Remittances Review
April, 2024
Volume: 9, No: 2, pp.3280-3290
ISSN: 2059-6588(Print) | ISSN 2059-6596(Online)
Received: 05 February 2024, Accepted: 05 April 2024
DOI: https://doi.org/10.33282/rr.vx9i2.165

Exploring the Volatile Behavior of Stock Prices in Pakistan: An Industry-Level Analysis

Abida Hafeez[1], Huma Fatima[2]

[1] Assistant Professor, Department of Economics, Division of Management and Administrative Sciences, University of Education, Lahore. abida.hafeez@ue.edu.pk (Corresponding Author).

[2] Assistant Professor, UE Business School, Division of Management and Administrative Sciences, University of Education, Lahore.

Abstract
This study uses daily stock price data from the non-financial sector from 2006 to 2020 to assess the effect of institutional development on the industry risk premia of the Pakistan Stock Exchange (PSX). The main objective is to look into how industry risk premia behave stochastically following institutional development and changes to regulatory policies in the Pakistan Stock Market. The GARCH-M framework has been employed to capture time-varying risk premia, while Carhart's four-factor model is used to detect risk premia. The Four-Factor asset pricing model's results show notable momentum premium in addition to market, size, and value effects in the PSX. A strong relationship has been observed using the GARCH-M framework between industry returns and risk. There is a considerable amount of fluctuation in the expected returns across different industries. The Pakistan Stock Exchange likewise exhibits the non-synchronous trading effect and persistent industry return volatility. The dummy variable's coefficient appears to be highly significant across a variety of industry portfolios, demonstrating the PSX's strong impact from institutional advancements and changes in regulatory policy.

Keywords: Asset Pricing Model, Emerging Market, Time-varying risk premia, Momentum, GARCH-M Model

1. Introduction

Among major firm characteristics and factors, an industry-related factor/characteristic of a firm plays an important role in shaping its business risk (Kale, et al., 1991), and determining prices of common stocks as well as single information can affect the entire market. A significant role of industry characteristics is played in market volatility at the domestic level (Lessard, 1974, 1976). Some reasons have been explored by Grinold, et al. (1989) to highlight the behaviour of the industrial composition and stock market is pointed out amongst these explanations. Broadly speaking, some industries internally show more volatile behaviour concerning other industries. Likewise, different sectors including energy, consumer goods, and transportation play a significant role in the construction of an index in an economy. King (1966) suggests in case that a significant difference is experienced in industry-level risk premia, then it is important to isolate market risk premia from industry risk premia. It is also observed that less variation is shown in different sub-periods undertaken through the industry-related variance components. A substantial

April, 2024
Volume: 9, No: 2, pp.3280-3290
ISSN: 2059-6588(Print) | ISSN 2059-6596(Online)

differential effect of various reforms and policies on the cost of capital investment has also been found in various sectors (Isimbabi, 1994; Prager, 1989).

Industry-related reforms and regulatory policies are observed either as a part of reform(s) packages or as an additional policy measure in Pakistan. Many industries such as agriculturebased industries (i.e. textile and sugar etc.) enjoy holidays or tax exemption, easy access to loans, and additional fiscal incentives. To boost foreign exchange reserves, the government of Pakistan provides concessional export funding to export-dominated firms along with relief on import duties of machinery and raw materials as well. A regulatory framework and security have been offered to specific countries to attract international/foreign investors. These reforms and policies have caused a substantial impact on volatile (stochastic) stock price behaviour rather than stabilizing prices. After experiencing structural changes in institutional capital and regulatory policies along with institutional developments in the financial industry, the study also distinguishes the impact of these changes on the stochastic behaviour of industry returns since 2009. Moreover, major reforms and institutional developments introduced during the period under consideration include the demutualization and successful corporatization of stock exchanges in 2012 as well as all three stock markets of Pakistan were integrated in 2016, located in Lahore, Islamabad, and Karachi to lessen fragmentation.

From the viewpoint of both foreign and domestic investors, the aforementioned and identified factors are significant while weighing the cost of investment and discount rates for their future cash flows and investment(s). The risk of a particular sector is of great importance for policymakers and lending institutions to charge the cost of investment in comparison to the discount rate along with firm(s) expected risk premia in this specific sector of the economy. In this regard, policymakers will be able to evaluate the financial advantages and disadvantages of a subsidy for a certain industry. Furthermore, opening up the market to foreign investors (Chinese share in PSX) is primarily responsible for the foreign influx of risk (investment) capital for many industries, such as food items, chemicals, fuel and energy, and engineering. Likewise, funds are obtained through companies, which are export-oriented, in most cases, such companies acquire payments in advance from overseas clients. It is anticipated that such shifts in industry-related reforms and regulatory policies could be among such reasons that caused changing the share (contribution) of industry-related risk premia towards risk premium for the overall market over time. It is also anticipated that the risk premia can differ in export-oriented companies competing in the multinationals, markets, and industries, which are safeguarded domestically

This study aims to elucidate the relationship between institutional development(s) and the timevarying stochastic behavior of industry stock returns. This research paper's main objective is to determine how industry risk premia behave over time. According to the corresponding hypothesis, multinational corporations, which dominate the majority of export-oriented and growing industries, will have greater risk premia and significantly increase the market premium, on the whole, in comparison to other industries. The study has different sections including review literature in Section 2. Section 3 contains a description of the data and methodology. Section 4 represents the results. The conclusion is in Section 5.

2. Literature Review

An increasing amount of financial research emphasizes the significance of industries in explaining variations in stock returns brought about by fundamental shifts in regulation and technology. According to King (1966), a lot of investors categorize companies according to how similar they have performed. King (1966) suggests keeping apart the sector risk and market risk in cases where the overall industry risk premium differs significantly. Comparing the explanatory power of industry-based factors with factors related to other characteristics of the firm, such as historical beta, E/P (earning-price ratio), dividend yield, and size, several researchers (Kale, et al., 1991; Rosenberg and Marathe, 1979; Rosenberg, 1974; Beaver, et al., 1970) have employed the equity return's implicit factor model, following in the footsteps of King (1966). Their results suggest that industry factors in risk forecasting models should be included in the estimation process and should be estimated more precisely than other components.

According to Isimbabi (1994), the banking system that could develop if certain market-based as well as risk-based reforms were implemented may not be less dangerous or more stable than the one that would arise if the barriers separating banking from the commerce sector were removed. The risk of the company is impacted by the regulatory policies. Additionally, it is discovered that the regulatory decisions have statistically and economically substantial effects on electric utilities' debt costs (Prager, 1989). According to Ahorony and Swary (1981), this advises taking the industry-based effect into account to reflect the policy disparity and time of promulgation for distinct industries.

The idea that the opening of financial markets was a result of higher price movement(s) along with increased industry (risk) premia during the Pakistan Stock Exchange reform period, instead of stabilizing security prices, gained support from Nishat (2001). When compared to non-reform times, the industry stock returns during reform periods generally looked higher. greater stock gains during the reform era were found to be more strongly correlated with higher risk than during the non-reform era. Regulating changes and financial liberalization, however, increased risk premia in the majority of the businesses. Furthermore, the results suggested that, in theory, time-variant beta caused a link between risk and return before the majority of industries underwent reform. Industry stock returns were more volatile over the course of the reform era, particularly in the early stages of the reforms. Throughout periods both reforms as well as nonreform, the degree of volatility persistence and the effect of non-synchronous trading on the Pakistan Stock Exchange appeared statistically significant in a few industries.

Hong, Torous, and Valkanov (2007) look into how well portfolio returns for the industry predict stock market movements and discover that returns of the industry can forecast behavior of the stock market. Information gradually moves from the option market to the stock market when options volume seems to be indicative of changes in stock prices, according to Pan and Poteshman (2006). Changes in market returns can be largely explained by the financials and returns of the consumer service business (Lee, et al., 2013).

Hou and Robinson (2006) demonstrate how the cross-section of mean stock return can be explicated by variations in industry concentration. Even after adjusting for momentum, size, and

Volume: 9, No: 2, pp.3280-3290
ISSN: 2059-6588(Print) | ISSN 2059-6596(Online)

value businesses in concentrated industries still generate poorer returns. Additionally, more concentrated businesses have bigger value premiums. According to Moskowitz and Grinblatt (1999), industry portfolios exhibit a strong degree of momentum. Furthermore, the results of Hou (2003) include the industrial momentum effect.

According to Umutlu et al. (2010), there is a negative relation between stock return volatility and financial liberalization. Nonetheless, after expanding the pool of potential foreign investors and boosting investor volume, they discovered a positive correlation between financial liberalization and volatility. Li et al. (2022) contend that the overall volatility of stock returns is constrained by the greater degree of financial market liberalization.

3. Methodology and Data Description

Carhart (1997) added a momentum factor to the Fama and French three-factor model (TFM). The result is the Carhart four-factor model (CFM), which looks like this:

$$R_{it} - R_{Ft} = \alpha_i + b_i(R_{Mt} - R_{Ft}) + s_i(SMB_t) + h_i(HML_t) + w_i(WML_t) + \varepsilon_{it} \qquad (1)$$

R_{it} is a representation of the return on portfolio $i$at time t in regression equation (1). R_{Ft} is a riskfree return. The market return is presented by RM_t. HML_t(high minus low), which is computed by deducting return(s) on portfolios of low-value stocks from high-value stocks. SMB_t (small minus big) is the result of subtracting stock return(s) on portfolios of big-capitalization stocks from small-capitalization stocks. Lastly, the computation of WML_t (winner minus loser) involves a difference between the returns of last year's winner stocks and loser stocks.

The GARCH-M Model suggested by Engle, Lilien, and Robins (1987) is often utilized in order to examine time variation in risk premia. After incorporating size, momentum, and value premiums, the GARCH-M model is presented as follows:

$$y_t = \gamma_0 + \gamma_1 x_{1t} + \gamma_2 x_{2t} + \gamma_3 x_{3t} + \gamma_4 x_{4t} + \theta h_t^{1/2} + \mu_t \qquad (2)$$

$$\mu_t = \varepsilon_t - \phi \varepsilon_{t-1} \qquad (3)$$

$$h_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \varepsilon_{t-1}^2 + \sum_{i=1}^{q} \beta h_{t-1} + \delta D_t \qquad (4)$$

The portfolios' returns for industry are exhibited by y_t at time t. x_{1t}, x_{2t}, x_{3t},&x_{4t} are right-hand side (RHS) portfolios at time t. Assuming that μ_t (error term) is the moving average (MA) of order 1.$h_t^{1/2}$ represents a conditional standard deviation. θ is the coefficient for risk aversion. α_1 represents the ARCH effect and β is the moving average (MA). The persistence in volatility is shown by α_1+β. δ (coefficient of dummy variable) distinguishes the difference in risk premia after the impact of institutional development.

The log-likelihood function's value is presented by the Likelihood figure(s). Both Q2 (12) and Q (12), which denote an ARCH (12) process an autoregressive (AR) or moving average (MA) process of order 12 in residuals and of order 12 in squared residuals, respectively, are the statistics from the Box-Pierce Portmanteau Test. A dummy variable introduced for reforms (D = 1; the time of regulatory reforms & development, and D = 0; the time of non-reform) has been introduced in equation (4) to determine the impact of institutional development and reforms on the return and risk in the GARCH-M framework.

3.1. Data Source

The primary data sources are DataStream and the Pakistan Stock Exchange's (PSX) Data Portal. The daily stock prices of 300 listed non-financial companies of the PSX from January 2006 through December 2020 are used in this study to represent fourteen different industries. The riskfree rate of return is based on a six-month Treasury bond. Accounting information has been gathered from several "Analysis Reports" published by the Pakistan Stock Exchange and "Balance Sheet Analysis" bulletins published by the State Bank of Pakistan (SBP).

3.2. Portfolio Formation

Value-weighted portfolios are computed in this research paper. When compared to equallyweighted portfolios, value-weighted returns have received more support in academic research. In addition to CAPM, the Carhart four-factor model's technique for portfolio formation has been implemented to account for the influences of size (SMB), value (HML), and momentum (WML).

3.3. Variable Construction

The following is how the market, size, value, and momentum premiums are put together:

- The market premium is computed as the yield on the six-month Treasury Bills less the return on the KSE 100 index. This is the method used to compute the market premium. The symbol RM-RF represents the market premium.
- To calculate the size premium, subtract the value-weighted return of the three large market capitalization/size portfolios from value-weighted return of 3 small-size portfolios, which are ordered separately based on momentum and BE/ME. Then, add the two to obtain the SMB. Size can be stated mathematically as:

$$SMB_{B/M} = (SH + SN + SL)/3 - (BH + BN + BL)/3 \quad (5)$$

$$SMB_{MM} = (SW + SN + SL)/3 - (BW + BN + BL)/3 \quad (6)$$

$$SMB = (SMB_{B/M} + SMB_{MM})/2 \quad (7)$$

- The value-weighted portfolios having low book-to-market (B/M) value are subtracted from the value-weighted portfolios with high book-to-market (B/M) value to construct the value premium. The estimate is as follows:

$$HML = (SH + BH)/2 - (SL + BL)/2 = [(SH - SL) + (BH - BL)]/2 \quad (8)$$

Remittances Review
April, 2024
Volume: 9, No: 2, pp.3280-3290
ISSN: 2059-6588(Print) | ISSN 2059-6596(Online)

- The value-weighted portfolios for loser stocks are subtracted from the value-weighted portfolios for winner stocks to determine the momentum premium. The following formula is used to compute it:

$$WML = (SW + BW)/2 - (SL + BL)/2 = [(SW - SL) + (BW - BL)]/2 \quad (9)$$

3.4. LHS Portfolios

The PSX and SBP (State Bank of Pakistan), the country's central bank, offer the industry definitions that are used to construct LHS industry portfolios. The fourteen (14) value-weighted industry portfolios have been constructed based on stocks of the non-financial sector only. These portfolios included domestic, multinational, growth, and export-oriented firms belonging to textile (Tex.), sugar (Sug.), cement (Cem.), chemical (Chem.), engineering (Eng.), food products, fuel & energy, glass & ceramics, information, communication & transport (ICT), paper & board, automobile (Auto.), pharmaceutical (Pharm.), synthetic & rayon, and miscellaneous industries.

4. Result Discussion

As predicted, higher return volatility is correlated with higher expected returns on industry portfolios in the majority of the industries (summary statistics shown in Table 1). Kurtosis reveals an additional intriguing trend that shows different industry portfolios have higher kurtosis values. Furthermore, the elevated kurtosis number indicates significant deviations from expected returns on industry portfolios in the PSX, indicating both positive and negative trends.

Most of the time, the predicted market (risk) premium using the four-component model shows nearly the same behavior or pattern across different industries. According to Table 2's results, industries' portfolios that are experiencing growth and are vulnerable to both foreign and local policy changes, such as chemicals, information and communication, fuel and energy, and cement, along with multinational corporations, with higher risk premia. For instance, the information & communication industry has the highest risk premia because of the presence of a small number of very large international corporations. This result supports the accepted theory that, in comparison to domestic industries, those using a portion of foreign capital in their operations appear riskier and, as a result, demand greater risk premia.

Table 1: Descriptive Analysis

Statistics	Tex.	Sug.	Cem.	Chem.	Engin.	Food Prod.	Fuel & En.	Glass & Cera.	ICT.	Paper	Auto.	Pharm.	S. Ray.	Misc.
Mean	-0.02	0.03	0.03	0.00	-0.01	0.10	0.03	0.03	-0.04	0.01	0.06	0.04	-0.01	0.07
Max.	5.50	5.10	6.90	8.60	5.71	6.52	9.13	11.0	9.40	8.50	5.96	5.38	6.01	4.80
Min.	-8.50	-21.0	-7.23	-7.74	-19.0	-5.03	-11.3	-27.4	-12.0	-6.44	-12.0	-12.10	-8.10	-4.55
Std. dev.	1.14	1.14	2.04	1.55	1.33	1.51	1.73	1.81	2.10	1.70	1.33	1.54	1.73	1.54
Skew.	-0.53	-2.70	-0.10	-0.50	-1.41	0.10	-0.20	-1.50	-0.20	0.00	-0.54	-0.50	-0.14	0.14
Kurt.	7.10	51.3	4.40	6.50	18.10	4.30	6.08	25.4	5.24	4.20	7.71	7.50	3.63	3.60

Remittances Review
April, 2024
Volume: 9, No: 2, pp.3280-3290
ISSN: 2059-6588(Print) | ISSN 2059-6596(Online)

Table 2: Industry Portfolios and Risk Premiums (%)

Industry	Mar.	t-statistics	SMB	t-statistics	HML	t-statistics	WML	t-statistics	R^2-adj	F-statistics
Tex.	0.68	46.39	0.23	11.41	0.19	12.95	0.05	3.45	0.49	27.33*
Sug.	0.49	25.85	0.38	14.54	0.00	-0.01	-0.02	-0.88	0.19	26.26*
Cem.	0.97	46.89	0.04	1.32	0.23	11.18	0.01	0.26	0.56	11.18*
Chem.	0.92	72.05	-0.17	-9.84	-0.03	-2.65	-0.01	-0.75	0.80	4.88*
Eng.	0.59	26.14	0.23	7.30	0.14	5.93	0.01	0.43	0.23	8.51*
Food	0.08	2.77	-0.23	-5.84	-0.33	-11.46	-0.03	-1.26	0.08	26.55*
Fuel & Ener.	0.95	61.66	-0.32	-14.97	-0.20	-12.88	-0.02	-1.44	0.77	37.60*
Glass & Cera.	0.67	21.48	0.33	7.52	0.06	1.82	-0.07	-2.53	0.16	2.61**
ICT	1.04	40.45	-0.17	-4.75	-0.01	-0.47	-0.05	-2.03	0.55	8.02*
Pap. & Board	0.74	26.84	0.14	3.67	0.25	8.96	-0.02	-0.80	0.27	5.89*
Auto.	0.62	31.77	0.11	4.02	0.07	3.34	-0.01	-0.27	0.34	12.36*
Pharm.	0.65	26.61	0.17	4.94	0.09	3.49	-0.04	-1.91	0.25	6.61*
Syn. & Ray.	0.52	16.52	0.13	2.96	0.07	2.24	-0.08	-2.62	0.12	7.54*
Misc.	0.29	10.89	-0.12	-3.32	-0.08	-2.92	0.08	3.37	0.10	7.78*

** Significant at 10 percent level, *Significant at 5 percent level.

Table 3: Estimates for Carhart Regression and Specification Tests

Parameter	Tex.	Sug.	Cem.	Chem.	Engin.	Food Prod.	Fuel & En.	Glass & Cera.	ICT.	Paper	Auto.	Pharm.	S. Ray.	Misc.
α_0	-0.05	-0.02	0.00	-0.04	-0.44	0.18	-0.21	-0.23	-0.10	-0.10	0.11	0.10	-0.14	0.10
SE(α_0)	0.03	0.02	0.02	0.01	0.32	0.33	0.21	0.13	0.32	0.30	0.32	0.32	0.13	0.43
beta	0.70	0.50	0.97	0.92	0.60	0.28	2.01	0.70	1.14	0.81	1.12	0.70	1.02	0.30
SE(beta)	0.04	0.10	0.02	0.01	0.22	0.13	0.02	0.13	0.33	0.32	0.12	0.12	0.13	0.13
size	0.4	0.40	0.04	-0.17	0.43	-0.43	-0.42	0.33	-0.20	0.21	0.14	0.20	0.43	-0.22
SE(size)	0.01	0.30	0.03	0.02	0.43	0.54	0.32	0.44	0.14	0.14	0.04	0.33	0.14	0.04
hml	0.20	0.01	0.23	-0.03	0.24	-0.23	-0.40	0.10	-0.11	0.31	0.10	0.10	0.10	-0.09
SE(hml)	0.03	0.04	0.02	0.01	0.12	0.43	0.22	0.31	0.04	0.30	0.22	0.12	0.33	0.04
wml	0.10	-0.04	0.01	-0.01	0.11	-0.33	-0.42	-0.17	-0.12	-0.12	-0.11	-0.14	-0.12	0.38
SE(wml)	0.03	0.01	0.02	0.01	0.12	0.53	0.31	0.13	0.12	0.13	0.22	0.12	0.13	0.32
R^2-adj.	0.49	0.20	0.56	0.80	0.33	0.38	0.80	0.20	0.60	0.30	0.44	0.30	0.13	0.11
D.W.	2.10	1.80	1.77	1.82	2.02	1.84	2.00	2.00	2.01	2.07	1.50	2.09	2.05	2.03
NONLIN	19.1*	15.1*	4.24*	2.51	20.31*	0.74	0.00	2.01	0.00	20.*	20.00*	5.20*	2.20	1.00
NORM	13176*	87182*	990.1*	62655*	98442*	160.7*	830.5*	138764*	1100*	143*	9233.4*	6126.3*	40.28*	60.60*
ARCH	37.02*	0.01	90.11*	12.64*	0.605	170.9*	99.84*	0.99	80.34*	201*	20.03*	24.20*	207.3*	305.5*
HET	8.35*	17.09*	26.02*	14.96*	8.51*	140.3*	16.00*	9.04*	30.06*	10.5*	5.504*	14.06*	30.06*	12.16*

** Significant at 10 percent level, *Significant at 5 percent level. Figures in parentheses are standard errors.

April, 2024
Volume: 9, No: 2, pp.3280-3290
ISSN: 2059-6588(Print) | ISSN 2059-6596(Online)

Using estimates from the Carhart Four-Factor Model (CFM), the predicted risk premia throughout the duration of the study ranges from 0.08 to 1.04 percent per day. Throughout the whole study period, the shares of risk premia for food goods and information & communication are, respectively, the lowest and the largest in the entire market risk premium. The results of the Chow test show a significant deviation in risk premia following the implementation of institutional development and regulatory reforms in the PSX.

Specification tests are used to empirically assess CFM's performance. In this instance, the error process is NID (0, σ2) (normally& identically distributed having '0' mean along with constant variance).It is believed that risk premium looks serially uncorrelated, normally distributed, as well as stationary. Table 3's findings show that non-normality, non-linearity, and non-constancy of parameters exist. It most likely reflects the idea that risk premia change over time and are not always the same. Introduced by Engle, (1982), the ARCH (autoregressive conditional heteroskedasticity) paradigm provides a better way to model this stochastic behavior. By making the time-variant conditional variances ('s) dependent on the variables' most recent values, the ARCH process represented them. The outcomes of GARCH (1, 1)-in-Mean procedure are shown in Table 4.

Table 4: Results for GARCH (1, 1)-in-Mean Model

Parameter	Tex.	Sug.	Cem.	Chem.	Engin.	Food Prod.	Fuel & En.	Glass & Cera.	ICT.	Paper	Auto.	Pharm.	S. Ray.	Misc.
γ_0	0.10	-0.10	-0.24	-0.10	-0.20	-0.40	-0.15	-0.06	-0.11	-0.31	0.33	-0.10	-0.26	-0.18
γ_1	-0.10	0.54	-0.34	0.92	0.60	0.10	0.10	0.60	-0.22	0.70	-0.10	0.60	0.60	0.32
γ_2	0.01	0.40	0.44	-0.20	0.26	-0.20	-0.30	0.29	-0.13	0.22	-0.14	0.21	0.20	-0.33
γ_3	0.22	0.00	0.22	-0.10	0.35	-0.32	-0.20	0.12	-0.09	0.20	-0.11	0.16	0.10	-0.21
γ_4	0.11	-0.11	-0.57	-0.23	-0.43	0.11	0.14	-0.17	0.01	-0.43	0.23	-0.14	-0.13	0.43
θ	0.60	0.12	0.70	0.10	0.60	0.37	0.64	0.24	0.58	0.10	0.75	0.00	0.17	0.40
t-stat (θ)	8.01*	1.30	7.40*	0.96	1.46	4.08*	0.42	0.74	8.75*	0.60	8.30*	0.09	1.49	2.03**
$\alpha_{0.}$	0.18	0.14	3.31	0.06	0.30	0.24	0.53	0.28	1.32	0.35	0.26	0.50	0.21	0.06
t-stat (α_0)	16.40*	5.06*	20.01*	14.4*	7.06*	8.20*	4.02*	6.59*	13.05*	5.90*	16.05*	18.02*	7.03*	5.06*
α_1	0.18	0.12	0.10	0.25	0.27	0.15	0.07	0.23	0.12	0.24	0.15	0.35	0.12	0.10
t-stat (α_1)	17.12*	8.89*	16.01*	21.22*	8.07*	10.52*	6.79*	9.18*	17.45*	8.24*	18.19*	16.21*	9.84*	9.40*
β	0.65	0.82	0.81	0.69	0.46	0.73	0.88	0.64	0.76	0.59	0.70	0.40	0.82	0.88
t-stat (β)	66.73*	46.98*	87.41*	57.53*	8.54*	32.65*	48.60*	21.00*	105.38*	13.97*	84.85*	13.99*	49.33*	74.97*
δ_1	0.10	0.01	-1.96	-0.01	0.06	0.09	0.00	0.10	-0.59	0.06	-0.08	0.07	0.07	0.02
t-stat (δ_1)	4.30*	1.82**	-16.8*	-4.34*	2.16*	5.14*	0.86	3.11*	-7.42*	1.93**	-5.77*	3.78*	3.80*	3.01*
likelihood	-4930	-3705	-8415	-2820	-4381	-5182	-3353	-5259	-8679	-5091	-5985	-4756	-5485	-4953
Q(12)	3.89	36.29	42.40	17.24	57.58	36.58	31.93	8.18	13.21	25.07	7.17	58.73	10.40	129.14
$Q^2(12)$	0.06	0.21	7.25	2.74	0.98	24.97	9.69	1.58	0.30	15.97	3.62	5.62	20.07	37.02

** Significant at 10 percent level, *Significant at 5 percent level. Figures in parentheses are standard errors.

Volume: 9, No: 2, pp.3280-3290
ISSN: 2059-6588(Print) | ISSN 2059-6596(Online)

The automobile industry receives 0.75 percent as compensation for taking on risk, while the cement industry follows with 0.70 percent every day. This is indicated by the parameter (θ). According to the findings, a considerable number of export-oriented and growing industries with global linkages have a higher risk-aversion coefficient. Table 4 shows that volatility was present for the whole research period. All industries seem to have a significant coefficient (α_1) of the ARCH effect, which increases the volatility of future returns.

Furthermore, as evidenced by the coefficient (α_1) of an ARCH impact being smaller than 1 (one), no industry portfolio in the PSX throughout this era has a fat-tailed distribution for the excess holding yield's unconditional variance. This is consistent with the findings for emerging markets from Nishat (2001) and DeSantis and Imrohoroglu (1997). The portfolios demonstrate that the coefficient of persistence (α_1+β) in the volatility of returns is significant for each industry.

Similarly, the moving average's coefficient (β) for the entire period shows that non-synchronous trading has had a significant impact on all businesses. According to Table 4, there has been a notable shift in fourteen different portfolios' risk premia of different industries over the study period, with ten (10) industries exhibiting an upward shift and four (04) indicating a downward shift, based on the value of the dummy variable. Consequently, the rise in industry risk premia observed in ten different industries indicates that institutional expansion and regulatory modifications have significantly impacted the Pakistan Stock Exchange.

5. Conclusion

Through the use of daily stock price data from the non-financial sector, this study examines how institutional growth has affected the industry risk premia of the Pakistan Stock Exchange (PSX) between 2006 and 2020. The objective of this research is to look into how industry risk premia behave stochastically following institutional development and changes to the Pakistan Stock Exchange's regulatory framework. The empirical research methodology used is the four-factor model and the GARCH-in-Mean model. The results exhibit significant momentum, market, size, and value effects in the PSX. The findings for industry-based portfolios affirm the primary hypothesis indicating an increase in price movement(s) and risk premia in response to regulatory reforms and the financial markets opening instead of keeping industry stock prices stable. The results suggest that portfolios for most of the industries exhibit theoretical risk-return relation as a risk factor(s) are permitted to be time-variant. In the Pakistani stock market, the nonsynchronous trading effect and the degree of volatility persistence are significant. The model with time-varying risk premium also reveals a noteworthy correlation between industry returns and risk. There is a considerable amount of fluctuation in the expected returns across different industries. The considerable impact of institutional innovations and regulatory policy changes in the PSX is indicated by the coefficient of the dummy variable, which shows significance for different industry portfolios.

References

Ahorony, J. and Swary, I. (1981). Effects of the 1970 Bank Holding Company Act: Evidence from Capital Markets. *The Journal of Finance*, *36(*4), 841-853.

Beaver, W. H., Kettler, P. and Scholes, M. (1970). The association between market determined and accounting determined risk measures. *The Accounting Review*, *45*(4), 654-682.

Carhart, M. M. (1997). On persistence in mutual fund performance. *The Journal of Finance*, *52*, 57–82

DeSantis, G. and Imrohoroglu, S. (1997). Stock Returns and Volatility in Emerging Financial Markets. *Journal of International Money and Finance, 16*, 561-579.

Engle, R. F. (1982). Autoregressive conditional heteroskedasticity with estimates of the variance of United Kingdom inflations. *Econometrica,50*(4), 987–1008.

Engle, R. F., Lilien, D. M. and Robins, R. P. (1987). Estimating time varying risk premia in the term structure: The ARCH-M Model. *Econometrica*, *50*, 987–1007.

Grinold, R., Rudd, A. and Slefek, D. (1989). Global factors: fact or friction. *Journal of Portfolio Management*, *16*(1), 79–89.

Hong, H., Torous, W. and Valkanov, R. (2007). Do industries lead stock markets? *Journal of Financial Economics*, *83*(2), 367-396.

Hou, K. (2003). Industry information diffusion and the lead-lag effect in stock returns. Working paper, Ohio State University

Isimbabi, M. J. (1994). The stock market perception of industry risk and the separation of banking and commerce. *Journal of Banking and Finance*, *18*, 325–349.

Kale, J. K., Hakansson, N. H. and Platt, G. W. (1991). Industry vs. other factors in risk prediction. Walter A Haas School of Business Research Programme in Finance Working Paper Series, Institute of Business and Economic Research, University of California at Berkley. (Finance Working Paper No. 201.)

King, B. F. (1966) Market and industry factors in stock prices behaviour. *Journal of Business39*,139–190.

Lee, C.-C., Chen, M.-P. and Chang, C.-H. (2013). Dynamic relationships between industry returns and stock market returns. *The North American Journal of Economics and Finance*, *26*. 119–144.

Lessard, D. R. (1974). World, national, and industry factors in equity returns. *The Journal of Finance*, *29*(2), 379–391.

Lessard, D. R. (1976). International diversification. *Financial Analyst Journal*, *32*,32–38.

Li, S., Wang, Y., Zhang, Z., and Zhu Y. (2022).research on the factors affecting stock price volatility. *Advances in Economics, Business, and Management Research*, *211*, 2884-2889.

Moskowitz, T. J. and Grinblatt, M. (1999). Do Industries Explain Momentum? *The Journal of Finance*, *54*(5), 1249-1290.

Nishat, M. (2001). Industry risk premia in Pakistan. *The Pakistan Development Review,40*(4), 929–949

Pan, J. and Poteshman, A. M. (2006). The Information in option volume for future stock prices. *The Review of Financial Studies*, *19*(3), 871-908.

Prager, R. A. (1989). Using stock price data to measure the effects of regulation: The interstate commerce act and the railroad industry. *Rand Journal of Economics*, *20*(2), 280–293.

Rosenberg, B. (1974). Extra-Market components of covariance in security returns. *Journal of Financial and Quantitative Analysis, 9*(2), 263-273.

Rosenberg, B. and Marathe, V. (1979). Test of capital asset pricing hypothesis. *Research in Finance*,*1*, 115-224.

Umutlu, M., Akdeniz, L., & Altay-Salih, A. (2010). The degree of financial liberalization and aggregated stock-return volatility in emerging markets. *Journal of banking & finance*, *34*(3), 509- 521.