of its conventional counterparts, this does not reflect a more pronounced momentum effect in relative percentage terms. Instead, the difference is attributable mainly to the much greater average magnitudes of shocks being recorded for Islamic indices, as seen in Table 2.

Our results are aligned with the vast majority of previous research, which finds return predictability following price shocks. Specifically, the pattern of underreaction after positive shocks and partial reversal after negative shocks resembles the results of Ajayi et al. (2006), despite their focus on multiple U.S. indices, as is common in this area. Although, as mentioned in the literature review, most studies for non-U.S. markets find price reversals following both positive and negative shocks, Ajayi and Mehdian (1994) also reported increasing CARs after both types of shocks, using a definition of price shocks comparable to the one applied in this study. Also, Rezvanian et al. (2011) reached aligned outcomes for China. For emerging markets specifically, similar patterns have been documented by Mehdian et al. (2007) for Turkey.

Regarding possible explanations for these phenomena, those related to market microstructure, such as bid-ask bounce and non-synchronous trading effects, can likely be ruled out. This is because our study includes a range of markets with varying trading systems, which reduces the potential influence of these specific microstructural factors (Amini et al., 2012). However, this study finds support for the Uncertain Information Hypothesis (UIH), which may be applicable across different markets (Brown et al., 1988). This theory proposes that investors are affected in the short-term by the release of unexpected information, with an initial underreaction or overreaction, followed by a gradual correction after the reduction of their uncertainty (Brown et al., 1988). Applied to the context of price shocks, the UIH implies that positive shocks can lead to an initial underreaction because of the uncertainty associated with the good news. As investor confidence rises and uncertainty falls, prices will then move upwards, leading to increasingly positive CARs. For negative shocks, the UIH predicts that the initial price decline may be overestimated due to heightened uncertainty. As

the uncertainty is dissipated, prices partially recover, again leading to rising CARs after the shock. This pattern aligns with the results in Tables 4, 5, and Figure 1.

Moreover, the more commonly cited behavioural explanations for return predictability following large price changes may also account for the observed results.

The price continuation seen in our study after positive shocks could be attributed to the slow incorporation of news into prices (Lasfer et al., 2003; Mazouz et al., 2009). This lag in adjustment can, in turn, be caused by a multitude of behavioural biases. For example, investor overconfidence, classically identified as a key momentum driver (Jegadeesh & Titman, 1993), also in Islamic markets (Cheema & Nartea, 2018), can cause gradual price adjustments. Similarly, the conservatism bias, i.e., investors' hesitation to update their expectations with new information, can lead to underreaction. Other sources that may contribute to it are the existence of momentum traders (Hong & Stein, 1999) and the anchoring bias (George & Hwang, 2004), where investors only make partial changes to their expectations when they encounter new information.

As for the behavioural explanation behind the partial correction following negative price shocks, it may be related to the overweighting of current information, triggering an overreaction to these significant price changes (De Bondt & Thaler, 1985; Park, 1995; Madura & Richie, 2004). Once again, behavioural elements that the academic literature has established offer further explanations for this phenomenon. Specifically, it may be motivated by the representativeness bias (Barberis et al., 1998), where investors tend to extrapolate a small number of recent observations into legitimate trends. Additionally, the self-attribution bias (Daniel et al., 2001) and the existence of news watcher traders, i.e., those who adjust their strategies based on newly available information (Hong & Stein, 1999), can be seen as relevant justifications in this context.

Overall, our results for stock indices suggest that investors appear to be more heavily affected by behavioural biases related to momentum following large price increases while simultaneously being more vulnerable to biases that cause reversals after negative price shocks.

A crucial aspect that remains to be addressed in this study is whether the magnitude of the price reaction effects (since the direction has already been shown to be the same) significantly differs between Islamic and conventional indices following price shocks. Two-sample t-tests were conducted to investigate this, under the assumption of unequal group variances due to potential differences in volatility between the two index types, motivated by the constraints

imposed by Shariah compliance screening. The results for positive shocks are presented in Table 6.

Table 6: Two-sample T-test results for stock indices' reactions to positive shocks

		Shock size		
		1 st. dev.	**2 st. dev.**	**3 st. dev.**
		t-statistic	**t-statistic**	**t-statistic**
Total	**CAR0**	4.90940***	2.75496***	1.85867*
	CAR1	2.74314***	1.81763*	0.59989
	CAR2	2.16842**	0.87604	0.40812
	CAR3	2.11973**	1.08969	0.97164
	CAR4	1.84240*	0.59186	0.75671
	CAR5	1.85684*	0.67978	0.41127
	CAR6	1.70393*	0.53114	0.38488
	CAR7	1.65512*	0.38626	0.22578
	CAR8	1.75818*	0.39963	0.11130
	CAR9	1.02102	0.32727	0.18026
	CAR10	1.08047	0.34630	-0.04064

Note: Asterisks indicate significance levels (*10%, ** 5%, *** 1%) based on F-tests for global significance

The table shows limited evidence that the CARs following positive shocks differ significantly between Islamic and conventional stock indices. In particular, the immediate reaction (CAR0), i.e., the shock size, is significantly different (larger for Shariah-compliant indices as established before) for all price change thresholds. However, this divergence appears to diminish rapidly over time. From CAR1 to CAR8, the differences remain statistically significant solely for the smallest shocks, and mainly at the 5% and 10% levels, indicating a progressively weaker divergence. By CAR9 and CAR10, the differences are no longer statistically significant at any level. Thus, while conventional indices display, as mentioned in Table 4, a stronger underreaction, this effect does not seem to be significantly different from their Islamic counterparts, with the exception of small price shocks in the first days.

This pattern repeats across individual markets, as shown in Table A8 in the Annexes, though significant differences in CARs following one standard deviation positive shocks typically only hold for the first two days. Table 7 provides the same breakdown for negative shocks, which have some differences from positive shocks.

Table 7: Two-sample T-test results for stock indices' reactions to negative shocks

		Shock size		
		1 st. dev.	**2 st. dev.**	**3 st. dev.**
		t-statistic	**t-statistic**	**t-statistic**
Total	**CAR0**	-2.57727**	-0.99777	-1.11829
	CAR1	-2.19271**	-0.84121	-1.91236**
	CAR2	-1.06318	0.17357	-0.81862
	CAR3	-0.82727	0.13343	-0.52234
	CAR4	-0.56779	0.53099	0.18988
	CAR5	-0.88256	-0.06977	-0.23246
	CAR6	-0.90619	-0.30448	-0.22390
	CAR7	-0.77141	-0.44866	-0.16367
	CAR8	-0.17792	0.00900	0.27959
	CAR9	-0.13612	-0.16847	0.20980
	CAR10	0.09655	-0.20796	0.15828

Note: Asterisks indicate significance levels (*10%, ** 5%, *** 1%) based on F-tests for global significance

First, the difference in shock size between Islamic and conventional indices (measured by CAR0, in abnormal terms) is generally not statistically significant, except for the smallest shocks, at a 5% level. This happens, even though, on average, Shariah-compliant indices experienced larger negative price shocks in absolute terms, as previously discussed. In the days following the shock, there is even more limited evidence of any significant difference in price reaction between the two index types. A notable exception occurs on the day after the shock (CAR1), where differences are again significant at 5% for the one and three standard deviation levels. This scarce difference in post-shock behaviour may be attributed to the much weaker average reversal effect after negative shocks, especially when contrasted with the stronger continuation observed after positive shocks, as discussed earlier. As a result, when analysing negative shocks, the evidence of difference in reaction between Islamic and conventional indices becomes even weaker.

Table A9 in the Annexes provides the results of this test for each of the individual markets. These results point towards insignificant differences in reaction between Islamic and conventional indices, following, at the maximum, the third day (observed only in specific markets and for the smallest category of shocks). Also, Tables A10 and A11 in the Annexes suggest that the differences in post-shock (both positive and negative) reaction between both types of indices are mostly insignificant across the subperiods of this sample.

In a nutshell, these results point towards limited differences in reaction after significant price changes between Islamic and non-Islamic stock indices. At a glance, this may be understood as surprising given the screening criteria used for Islamic Finance, particularly the exclusion of highly leveraged companies and the focus on uncertainty reduction. However, this finding for stock indices is aligned with studies that have shown that the level of efficiency of Shariah-compliant instruments is not much different from conventional ones, e.g., Guyot (2011). Specifically, regarding the differences in longer-term momentum returns, Cheema and Nartea (2018) concluded that they are not significantly different between Islamic and conventional stocks when controlling for a group of market factors, although this study focuses on longer-term (six-month) returns.

4.2. Individual stocks

As mentioned, this dissertation's second portion focuses on analysing the short-term reaction of Shariah and non-Shariah compliant individual stocks to price shocks.

Table 8 displays the number of positive (Panel A) and negative (Panel B) large price changes per market and shock size, divided between Islamic and conventional individual stocks.

Table 8: Frequency of shocks across individual stocks

Panel A: Positive shocks

	Shock size								
	1 st. dev.			**2 st. dev.**			**3 st. dev.**		
	Shariah	**Non-Shariah**	**Total**	**Shariah**	**Non-Shariah**	**Total**	**Shariah**	**Non-Shariah**	**Total**
Indonesia	1484	1550	3034	462	473	935	166	155	321
Malaysia	1436	1470	2906	459	449	908	164	179	343
Pakistan	1562	1659	3221	502	577	1079	160	196	356
Saudi Arabia	1593	1716	3309	462	482	944	167	133	300
Total	**6075**	**6395**	**12470**	**1885**	**1981**	**3866**	**657**	**663**	**1320**

Panel B: Negative shocks

	Shock size								
	1 st. dev.			**2 st. dev.**			**3 st. dev.**		
	Shariah	**Non-Shariah**	**Total**	**Shariah**	**Non-Shariah**	**Total**	**Shariah**	**Non-Shariah**	**Total**
Indonesia	1447	1531	2978	386	390	776	118	141	259
Malaysia	1481	1476	2957	400	423	823	146	156	302
Pakistan	1451	1517	2968	380	428	808	115	113	228
Saudi Arabia	1596	1681	3277	404	425	829	141	127	268
Total	**5975**	**6205**	**12180**	**1570**	**1666**	**3236**	**520**	**537**	**1057**

This section includes a total of 24,650 shocks (12,470 positive and 12,180 negative), as expected, substantially more than those observed at the index level in Table 1. Panel A reveals, interestingly, a higher number of positive price shocks among non-Shariah stocks compared to Shariah-compliant ones, which contrasts with the pattern reported in Table 1 for indices. Still, a similar conclusion can be drawn regarding the relatively even (although Saudi Arabia and Pakistan stand out with the highest number of positive shocks) distribution of shocks across markets and the sharp reduction in their frequency as shock size increases. Panel B shows that, overall, the number of significant negative price changes for individual stocks is slightly lower than that of positive shocks. Similar to the positive shocks, conventional stocks account for a greater number of negative shocks, with Saudi Arabia emerging as the market with the highest frequency. Notably, all selected stocks across the four markets experienced shocks at all defined thresholds for both positive and negative price movements.

Regarding shock size, Table 9 summarises the average, largest, and smallest positive shocks by shock type and Shariah compliance, as done before for stock indices.

Table 9: Size distribution of positive shocks in individual stocks

		Shock size					
		1 st. dev.		2 st. dev.		3 st. dev.	
		Shariah	Non-Shariah	Shariah	Non-Shariah	Shariah	Non-Shariah
Indonesia	Average shock	4.098%	3.160%	6.517%	4.863%	9.204%	6.589%
	Largest shock	22.137%	22.314%	22.137%	22.314%	22.137%	22.314%
	Smallest shock	0.721%	0.302%	1.242%	0.608%	2.416%	0.608%
Malaysia	Average shock	2.442%	2.037%	3.617%	3.125%	4.711%	4.087%
	Largest shock	17.339%	14.776%	17.339%	14.776%	17.339%	14.776%
	Smallest shock	0.279%	0.197%	0.717%	0.501%	1.105%	0.789%
Pakistan	Average shock	2.927%	3.373%	4.069%	4.646%	4.802%	5.418%
	Largest shock	9.532%	9.758%	9.532%	9.758%	9.532%	9.758%
	Smallest shock	0.551%	0.485%	1.181%	1.224%	1.857%	1.906%
Saudi Arabia	Average shock	2.803%	2.693%	4.244%	3.980%	5.615%	5.093%
	Largest shock	9.764%	9.571%	9.764%	9.571%	9.764%	9.571%
	Smallest shock	0.682%	0.578%	1.384%	1.111%	1.934%	1.623%
Total	Average shock	3.066%	2.832%	4.602%	4.191%	6.098%	5.267%
	Largest shock	22.137%	22.314%	22.137%	22.314%	22.137%	22.314%
	Smallest shock	0.279%	0.197%	0.717%	0.501%	1.105%	0.608%

The conclusions align with those in Table 2, showing that Islamic stocks generally experience larger average positive shocks than conventional stocks, both across all markets and thresholds, and within each market (with the exception of Pakistan). A notable difference from the index results is that, in aggregate terms, the largest individual shock is slightly greater for conventional stocks, contrasting with the substantially larger maximum shock observed for Islamic indices. Also, as expected, the average positive shock is much larger for individual stocks than for stock indices, across all markets and size thresholds. Table 10 focuses on the descriptive statistics for the size of negative shocks.

Table 10: Size distribution of negative shocks in individual stocks

		Shock size					
		1 st. dev.		2 st. dev.		3 st. dev.	
		Shariah	Non-Shariah	Shariah	Non-Shariah	Shariah	Non-Shariah
Indonesia	**Average shock**	-3.616%	-2.842%	-5.517%	-4.514%	-7.188%	-5.887%
	Largest shock	-22.227%	-22.314%	-22.227%	-22.314%	-22.227%	-22.314%
	Smallest shock	-0.740%	-0.105%	-1.701%	-0.509%	-2.115%	-0.613%
Malaysia	**Average shock**	-2.281%	-1.934%	-3.525%	-2.924%	-4.700%	-3.899%
	Largest shock	-25.005%	-12.057%	-25.005%	-12.057%	-25.005%	-12.057%
	Smallest shock	-0.277%	-0.196%	-0.413%	-0.563%	-1.009%	-0.925%
Pakistan	**Average shock**	-2.744%	-3.037%	-4.198%	-4.489%	-5.373%	-5.860%
	Largest shock	-10.534%	-17.338%	-10.534%	-17.338%	-10.534%	-17.338%
	Smallest shock	-0.540%	-0.502%	-1.719%	-1.509%	-1.772%	-2.060%
Saudi Arabia	**Average shock**	-2.573%	-2.669%	-4.251%	-4.211%	-5.733%	-5.775%
	Largest shock	-10.568%	-10.536%	-10.568%	-10.536%	-10.568%	-10.536%
	Smallest shock	-0.559%	-0.554%	-1.186%	-1.504%	-1.980%	-1.662%
Total	**Average shock**	-2.795%	-2.627%	-4.365%	-4.026%	-5.694%	-5.277%
	Largest shock	-25.005%	-22.314%	-25.005%	-22.314%	-25.005%	-22.314%
	Smallest shock	-0.277%	-0.105%	-0.413%	-0.509%	-1.009%	-0.613%

These findings also indicate that Shariah-compliant individual stocks tend to face larger average negative shocks (in absolute terms) than their non-Shariah counterparts. This observation holds true in all shock sizes, in aggregate, and in most individual markets, with the exceptions of Pakistan and now also Saudi Arabia. It mirrors the pattern for stock indices noted in Table 3, further supporting the idea that Shariah-compliant instruments may be more sensitive to various market developments. Yet, while Shariah-compliant individual stocks suffer more intense positive and negative shocks, they do not have a higher frequency relative to non-Shariah stocks, a contrast with the trend for stock indices. Also, when considering their absolute values, negative shocks are found to have a slightly lower mean

size than positive shocks for Shariah-compliant and conventional stocks. This is another contrast with the results for stock indices shown in Tables 2 and 3. Finally, as with positive shocks, the average negative shock is also consistently larger for individual stocks than stock indices.

As detailed in section 3.2, Table 11 shows the number of stocks each model had as its best fit according to the Akaike Information Criterion (AIC). Note that, for the purposes of the tables coming from this point onwards, the estimations according to the Fama-French Three-factor and Carhart-Fama-French models are referred to as "Three Factor" and "Four Factor", respectively, for simplicity purposes.

Table 11: Best-fitting model for each individual stock

	Best-fit model					
	Single Index		**Three Factor**		**Four Factor**	
	Shariah	**Non-Shariah**	**Shariah**	**Non-Shariah**	**Shariah**	**Non-Shariah**
Indonesia	3	3	2	2	0	0
Malaysia	3	1	2	4	0	0
Pakistan	5	4	0	1	0	0
Saudi Arabia	1	0	4	5	0	0
Total	12	8	8	12	0	0

It is noteworthy that the 40 stocks are relatively evenly distributed (even in terms of Shariah compliance) between the Single Index Model and the Fama-French 3-factor models, with no individual stock fitting the Carhart-Fama-French model. This is likely for two reasons. First, the parameter associated with the momentum factor (the only difference between the 3-factor and 4-factor models) was statistically insignificant in the OLS regression described in section 3.2. And second, the AIC criterion tends to favour models with fewer parameters, and the Carhart-Fama-French model has the largest number of regressors.

Table 12 shows the CARs (up to day 10) of individual stocks following positive shocks according to the best-fit estimations for abnormal returns, sorted by Shariah compliance and shock size. It is important to note that these results are presented only at the aggregate level (all markets combined), as the patterns observed across individual markets were very similar to those in stock indices.

Table 12: Individual stocks' reactions to positive shocks using the best-fit model

		Shock size					
		1 st. dev.		2 st. dev.		3 st. dev.	
		Shariah	Non-Shariah	Shariah	Non-Shariah	Shariah	Non-Shariah
Best fit	CAR0	3.089%***	2.853%***	4.630%***	4.221%***	6.135%***	5.312%***
	CAR1	3.180%***	3.050%***	4.690%***	4.575%***	6.267%***	5.747%***
	CAR2	3.218%***	3.125%***	4.747%***	4.781%***	6.481%***	5.963%***
	CAR3	3.295%***	3.158%***	4.837%***	4.910%***	6.564%***	6.124%***
	CAR4	3.357%***	3.185%***	4.854%***	4.903%***	6.562%***	6.096%***
	CAR5	3.431%***	3.237%***	4.875%***	4.977%***	6.651%***	6.242%***
	CAR6	3.447%***	3.226%***	4.825%***	4.908%***	6.491%***	6.118%***
	CAR7	3.481%***	3.197%***	4.891%***	4.918%***	6.640%***	6.246%***
	CAR8	3.528%***	3.236%***	4.924%***	4.994%***	6.657%***	6.280%***
	CAR9	3.576%***	3.257%***	5.027%***	4.985%***	6.857%***	6.298%***
	CAR10	3.668%***	3.323%***	5.215%***	5.059%***	7.185%***	6.413%***

Note: Asterisks indicate significance levels (*10%, ** 5%, *** 1%) based on F-tests for global significance

The findings provide additional support for the presence of price continuation after large positive price changes, reflected in the consistent increase of positive CARs over the 10-day period (while remaining statistically significant, even at the 1% level) for both Islamic and conventional stocks, and shock sizes. While the difference is marginal, the magnitude of this effect tends to be slightly smaller for Shariah-compliant stocks compared to their conventional counterparts. In contrast to the index-level results presented in Table 4, the degree of underreaction is relatively consistent across different shock sizes. Interestingly, the underreaction effect is generally slightly weaker for individual stocks, regardless of shock size or Shariah compliance status, than observed at the index level.

Additionally, all models produce highly similar CAR patterns over the 10-day window, as displayed in Table A12 in the Annexes, reinforcing the robustness of the analysis and the finding of underreaction to positive shocks for both groups of individual stocks.

The corresponding analysis for negative shocks is made in Table 13. Consistent with the results presented in Table 5 for stock indices, it reveals a pattern of partial price reversal (overreaction) for Islamic and conventional stocks marked by post-shock best-fit CARs that, although remaining negative, increase (and are statistically significant at the 1% level) in the short-term across the different shock sizes.

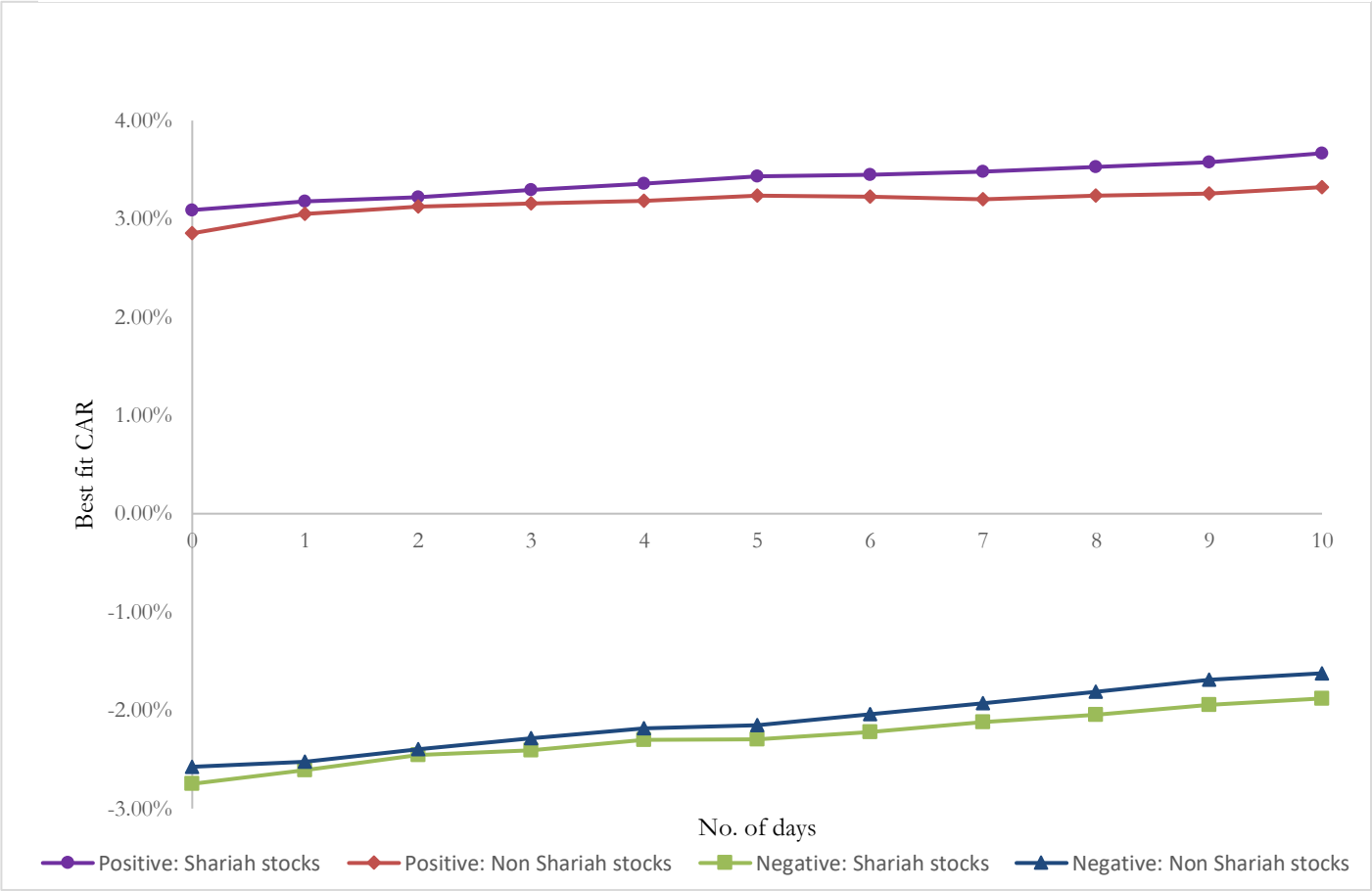
Table 13: Individual stocks' reactions to negative shocks using the best-fit model

		Shock size					
		1 st. dev.		2 st. dev.		3 st. dev.	
		Shariah	Non-Shariah	Shariah	Non-Shariah	Shariah	Non-Shariah
Best fit	CAR0	-2.748%***	-2.575%***	-4.289%***	-3.934%***	-5.580%***	-5.143%***
	CAR1	-2.607%***	-2.522%***	-4.020%***	-3.896%***	-5.201%***	-5.233%***
	CAR2	-2.457%***	-2.396%***	-3.773%***	-3.699%***	-4.858%***	-5.051%***
	CAR3	-2.407%***	-2.287%***	-3.779%***	-3.617%***	-4.998%***	-5.034%***
	CAR4	-2.303%***	-2.184%***	-3.641%***	-3.585%***	-4.961%***	-4.917%***
	CAR5	-2.297%***	-2.153%***	-3.621%***	-3.537%***	-5.052%***	-5.049%***
	CAR6	-2.223%***	-2.040%***	-3.577%***	-3.322%***	-4.941%***	-4.921%***
	CAR7	-2.120%***	-1.931%***	-3.441%***	-3.061%***	-4.696%***	-4.589%***
	CAR8	-2.048%***	-1.810%***	-3.347%***	-2.857%***	-4.515%***	-4.436%***
	CAR9	-1.946%***	-1.692%***	-3.210%***	-2.635%***	-4.264%***	-4.099%***
	CAR10	-1.879%***	-1.623%***	-3.117%***	-2.599%***	-4.177%***	-4.105%***

Note: Asterisks indicate significance levels (*10%, ** 5%, *** 1%) based on F-tests for global significance

As with positive price shifts, non-Shariah-compliant shares experience a slightly more pronounced overreaction. However, in contrast with the indices' conclusions, the overreaction's average magnitude is significantly greater than the underreaction observed after positive shocks. While the intensity of the effect diminishes slightly with increasing shock size, the overall magnitude of the reversal for individual stocks is considerably more pronounced than that observed at the index level. As before, the post-shock CAR trends are nearly identical across the models for abnormal return estimation, which is observed in Table A13 in the Annexes. Figure 2 provides a visual representation of the reaction (using best-fit CARs) of Islamic and conventional stocks to positive and negative price shocks.

Figure 2: Individual stocks' reactions to positive and negative shocks using the best-fit model



The figure illustrates a pattern of price continuation, i.e., underreaction following large positive price changes, reflected in increasing positive CARs for both Shariah and non-Shariah stocks. It also shows a tendency of partial reversal after significant negative price movements, where CARs, though initially negative, become progressively less negative over the 10-day period. This evolution occurs gradually, similar to the behaviour of stock indices in Figure 1. As with indices, these post-shock reaction patterns remain consistent throughout the 10-year sample period, as evidenced in Tables A14 and A15 in the Annexes.

In terms of effect size, it is evident for both types of stocks that, unlike the pattern shown in Figure 1 for indices, the overreaction following negative price changes is more pronounced than the underreaction following positive ones.

Compared to the reaction of stock indices illustrated in Figure 1, the lines representing both Islamic and conventional individual stocks show more pronounced positive and negative CARs. This is a consequence of the larger average shock sizes observed for individual stocks, as reported in Tables 9 and 10, relative to those in Tables 2 and 3 for indices.

Overall, since the results obtained for individual stocks are mostly conciliable with those of indices, they further confirm return predictability following significant price changes. The consistent observation of underreaction after positive shocks and partial reversal after negative shocks across both Shariah-compliant and conventional stocks reinforces the idea that these effects are not limited to the aggregate market but are also present at the firm level and are in line with some previous research (Ajayi & Mehdian, 1994; Mehdian et al., 2007; Rezvanian et al., 2011). The same underlying mechanisms discussed earlier, i.e., the Uncertain Information Hypothesis (Brown et al., 1988) and a plethora of behavioural biases, remain central to understanding these patterns.

However, a notable distinction arises when comparing individual stocks with stock indices: the magnitude of the overreaction following negative shocks is much greater than the underreaction observed after positive shocks in the case of individual stocks.

In particular, the UIH may gain additional explanatory relevance, as the more substantial reversal effect suggests that the initial overreaction to adverse events is more intensely corrected over time, leading to a sharper post-shock increase in CARs than what happens with indices.

This heightened correction may also arise from the higher perceived information content of firm-specific events (e.g., earnings announcements or management changes), which can elevate uncertainty and trigger the tendency to overweight current (negative) information (De Bondt & Thaler, 1985; Park, 1995; Madura & Richie, 2004). Additionally, individual stocks typically involve greater information asymmetry and lower transparency compared to indices, which may enlarge the influence of behavioural biases such as the self-attribution bias (Daniel et al., 2001) and the representativeness bias (Barberis et al., 1998). Thus, these behavioural mechanisms may have a stronger influence on investors in individual stocks, helping to explain the more pronounced reversals observed not only when compared to stock indices but also relative to the underreactions that follow positive shocks within individual stocks themselves.

Note also that the underreaction following positive shocks is slightly less pronounced for individual stocks than for stock indices, although the difference is much smaller (this could be explained, in part, by a lower incidence of some of the behavioural factors contributing to underreaction, as discussed in section 4.1.).

As with stock indices, Table 14 presents the T-statistics from a two-sample t-test (assuming unequal variances) performed to compare the post-shock responses, considering best-fit CARs, of Islamic and conventional individual stocks following positive shocks.

Table 14: Two-sample T-test results for individual stock reactions to positive shocks using the best-fit model

		Shock size		
		1 st. dev.	**2 st. dev.**	**3 st. dev.**
		t-statistic	**t-statistic**	**t-statistic**
Best fit	**CAR0**	6.72254***	5.05514***	4.63737***
	CAR1	2.31487**	0.90450	1.90657**
	CAR2	1.31169	-0.20560	1.49193
	CAR3	1.65529*	-0.38668	1.10264
	CAR4	1.89513*	-0.24642	1.07566
	CAR5	1.97274**	-0.48260	0.90995
	CAR6	2.11081**	-0.37901	0.81566
	CAR7	2.55147**	-0.11931	0.81513
	CAR8	2.51492**	-0.29246	0.76668
	CAR9	2.60974***	0.16784	1.09334
	CAR10	2.67960***	0.58951	1.43039

Note: Asterisks indicate significance levels (*10%, ** 5%, *** 1%) based on F-tests for global significance

Regarding relative shock size, the difference in CAR0 between Islamic and conventional stocks is statistically significant across all three models and the best-fit estimation, even at the 1% level, confirming that, on average, Shariah-compliant stocks experience larger positive shocks than their conventional counterparts (see Table 9). Additionally, the results provide slightly stronger evidence of significant differences in CARs between Islamic and conventional individual stocks than was observed for stock indices. Notably, for the smallest shock sizes, conventional stocks display a significantly larger continuation effect, with the two-sample t-test results showing significance (at least at the 10% level) for most of the 10-day window across all models. However, consistent with earlier findings, these differences become insignificant for the larger shock categories after day one. This points to overall scarce evidence of significant divergence in post-shock reactions between Islamic and conventional stocks after positive price shocks. Table A16 in the Annexes confirms these findings for all three abnormal return estimation models, particularly the significant differences in continuation effect size for smaller shocks.

Table 15 displays the results of the corresponding analysis focused on negative shocks.

Table 15: Two-sample T-test results for individual stock reactions to positive shocks using the best-fit model

		Shock size		
		1 st. dev.	**2 st. dev.**	**3 st. dev.**
		t-statistic	**t-statistic**	**t-statistic**
Best fit	**CAR0**	-5.63738***	-4.58522***	-2.58450***
	CAR1	-1.68394*	-0.98566	0.12206
	CAR2	-0.96659	-0.47948	0.61929
	CAR3	-1.61787	-0.90394	0.09630
	CAR4	-1.42150	-0.28000	-0.10786
	CAR5	-1.56883	-0.38704	-0.00608
	CAR6	-1.84423*	-1.07673	-0.04146
	CAR7	-1.78094*	-1.51645	-0.20905
	CAR8	-2.10811**	-1.85125*	-0.14522
	CAR9	-2.18684**	-2.13405**	-0.30509
	CAR10	-2.12506**	-1.86070*	-0.12959

Note: Asterisks indicate significance levels (*10%, ** 5%, *** 1%) based on F-tests for global significance

As with the conclusions drawn from Table 14, it shows that differences in shock size between Islamic and conventional stocks are statistically significant, confirming that Islamic stocks, on average, experience larger negative price shifts than their conventional counterparts (as seen in Table 10). Interestingly, there is even more limited evidence of differences in the magnitude of price reversal between the two groups, which resembles the findings for stock indices in the days after negative shocks. This is supported by the fact that, for best-fit estimations and across all three models (see Table A17 in the Annexes), the difference in Islamic and non-Islamic stocks' CARs for the smallest shock class is not statistically significant between days two and five. Similarly, any significant differences in CARs disappear after day one for the larger shock type.

Thus, as also concluded for indices in Table 7, the gap in reversal magnitude between Islamic and conventional stocks appears smaller than the difference in continuation in response to positive shocks. However, in contrast with the case of indices, this cannot be explained by the relative size of the effects, as overreactions are more pronounced than underreactions in the case of individual stocks, as shown in Figure 2.

Consequently, the general results in relative reaction between both groups of stocks are similar to the ones obtained using stock indices, pointing towards a matching reaction between them. This is aligned with the previously mentioned results of Guyot (2011) and

Cheema and Nartea (2018), who showed comparable levels of efficiency between Islamic and conventional stock markets. It may also be justified by the fact that, despite the theoretical distinctions between Islamic and traditional Finance, short-term market behaviour can converge due to increasing market integration and the shared exposure of both types of stocks to common macroeconomic conditions and investor sentiment.

Additionally, Tables A18 and A19 in the Annexes confirm the limited disparities of post-shock reactions between Islamic and non-Islamic stocks across the various subperiods of this sample. However, exceptions are observed, with significant differences in post-shock CARs emerging for the smallest positive shocks during the second subperiod and for multiple negative shock sizes in the first subperiod.

5. Conclusion

This dissertation investigated the short-term return behaviour of Islamic stocks following large one-day price shocks across four emerging markets: Indonesia, Malaysia, Pakistan, and Saudi Arabia, spanning 2015 to 2024. By analysing stock indices and individual stocks across Shariah-compliant and conventional assets, the study tested the weak-form Efficient Market Hypothesis (EMH). It explored whether these markets exhibit inefficiencies that investors could exploit.

The findings revealed strong evidence of short-term return predictability. Most notably, both Islamic and conventional assets demonstrated price continuation following positive shocks, while displaying price reversals after negative shocks. These effects were statistically significant for both types of equities and are consistent with some previous research on emerging markets, namely that of Ajayi and Mehdian (1994), Mehdian et al. (2007), and Rezvanian et al. (2011), although they do not reflect the majority of existing studies.

These patterns are consistent with explanations grounded in Behavioural Finance. Underreaction, which results in continuation, is often attributed, among others, to investor overconfidence (Jegadeesh & Titman, 1993) and conservatism that contributed to a delayed adjustment to new information. On the other hand, overreaction, leading to reversals, may arise from overweighting of current information (De Bondt & Thaler, 1985; Park, 1995; Madura & Richie, 2004) combined with others such as the representativeness (Barberis et al., 1998) and self-attribution (Daniel et al., 2001) biases. Both may be more common in emerging markets where information dissemination is slower, and individual investors dominate.

Given the diversity of trading mechanisms across the sampled markets, microstructure-based explanations are unlikely to drive the observed return patterns. Instead, the results align with the Uncertain Information Hypothesis (Brown et al., 1988), which predicts that investors react cautiously (in case of positive) or irrationally (in case of negative) to unexpected news, causing short-term price inefficiencies that gradually adjust by following the patterns found in our study.

The investigation showed some variations in which asset type (Islamic or conventional) exhibited the strongest effects and differences in whether momentum or reversal patterns were more pronounced in individual stocks or indices. To assess whether these differences in behaviour of equities based on Shariah compliance were statistically significant, two-sample t-tests were conducted on post-shock CARs. However, the results showed scarce

evidence (for both individual stocks and indices) of significant differences, suggesting that, despite the structural and theoretical distinctions between Islamic and conventional finance, their short-term market behaviour converges, possibly due to shared exposure to macroeconomic conditions and investor sentiment. It also presents support to the notion that there is a similar level of efficiency between Islamic and conventional instruments (Guyot, 2011; Cheema & Nartea, 2018)

Another contribution of this study is the finding that Islamic instruments consistently experienced larger positive and negative shocks than conventional ones. These differences were mostly statistically significant and may result from Shariah-compliant instruments being more sensitive to both positive and negative events.

All findings should be interpreted considering this analysis's limitations. As a consequence of data constraints, the previously mentioned usage of the same factor models for all stocks (for the results in section 4.2) within a month limited the precision of abnormal return estimates. Furthermore, there were no controls for relevant explanatory variables such as market capitalisation or trading volume, which may have also influenced the final results, particularly for individual stocks.

Still, these conclusions have meaningful implications. The presence of short-term return anomalies across both Islamic and conventional markets clearly challenges the EMH in the weak-form. Additionally, from the investor's perspective, it opens the possibility of designing profitable trading strategies based on post-shock price patterns. In particular, acquiring or holding both Islamic and conventional individual stocks and indices after positive or negative shocks may generate positive abnormal returns, possibly allowing investors to "beat the market" in the short run. Also, policymakers should promote market transparency and investor education to mitigate behavioural biases driving these reactions.

With Islamic Finance projected to reach $6.7 trillion by 2027 (Islamic Corporation for the Development of the Private Sector (ICD) & Refinitiv, 2023), a better understanding of these markets' dynamics is crucial. This dissertation contributes to that goal by showing that Islamic equities behave mostly similarly to conventional ones in response to large price shifts. To the best of our knowledge, it is innovative, as it is the first study to compare the behaviour of these two types of instruments in this established area of research.

Future research could, however, extend this work by exploring different time horizons (e.g., intraday or weekly data), as suggested by Amini et al. (2012), to better understand, for instance, the speed of information incorporation into prices. Moreover, studying the impact

of calendar (or seasonal) anomalies on the reaction to price shocks of Islamic versus conventional markets may also produce valuable insights. With improved data, future studies may also attempt to incorporate liquidity and firm-level characteristics for a more appropriate comparison between the behaviour of Shariah and non-Shariah compliant stocks following price shocks. Finally, a possible suggestion would be to assess whether the identified size of CARs would be sufficient to design a profitable short-term investment strategy after accounting for relevant factors such as transaction costs.

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Annexes

Table A1: Description of selected stock indices

Ticker	Index designation	Market	Index type	Index composition
.KSE	KSE 100 Index	Pakistan	Conventional	100 companies listed on the Pakistan Stock Exchange based on market capitalisation and sector representation
.KMI30	KMI 30 Index	Pakistan	Islamic	30 most liquid Shariah compliant companies listed on the Pakistan Stock Exchange
.JKSE	JSE Composite Index	Indonesia	Conventional	All listed companies in the Main Board and Development Board of the Indonesia Stock Exchange
.JKII	Jakarta Islamic Index	Indonesia	Islamic	30 most liquid Shariah compliant companies listed on the Indonesia Stock Exchange
.KLSE	FTSE Bursa Malaysia KLCI	Malaysia	Conventional	30 largest companies listed on the Main Board of the Malaysia Stock Exchange based on market capitalisation
.FTFBMHS	FTSE Bursa Malaysia Hijrah Shariah Index	Malaysia	Islamic	30 largest Shariah compliant companies listed on the Main Board of the Malaysia Stock Exchange based on market capitalisation
.TASI	Tadawul All Share Index	Saudi Arabia	Conventional	All listed companies on Main Market of the Saudi Stock Exchange
.SPSHSA	S&P Saudi Arabia Shariah Index	Saudi Arabia	Islamic	202 companies listed on the Saudi Stock Exchange based on market capitalisation

Table A2: Description of selected Islamic individual stocks

Ticker	Issuer	Market	Sector	Market Capitalisation
BYAN.JK	Bayan Resources Tbk PT	Indonesia	Coal (NEC)	41 619 489 581
TLKM.JK	Telkom Indonesia (Persero) Tbk PT	Indonesia	Integrated Telecommunications Services (NEC)	16 552 755 019
AMRT.JK	Sumber Alfaria Trijaya Tbk PT	Indonesia	Supermarkets & Convenience Stores	7 296 964 691
UNTR.JK	United Tractors Tbk PT	Indonesia	Coal Mining Support	6 158 103 736
ISAT.JK	Indosat Tbk PT	Indonesia	Wireless Telecommunications Services (NEC)	4 931 570 836
TENA.KL	Tenaga Nasional Bhd	Malaysia	Fossil Fuel Electric Utilities	19 459 632 369
IHHH.KL	IHH Healthcare Bhd	Malaysia	Hospitals, Clinics & Primary Care Services	14 415 755 157
CELC.KL	CelcomDigi Bhd	Malaysia	Wireless Telecoms Service Providers	9 515 902 898
PCGB.KL	PETRONAS Chemicals Group Bhd	Malaysia	Commodity Chemicals (NEC)	9 267 617 920
PMET.KL	Press Metal Aluminium Holdings Bhd	Malaysia	Primary Aluminium Production	9 046 711 410
FAUF.PSX	Fauji Fertilizer Company Ltd	Pakistan	Fertilizers	1 872 369 261
AMZN.PSX	Meezan Bank Ltd	Pakistan	Islamic Banks	1 559 753 752
MLKP.PSX	Nestle Pakistan Ltd	Pakistan	Food Processing (NEC)	1 213 450 497
LUKC.PSX	Lucky Cement Ltd	Pakistan	Cement & Concrete Manufacturing	1 158 101 224
ENGR.PSX	Engro Fertilizers Ltd	Pakistan	Fertilizers	979 277 812
1120.SE	Al Rajhi Banking and Investment Corporation SJSC	Saudi Arabia	Retail & Mortgage Banks	100 906 666 641
2010.SE	Saudi Basic Industries Corporation SJSC	Saudi Arabia	Commodity Chemicals (NEC)	53 599 999 987
7010.SE	Saudi Telecom Company SJSC	Saudi Arabia	Integrated Telecommunications Services (NEC)	53 333 333 320
1211.SE	Saudi Arabian Mining Company SJSC	Saudi Arabia	Diversified Mining	51 008 034 470
2200.SE	Arabian Pipes Company SJSC	Saudi Arabia	Iron & Steel (NEC)	48 719 999 988

Note: Market capitalisation is presented in USD and as of 31/12/2024

Table A3: Description of selected conventional individual stocks

Ticker	Issuer	Market	Sector	Market Capitalisation
TPIA.JK	Chandra Asri Pacific PT Tbk	Indonesia	Commodity Chemicals (NEC)	40 006 290 773
ASII.JK	Astra International Tbk PT	Indonesia	Consumer Goods Conglomerates	12 231 160 290
BBNI.JK	Bank Negara Indonesia (Persero) Tbk PT	Indonesia	Banks (NEC)	9 903 642 410
ICBP.JK	Indofood CBP Sukses Makmur Tbk PT	Indonesia	Ready-Made Meals	8 179 259 207
DNET.JK	Indoritel Makmur Internasional Tbk PT	Indonesia	Internet Service Providers	7 871 077 476
MBBM.KL	Malayan Banking Bhd	Malaysia	Banks (NEC)	27 687 588 982
PUBM.KL	Public Bank Bhd	Malaysia	Banks (NEC)	19 833 229 884
CIMB.KL	CIMB Group Holdings Bhd	Malaysia	Banks (NEC)	19 713 189 982
HLBB.KL	Hong Leong Bank Bhd	Malaysia	Corporate Banks	9 986 505 411
YTLP.KL	YTL Power International Bhd	Malaysia	Multiline Utilities	8 187 907 126
OGDC.PSX	Oil and Gas Development Co Ltd	Pakistan	Oil & Gas Exploration and Production (NEC)	3 510 572 725
MARE.PSX	Mari Energies Ltd	Pakistan	Oil & Gas Exploration and Production (NEC)	3 103 104 974
PPL.PSX	Pakistan Petroleum Ltd	Pakistan	Oil & Gas Exploration and Production (NEC)	1 989 240 465
UBL.PSX	United Bank Ltd	Pakistan	Corporate Banks	1 680 593 732
COLG.PSX	Colgate-Palmolive (Pakistan) Ltd	Pakistan	Personal Products (NEC)	1 310 808 827
1180.SE	Saudi National Bank SJSC	Saudi Arabia	Islamic Banks	53 439 999 987
1010.SE	Riyad Bank SJSC	Saudi Arabia	Banks (NEC)	22 879 999 994
1060.SE	Saudi Awwal Bank SJSC	Saudi Arabia	Banks (NEC)	18 438 356 173
1080.SE	Arab National Bank SJSC	Saudi Arabia	Banks (NEC)	11 242 666 664
1050.SE	Banque Saudi Fransi SJSC	Saudi Arabia	Banks (NEC)	10 559 999 997

Note: Market capitalisation is presented in USD and as of 31/12/2024

Table A4: Stock indices' reactions to positive shocks by market

		Shock size					
		1 st. dev.		2 st. dev.		3 st. dev.	
		Shariah	Non-Shariah	Shariah	Non-Shariah	Shariah	Non-Shariah
Indonesia	CAR0	1.762%***	1.351%***	2.786%***	2.127%***	4.598%***	3.207%***
	CAR1	1.786%***	1.442%***	2.969%***	2.187%***	4.352%***	3.709%***
	CAR2	1.678%***	1.381%***	2.965%***	2.173%***	4.658%***	3.708%***
	CAR3	1.783%***	1.440%***	3.163%***	2.331%***	5.277%***	2.979%***
	CAR4	1.885%***	1.554%***	3.349%***	2.512%***	5.748%***	2.828%**
	CAR5	1.832%***	1.501%***	3.498%***	2.593%***	6.073%***	3.294%**
	CAR6	1.803%***	1.506%***	3.174%***	2.513%***	5.954%***	3.398%*
	CAR7	1.808%***	1.503%***	3.219%***	2.473%***	5.769%***	3.402%
	CAR8	1.940%***	1.528%***	3.560%***	2.615%***	5.588%***	3.235%
	CAR9	1.943%***	1.680%***	3.605%***	2.669%***	5.811%***	2.694%
	CAR10	2.014%***	1.702%***	3.568%***	2.688%***	5.608%**	2.360%
Malaysia	CAR0	1.113%***	0.986%***	1.634%***	1.384%***	2.300%***	2.327%***
	CAR1	1.144%***	1.027%***	1.680%***	1.449%***	2.184%***	2.113%***
	CAR2	1.273%***	1.099%***	1.787%***	1.607%***	2.553%***	2.543%***
	CAR3	1.282%***	1.101%***	1.854%***	1.773%***	2.616%***	3.284%***
	CAR4	1.286%***	1.142%***	1.715%***	1.772%***	2.917%**	3.522%***
	CAR5	1.380%***	1.179%***	1.755%***	1.877%***	2.820%**	3.667%***
	CAR6	1.346%***	1.177%***	1.736%***	1.847%***	2.608%*	3.829%***
	CAR7	1.393%***	1.219%***	1.877%***	1.979%***	2.816%	4.199%***
	CAR8	1.471%***	1.281%***	1.870%***	2.036%***	2.649%	4.099%***
	CAR9	1.492%***	1.330%***	2.019%***	2.158%***	2.927%	4.703%***
	CAR10	1.603%***	1.407%***	2.088%***	2.195%***	2.811%	4.896%***
Pakistan	CAR0	1.945%***	1.606%***	2.907%***	2.431%***	3.612%***	3.025%***
	CAR1	2.215%***	1.870%***	3.396%***	3.028%***	4.038%***	3.471%***
	CAR2	2.265%***	1.918%***	3.632%***	3.368%***	4.548%***	4.026%***
	CAR3	2.309%***	1.965%***	3.957%***	3.509%***	5.002%***	3.912%***
	CAR4	2.456%***	2.093%***	4.225%***	3.690%***	4.852%***	3.932%***
	CAR5	2.498%***	2.104%***	4.550%***	3.875%***	4.875%***	4.317%***
	CAR6	2.618%***	2.188%***	4.620%***	3.934%***	4.986%***	4.413%***
	CAR7	2.652%***	2.205%***	4.752%***	4.143%***	4.710%***	4.464%***
	CAR8	2.735%***	2.286%***	4.623%***	4.076%***	4.235%***	4.476%***
	CAR9	2.857%***	2.397%***	4.742%***	4.044%***	3.919%***	4.245%***
	CAR10	3.012%***	2.522%***	5.076%***	4.262%***	3.981%***	4.545%***
Saudi Arabia	CAR0	1.426%***	1.691%***	2.210%***	2.608%***	4.443%***	3.791%***
	CAR1	1.588%***	1.932%***	2.022%***	2.488%***	3.057%***	3.386%***
	CAR2	1.758%***	2.132%***	2.113%***	2.879%***	3.197%***	3.736%***
	CAR3	1.860%***	2.156%***	2.178%***	2.638%***	3.038%***	3.000%***

	CAR4	1.993%***	2.292%***	2.178%***	3.068%***	2.645%***	3.388%***
	CAR5	2.029%***	2.308%***	2.102%***	2.863%***	2.464%***	2.981%***
	CAR6	2.109%***	2.357%***	2.296%***	3.042%***	2.984%***	2.914%***
	CAR7	2.174%***	2.393%***	2.308%***	3.176%***	2.976%***	2.564%***
	CAR8	2.238%***	2.452%***	2.308%***	3.128%***	3.056%***	2.269%***
	CAR9	2.190%***	2.661%***	2.385%***	3.520%***	3.284%***	2.449%***
	CAR10	2.257%***	2.736%***	2.517%***	3.708%***	3.095%***	2.765%***

Note: Asterisks indicate significance levels (*10%, ** 5%, *** 1%) based on F-tests for global significance

Table A5: Stock indices' reactions to negative shocks by market

		Shock size					
		1 st. dev.		**2 st. dev.**		**3 st. dev.**	
		Shariah	**Non-Shariah**	**Shariah**	**Non-Shariah**	**Shariah**	**Non-Shariah**
Indonesia	**CAR0**	-1.757%***	-1.398%***	-2.787%***	-2.383%***	-4.299%***	-3.262%***
	CAR1	-1.688%***	-1.383%***	-2.857%***	-2.481%***	-4.491%***	-3.483%***
	CAR2	-1.559%***	-1.326%***	-2.663%***	-2.344%***	-4.497%***	-3.412%***
	CAR3	-1.543%***	-1.356%***	-2.557%***	-2.414%***	-4.870%***	-3.521%***
	CAR4	-1.521%***	-1.366%***	-2.646%***	-2.435%***	-4.658%***	-3.628%***
	CAR5	-1.491%***	-1.402%***	-2.675%***	-2.498%***	-4.495%***	-3.645%**
	CAR6	-1.507%***	-1.410%***	-2.623%***	-2.455%***	-3.999%***	-3.702%**
	CAR7	-1.525%***	-1.441%***	-2.657%***	-2.603%***	-3.750%***	-4.009%**
	CAR8	-1.524%***	-1.525%***	-2.741%***	-2.772%***	-3.568%**	-3.910%*
	CAR9	-1.473%***	-1.503%***	-2.502%***	-2.534%***	-1.822%**	-3.356%
	CAR10	-1.455%***	-1.489%***	-2.282%***	-2.325%**	-1.122%**	-3.005%
Malaysia	**CAR0**	-1.099%***	-1.036%***	-1.792%***	-1.632%***	-2.726%***	-2.423%***
	CAR1	-1.122%***	-1.009%***	-1.724%***	-1.613%***	-2.758%***	-2.159%***
	CAR2	-1.162%***	-1.044%***	-1.672%***	-1.721%***	-2.417%***	-2.087%***
	CAR3	-1.179%***	-1.073%***	-1.741%***	-1.703%***	-2.353%**	-2.229%***
	CAR4	-1.222%***	-1.140%***	-1.763%***	-1.944%***	-2.520%**	-2.375%***
	CAR5	-1.317%***	-1.141%***	-1.823%***	-1.965%***	-2.529%	-2.423%***
	CAR6	-1.297%***	-1.124%***	-1.777%***	-1.819%***	-2.695%	-2.376%***
	CAR7	-1.286%***	-1.104%***	-1.721%***	-1.650%***	-2.665%	-2.305%***
	CAR8	-1.282%***	-1.104%***	-1.679%***	-1.628%***	-2.200%	-2.220%***
	CAR9	-1.211%***	-1.023%***	-1.573%**	-1.432%***	-1.875%	-1.953%***
	CAR10	-1.284%***	-1.127%***	-1.873%**	-1.580%***	-2.396%	-2.051%***
Pakistan	**CAR0**	-1.969%***	-1.661%***	-3.153%***	-2.703%***	-4.243%***	-3.586%***
	CAR1	-2.214%***	-1.873%***	-3.191%***	-2.861%***	-4.592%***	-3.732%***
	CAR2	-2.020%***	-1.745%***	-2.817%***	-2.711%***	-4.165%***	-3.389%***
	CAR3	-1.901%***	-1.652%***	-2.830%***	-2.705%***	-4.044%***	-3.651%***
	CAR4	-1.899%***	-1.639%***	-3.015%***	-2.883%***	-4.113%***	-4.018%***

	CAR5	-1.932%***	-1.658%***	-3.082%***	-3.017%***	-3.935%***	-4.241%***
	CAR6	-1.876%***	-1.652%***	-2.980%***	-2.882%***	-3.791%***	-4.023%***
	CAR7	-1.766%***	-1.616%***	-2.900%***	-2.776%***	-3.587%**	-3.718%***
	CAR8	-1.735%***	-1.607%***	-2.943%***	-2.923%***	-3.433%**	-3.759%***
	CAR9	-1.637%***	-1.569%***	-2.706%***	-2.773%***	-3.337%*	-3.591%***
	CAR10	-1.659%***	-1.641%***	-2.733%***	-2.785%***	-2.828%*	-3.297%***
Saudi Arabia	**CAR0**	-1.535%***	-1.948%***	-2.612%***	-3.283%***	-3.811%***	-4.647%***
	CAR1	-1.686%***	-2.002%***	-2.791%***	-3.187%***	-3.981%***	-3.698%***
	CAR2	-1.655%***	-2.107%***	-2.731%***	-3.445%***	-3.549%***	-4.154%***
	CAR3	-1.756%***	-2.183%***	-2.798%***	-3.438%***	-3.632%***	-4.168%***
	CAR4	-1.839%***	-2.311%***	-2.965%***	-4.011%***	-3.917%***	-5.530%***
	CAR5	-1.850%***	-2.117%***	-3.127%***	-3.354%***	-4.450%***	-4.603%***
	CAR6	-1.914%***	-2.098%***	-3.280%***	-3.365%***	-4.482%***	-4.515%***
	CAR7	-1.915%***	-2.061%***	-3.284%***	-3.131%***	-4.558%***	-4.450%***
	CAR8	-1.824%***	-2.219%***	-3.006%***	-3.268%***	-4.011%***	-4.689%***
	CAR9	-1.826%***	-2.176%***	-2.835%***	-2.772%***	-3.866%***	-3.650%**
	CAR10	-1.819%***	-2.242%***	-2.809%***	-2.780%***	-3.906%***	-3.488%**

Note: Asterisks indicate significance levels (*10%, ** 5%, *** 1%) based on F-tests for global significance

Table A6: Stock indices' reactions to positive shocks by subperiod

		Shock size					
		1 st. dev.		**2 st. dev.**		**3 st. dev.**	
		Shariah	**Non-Shariah**	**Shariah**	**Non-Shariah**	**Shariah**	**Non-Shariah**
2015-2017	**CAR0**	1.480%***	1.331%***	2.260%***	1.870%***	3.017%***	2.961%***
	CAR1	1.679%	1.548%	2.441%	1.950%	3.058%***	3.096%***
	CAR2	1.783%	1.674%	2.647%	2.207%	3.575%***	3.657%***
	CAR3	1.879%***	1.782%***	2.745%	2.331%***	3.393%***	3.570%***
	CAR4	1.990%***	1.873%***	2.877%	2.376%***	3.386%***	3.471%***
	CAR5	2.002%***	1.866%***	2.812%***	2.246%***	3.097%***	3.027%***
	CAR6	2.033%***	1.909%***	2.557%***	2.150%***	2.772%***	2.945%***
	CAR7	2.107%***	1.942%***	2.543%***	2.232%***	2.554%***	2.645%***
	CAR8	2.173%***	2.013%***	2.702%***	2.146%***	2.574%	2.634%***
	CAR9	2.269%***	2.193%***	2.830%***	2.335%***	2.772%	2.781%***
	CAR10	2.419%***	2.393%***	2.898%***	2.509%***	3.029%***	3.316%***
2018-2020	**CAR0**	1.850%***	1.622%***	2.636%	2.590%	4.381%	3.781%
	CAR1	2.031%***	1.765%	3.012%	2.919%	4.456%	4.121%
	CAR2	2.038%	1.775%	3.068%	3.108%	4.551%	4.565%
	CAR3	2.166%	1.784%	3.313%	3.146%	5.067%	4.216%
	CAR4	2.298%	1.911%	3.465%	3.442%	4.886%	4.247%
	CAR5	2.346%***	1.933%***	3.723%***	3.651%***	5.034%**	4.997%***

	CAR6	2.498%***	2.031%***	4.008%***	3.713%***	5.773%**	5.144%***
	CAR7	2.491%***	2.027%***	4.164%***	3.743%***	5.831%**	5.047%***
	CAR8	2.573%***	2.047%***	4.127%***	3.821%***	5.118%**	4.644%***
	CAR9	2.594%***	2.138%***	4.264%***	3.949%***	5.056%*	4.304%**
	CAR10	2.645%***	2.129%***	4.345%***	4.079%***	4.629%	4.440%**
2021-2024	**CAR0**	1.414%***	1.255%***	2.238%***	1.893%***	3.934%***	2.571%***
	CAR1	1.451%***	1.378%***	2.118%***	2.031%***	2.844%***	2.582%***
	CAR2	1.527%***	1.419%***	2.218%***	2.223%***	3.238%***	2.821%***
	CAR3	1.525%***	1.421%***	2.355%***	2.292%***	3.758%***	2.741%***
	CAR4	1.590%***	1.513%***	2.334%***	2.489%***	4.000%***	3.029%***
	CAR5	1.620%***	1.509%***	2.417%***	2.592%***	4.238%***	3.178%***
	CAR6	1.576%***	1.488%***	2.294%***	2.679%***	4.193%***	3.302%***
	CAR7	1.622%***	1.520%***	2.351%***	2.872%***	4.134%***	3.629%***
	CAR8	1.729%***	1.597%***	2.380%***	2.940%***	4.166%***	3.697%***
	CAR9	1.709%***	1.707%***	2.423%***	2.994%***	4.165%***	3.797%***
	CAR10	1.815%***	1.764%***	2.652%***	3.041%***	3.975%***	3.761%***

Note: Asterisks indicate significance levels (*10%, ** 5%, *** 1%) based on F-tests for global significance

Table A7: Stock indices' reactions to negative shocks by subperiod

		Shock size					
		1 st. dev.		**2 st. dev.**		**3 st. dev.**	
		Shariah	**Non-Shariah**	**Shariah**	**Non-Shariah**	**Shariah**	**Non-Shariah**
2015-2017	**CAR0**	-1.477%***	-1.407%***	-2.359%***	-2.442%***	-3.605%***	-3.512%***
	CAR1	-1.531%***	-1.428%***	-2.340%***	-2.487%***	-3.601%***	-3.179%***
	CAR2	-1.436%***	-1.468%***	-2.119%***	-2.524%***	-3.242%***	-3.169%***
	CAR3	-1.358%***	-1.409%***	-2.032%***	-2.341%***	-2.905%***	-2.863%***
	CAR4	-1.428%***	-1.408%***	-2.112%***	-2.482%***	-3.090%***	-2.997%***
	CAR5	-1.374%***	-1.309%***	-2.175%***	-2.406%***	-3.421%***	-2.995%***
	CAR6	-1.378%***	-1.256%***	-2.315%***	-2.494%***	-3.356%***	-3.122%***
	CAR7	-1.415%***	-1.283%***	-2.439%***	-2.504%***	-3.727%***	-3.554%***
	CAR8	-1.383%***	-1.294%***	-2.412%***	-2.588%***	-3.391%***	-3.369%***
	CAR9	-1.329%***	-1.282%***	-2.403%***	-2.512%***	-3.359%***	-3.253%***
	CAR10	-1.374%***	-1.336%***	-2.323%***	-2.423%***	-3.427%***	-3.076%***
2018-2020	**CAR0**	-1.839%***	-1.695%***	-3.019%***	-2.820%***	-3.968%***	-3.767%***
	CAR1	-1.970%***	-1.772%***	-3.239%***	-3.005%***	-4.390%***	-3.820%***
	CAR2	-1.863%***	-1.709%***	-3.009%***	-2.972%***	-4.159%***	-3.979%***
	CAR3	-1.919%***	-1.752%***	-3.120%***	-3.099%***	-4.617%***	-4.451%***
	CAR4	-1.927%***	-1.841%***	-3.252%***	-3.520%***	-4.707%***	-5.239%***
	CAR5	-2.096%***	-1.897%***	-3.363%***	-3.389%***	-4.823%***	-5.045%***
	CAR6	-2.095%***	-1.866%***	-3.447%***	-3.241%***	-4.834%***	-4.982%***

	CAR7	-2.000%***	-1.854%***	-3.386%***	-3.210%***	-4.497%***	-4.763%***
	CAR8	-1.973%***	-1.917%***	-3.192%***	-3.343%***	-3.908%**	-4.950%***
	CAR9	-1.874%***	-1.828%***	-2.867%***	-2.884%***	-3.021%*	-4.105%**
	CAR10	-1.853%***	-1.856%***	-2.790%***	-2.867%***	-2.602%	-3.880%**
2021-2024	**CAR0**	-1.457%***	-1.346%***	-2.447%***	-2.222%***	-3.868%***	-3.258%***
	CAR1	-1.527%***	-1.405%***	-2.437%***	-2.117%***	-3.955%***	-2.808%***
	CAR2	-1.491%***	-1.377%***	-2.371%***	-2.148%***	-3.487%***	-2.529%***
	CAR3	-1.500%***	-1.397%***	-2.367%***	-2.172%***	-3.364%***	-2.561%***
	CAR4	-1.510%***	-1.428%***	-2.513%***	-2.308%***	-3.462%***	-3.011%***
	CAR5	-1.483%***	-1.397%***	-2.592%***	-2.243%***	-3.417%***	-2.764%***
	CAR6	-1.489%***	-1.439%***	-2.398%***	-2.112%***	-3.177%***	-2.465%***
	CAR7	-1.479%***	-1.398%***	-2.298%***	-1.899%***	-3.027%***	-2.253%***
	CAR8	-1.441%***	-1.465%***	-2.324%***	-1.996%***	-2.940%***	-2.210%***
	CAR9	-1.425%***	-1.429%***	-2.115%***	-1.798%***	-2.695%***	-1.799%***
	CAR10	-1.453%***	-1.507%***	-2.275%***	-1.846%***	-2.709%***	-1.633%**

Note: Asterisks indicate significance levels (*10%, ** 5%, *** 1%) based on F-tests for global significance

Table A8: Two-sample T-test results for stock indices' reactions to positive shocks by market

		Shock size		
		1 st. dev.	**2 st. dev.**	**3 st. dev.**
		t-statistic	**t-statistic**	**t-statistic**
Indonesia	**CAR0**	5.52832***	2.69033***	1.43211
	CAR1	2.81691***	2.05619**	0.40930
	CAR2	1.96277*	1.88419*	0.61729
	CAR3	1.94965	1.60472	1.04134
	CAR4	1.55791	1.32123	1.17848
	CAR5	1.37254	1.28423	1.00878
	CAR6	1.07909	0.77532	0.70958
	CAR7	0.98869	0.78409	0.58206
	CAR8	1.28953	0.94686	0.54711
	CAR9	0.75980	0.84789	0.64942
	CAR10	0.84787	0.71435	0.59080
Malaysia	**CAR0**	2.77130***	1.92013*	-0.05190
	CAR1	1.74598*	1.35817	0.15023
	CAR2	1.81217*	0.72541	0.01430
	CAR3	1.43411	0.25932	-0.76612
	CAR4	1.02893	-0.16384	-0.61231
	CAR5	1.27102	-0.32891	-0.76773
	CAR6	0.99854	-0.28720	-1.13525

	CAR7	0.97279	-0.26062	-1.13776
	CAR8	0.95478	-0.39724	-1.22724
	CAR9	0.75645	-0.31439	-1.36229
	CAR10	0.85398	-0.22817	-1.55152
Pakistan	**CAR0**	5.33700***	3.10731***	2.09954**
	CAR1	3.03864***	1.41245	1.38633
	CAR2	2.16962**	0.71519	0.77640
	CAR3	1.73418	0.96536	1.23782
	CAR4	1.69652	1.09812	1.05056
	CAR5	1.57236	1.08724	0.49721
	CAR6	1.56728	1.05937	0.47053
	CAR7	1.45700	0.84115	0.17948
	CAR8	1.39871	0.69752	-0.16547
	CAR9	1.33347	0.85470	-0.23185
	CAR10	1.28766	0.89611	-0.34976
Saudi Arabia	**CAR0**	-3.03440***	-1.50359	0.63639
	CAR1	-3.08883***	-1.86874*	-0.52490
	CAR2	-2.43903**	-2.38997**	-0.55725
	CAR3	-1.47825	-0.94133	0.03154
	CAR4	-1.35905	-1.83111	-0.60720
	CAR5	-1.13747	-1.36578	-0.38567
	CAR6	-0.91069	-1.20761	0.06845
	CAR7	-0.72178	-1.20049	0.33480
	CAR8	-0.62600	-0.97401	0.52734
	CAR9	-1.32566	-1.34470	0.48870
	CAR10	-1.18742	-1.29746	0.18016

Note: Asterisks indicate significance levels (*10%, ** 5%, *** 1%) based on F-tests for global significance

Table A9: Two-sample T-test results for stock indices' reactions to negative shocks by market

		Shock size		
		1 st. dev.	**2 st. dev.**	**3 st. dev.**
		t-statistic	**t-statistic**	**t-statistic**
Indonesia	**CAR0**	-5.34761***	-2.28329**	-2.52162**
	CAR1	-2.51209**	-1.11089	-1.20761
	CAR2	-1.55243	-0.72889	-0.87498
	CAR3	-0.98057	-0.25055	-0.79164
	CAR4	-0.72100	-0.35570	-0.59092
	CAR5	-0.34940	-0.24056	-0.36168
	CAR6	-0.36144	-0.23147	-0.13310

	CAR7	-0.29683	-0.06582	0.10436
	CAR8	0.00225	0.03391	0.12072
	CAR9	0.09122	0.03338	0.56908
	CAR10	0.09908	0.04395	0.66020
Malaysia	**CAR0**	-1.28899	-1.07724	-0.87401
	CAR1	-1.35208	-0.43928	-0.92738
	CAR2	-1.13039	0.16780	-0.44917
	CAR3	-0.84663	-0.10925	-0.14463
	CAR4	-0.56721	0.44905	-0.13565
	CAR5	-1.12069	0.34727	-0.10289
	CAR6	-1.02574	0.09382	-0.26202
	CAR7	-1.00826	-0.14840	-0.29667
	CAR8	-0.93357	-0.10627	0.01588
	CAR9	-0.96501	-0.31483	0.07373
	CAR10	-0.71871	-0.54067	-0.26411
Pakistan	**CAR0**	-3.80151***	-2.48287**	-1.97128*
	CAR1	-2.42128**	-0.98565	-1.38298
	CAR2	-1.48324	-0.24817	-0.90993
	CAR3	-1.13683	-0.25162	-0.40904
	CAR4	-0.97078	-0.20453	-0.07353
	CAR5	-0.91651	-0.08928	0.20891
	CAR6	-0.70022	-0.12521	0.14726
	CAR7	-0.42119	-0.13957	0.07169
	CAR8	-0.33410	-0.02115	0.17456
	CAR9	-0.17226	0.06897	0.13058
	CAR10	-0.04268	0.05357	0.26098
Saudi Arabia	**CAR0**	3.27167***	2.10173**	1.34785
	CAR1	2.14914**	1.15599	-0.44260
	CAR2	2.36710**	1.73425	0.87089
	CAR3	1.90085*	1.29697	0.68084
	CAR4	1.71496	1.64374	1.50498
	CAR5	0.87300	0.34728	0.13056
	CAR6	0.57761	0.12087	0.02708
	CAR7	0.42989	-0.20672	-0.08023
	CAR8	1.04120	0.31176	0.42447
	CAR9	0.88494	-0.07845	-0.14353
	CAR10	1.05180	-0.03456	-0.26401

Note: Asterisks indicate significance levels (*10%, ** 5%, *** 1%) based on F-tests for global significance

Table A10: Two-sample T-test results for stock indices' reactions to positive shocks by subperiod

		Shock size		
		1 st. dev.	**2 st. dev.**	**3 st. dev.**
		t-statistic	**t-statistic**	**t-statistic**
2015-2017	**CAR0**	2.40871**	2.23026**	0.12476
	CAR1	1.36130	2.09227	-0.07657
	CAR2	0.84547	1.43101	-0.10920
	CAR3	0.64427	1.27557	-0.24966
	CAR4	0.65768	1.29204	-0.10875
	CAR5	0.67923	1.31887	0.07988
	CAR6	0.57268	0.86435	-0.19128
	CAR7	0.70405	0.62821	-0.09556
	CAR8	0.62804	1.00504	-0.05542
	CAR9	0.28667	0.87430	-0.00712
	CAR10	0.08962	0.64209	-0.22071
2018-2020	**CAR0**	2.95728***	0.20894	0.90229
	CAR1	2.18269**	0.29068	0.35064
	CAR2	1.65676*	-0.10264	-0.01339
	CAR3	1.91492*	0.30382	0.52747
	CAR4	1.75909*	0.03967	0.35871
	CAR5	1.60747	0.10324	0.01787
	CAR6	1.63841	0.38450	0.27444
	CAR7	1.45049	0.47779	0.29602
	CAR8	1.55437	0.32871	0.16755
	CAR9	1.22601	0.31289	0.24179
	CAR10	1.26022	0.23856	0.05261
2021-2024	**CAR0**	3.33536***	2.15278**	1.73914*
	CAR1	1.13660	0.54542	0.59898
	CAR2	1.19310	-0.02255	0.63405
	CAR3	0.92543	0.23863	1.34871
	CAR4	0.61269	-0.54509	1.24280
	CAR5	0.79861	-0.53088	1.19451
	CAR6	0.56299	-1.07939	0.84282
	CAR7	0.58529	-1.36390	0.43807
	CAR8	0.71084	-1.33701	0.38132
	CAR9	0.01054	-1.34138	0.31522
	CAR10	0.24185	-0.81313	0.16343

Note: Asterisks indicate significance levels (*10%, ** 5%, *** 1%) based on F-tests for global significance

Table A11: Two-sample T-test results for stock indices' reactions to positive shocks by subperiod

		Shock size		
		1 st. dev.	**2 st. dev.**	**3 st. dev.**
		t-statistic	**t-statistic**	**t-statistic**
2015-2017	**CAR0**	-0.91036	0.38999	-0.22907
	CAR1	-0.95163	0.50751	-0.77439
	CAR2	0.23696	1.22028	-0.13356
	CAR3	0.30960	0.77388	-0.06433
	CAR4	-0.10303	0.79593	-0.12671
	CAR5	-0.30774	0.46638	-0.43742
	CAR6	-0.54072	0.34322	-0.26924
	CAR7	-0.53177	0.11337	-0.15785
	CAR8	-0.33077	0.29277	-0.01987
	CAR9	-0.16552	0.17997	-0.09969
	CAR10	-0.12872	0.16644	-0.32062
2018-2020	**CAR0**	-1.65289*	-0.94616	-0.50384
	CAR1	-1.46706	-0.73072	-0.95328
	CAR2	-0.90901	-0.08865	-0.21711
	CAR3	-0.78369	-0.04074	-0.15854
	CAR4	-0.33878	0.43001	0.42677
	CAR5	-0.68602	0.03765	0.15062
	CAR6	-0.74221	-0.27379	0.09700
	CAR7	-0.43727	-0.20822	0.15541
	CAR8	-0.15076	0.16029	0.55604
	CAR9	-0.12292	0.01749	0.59576
	CAR10	0.00892	0.08084	0.69012
2021-2024	**CAR0**	-1.97988**	-1.26813	-1.18188
	CAR1	-1.41800	-1.32217	-1.73303
	CAR2	-1.02457	-0.83726	-1.41719
	CAR3	-0.86432	-0.65982	-1.19665
	CAR4	-0.60240	-0.56751	-0.51747
	CAR5	-0.54866	-0.87731	-0.71013
	CAR6	-0.30213	-0.71129	-0.73947
	CAR7	-0.46366	-0.92607	-0.75252
	CAR8	0.12750	-0.72120	-0.66999
	CAR9	0.01981	-0.70334	-0.77344
	CAR10	0.26372	-0.90946	-0.90517

Note: Asterisks indicate significance levels (*10%, ** 5%, *** 1%) based on F-tests for global significance

Table A12: Individual stocks' reactions to positive shocks by model

		Shock size					
		1 st. dev.		2 st. dev.		3 st. dev.	
		Shariah	Non-Shariah	Shariah	Non-Shariah	Shariah	Non-Shariah
Single Index	CAR0	3.091%***	2.855%***	4.631%***	4.223%***	6.133%***	5.308%***
	CAR1	3.182%***	3.054%***	4.691%***	4.580%***	6.264%***	5.740%***
	CAR2	3.222%***	3.131%***	4.750%***	4.788%***	6.478%***	5.953%***
	CAR3	3.300%***	3.167%***	4.840%***	4.920%***	6.559%***	6.112%***
	CAR4	3.364%***	3.195%***	4.857%***	4.916%***	6.556%***	6.084%***
	CAR5	3.439%***	3.250%***	4.879%***	4.992%***	6.644%***	6.230%***
	CAR6	3.456%***	3.241%***	4.829%***	4.927%***	6.483%***	6.107%***
	CAR7	3.492%***	3.214%***	4.894%***	4.940%***	6.631%***	6.236%***
	CAR8	3.540%***	3.256%***	4.927%***	5.018%***	6.648%***	6.275%***
	CAR9	3.588%***	3.279%***	5.031%***	5.013%***	6.847%***	6.298%***
	CAR10	3.681%***	3.346%***	5.219%***	5.092%***	7.175%***	6.418%***
Three Factor	CAR0	3.090%***	2.854%***	4.631%***	4.223%***	6.138%***	5.313%***
	CAR1	3.179%***	3.051%***	4.692%***	4.579%***	6.271%***	5.749%***
	CAR2	3.218%***	3.127%***	4.751%***	4.787%***	6.488%***	5.967%***
	CAR3	3.295%***	3.161%***	4.842%***	4.918%***	6.572%***	6.130%***
	CAR4	3.356%***	3.189%***	4.859%***	4.913%***	6.570%***	6.103%***
	CAR5	3.430%***	3.242%***	4.882%***	4.989%***	6.660%***	6.250%***
	CAR6	3.446%***	3.232%***	4.833%***	4.922%***	6.503%***	6.126%***
	CAR7	3.481%***	3.205%***	4.901%***	4.934%***	6.655%***	6.254%***
	CAR8	3.528%***	3.245%***	4.934%***	5.012%***	6.674%***	6.290%***
	CAR9	3.575%***	3.267%***	5.039%***	5.005%***	6.877%***	6.309%***
	CAR10	3.668%***	3.333%***	5.228%***	5.082%***	7.208%***	6.426%***
Four Factor	CAR0	3.090%***	2.854%***	4.632%***	4.223%***	6.138%***	5.314%***
	CAR1	3.180%***	3.052%***	4.693%***	4.579%***	6.271%***	5.750%***
	CAR2	3.218%***	3.127%***	4.751%***	4.787%***	6.488%***	5.968%***
	CAR3	3.295%***	3.162%***	4.843%***	4.918%***	6.573%***	6.131%***
	CAR4	3.357%***	3.190%***	4.860%***	4.914%***	6.571%***	6.104%***
	CAR5	3.431%***	3.243%***	4.882%***	4.989%***	6.661%***	6.251%***
	CAR6	3.446%***	3.233%***	4.834%***	4.923%***	6.504%***	6.128%***
	CAR7	3.481%***	3.206%***	4.902%***	4.935%***	6.656%***	6.256%***
	CAR8	3.529%***	3.246%***	4.936%***	5.013%***	6.675%***	6.292%***
	CAR9	3.576%***	3.269%***	5.040%***	5.007%***	6.877%***	6.311%***
	CAR10	3.668%***	3.335%***	5.230%***	5.083%***	7.209%***	6.428%***

Note: Asterisks indicate significance levels (*10%, ** 5%, *** 1%) based on F-tests for global significance

Table A13: Individual stocks' reactions to negative shocks by model

		Shock size					
		1 st. dev.		2 st. dev.		3 st. dev.	
		Shariah	Non-Shariah	Shariah	Non-Shariah	Shariah	Non-Shariah
Single Index	CAR0	-2.751%***	-2.579%***	-4.297%***	-3.946%***	-5.597%***	-5.166%***
	CAR1	-2.613%***	-2.529%***	-4.036%***	-3.919%***	-5.237%***	-5.280%***
	CAR2	-2.466%***	-2.407%***	-3.798%***	-3.733%***	-4.912%***	-5.122%***
	CAR3	-2.419%***	-2.301%***	-3.813%***	-3.661%***	-5.070%***	-5.128%***
	CAR4	-2.318%***	-2.202%***	-3.684%***	-3.640%***	-5.053%***	-5.035%***
	CAR5	-2.316%***	-2.174%***	-3.672%***	-3.603%***	-5.162%***	-5.190%***
	CAR6	-2.246%***	-2.065%***	-3.636%***	-3.397%***	-5.068%***	-5.083%***
	CAR7	-2.146%***	-1.959%***	-3.507%***	-3.145%***	-4.839%***	-4.773%***
	CAR8	-2.075%***	-1.842%***	-3.420%***	-2.950%***	-4.672%***	-4.641%***
	CAR9	-1.976%***	-1.725%***	-3.289%***	-2.735%***	-4.436%***	-4.322%***
	CAR10	-1.911%***	-1.659%***	-3.202%***	-2.705%***	-4.362%***	-4.345%***
Three Factor	CAR0	-2.746%***	-2.572%***	-4.281%***	-3.926%***	-5.567%***	-5.130%***
	CAR1	-2.603%***	-2.517%***	-4.003%***	-3.879%***	-5.174%***	-5.208%***
	CAR2	-2.451%***	-2.389%***	-3.748%***	-3.673%***	-4.817%***	-5.012%***
	CAR3	-2.399%***	-2.277%***	-3.746%***	-3.582%***	-4.942%***	-4.981%***
	CAR4	-2.292%***	-2.172%***	-3.601%***	-3.541%***	-4.890%***	-4.851%***
	CAR5	-2.284%***	-2.138%***	-3.574%***	-3.484%***	-4.967%***	-4.970%***
	CAR6	-2.209%***	-2.022%***	-3.524%***	-3.262%***	-4.844%***	-4.830%***
	CAR7	-2.105%***	-1.911%***	-3.383%***	-2.993%***	-4.589%***	-4.487%***
	CAR8	-2.032%***	-1.788%***	-3.286%***	-2.783%***	-4.398%***	-4.323%***
	CAR9	-1.930%***	-1.668%***	-3.146%***	-2.555%***	-4.140%***	-3.977%***
	CAR10	-1.863%***	-1.598%***	-3.052%***	-2.514%***	-4.048%***	-3.975%***
Four Factor	CAR0	-2.746%***	-2.572%***	-4.281%***	-3.926%***	-5.567%***	-5.130%***
	CAR1	-2.603%***	-2.517%***	-4.003%***	-3.879%***	-5.174%***	-5.208%***
	CAR2	-2.450%***	-2.388%***	-3.748%***	-3.673%***	-4.816%***	-5.012%***
	CAR3	-2.399%***	-2.277%***	-3.746%***	-3.582%***	-4.941%***	-4.982%***
	CAR4	-2.292%***	-2.172%***	-3.600%***	-3.541%***	-4.889%***	-4.852%***
	CAR5	-2.284%***	-2.137%***	-3.574%***	-3.484%***	-4.965%***	-4.971%***
	CAR6	-2.209%***	-2.022%***	-3.524%***	-3.261%***	-4.843%***	-4.831%***
	CAR7	-2.105%***	-1.911%***	-3.383%***	-2.992%***	-4.587%***	-4.488%***
	CAR8	-2.031%***	-1.788%***	-3.285%***	-2.783%***	-4.395%***	-4.325%***
	CAR9	-1.929%***	-1.667%***	-3.146%***	-2.555%***	-4.138%***	-3.979%***
	CAR10	-1.862%***	-1.597%***	-3.051%***	-2.513%***	-4.045%***	-3.978%***

Note: Asterisks indicate significance levels (*10%, ** 5%, *** 1%) based on F-tests for global significance

Table A14: Individual stocks' reactions to positive shocks by subperiod

		Shock size					
		1 st. dev.		2 st. dev.		3 st. dev.	
		Shariah	Non-Shariah	Shariah	Non-Shariah	Shariah	Non-Shariah
2015-2017	CAR0	2.921%***	2.633%***	4.369%***	3.806%***	5.696%***	4.611%***
	CAR1	2.996%***	2.838%***	4.316%***	4.068%***	5.391%***	4.731%***
	CAR2	3.050%***	2.912%***	4.386%***	4.250%***	5.521%	4.911%***
	CAR3	3.088%***	3.003%***	4.418%***	4.453%***	5.575%	5.088%***
	CAR4	3.121%***	3.047%***	4.435%***	4.479%***	5.456%	4.966%***
	CAR5	3.165%***	3.090%***	4.349%***	4.500%***	5.134%	4.929%***
	CAR6	3.151%***	3.135%***	4.216%***	4.525%***	4.981%	4.698%***
	CAR7	3.163%***	3.167%***	4.258%***	4.610%***	4.982%	4.855%***
	CAR8	3.264%***	3.259%***	4.316%***	4.818%***	5.126%	5.166%***
	CAR9	3.285%***	3.339%***	4.422%***	4.986%***	5.210%***	5.443%***
	CAR10	3.318%***	3.378%***	4.523%***	5.096%***	5.343%***	5.750%***
2018-2020	CAR0	3.379%***	3.036%***	5.022%***	4.458%***	6.646%***	5.518%***
	CAR1	3.467%***	3.203%***	4.962%***	4.649%***	6.653%***	5.705%***
	CAR2	3.455%***	3.215%***	4.953%***	4.771%***	6.662%***	5.929%***
	CAR3	3.601%***	3.203%***	5.052%***	4.914%***	6.695%***	6.083%***
	CAR4	3.582%***	3.214%***	4.923%***	4.930%***	6.498%***	6.194%***
	CAR5	3.728%***	3.221%***	5.196%***	5.025%***	7.079%***	6.574%***
	CAR6	3.731%***	3.100%***	5.160%***	4.790%***	6.957%***	6.354%***
	CAR7	3.791%***	2.995%***	5.350%***	4.721%***	7.437%***	6.236%***
	CAR8	3.764%***	2.936%***	5.342%***	4.691%***	7.409%***	6.117%***
	CAR9	3.735%***	2.817%***	5.363%***	4.510%***	7.469%***	5.941%***
	CAR10	3.813%***	2.901%***	5.598%***	4.548%***	7.899%***	6.037%***
2021-2024	CAR0	2.982%***	2.868%***	4.495%***	4.337%***	6.007%***	5.609%***
	CAR1	3.083%***	3.080%***	4.717%***	4.865%***	6.522%***	6.402%***
	CAR2	3.149%***	3.203%***	4.818%***	5.146%***	6.958%***	6.636%***
	CAR3	3.199%***	3.231%***	4.938%***	5.215%***	7.101%***	6.793%***
	CAR4	3.337%***	3.258%***	5.065%***	5.171%***	7.333%***	6.731%***
	CAR5	3.377%***	3.350%***	4.962%***	5.265%***	7.291%***	6.835%***
	CAR6	3.421%***	3.383%***	4.953%***	5.250%***	7.095%***	6.843%***
	CAR7	3.450%***	3.369%***	4.938%***	5.265%***	7.071%***	7.115%***
	CAR8	3.518%***	3.445%***	4.988%***	5.323%***	7.042%***	7.083%***
	CAR9	3.638%***	3.531%***	5.151%***	5.315%***	7.430%***	7.067%***
	CAR10	3.777%***	3.601%***	5.359%***	5.391%***	7.804%***	7.076%***

Note: Asterisks indicate significance levels (*10%, ** 5%, *** 1%) based on F-tests for global significance

Table A15: Individual stocks' reactions to negative shocks by subperiod

		Shock size					
		1 st. dev.		2 st. dev.		3 st. dev.	
		Shariah	Non-Shariah	Shariah	Non-Shariah	Shariah	Non-Shariah
2015-2017	CAR0	-2.680%***	-2.344%***	-4.078%***	-3.519%***	-5.227%***	-4.380%***
	CAR1	-2.510%***	-2.245%***	-3.801%***	-3.428%***	-4.629%***	-4.312%***
	CAR2	-2.410%***	-2.096%***	-3.644%***	-3.220%***	-4.342%***	-4.093%***
	CAR3	-2.378%***	-1.896%***	-3.757%***	-2.909%***	-4.527%***	-3.640%***
	CAR4	-2.207%***	-1.817%***	-3.438%***	-2.834%***	-4.334%***	-3.323%***
	CAR5	-2.145%***	-1.695%***	-3.420%***	-2.768%***	-4.520%***	-3.319%***
	CAR6	-2.180%***	-1.653%***	-3.569%***	-2.630%***	-4.674%***	-3.117%***
	CAR7	-2.083%***	-1.545%***	-3.568%***	-2.497%***	-4.790%***	-3.175%***
	CAR8	-2.055%***	-1.376%***	-3.523%***	-2.365%***	-4.637%***	-2.910%***
	CAR9	-2.006%***	-1.254%***	-3.528%***	-2.117%***	-4.658%***	-2.693%***
	CAR10	-2.000%***	-1.175%***	-3.454%***	-2.075%***	-4.569%***	-2.652%***
2018-2020	CAR0	-3.068%***	-2.852%***	-4.742%***	-4.198%***	-6.054%***	-5.484%***
	CAR1	-2.891%***	-2.923%***	-4.269%***	-4.393%***	-5.656%***	-6.123%***
	CAR2	-2.638%***	-2.790%***	-3.842%***	-4.167%***	-5.089%***	-6.112%***
	CAR3	-2.627%***	-2.797%***	-3.820%***	-4.269%***	-5.261%***	-6.635%***
	CAR4	-2.488%***	-2.750%***	-3.772%***	-4.349%***	-5.331%***	-6.640%***
	CAR5	-2.568%***	-2.824%***	-3.939%***	-4.443%***	-5.629%***	-7.150%***
	CAR6	-2.470%***	-2.672%***	-3.898%***	-4.171%***	-5.384%***	-7.019%***
	CAR7	-2.361%***	-2.563%***	-3.719%***	-3.900%***	-4.886%***	-6.544%***
	CAR8	-2.208%***	-2.436%***	-3.488%***	-3.549%***	-4.492%***	-6.220%***
	CAR9	-2.029%***	-2.311%***	-3.249%***	-3.293%***	-3.878%***	-5.597%***
	CAR10	-1.918%***	-2.293%***	-3.151%***	-3.308%***	-3.812%***	-5.684%***
2021-2024	CAR0	-2.568%***	-2.519%***	-4.066%***	-3.985%***	-5.308%***	-5.336%***
	CAR1	-2.471%***	-2.401%***	-3.978%***	-3.749%***	-5.169%***	-4.933%***
	CAR2	-2.360%***	-2.296%***	-3.816%***	-3.591%***	-5.061%***	-4.586%***
	CAR3	-2.272%***	-2.160%***	-3.762%***	-3.496%***	-5.116%***	-4.295%***
	CAR4	-2.234%***	-1.997%***	-3.689%***	-3.383%***	-5.093%***	-4.194%***
	CAR5	-2.203%***	-1.945%***	-3.507%***	-3.203%***	-4.823%***	-4.007%***
	CAR6	-2.078%***	-1.812%***	-3.305%***	-2.985%***	-4.627%***	-3.935%***
	CAR7	-1.975%***	-1.704%***	-3.099%***	-2.635%***	-4.360%***	-3.470%***
	CAR8	-1.930%***	-1.621%***	-3.085%***	-2.527%***	-4.425%***	-3.584%***
	CAR9	-1.850%***	-1.509%***	-2.921%***	-2.358%***	-4.380%***	-3.474%***
	CAR10	-1.774%***	-1.408%***	-2.817%***	-2.273%***	-4.269%***	-3.420%***

Note: Asterisks indicate significance levels (*10%, ** 5%, *** 1%) based on F-tests for global significance

Table A16: Two-sample T-test results for individual stocks' reactions to positive shocks by model

		Shock size		
		1 st. dev.	**2 st. dev.**	**3 st. dev.**
		t-statistic	**t-statistic**	**t-statistic**
Single Index	**CAR0**	6.70749***	5.03969***	4.65429***
	CAR1	2.28715**	0.87613	1.91864*
	CAR2	1.27554	-0.23734	1.50820
	CAR3	1.61385	-0.42318	1.11886
	CAR4	1.84353*	-0.29007	1.08690
	CAR5	1.91683*	-0.53395	0.91817
	CAR6	2.04715**	-0.44411	0.81877
	CAR7	2.48078**	-0.19517	0.81394
	CAR8	2.43635**	-0.37942	0.75563
	CAR9	2.52378**	0.06900	1.06940
	CAR10	2.58481***	0.47868	1.39743
Three Factor	**CAR0**	6.69092***	5.04258***	4.63716***
	CAR1	2.28270**	0.89353	1.90996*
	CAR2	1.27469	-0.22012	1.49695
	CAR3	1.60976	-0.40222	1.10877
	CAR4	1.84057*	-0.26834	1.07862
	CAR5	1.91152*	-0.50597	0.91240
	CAR6	2.04488**	-0.40251	0.82277
	CAR7	2.47994**	-0.14461	0.82663
	CAR8	2.43854**	-0.32385	0.78037
	CAR9	2.52737**	0.13326	1.10769
	CAR10	2.59711***	0.55356	1.44525
Four Factor	**CAR0**	6.68874***	5.04243***	4.63591***
	CAR1	2.28038**	0.89364	1.90857*
	CAR2	1.27185	-0.22001	1.49539
	CAR3	1.60662	-0.40215	1.10728
	CAR4	1.83721*	-0.26816	1.07709
	CAR5	1.90775*	-0.50576	0.91082
	CAR6	2.04043**	-0.40239	0.82112
	CAR7	2.47512**	-0.14443	0.82504
	CAR8	2.43310**	-0.32391	0.77846
	CAR9	2.52133**	0.13296	1.10533
	CAR10	2.59052***	0.55306	1.44254

Note: Asterisks indicate significance levels (*10%, ** 5%, *** 1%) based on F-tests for global significance

Table A17: Two-sample T-test results for individual stocks' reactions to negative shocks by model

		Shock size		
		1 st. dev.	**2 st. dev.**	**3 st. dev.**
		t-statistic	**t-statistic**	**t-statistic**
Single Index	**CAR0**	-5.59972***	-4.51780***	-2.52842**
	CAR1	-1.65934*	-0.93593	0.16303
	CAR2	-0.93796	-0.42200	0.66740
	CAR3	-1.58399	-0.83621	0.15415
	CAR4	-1.38861	-0.21504	-0.04374
	CAR5	-1.52942	-0.31549	0.06137
	CAR6	-1.79936*	-0.99469	0.02963
	CAR7	-1.73452*	-1.42563	-0.12629
	CAR8	-2.05617**	-1.75454*	-0.05566
	CAR9	-2.13188**	-2.03084**	-0.20598
	CAR10	-2.06783**	-1.75837*	-0.03035
Three Factor	**CAR0**	-5.66259***	-4.60549***	-2.58546***
	CAR1	-1.70311*	-0.99721	0.12798
	CAR2	-0.98652	-0.49159	0.63054
	CAR3	-1.64091	-0.92017	0.10706
	CAR4	-1.44923	-0.29950	-0.09482
	CAR5	-1.60445	-0.41609	0.00782
	CAR6	-1.88510*	-1.11739	-0.03019
	CAR7	-1.82995*	-1.56932	-0.20086
	CAR8	-2.16874**	-1.91459*	-0.13822
	CAR9	-2.25993**	-2.21059**	-0.30361
	CAR10	-2.20862**	-1.94418*	-0.12996
Four Factor	**CAR0**	-5.66292***	-4.60509***	-2.58277***
	CAR1	-1.70328*	-0.99677	0.13154
	CAR2	-0.98633	-0.49144	0.63498
	CAR3	-1.64054	-0.92032	0.11185
	CAR4	-1.44915	-0.29988	-0.08953
	CAR5	-1.60473	-0.41671	0.01356
	CAR6	-1.88543*	-1.11800	-0.02404
	CAR7	-1.83048*	-1.56999	-0.19406
	CAR8	-2.16957**	-1.91523*	-0.13088
	CAR9	-2.26092**	-2.21110**	-0.29524
	CAR10	-2.20968**	-1.94456*	-0.12088

Note: Asterisks indicate significance levels (*10%, ** 5%, *** 1%) based on F-tests for global significance

Table A18: Two-sample T-test results for individual stocks' reactions to positive shocks by subperiod

		Shock size		
		1 st. dev.	**2 st. dev.**	**3 st. dev.**
		t-statistic	**t-statistic**	**t-statistic**
2015-2017	**CAR0**	4.73589***	4.07877***	3.47633***
	CAR1	1.62702	1.17442	1.50390
	CAR2	1.13031	0.50334	1.14178
	CAR3	0.60898	-0.11285	0.80212
	CAR4	0.48503	-0.12877	0.72228
	CAR5	0.45438	-0.43947	0.30883
	CAR6	0.09013	-0.85458	0.42423
	CAR7	-0.02174	-0.92669	0.18419
	CAR8	0.02438	-1.25967	-0.05369
	CAR9	-0.25924	-1.34149	-0.29902
	CAR10	-0.27653	-1.28002	-0.48935
2018-2020	**CAR0**	4.98967***	3.53554***	3.22289***
	CAR1	2.51047**	1.35725	2.00821**
	CAR2	1.78628*	0.63168	1.25454
	CAR3	2.52793**	0.40770	0.92209
	CAR4	2.12941**	-0.01892	0.41857
	CAR5	2.65712***	0.43221	0.63520
	CAR6	3.04158***	0.88047	0.71673
	CAR7	3.59233***	1.38534	1.31768
	CAR8	3.62671***	1.42788	1.41192
	CAR9	3.78371***	1.79374*	1.59696
	CAR10	3.54122***	2.05553**	1.80910*
2021-2024	**CAR0**	2.13622**	1.30074	1.53621
	CAR1	0.02763	-0.70529	0.25900
	CAR2	-0.47303	-1.20531	0.53153
	CAR3	-0.24021	-0.89323	0.43964
	CAR4	0.55176	-0.32157	0.80044
	CAR5	0.17595	-0.87756	0.58847
	CAR6	0.23618	-0.84474	0.32758
	CAR7	0.47449	-0.89519	-0.05505
	CAR8	0.40561	-0.88359	-0.05097
	CAR9	0.57270	-0.41823	0.43389
	CAR10	0.89998	-0.07757	0.84015

Note: Asterisks indicate significance levels (*10%, ** 5%, *** 1%) based on F-tests for global significance

Table A19: Two-sample T-test results for individual stocks' reactions to negative shocks by subperiod

		Shock size		
		1 st. dev.	**2 st. dev.**	**3 st. dev.**
		t-statistic	**t-statistic**	**t-statistic**
2015-2017	**CAR0**	-6.27013***	-4.38598***	-3.01429***
	CAR1	-3.02532***	-1.81975*	-0.73813
	CAR2	-2.88487***	-1.76431*	-0.56725
	CAR3	-3.66885***	-2.95428***	-1.60956
	CAR4	-2.71402***	-1.95984	-1.73137*
	CAR5	-2.94903***	-2.04249**	-1.97191**
	CAR6	-3.15557***	-2.65285***	-2.31975**
	CAR7	-3.04042***	-2.85985***	-2.28149**
	CAR8	-3.64863***	-2.95792***	-2.27567**
	CAR9	-3.79551***	-3.43187***	-2.45453**
	CAR10	-3.96826***	-3.21691***	-2.27758**
2018-2020	**CAR0**	-3.33192***	-3.60038***	-1.95770*
	CAR1	0.30976	0.50361	0.98028
	CAR2	1.15585	1.06517	1.78920*
	CAR3	1.09570	1.23523	1.96214*
	CAR4	1.48146	1.40238	1.66330*
	CAR5	1.30363	1.09442	1.71893*
	CAR6	0.94653	0.54155	1.66321*
	CAR7	0.87842	0.33867	1.58919
	CAR8	0.93441	0.10797	1.59440
	CAR9	1.13770	0.07769	1.60854
	CAR10	1.47790	0.27176	1.71468**
2021-2024	**CAR0**	-1.13589	-0.67946	0.09974
	CAR1	-0.95562	-1.20449	-0.57603
	CAR2	-0.70935	-0.95345	-0.90678
	CAR3	-1.06492	-1.00703	-1.45890
	CAR4	-2.00760**	-1.04703	-1.45447
	CAR5	-1.97640**	-0.96338	-1.28214
	CAR6	-1.88216*	-0.94903	-1.01167
	CAR7	-1.81523*	-1.30329	-1.27725
	CAR8	-1.94665*	-1.49709	-1.11089
	CAR9	-2.06900**	-1.46004	-1.18652
	CAR10	-2.13955**	-1.33925	-1.04113

Note: Asterisks indicate significance levels (*10%, ** 5%, *** 1%) based on F-tests for global significance

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