ISSN: 2029-4913/eISSN: 2029-4921

VILNIUS TECH
Vilnius Gediminas Technical University

TECHNOLOGICAL and ECONOMIC DEVELOPMENT of ECONOMY

2025
Volume 31
Issue 5
Pages 1433–1456
https://doi.org/10.3846/tede.2025.22918

IDENTIFICATION OF RISK FACTORS: A COMPARISON OF CONVENTIONAL AND ISLAMIC STOCKS

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Article History:
- received 04 December 2023
- accepted 11 November 2024
- first published online 31 March 2025

Abstract. The study identifies the difference in the long-run risk factors for Conventional Capital Market (CCM) and Islamic Capital Market (ICM) in the post-Shari'ah-screening era in an emerging market. The sample includes macroeconomic variables representing the real sector (industrial production), money market (interest rate), international market (exchange rate) and external sector (exports and workers' remittances) and two market indexes for 164 Months (01/10–08/23). Johansen cointegration and Granger causality tests are applied to document the evidence. Results support the integration of market indexes with macroeconomic indicators; however, market indexes lack mutual integration in the long run. The integrated group of variables differs slightly for ICM (exchange rate and industrial production) and CCM (industrial production). The real sector activity is reflected in the market, while the monetary sector is missing. The behaviour of the Islamic market is in line with the theory – a reflection of the real sector and lack of integration with interest rates. We recommend three policy actions, including improved facilitation of industrial production, prudent management of exchange rate, and a balanced monetary policy, as theory suggests the usefulness of stock indicators for monetary policymaking. The comparative study on macroeconomic risk factors in an emerging market enhances the understanding of a market with dual indexes, including CCM and ICM.

Keywords: stock market risk, macroeconomic variables, asset pricing, Islamic capital market.

JEL Classification: G11, G12.

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1. Introduction

The Islamic Financial Services Industry (IFSI) is an emerging area of finance whereby the financial institutions and markets activities are regulated by *Shari'ah* (Islamic law), in addition to national laws. The modern Islamic financial system was developed for religious reasons; primarily, however, it has attracted attention beyond religious following, especially in the post-financial crisis era (2007–2008), due to built-in strengths. The strengths include socially responsible investing, Profit and Loss Sharing (PLS), linkage of the real and financial sectors through asset-based financing and discouraging excessive risk and speculation (*Gharar* and *Maisir*). IFSI has shown growth momentum during the first quarter of the 21st century. The global volume of assets under the management of IFSI has reached a bulky figure of US$ 3.25 trillion by 2022 (from US$ 1.88 trillion in 2015), depicting a compound annual growth of approximately 8%. The majority (69.3%) of assets are concentrated in the banking sector, followed by Sukuk (25.6%) [Islamic bonds], Islamic funds (4.2%), and takaful [Islamic insur-

ance] less than 1% (Islamic Financial Services Board, 2023). Focusing on the Muslim population alone (although IFSI is attractive to all followers of Abrahamic religions), the prospective customer base is in billions (Lipka, 2017) – with increasing incomes. Geographically, IFSI is expanding in countries with a majority of Muslim residents. Based on the volume of assets under the management of IFSI, the Gulf Cooperation Council (GCC) region leads with 53.6%. Other notable areas include the Far East, South Asia, and the Middle East.

IFSI advocates for equity financing (PLS) and trading in assets to generate returns, as opposed to interest-based operations under the conventional financial system. Profit on capital is linked with bearing the risk of loss; otherwise, it is *Riba* (interest & usury) – forbidden by *Shari'ah*. An established principle of Islamic financing is "*al-kharaj bi daman*" (linkage of profit/gain with risk/responsibility). Capital market investments (equities) are primarily based on the principle of PLS. Modern capital market operations (equity instruments) align with Islamic financial laws with few restrictions (Accounting and Auditing Organization for Islamic Financial Institutions, 2015, p. 560). An investor has to follow *Shari'ah* guidelines while making equity investing decisions. *Shari'ah*-compliant stock universes are created by filtering equities through *Shari'ah* screens. For the facilitation of investors, multiple organisations are engaged in *Shari'ah* screening of the stocks based on predefined *Shari'ah*-compliance filters and AAOIFI guidelines. Several Islamic indexes are managed by reputed firms, including DJIM, FTSE, S&P, MSCI, Bloomberg, etc., in addition to the country-specific provision of Islamic Capital Market (ICM) services. Developments in ICM led to the development of Islamic Asset Funds. There are over 1,000 Islamic funds worldwide, with assets under management amounting to approximately US$137 billion. Malaysia and Saudi Arabia are centers of Islamic fund management with a market share of approximately 38% and 28%, respectively (Islamic Financial Services Board, 2023). According to an estimate by Ernst and Young (2013), the potential is up to US$ 500 billion.

Asset pricing is another dynamic area of finance. Under the conventional financial system, certain significant developments have taken place over the years, including the Modern Portfolio Theory (MPT), Capital Asset Pricing Model (CAPM), Arbitrage Pricing Theory (APT), Fama-French (FF) 3-factor and Carhart 4-factor models. The focus of asset pricing models has remained on establishing the required rate of return (based on risk-premium). With the inception of ICM, the question of the valuation of Islamic securities came to the fore. A few notable efforts in the development of an asset pricing model (inspired by CAPM) for Islamic investments include Tomkins and Karim (1987), El-Ashkar (1995), Shaikh (2009), Hanif (2011), and Hakim et al. (2016). At the same time, some studies have covered selected Islamic capital markets through the application of conventional models (e.g., Hakim & Rashidian, 2004; Yusof & Majid, 2007; Hassan et al., 2010; Hussin et al., 2012; Hassan & Girard, 2010; Rana & Akhter, 2015; Mustafa et al., 2015). However, well-documented evidence for the updated risk factors for various ICMs is still required, and this study is an effort to fill this gap in the literature. The valuation of Islamic securities and identifying risk factors are exciting questions for investors and academicians.

Theoretically, ICM is expected to show disassociation with interest rates because an Islamic investor does not have the option to switch to a risk-free investment avenue when there is an increase in the interest rate and vice versa. However, two additional factors need consideration. First is the emerging sukuk market, which offers relatively less risky returns and

is priced as per the prevailing interest rate, and second is the participation of conventional investors in trading at ICM; hence, results in practice may differ. Some empirics support the assertion e.g. Yusof and Majid (2007), Wahyudi and Sani (2014), Hanif and Bhatti (2018), Rana and Akhter (2015), Saraç and Ülev (2017). Furthermore, ICM is expected to be more aligned with real-sector activities than monetary, given the exclusion of the financial sector and highly leveraged firms from the ICM universe of stocks through filtration. The significance of industrial production for ICM is documented in the literature (Hussin et al., 2012; Mustafa et al., 2015).

The study documents the risk factors for ICM and the conventional stock market (CCM) in an emerging market to conclude similarities and differences in the post-*Shari'ah* screening era. There is a standing call in the literature to study the long-run integration of macroeconomic variables and ICM (Hanif & Bhatti, 2018). An interesting study finding could answer the critical question, 'of whether *Shari'ah* screening has made any difference' in the risk factors for stock returns in the selected markets. The specific contributions to the literature include the following.

- First is the documentation of evidence on the relevance of macroeconomic risk factors in the selected markets.
- Second is testing the mutual long-run integration of CCM and ICM.
- Third is uncovering the difference in groups of significantly integrating variables for each index (CCM and ICM).
- Finally, testing the ICM-specific hypothesis as to whether the real sector is represented by the Islamic index, while disassociation appears with the money market (interest rate).

The study contributes to the knowledge by uncovering the impact of a significant development (*Shari'ah* screening) on stock returns in Pakistani institutional settings. Chen et al. (1986) document that general economic state variables are expected to influence the stock market. The study aims to identify significant macroeconomic variables contributing to variations in stock returns, covering ICM and CCM. We selected the Pakistani market because of its unique position due to multiple factors, including its contributions to the development of the IFSI, strategic location, and the British common legal framework.[1] Our study to investigate risk factors is timely, given the overall developments in the region. Additionally, *the Shari'ah* screening process started in the selected market in 2008 and completed 15 years of operations in 2023. Moreover, numerous Islamic mutual funds, banks, and Takaful companies have been established in Pakistan and elsewhere, which need updated risk factors for ICM.

After the selected literature review, the following Section develops hypotheses. Section 3 presents the research methodology, followed by the results and discussion in Section 4. The last Section offers concluding remarks and policy recommendations.

[1] Multiple factors motivated us to study the Pakistani market: First, Pakistan has remained an academic powerhouse in the area of modern Islamic finance during the last quarter of the 20th century. Second, Pakistan has a strategic location in South Asia – a fast-growing region in the first decade of the 21st century. Third, the Pakistan Stock Exchange (PSX) has shown an outstanding performance at times; it was included in the list of top-performing markets in 1991, 2002, and 2016. Fourth, Pakistan is a British common-law country, resulting in ease for global investors and portfolio managers alike. Fifth, Pakistan has negotiated the China-Pakistan Economic Corridor (CPEC), which is being well appreciated as a game changer in the region (Hindustan Times, 2016). Sixth, the cointegration of KSE is very low with developed markets (Hasan et al., 2008) – offering an opportunity for portfolio diversification by global investors. Finally, Pakistan has amicable relations with countries of the GCC region – a potential for foreign direct investment from the center of modern IFSI.

2. Literature review

Asset pricing underwent a dynamic process during the second half of the 20th century MPT (Markowitz, 1952); CAPM (Sharpe, 1964); APT (Ross, 1976); FF 3 factor (Fama & French, 1992) 4-factor (Carhart, 1997). The process started with MPT – where risk quantification (by standard deviation) took place, and the risk-return relationship was established. Building on the risk-return relationship, CAPM identified a single risk factor (market beta). APT expanded the scope of risk factors to be identified in specific institutional settings. FF 3 factor model identifies three risk factors (market, size, and book to market), while Carhart adds the fourth variable (momentum) in the asset pricing model. APT's silence in identifying risk factors makes it more dynamic, localised, and adjustable in different institutional settings. These studies have focused on identifying the needed rate of return for an underlying investment opportunity – depending upon risk. Multiple studies have identified different variables – from monetary and real sectors – contributing to the risks of capital markets.

Identifying risk factors in a particular market is helpful in portfolio diversification. The stock market is expected to reflect the economic performance of society – including real and financial sectors. The association of stock market movements with real and financial sectors (macroeconomic variables) has been evidenced since the inception of APT (e.g. USA – Roll and Ross (1984), Chen et al. (1986); Japan – Mukherjee and Naka (1995); Korean market – Kwon and Shin (1999); Pakistan – Nishat and Shaheen (2004); Jordan – Adel (2004); South East Asian markets – Chancharoenchai et al. (2005); South Asian markets – Lamba (2005); New Zealand – Gan et al. (2006); Greece – Patra and Poshakwale (2006); BRIC markets – Gay (2008); Baltic region – Pilinkus (2010), Rudzkis and Valkavičienė (2014); BRICS – Panda et al. (2023). With the emergence of Islamic stock markets, researchers have started focusing on this area, and evidence is available for a few markets (e.g. South East Asian markets – Quadry et al. (2016); Malaysia – Yusof and Majid (2007), Hussin et al. (2012), Vejzagic and Zarafat (2013), Rashid et al. (2014), Mustafa et al. (2015); Indonesia – Wahyudi and Sani (2014); Pakistan – Rana and Akhter (2015), Hanif et al. (2016); and Turkey – Saraç and Ülev (2017), and Erdoğan et al. (2020). The integration of macroeconomic indicators with the stock market is a well-documented area of research globally. A brief review of objectively selected studies – covering a wide range of institutional settings – is presented in the following paragraphs. We first present a review of conventional markets, followed by a literature summary on Islamic markets.

Conventional Stock Market: A range of significant variables from monetary and real sectors emerged globally. Chen et al. (1986) identified a set of four significant variables, including inflation, interest rate, risk premium and industrial production, for the US market using monthly data (1953–1983). Interdependence between interest rate settings and stock prices in the US market is also documented by Bjørnland and Leitemo (2005). Humpe and Macmillan (2007) document a set of three significant variables (industrial production, interest rate, and inflation) for the USA and two significant variables (industrial production and money supply) for the Japanese market (monthly data 1965–2005). In a recent study, Bhuiyan and Chowdhury (2020) document the positive influence of money supply and the negative influence of interest rates on USA stock indices. Also, Abbas and Wang (2020) conclude a strong bidirectional relation-

ship between the stock market and macroeconomic variables. Mukherjee and Naka (1995) identified six macroeconomic variables in Japan integrated with the stock market: exchange rate, money supply, inflation, industrial production, long-term government bond rate, and call money rate. For the Korean market, Kwon and Shin (1999) identified four variables (the production index, exchange rate, trade balance, and money supply) by studying 13 years (1980–1992). Gan et al. (2006) identified the significant influence of three variables (interest rate, money supply, and real GDP) on the New Zealand stock market from 1990–2002.

Gay (2008) examined the association of global factors (oil prices and exchange rates) and stock markets for the BRIC (Brazil, Russia, India and China) group and concluded the lack of integration of these markets with global factors. However, Panda et al. (2023) found two variables (changes in inflation and foreign investment) significant with a negative impact on the stock market for BRICS economies.

Inflation and exchange rates remained significant for the German market, while inflation for the UK (1999 to 2011) was documented by Masuduzzaman (2012). Büttner and Hayo (2009) conclude on the role of exchange rate (reduction in exchange rate risk) in enhancing market integration in the European Union. Inflation, money supply, and trading volume were integrated with stock prices at the Athens stock exchange during 1990–1999 (Patra & Poshakwale, 2006). Evidence from Joran supports the stock market's long-run relationship with four variables: industrial production, money supply, inflation and interest rate during 1980–2003 (Adel, 2004).

A study on the ASEAN region covering 1986–1997 by Chancharoenchai et al. (2005) documents significant variables for a group of markets including Indonesia (interest rate and January effect), Philippines (treasury bills rate and January effect), Malaysia (inflation, money supply, and interest rate), and for Korea (inflation and money supply). Srivastava (2010) found evidence of the integration of macroeconomic factors (industrial production, interest rate and inflation) and the stocks during 1996–2009. Tripathi and Seth (2014) confirm the findings regarding industrial output (at 10%); however, they found two additional significant variables, including oil prices and money supply for the Indian market (1997–2011), by applying the Johansen cointegration test. A comparative study of China and India from 1999–2009 was conducted by Hosseini et al. (2011). Three sets of variables, covering the financial sector (inflation and money supply), the real sector (industrial production) and a global variable (oil prices), were included. The findings support the integration of markets with macroeconomic variables in the long run.

The following six significant variables as stock market risk factors are identified in the Pakistani institutional framework. Exchange rate (Hasan & Javed, 2009; Mohammad et al., 2009, 2012); Interest rate (Hasan & Javed, 2009; Mohammad et al., 2012); Inflation (Hasan & Javed, 2009; Akbar et al., 2012); money supply (Hasan & Javed, 2009; Mohammad et al., 2009, 2012); foreign exchange reserves (Mohammad et al., 2009; Akbar et al., 2012); and Industrial production (Akbar et al., 2012; Mohammad et al., 2012).

We conclude, based on this selected review, the following:

- First, the results of the studies depend on multiple factors, including data frequency (daily, monthly, quarterly, semiannual and annual), choice of econometric technique (correlation, unit root, regression, cointegration, causality tests, ARDL, VECM and Var

models, etc.), economic settings (developed and developing), selection of variables and quantification. For example, two sets of studies with different results – within the same institutional settings and for almost the same sample period are (Srivastava, 2010; Tripathi & Seth, 2014; Mohammad et al., 2009, 2012).

- Second, quantity and the set of associated variables are different in different institutional settings. These results confirm the hypothesis that there cannot be a uniform set of global variables as predictors of stock returns for all markets (such as CAPM, 3-factor, and 4-factor models).
- Third is the stability of the relationship of identified variables over time (Harrington, 1987, p. 189). There is no future guarantee of the persistence of relationships identified in a study.

One way to address the issues is to study markets regularly by using different data frequencies, pricing models, econometric techniques and study periods to identify the relevant variables and document any change in underlying risk factors over time.

Islamic Stock Market: ICM consists of a group of equities objectively screened in light of *Shari'ah* within the broader conventional stock market. Several organisations, including FTSE, DJIM, MSCI, Bloomberg, KMI, etc., are engaged in *Shari'ah* screening of stocks globally. The *Shari'ah* screens consist of two tiers.

- First is business screening, which covers a firm's core business activity. *Haram* (prohibited) businesses are excluded from the stock universe.
- The second tier covers financial screening in the areas of tolerance limit for interest-based financing, *haram* investments, the mixture of liquid and real assets and *haram* income.

Given the differences in tolerance limits set by various organisations, different *Shari'ah*-compliant stock universes emerge. While a call for uniformity in stock screening criteria globally sounds good, these tolerance limits are concessions and should be fixed based on the ground realities of a market. Furthermore, the limits need to be revised periodically, considering changes happening within a particular economy. Literature raises questions on *Shari'ah* screening practices from multiple angles, including *Shari'ah*-compliance filters and tolerance limits (see inter alia Khatkhatay & Nisar, 2007; Obaidullah, 2009; Mansoori & Khan, 2015; Hanif, 2019). In the Pakistani ICM, stock selection occurs based on specific *Shari'ah* screens, including business and financial screens (AlMeezan, n.d.). Under business screening, companies engaged in *Shari'ah* non-compliant businesses, including the traditional financial sector, pork-related items, pornography, etc., are eliminated. Companies which qualify on the business screen are further filtered through financial screens. Financial screens address five areas.

1. The first is leverage. Firms with leverage (interest-based debts) over a preset limit (of 37% of total assets) are declared *Shari'ah* non-compliant.
2. Second, companies with dual operations, including Shari'ah compliant and *Shari'ah* non-compliant. If *Shari'ah*-noncompliant investments exceed the limit of 33% of total assets, such a company is excluded.
3. The third screen concerns liquidity (the limit is 75% of total assets). If a firm crosses this threshold, it is declared *Shari'ah* noncompliant.
4. The fourth screen deals with *haram* earnings (the limit of *haram* income is up to 5%

of total revenue). Investors must still purify income even if a portion of haram income is less than 5%.

5. Finally, the netbook (net liquid assets) to market ratio limit. To remain on the list of the ICM universe, the net book-to-market ratio must be less than one (this is a unique test applied only in the Pakistani market) (AlMeezan, n.d.).

Applying *Shari'ah* filtration significantly reduces the stock universe as the whole conventional financial sector is excluded. Additionally, highly leveraged firms are also excluded. In the presence of these tests, ICMs are not similar to traditional markets. One might expect a different behaviour of ICM from CCM. However, investors are free to participate in trading at ICM and CCM, reducing divergences.

Theoretically, two hypotheses are justified for an Islamic capital market in identifying risk factors.

- First, the Islamic stock market is expected to depict a zero or lesser degree of integration with interest rates. This hypothesis is against the conventional wisdom – of a negative relationship between interest rate and stock market returns – because of *Shari'ah* restrictions on earning interest. Conventional wisdom asserts that investors get the motivation to reduce risky investments when the gain on risk-free opportunities increases. However, for an Islamic investor, such a flight is not expected – although investment in *Shari'ah*-compliant equities is not restricted to Islamic investors alone, leading to hindrances in achievement to a certain degree.
- Second, ideally, Islamic stocks are expected to show more integration with the real sector than the monetary sector. The basis of this hypothesis includes the filtration process of companies – where the conventional financial sector, highly levered firms, and firms with earnings through interest beyond 5% are excluded.

Studies on the integration of Islamic capital markets with macroeconomic indicators are shallow (except Malaysian ICM), although emerging, compared to conventional stocks, given the infancy of the Islamic capital market. However, a review of empirical studies follows. Quadry et al. (2016) document a significant relationship between oil prices and Islamic equity markets of Southeast Asia (Malaysia, Singapore, and Thailand) for 2007–2015 by applying VECM. Risk factors of ICM in Malaysia identified by researchers include exchange rate (Majid & Yusof, 2009; Hussin et al., 2012; Vejzagic & Zarafat, 2013; Rashid et al., 2014; Mustafa et al., 2015), interest rate (Majid & Yusof, 2009; Vejzagic & Zarafat, 2013; Rashid et al., 2014), money supply (Majid & Yusof, 2009; Hussin et al., 2012; Vejzagic & Zarafat, 2013; Mustafa et al., 2015), market index (Rashid et al., 2014), industrial production (Hussin et al., 2012; Mustafa et al., 2015), and inflation (Hussin et al., 2012).

As reported below, a lack of association between interest rate and ICM has emerged in multiple studies covering different markets. For Malaysia, Yusof and Majid (2007) showed that interest rate volatility affected the traditional market but not the Islamic stock market (1992 to 2000). For Indonesia, Wahyudi and Sani (2014) documented the significance of the exchange rate for the Islamic equity index, while the interest rate remained insignificant (at 5%). The study period is 2002–2011. Hanif and Bhatti (2018) document evidence from Pakistan on the short-run integration of the Islamic market with macroeconomic variables (2011–2016) through regression and Granger causality. The results indicate that the Islamic

market is linked with the real sector – exports, workers' remittances and industrial production – while the interest rate turned insignificant. Rana and Akhter (2015) documented that determinants are different for the conventional and Islamic markets by applying GARCH-M (2008–2013). As per the findings, KMI-30 was affected by the exchange rate only, while KSE-100 received an impact from the interest rate and the exchange rate. Saraç and Ülev (2017) document evidence from Turkiye (2011–2015) by applying cointegration and causality tests. The results support the hypothesis of "de-linkage of Islamic market from interest rate", while the conventional market showed integration with the interest rate.

Few studies documented results on ICMs by applying traditional asset pricing models. Hassan et al. (2010) noted the similarity between Islamic and conventional securities regarding risk returns by studying Malaysian Islamic unit trust funds by applying Carhart's 4-factor model. Also, Hassan and Girard (2010) find no difference between Islamic and conventional stock indexes in the risk-reward relationship by studying the Dow Jones Islamic Index based on Carhart's 4-factor model. However, Hayat and Kraeussl (2011), using CAPM, concluded that Islamic equity funds underperform conventional funds and Islamic benchmarks; based on global data (covering 145 Islamic equity funds over nine years (2000–2009). Hakim and Rashidian (2004) document that the Islamic index is competitive with the world stock market index; however, it underperforms in comparison with the green index by examining the Dow Jones Islamic index through CAPM. Hanif et al. (2016) document that the market index has a strong influence on the returns of *Shari'ah*-compliant companies, and the explanatory power of the *Shari'ah* Compliant Asset Pricing Model (S-CAPM) is better than CAPM (2001–2010) in Pakistan. Hakim et al. (2016) studied the Malaysian market using CAPM and S-CAPM comparatively (2004–2014) and documented the impact of the market index on the returns of Islamic securities. Finally, Hanif et al. (2019) find the Fama and French (FF) 3-factor model better explanatory than CAPM in the Pakistani market (2001–2010); however, adding variables improves explanatory power and refines the selection of risk factors. In a recent study, Erdoğan et al. (2020) tested volatility spillover between the exchange rate and Islamic stock markets of three emerging countries (India, Malaysia, and Turkiye). Findings support the transmission of volatility in Turkiye only.

This empirical evidence leads to multiple conclusions.

- The set of significant variables for CCMs and ICMs differs, and the number/quantity of risk factors varies across the studies.
- Industrial output (real sector) is reflected in the price movements of stocks.
- Multiple cases confirm the hypothesis that ICMs are not linked with the interest rate [in Malaysia, Indonesia, Pakistan, and Turkiye].
- Finally, the exchange rate (a global macroeconomic variable) has emerged as significant in most studies, showing external links to Islamic markets [from Turkiye, Pakistan, Indonesia, and Malaysia].

Focusing on the domestic market, most studies cover CCM due to the recent inception of ICM (in 2008). Only a few studies have been conducted on *Shari'ah*-compliant securities in the domestic market; hence, a literature gap exists about the risk factors for *Shari'ah*-compliant stock returns in the domestic market. Also, a few important macroeconomic variables (exports and workers' remittances) are less focused. This study is expected to identify significant

macroeconomic variables contributing to the stock returns generation process at PSX – for both markets, including CCM and ICM.

Institutional Settings: At the beginning of 2016, the Pakistan Stock Exchange was formed by merging the Karachi Stock Exchange-KSE (1947), Lahore Stock Exchange-LSE (1970), and Islamabad Stock Exchange-ISE (1989). These capital markets are regulated by the Securities and Exchange Commission of Pakistan (SECP), established in 1997 – earlier known as the Corporate Law Authority, created in 1947. In the first quarter of the 21st century, KSE displayed outstanding performance on multiple occasions, including the best-performing stock exchange in 2002 (The Economist, 2003; Dawn, 2002), Asia's 3rd best-performing equity market in 2016 (Verhage, 2016), and 2nd best performing in Sep-October 2023 (Mangi & Chakraborty, 2023). During the last two years, the KSE-100 index rose to 61,779 (12/2023) from 44,596 (12/2021), depicting a compound annual growth rate of close to 17%. The index rose by approximately 40% during the last six months, from June to Nov 2023 (Investing.com, 2023). Figure 1 depicts trends in indexes of ICM and CCM during the review period (01/2010 to 08/2023).

Pakistan has remained an active advocate for the availability of Islamic financial services. The country was known as an academic powerhouse in the last quarter of the 20th century. At a point in time (the 1980s), an effort was made to switch the whole economy from conventional to Islamic finance; however, the effort failed. Since the beginning of the 21st century, the country has operated a dual financial system. By the end of March 2023, the number of banking institutions offering Islamic financial services reached 22 (six fully-fledged Islamic banks), with a branch network of 6,368. The total assets of the Islamic banking industry amounted to PKR 8,118 billion (approximately US$ 28.3 billion), covering almost 20% of the domestic market share (State Bank of Pakistan, 2023a). KSE Meezan Index (KMI-30) was launched in 2008. Equities are screened based on *Shari'ah* filters reported earlier.

The research selected the KSE-100 index for CCM and KMI-30 for ICM. There is a comparable index of KSE-30 for the conventional market. However, cross-listing (between KMI-30 and KSE-30) is high. By December 2023, joint inclusion is 19/30 (63%). Cross-listing with KSE-100 is of a lesser degree (27/100), accounting for 27% of KSE-100 constituents. For

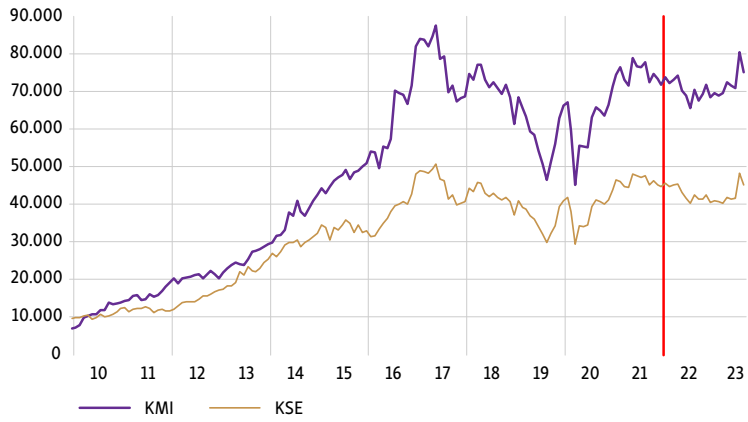

Figure 1. Trends in KMI and KSE (2010-2023) (Constructed by author; data source State Bank of Pakistan, 2023b)

comparison, the 'exclusivity' of securities included in an index is ideal; however, practically cross-listing companies between CCM and ICM exists.

Hypothesis: Based on the literature cited above, the following hypotheses are proposed for testing. Empirical evidence exists on the integration of macroeconomic variables and stock markets, including conventional and Islamic markets globally (although identification and quantity are country-specific); hence, we expect a relationship of markets with macroeconomic series during the period under review at PSX.

H1: *Macroeconomic variables and Stock markets are integrated.*

H1a: *he Islamic capital market and macroeconomic variables are integrated.*

H1b: *Conventional stock market and macroeconomic variables are integrated.*

The Islamic stock market is a subset of the broader national market. Only listed companies are included in *the Shari'ah*-compliant universe, and firms for the Islamic index (KMI-30) are chosen from that universe. Although certain major companies (financial sector and highly leveraged firms) could not be included in KMI-30 due to Shari'ah restrictions, and a maximum of 30 companies could be common in both indexes, we still expect an association between Islamic and conventional markets.

H2: *Conventional and Islamic stock markets are integrated.*

The conventional stock market represents the whole corporate sector, including financial and nonfinancial sectors; however, the Islamic capital market represents only *Shari'ah*-compliant companies, based on the KMI-30 criteria (halal business, less-leveraged, less risk-free income, and relatively low book-to-market). Hence, we expect variations in the associated variables. Empirics support this hypothesis (Yusof & Majid, 2007; Rana & Akhter, 2015). The Islamic market is expected to be more associated with the real sector, while the conventional market is associated with both the real and financial sectors. An investor may shift capital from equity to debt market, 'when there is an increase in the market interest rate' does not apply to an Islamic investor because of the prohibition of earning through interest. However, two additional factors need consideration: an emerging sukuk market (usually priced based on the prevailing market interest rate) and conventional investors' participation in ICM trading.

H3: *The integrated groups of macroeconomic variables are different for conventional and Islamic stock markets.*

H3a: *The Islamic market is (more) reflective of the real sector.*

H3b: *The Islamic market is not integrated with the interest rate.*

H3c: *The conventional market reflects the real and monetary sectors.*

3. Methodology

The methodology is explained in two sub-sections, including variable selection, data and econometric techniques applied to obtain results for analysis.

a. *Variable selection*: The purpose of the study is to search for significant macroeconomic variables integrated with domestic stock markets in the long run. We have included five

theoretically justified and/or empirically proven macroeconomic variables in various global studies. Our selected variables, which are empirically proven, include the exchange rate (global variable), interest rate (money market), and industrial production (real sector). We have added, intuitively, two variables (workers' remittances and exports) with relatively less empirical testing based on theoretical justifications (see Table 1). Expat remittances are a source of cash inflows leading to increased purchasing power in the domestic market. There was a massive influx of foreign remittances during the study period. According to official published data, the amount is US$ billion. 272.8 during the review period (01/2010 – 08/ 2023) (State Bank of Pakistan, 2023b). Likewise, exports increase liquidity in the domestic market. An increase in exports generates profits for the firms, leading to higher activity on the stock market. Export earnings for the last five years (2019–2023) are nearly US$ billion133 (State Bank of Pakistan, 2023b).

b. *Data and econometrics*: Data for monthly time series are extracted from statistical bulletins of the State Bank of Pakistan (2023b). Our study period covers 164 months (01/10 – 08/23). KMI was introduced in 2008; however, our analysis starts with an interval of about 18 months to exclude the infancy stage of the market index. There are multiple econometric tools to study the relationship of time series with tradeoffs; however, one has to choose, considering the nature of the data. The widely used techniques to study market integrations are correlation, Johansen's cointegration and Granger causality tests (Sharma & Seth, 2012). The study documents the results by applying Johansen cointegration and Granger causality. MS Excel and Eview 12 software are used for data analysis.

Table 1. Selected macroeconomic variables (constructed by author)

Variables	Symbol	Selected empirical evidence	Description
Exchange rate	XR	Mukherjee and Naka (1995), Kwon and Shin (1999), Masuduzzaman (2012), Mustafa et al. (2015), Wahyudi and Sani (2014), Rana and Akhter (2015)	US$- international currency – is used as a representative of foreign exchange for this study. Value of one US$ in domestic currency, i.e., PKRs
Interest rate	KIBOR	Srivastava (2010), Chancharoenchai et al. (2005), Adel (2004), Vejzagic and Zarafat (2013), Rashid et al. (2014), Saraç and Ülev (2017)	The Karachi Interbank Offered Rate (KIBOR) is the interest rate proxy.
Exports	EX	Kwon and Shin (1999) (trade balance), Hanif and Bhatti (2018)	Monthly exports figure by the central bank.
Workers' remittances	WE	Mohammad et al. (2009) (foreign reserves), Akbar et al. (2012) (foreign reserves), Hanif and Bhatti (2018)	Monthly workers' remittances by the central bank.
Industrial production index	IPI	Chen et al. (1986), Humpe and Macmillan (2007); Mohammad et al. (2012), Hussin et al. (2012)	Monthly industrial production index (large-scale manufacturing).
Conventional capital market	KSE-100		the KSE-100 index represents the conventional capital market.
Islamic capital market	KMI-30		Islamic capital market is represented by the KSE-Meezan Index (KMI-30).

Descriptive statistics include the mean, median, standard deviation, coefficient of variations, skewness, Kurtosis, and Jarque-Bera. Correlations document the mutual relationship of log returns of sample series.

Stationary check: Stationarity in the time series at the same order of integration is a requirement, although cointegration analysis is conducted using nonstationary data. Stationarity of time series is required to run the Granger causality test. Hence, the unit root in the time series is checked. Due to its better power than individual series tests, the study preferred the group unit root test (Fisher-ADF). *Panel/group* unit root tests are similar but not identical to single series. The selected unit root test (Fisher-ADF group unit root test) caters to individual and group results.

Cointegration analysis: To capture genuine long-run relationships among nonstationary variables, which, although rising over time, have a common trend that links them together, cointegration is used. Engle and Granger (1987) (as quoted in IHS, 2013) pointed out that a linear combination of two or more nonstationary series may be stationary. A long-run relationship between Y and X requires a linear combination of y_t and x_t that is stationary. If such a stationary linear combination exists, the nonstationary time series are said to be *cointegrated*. The study applies Johansen's (1991, 1995) cointegration test. Lag selection and trend assumption are significant matters relating to cointegration testing. The study selects the number of lags through Var lag order selection criteria (AIC and SBC). Once the lags are chosen, the appropriate model with trend assumptions for the underlying series is selected. There are three recommended models based on trend assumptions, including B (No deterministic trend (restricted constant)), C (Linear deterministic trend) and D (Linear deterministic trend (restricted)). The other two models (A and E) are rarely used. Model C is widely used in macro series (stochastic trend series) (IHS, 2013; Asteriou & Hall, 2007).

Granger causality: Granger causality is the most widely used technique to document causality and lead-lag relationships. The representation theorem suggests the existence of causality in at least one direction if two variables are cointegrated. Accordingly, *y* is said to be Granger-caused by *x* if *x* helps in the prediction of *y* or equivalently if the coefficients on the lagged *x*s are statistically significant. A two-way causation emerges if *x* Granger causes y and *y* Granger causes *x*. Stationarity of the series is required to test Granger causality. Raw data are converted into logrethmatic series by using the following Equation:

$$R_t = \ln\left(\frac{P_t}{P_{t-1}}\right). \quad (1)$$

ln natural log; R_t is return in month *t*; P_t is month t's price; and P_{t-1} is the price in the previous month.

Causality is tested by using the following model:

$$y_t = a_0 + \sum_{i=1}^{n} a_i y_{t-i} + \sum_{j=1}^{m} b_j x_{t-j} + \varepsilon_t. \quad (2)$$

The reported *F*-statistics are the Wald statistics for the joint hypothesis: $b_1 = b_2 = \ldots b_j = 0$ for each Equation. The null hypothesis is that *x* does *not* Granger-cause *y* (Asteriou & Hall, 2007; IHS, 2013).

4. Results and discussions

Descriptive statistics: Table 2 presents descriptive statistics. As per the results, average (median) monthly log returns are highest for ICM/KMI at 1.47% (1.62%), followed by CCM/KSE at 0.95% (1.29%), the exchange rate at 0.76% (0.20%), workers' remittances 0.66% (1.56%) and interest rate/KIBOR 0.36% (0.15%). The least positive change is for exports 0.24% (0.40%). However, industrial production showed a negative growth of 0.21% (0.74%) during the review period. Median values are far from average (except KMI), signifying the issue of outliers. The coefficient of variation (Std. D/Mean) [a relative measure of variations] is highest for both real sector variables (industrial production and exports), followed by workers' remittances and interest rates. The least variations exist for the exchange rate, ICM and CCM. There is positive growth in ICM, CCM, workers' remittances, interest rate and exports. However, increases in exchange rate (depreciation of domestic currency), interest rate, and negative growth of industrial production are causes of concern for policymakers. Overall, differenced data are not much dispersed (except exchange rate and industrial production), as depicted by relatively low skewness values. All skewness values are negative (left tail) except the exchange rate (right tail). All Kurtosis values are positive depicting leptokurtic distribution. Likewise, Jarque-Bera test results indicate a lack of normality in the series.

Figure A1 (Appendix) presents trends in the series. Panel A displays trends in the series at the log level. The exchange rate showed stability for an extended period and then significant upward movement. The interest rate showed mixed patterns and then upward trends. Workers' remittances depicted an upward slope, while exports showed mixed patterns, and industrial production significantly fell and then rose slightly. KMI and KSE showed mixed patterns and recovery in recent months. Trends in log returns are presented in Panel-B, indicating close to the random walk (normality).

Table 2. Descriptive statistics-log returns (constructed by author; data from State Bank of Pakistan, 2023b)

Description	LREx.R	LREX	LRIPI	LRKIBOR	LRKMI_30	LRKSE-100	LRWR
Mean	0.0076	0.0024	–0.0021	0.0036	0.0147	0.0095	0.0066
Median	0.0020	0.0040	–0.0047	0.0015	0.0162	0.0129	0.0156
Std. Dev.	0.0197	0.1120	0.0976	0.0506	0.0641	0.0559	0.1346
Coef. Var	2.59	46.67	–46.48	14.06	4.36	5.88	20.39
Skewness	1.883	–0.122	–2.302	–0.363	–0.092	–0.563	–0.302
Kurtosis	12.129	2.796	17.097	8.600	5.895	5.801	3.438
Jarque-Bera	666.40	0.6954	1502.98	217.95	57.52	62.28	3.817
Probability	0.000	0.706	0.000	0.000	0.000	0.000	0.1482

Correlation is calculated for log return series (stationary data). Of 21 pairwise correlation results, ten are negative (Table 3). The highest positive correlation is between exports and workers' remittances (66%), followed by CCM and ICM (64%), as expected. Other notable relationships include industrial production and exports (34%), interest and exchange rates (27%). The highest negative correlation is between CCM and the exchange rate (–21%). During the review period, the stock markets did not depict overwhelming correlations with other

markets (including the real sector, money market, and global variable). These results suggest at least three messages for policymakers, including:

- Growth in manufacturing may lead to an increase in exports.
- Interest rates may contribute to currency value; and
- Prudent currency exchange management is required as it may have potential implications for the stock markets.

Stationary check: Results of group unit root tests on the level and log return are presented in Table 4, panel A. We include results of group unit root (ADF–Fisher Chi-Square). As per the results, macroeconomic series are nonstationary at the level as a group, which disappears when data is converted into log returns at 1% (depicted by the probabilities) based on the individual unit root process. To clarify further, we present individual series results in Panel B, calculated by the ADF–Fisher chi-square test. As per the results, all macroeconomic series have trends at the level (nonstationary), as depicted by probability values (>5%). However,

Table 3. Correlation-log returns (constructed by author: data from State Bank of Pakistan, 2023b)

Variables	LREx.R	LREX	LRIPI	LRKIBOR	LRKMI_30	LRKSE-100
LREx.R	1.0000					
LREX	–0.1019	1.0000				
LRIPI	–0.0783	0.3401	1.0000			
LRKIBOR	0.2707	0.0832	0.0179	1.0000		
LRKMI-30	–0.1887	–0.0380	0.0794	–0.1733	1.0000	
LRKSE-100	–0.2078	0.0140	0.1616	–0.1845	0.6418	1.0000
LRWR	0.0324	0.6561	0.1380	–0.0223	–0.0129	–0.0580

Table 4. Group unit root testing

Method	At Level				At Log returns
Variables	Statistics	Probability**		Statistics	Probability**
Panel-A: Group at level			Log returns		
Individual unit root process					
ADF – Fisher Chi-square	17.717	0.2200		447.985	0.0000
ADF – Choi Z-stat	0.537	0.7044		–19.004	0.0000
Panel-B: Individual series			LR Series		
Exchange rate		0.9997	LR Ex. Rate		0.0000
Exports		0.0715	LR Exports		0.0000
Industrial production		0.0148	LR IPI		0.0000
KIBOR – Interest rate		0.9158	LR KIBOR		0.0000
KMI – Islamic market		0.5311	LR KMI		0.0000
KSE – Conventional market		0.5321	LR KSE		0.0000
Workers' remittances		0.5178	LR WR		0.0055

Note: ** Probabilities for Fisher tests are computed using an asymptotic chi-square distribution. All other tests assume asymptotic normality.

log return series are stationary at a 1% significance level. Additionally, the order of integration at the same level is recommended for running a cointegration test, although nonstationary series are used. In our sample, the log return series gained the same order of integration. Hence, our sample data are ready for cointegration at the level and Granger causality at log returns.

Table 5. Johansen cointegration unrestricted cointegration rank tests (Trace & Max. Eigenvalue**)

Null Hypothesis	Alternative Hypothesis	Eigenvalue	Rank value	0.05 Critical value	Probability***
λ trace rank tests			λ trace rank value		
H_0r = 0*	H_ar = 1	0.3118	157.26	125.61	0.000
H_0r = 1*	H_ar = 2	0.1704	97.84	95.75	0.035
H_0r = 2	H_ar = 3	0.1626	68.13	69.81	0.067
λ max rank tests			λ max rank value		
H_0r = 0*	H_ar > 0	0.3118	59.42	46.23	0.001
H_0r ≤ 1	H_ar > 1	0.1704	29.71	40.07	0.442

Note: *denotes rejection of the hypothesis at the 0.05 level; **Trace test 2 and Max. Eigenvalue test indicates 1 Cointegrating Equations (C.E.) at the 0.05 level; *** Mackinnon-Haug-Michelis (1999) p values.

Series: ER, EX, IPI, KIBOR, KMI, KSE and WR; Sample 2010M06 – 2023M08 [Included observations 159 after adjustments]; Trend assumption: Linear deterministic trend [Model C]. Lag interval (in first differences): 1 to 5 based on AIC and SC [similar results are for four lags]

Cointegration results are calculated by applying Johansen's (1991) model. The multivariate results of all series are presented in Table 5. By applying the lag selection criterion (AIC and SC), we selected lag intervals of 1–5. Standard cointegration model-C with the assumption of the linear deterministic trend (model-C is recommended for stochastic trend series) is used for documenting combined long-run comovements of time series. As per the results, based on the trace test (2) and max-eigenvalue test (1), cointegration equations were found to be significant (at 5%). Differences in trace statistics to critical values range from 31.65 to 2.09 and of max-eigenvalues 13.19, indicating a good fit, accuracy, and reliability of results. The results depict long-run equilibrium among macroeconomic time series – exchange rate, exports, industrial production, interest rates, ICM, CCM, and workers' remittances. These results indicate the joint movement of variables in the long run but not the causal relationship; hence, we run Granger causality to determine the directions. The representation theorem suggests the existence of causality in at least one direction if two variables are cointegrated.

Moreover, these results indicate comovements of selected series, as a whole – and a lack of bivariate relationships, which is essential to finding relevant risk factors. We calculated the bivariate long-run relationships to address the issue, focusing on stock indexes with other macroeconomic series – including CCM and ICM. To further explore the long-run relationship of stock markets and selected variables, we calculated the pairwise long-run relationship of selected time series with both market indexes – CCM and ICM. Table 6 presents the results of pairwise long-term integration of macroeconomic variables with CCM (KSE-100 index) and ICM (KMI-30). Lags selection is based on AIC, while model selection is made by checking the

results of cointegration equations by applying the Eviews summary option (depicting results of all models). Unlike a multivariate environment, lag selection is different for every pair.

The bivariate analysis results (of CCM) are presented in Panel-A. Model-C (linear deterministic trend) is chosen in four cases: exports, industrial production, interest rate and remittances. Different lags are appropriate for each pair, ranging from 1–5. Cointegration results (equation) emerged for CCM and exchange rate under model A (no deterministic trend) at seven lags. Model-C is recommended for stochastic trend series, and model-A is a rare case. Evidence supports the long-run integration of two variables (industrial production and exchange rate) (at 5%) with the KSE-100 index. The significance of the exchange rate emerges under the trace statistics criterion only and with the usage of the rare model (A); however, evidence still lacks max-eigen statistics. Granger causality confirms the relationship between industrial production and CCM but not for the exchange rate. However, Granger causality suggests relationships between exports and remittances. As the representation theorem suggests that causality must exist in at least one direction if two variables are cointegrated, the study considers only relationships that emerged under both techniques, including Johansen cointegration and Granger causality. Hence, we conclude that in the long run, CCM is integrated with industrial production only. Unidirectional causality exists from the market index to industrial production and exports, while remittances cause variations in CCM. Moreover, interest rates, exports, and workers' remittances showed a lack of long-run equilibrium with CCM during the period under review. The results confirm the reflection of the real economy (industrial production) but not the financial sector on stock market movements.

Table 6. Johansen cointegration – (CCM & ICM) unrestricted cointegration rank tests (Trace & Max. Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Trace Stat	0.05 Critical Value	Prob.***	Max-Eigen Stat	0.05 Critical Value	Prob.***	Lag	Model[ł]
Panel-A: CCM									
KSE-Ex. rate*	0.078	13.7	12.32	0.028	12.78	11.22	0.264	1-7	A
KSE-exports	0.053	10.5	15.49	0.240	8.83	14.26	0.300	1-3	C
KSE-IPI*	0.086	18.3	15.49	0.018	14.74	14.26	0.041	1-1	C
KSE-Int. rate	0.022	3.70	15.49	0.926	3.70	14.26	0.889	1-3	C
KSE-remittances	0.0314	8.24	15.49	0.439	5.07	14.26	0.731	1-5	C
Panel-B: ICM									
KMI-Ex. rate**	0.1537	28.6	15.49	0.000	26.53	14.26	0.000	1-5	C
KMI-exports	0.0561	10.9	15.49	0.215	9.29	14.26	0.262	1-3	C
KMI-IPI*	0.0907	18.8	15.49	0.015	15.40	14.26	0.032	1-2	C
KMI-Int. rate	0.0237	3.87	15.49	0.913	3.87	14.26	0.872	1-3	C
KMI-remittance	0.0369	8.46	15.49	0.417	6.06	14.26	0.604	1-3	C
KSE-KMI	0.0352	8.10	15.49	0.453	5.81	14.26	0.637	1-2	C

Note: **, * denotes rejection of hypothesis at 1% and 5%, respectively; *** Mackinnon-Haug-Michelis (1999) p values; ł Model 02 – No deterministic trend (restricted constant); Model 03 – Linear deterministic trend; Model 04 – Linear deterministic trend (restricted); Series included ER, EX, IPI, KIBOR, KMI, KSE and WR.

Table 7. Pairwise granger causality test

Markets		Causations		Variables	F-Stat	Prob.	F-Stat	Prob.	Lags
					>>>	>>>	<<<	<<<	
A: CCM									
KSE		==========		Ex. rate	0.89	0.51	1.25	0.27	7
KSE		==========	>>	Exports	3.06	0.03	1.75	0.15	3
KSE		==========	>>	Ind. prod.	6.15	0.01	0.04	0.84	1
KSE		==========		Interest rate	1.38	0.24	1.92	0.12	3
KSE	<<	==========		W.remittance	1.11	0.35	2.41	0.03	5
B: ICM									
KMI	<<	==========		Ex. rate	1.22	0.30	2.57	0.05	3
KMI		==========		Exports	2.48	0.06	2.05	0.10	3
KMI		==========	>>	Ind. prod.	4.09	0.04	0.13	0.71	1
KMI		==========		Interest rate	2.58	0.05	2.04	0.10	3
KMI	<<	==========		W.remittance	0.88	0.45	2.92	0.03	3
KMI		==========		KSE	0.03	0.96	0.19	0.81	2

Note: Null Hypothesis: X does not Granger cause Y; **, * Denotes rejection of the hypothesis at the 0.01 and 0.05 level.

Long-run equilibrium results of ICM with macroeconomic variables (Pairwise) are presented in Panel B (Table 6). Model C (linear deterministic trend) is appropriate for all pairwise cointegration equations. As per the results, two macroeconomic series, including exchange rate (1%) and industrial production (5%), are integrated with ICM based on trace statistics and maxeigen value in the long run during the sample period. The Granger causality (Table 7) confirms the relationship of ICM with exchange rate and Industrial production. Additionally, Granger's causality suggests a causation by remittances to ICM. Three variables, including exports, interest rates, and remittances, are not integrated with ICM in the long run. Following the representation theorem, we confirm that only two variables – exchange rate and industrial production – are significantly related to ICM during the period under review. The results indicate that the Islamic capital market is associated with broader real economic performance and the external sector while disassociating from interest rates. These findings are in line with the theory of the Islamic financial system.

In the case of the mutual association of CCM and ICM, the Johansen cointegration test shows a lack of integration, which is confirmed by the results of Granger causality. In the long run, ICM is not integrated with the CCM, leading to diversification opportunities for conventional portfolio managers within the economy. The lack of long-term integration of ICM with CCM is against expectations.

To conclude the results, we document the following significant findings and implications.

- The set of integrated variables is slightly different under Granger causality and bivariate cointegration analysis. For the conventional market, the group of integrated variables under Granger causality includes three variables (exports, industrial production and workers' remittances), while under the Johansen cointegration method, two variables (exchange rate and industrial production). For ICM, the integrated group under Jo-

hansen cointegration includes two series (exchange rate and industrial production); however, Granger causality indicates three significant variables (exchange rate, industrial production and remittances). We base our conclusion on the representation theorem – consider a variable significant only if identified under both techniques.

- Real sector activities are reflected in market-index movements (ICM and CCM) in the long run. It is good news for stakeholders, including investors and policymakers; however, evidence suggests a lack of integration with the financial sector.
- ICM and CCM are not integrated in the long run, contrary to expectations, because companies included in the Islamic Index are a portion of the broader conventional index, and both types of investors (conventional and Islamic) participate in trading at ICM.
- The integrated group of variables is different for CCM and ICM. In the case of CCM, only industrial production shows long-run integration with the market index. In the case of ICM, the integrated group is broader and includes exchange rate and industrial production. ICM reflects more sectors than CCM (a surprise, given that the conventional financial sector is represented by the traditional stock market due to *Shari'ah* restrictions).
- The monetary variable (interest rate) and global factor (exchange rate) show a lack of long-run equilibrium with CCM. This shows the corporate sector's divergence from monetary policy, and policy institutions need to take adequate measures.
- In line with the theory, the Islamic market is not linked with the interest rate, in the long run, at the Pakistan Stock Exchange (PSX) during the period under review. The results confirm the findings of Yusof and Majid (2007), Wahyudi and Sani (2014), Rana and Akhter (2015), Saraç and Ülev (2017), however, they differ from Majid and Yusof (2009), Vejzagic and Zarafat (2013), Rashid et al. (2014).
- Additionally, the Islamic capital market has shown linkages with the real sector (industrial production), reflecting the real economy. These findings are in line with the theory and confirm the empirical evidence documented by Hussin et al. (2012) and Mustafa et al. (2015).

We cannot reject hypothesis # 1 with all sub-hypotheses (1a and 1b). CCM and ICM are not integrated in the long run; hence, we cannot accept hypothesis # 2. In the case of the third hypothesis – the difference in the list of integrated macroeconomic series – the evidence leads to acceptance of hypothesis #3. As far as H3a is concerned – a reflection of the real sector on ICM – evidence supports the hypothesis. Additionally, the results support H3b – lack of integration of ICM with interest rate. Insufficient evidence emerges in support of H3c – the reflection of the real and monetary sectors on the conventional index. The real sector is reflected; however, integration with the financial sector is lacking.

5. Conclusions

This study aimed to identify the difference in risk factors between ICM and CCM in an emerging market during 2010–2023. Additionally, we test theoretical constructs, including a reflection of the real sector at ICM and a broader representation of the real and financial sectors at CCM. Macroeconomic variables included for testing represent the real sector (industrial production), money market (interest rate), international market (rate exchange rate) and external

sector (exports and workers' remittances). By applying cointegration and causality techniques, the study documents the long-run association of variables with ICM and CCM to uncover the difference in risk factors created by the *Shari'ah* screening of stocks. Findings suggest CCM and ICM are integrated with macroeconomic indicators with a slight difference. Exchange rate and industrial production are associated with ICM, while only industrial production shows long-run integration with CCM. Additionally, in the long run, market indexes depict a lack of integration – offering diversification opportunities. Surprisingly, CCM depicts a lack of integration with global variable as well as financial and external sectors. The evidence suggests that the behaviour of the Islamic market is in line with the theory – lack of integration with interest rates and reflection of the real sector.

These findings have broader implications for portfolio managers and policymakers. ICM is integrated with the real sector and shows a lack of integration with the money market – a sign of financial stability. While selecting stocks in domestic ICM, investors need to focus on the exchange rate. Policy recommendations include improved facilitation at stock markets (causing variations in industrial output), prudent management of exchange rates (transmitting volatility to ICM), and a balanced monetary policy (enhancing integration of the financial sector with stocks). The results are expected to enhance portfolio managers' knowledge (especially Islamic funds) about an emerging market with dual indexes, including CCM and ICM. The findings are equally fruitful for academia in increasing their understanding of the market and for the general public in managing their financial portfolios. Our contribution to the literature includes the latest evidence on equity risk factors in an emerging market – offering conventional and Islamic securities.

Study limitations include the choice of econometric techniques, model selection, and documentation of results on short-run integration. Future studies are expected to search for risk factors using different methods and models as well as document short-run associations. The future research agenda may also include testing the impact of fundamentals on stock returns in the post-Shari'ah-screening era.

Acknowledgements

The author acknowledges Ajman University's support during the research's completion and for providing the grant for Article Publication Charges (APC) to make the article freely accessible.

Funding

Article Publication Charges (APC) by Ajman University.

Author contributions

The single author completed all aspects of the study. Author holds position of "Noor Associate Professor in IBF" at Ajman University.

Disclosure statement

The author declares that there are no competing financial, professional, or personal interests from other parties.

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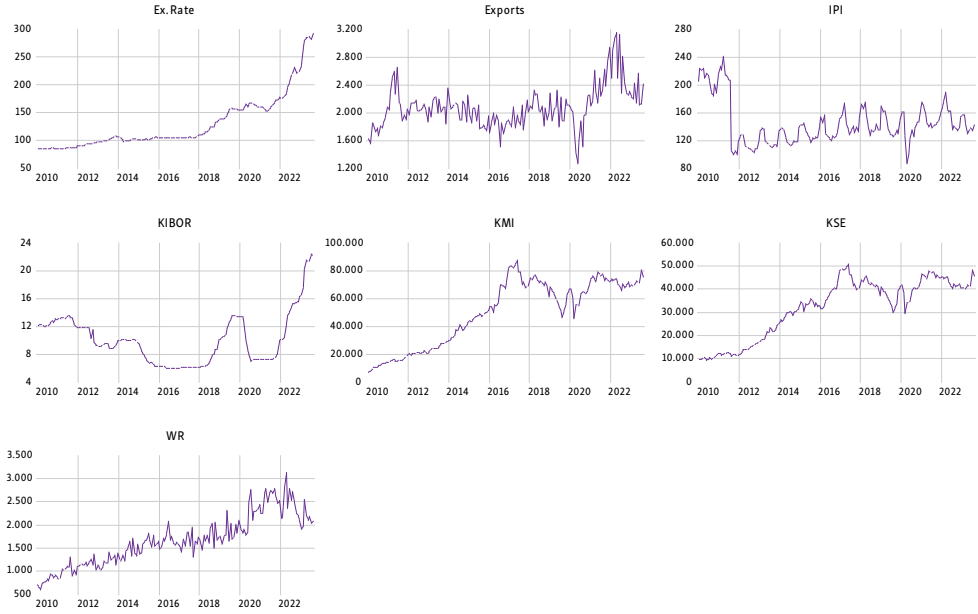
APPENDIX

A. Log level series (non-stationery)



B. Log-return series (stationery)

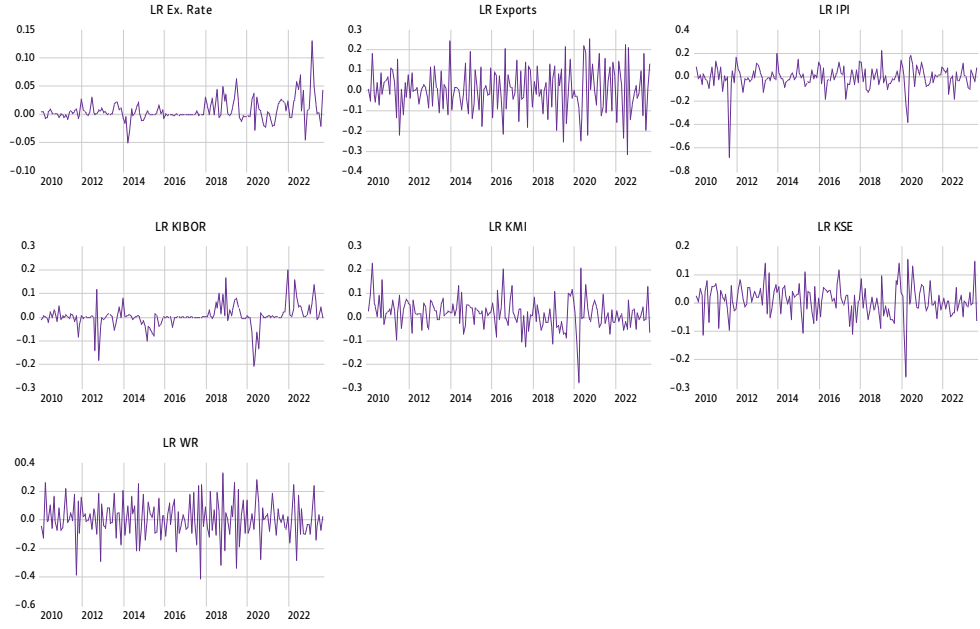


Figure A1. Trends in series (constructed by author; data from State Bank of Pakistan, 2023b)