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Systematic Risk in Energy Sector: Evidence from Pakistan Stock Exchange

Syed Mumtaz Ali Kazmi[1], Altaf Hussain[2], Rehan Tahir[3], Samiullah[4]

[1] Associate Professor, Department of Economics, National College of Business Administration and Economics, Sub Campus Bahawalpur, Pakistan. Email: drmumtazkazmi@ncbae.edu.pk
[2] Associate Professor, Department of Economics, The Islamia University Bahawalpur, Pakistan. Email: altaf.hussain@iub.edu.pk
[3] MS Administrative Sciences, Department of Administrative and Management Sciences, The Islamia University of Bahawalpur, Pakistan. Email: rehantahir923@gmail.com
[4] PhD Scholar, Department of Business Administration, National College of Business Administration and Economics, Sub Campus Bahawalpur, Pakistan. Email: asadaman557@gmail.com

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ABSTRACT

Given the importance of systematic risk for the profit maximization and for the growth of the organization, the objective of the current study is to measure the systematic risk in energy sector companies listed in Pakistan Stock Exchange. To quantify the risk, the study has utilized the Capital Asset Price Model (CAPM). The study used the monthly stock price of Oil & Gas exploration companies and Oil & Gas marketing companies. This study examined the sensitivity and relationship of a sample of major oil and gas corporations to different financial risk factors. The results are aligned with theory of corporate finance and risk because our hypothesis upholds that bigger the organizations, better is their capacity to reduce the probable effects of the progressions in the political, social and practical climate which will lead the organizations to have a low systematic risk.

Corresponding Author's Email: drmumtazkazmi@ncbae.edu.pk

1. Introduction

Financial experts all over globe considers financial risk a fundamental determinant for any investment. Uncertainty is tied to the expected outcome of a given investment and is correlated with a company's riskiness. The term financial risk refers to the probability of incurring a loss or earning a profit. The energy companies are most vulnerable to risk in their daily operations, as well as when making decisions about sizable future capital investments. Contemporary portfolio theory posits that systematic risk is a significant impediment to investment. The contemporary portfolio theory has given rise to a form of risk known as systematic risk. Based on the principle, risk diversification can be achieved when the correlation between assets chosen for a portfolio is negative. The degree of correlation directly impacts the extent of diversification advantage, with a higher correlation resulting in a diminished diversification benefit. Diversification was developed so that a particular investment's risk may be kept at a minimum level relative to a particular security. Those who wish to dominate the inflexible market as much as possible are individuals who are not only risk-takers, but also accept that the risk is more than usual. This is recognized as the essence of contemporary portfolio theory. When the market reverses course and suitably, these risk-takers will receive their retribution (Markowitz Harry, 1999).

The study's goal is to identify certain elements that influence how systematic risk is felt in various nations. It has been done before, but only for developed markets. The goal of the study is to identify the variables that affect Asia's growing markets. The South East Asian markets still need a lot of attention and focus because they are still in the process of developing. It is imperative to ascertain the various components that exert influence on the markets where securities are traded, as well as to comprehend the potential impact of alterations in global

macroeconomic aspects on these markets and the inherent undiversified risk linked with them. Consequently, it has been posited that there exists variation in systematic risk not only among countries but also across different sectors. However, as emerging nations are more vulnerable to hazards than fully established nations, the primary focus of this study is on factors that have an impact on the entire nation rather than just a single industry. What distinguishes this study from earlier ones is the spatial context. Given the importance of systematic risk for the profit maximization and for the growth of the organization, the objective of the current study is to measure the systematic risk in energy sector companies listed in Pakistan Stock Exchange.

The current study is unique in the context of measurement of systematic risk for energy sector. The available literature has not yet measured systematic risk for energy sector. The study of (Hussain & Amir Shah, 2017) used systematic risk for corporate governance, Shah, Hussain, Khan, Jacquemod, and Shah (2020) unfold determinants of systematic risk for commercial banks of Pakistan, Hanif, Naveed, and Rehman (2019) model systematic risk for financial institution of Pakistan and Ahmad, Ali, Arshad, and Shah (2011) used it for cement sector. None of the studies in the context of Pakistan has focused on the energy sector organization listed in Pakistan Stock Exchange. So the current study can be considered as a significant contribution in the literature. The paper follows the following structured. Section 1 is about introduction, section 2 review the existing literature while next comes the methodology and data section, section 4 provides the discussion of the results and the last section concludes the paper and provide policy implication.

2. Review of Literature

The risk-free rate can be conceptualized as the fundamental interest rate or the cost of time in which an individual assumes no risk, while the price of risk is the additional cost that the individual incurs for each additional unit. A fundamental linear relationship can be observed between two variables under consideration, namely the standard deviation or risk associated with the return, and the skillful combination of these risky assets to achieve a balanced portfolio, as well as the anticipated return on said assets. The non-divergent risk of an asset is contingent upon its connection with other assets in the market. To mitigate or diversify risk, it is necessary to incorporate risk-free securities into a portfolio (Sharpe, 1964). The risk assessment conducted by investors relies on the systematic risk of individual securities or portfolios, rather than their propensity to vary in tandem with a market portfolio consisting of all assets based on their overall market prices. Systematic risk persists even when a security is incorporated into a diversified portfolio, notwithstanding the mitigation or diversification of all unsystematic or residual risk. Accordingly, based on the model's assumption, systematic risk encompasses crucial and fundamental data pertaining to security risk, thereby facilitating the identification of optimal portfolios (Treynor, 1965).

The portfolio manager, whose strategy involves a substantial degree of speculation, would likely welcome opportunities to mitigate or eliminate market consequences arising from individual stock returns, as well as to efficiently transfer the inherent systematic risk of the portfolio in a timely and cost-effective manner. Futures contracts on stock indices has inherent value in both scenarios. When it comes to portfolio management, it is imperative to give careful consideration to the diversification of the stocks held inside it. One primary concern among portfolio managers pertains to the potential scenario in which unfavorable market dynamics may offset favorable firm-specific trends. The failure to acquire the suitable stock index potential spot may lead to the depletion of the manager's portfolio as a consequence of adverse market conditions. Stock index futures offer a strategically advantageous approach to adjusting the sensitivity of a certain portfolio to market associations. This is particularly advantageous when the manager's focus is directed on the portfolio's deficient timing skills. In the event that the forthcoming convention is disregarded, it is plausible that managers could potentially face substantial transaction costs when attempting to rebalance a portfolio in light of changed market forecasts (Jaki & Ćwięk, 2020). The portfolio manager, who employs a strategy characterized by a significant level of speculation, would probably be receptive to chances to minimize or eliminate the market implications resulting from the returns of individual stocks. Additionally, they would seek to transfer the inherent systematic risk of the portfolio in a prompt and cost-efficient manner. Futures contracts on stock indexes possess intrinsic value in both cases.

In the context of portfolio management, it is crucial to exercise meticulous deliberation on the diversity of companies contained within it. One key concern among portfolio managers revolves around the possibility of unfavorable market dynamics counteracting good firm-specific trends. The inability to get an appropriate stock index potential position may result in the depletion of the manager's portfolio due to unfavorable market conditions. Stock index futures provide a strategic method for altering the level of sensitivity of a certain portfolio to market correlations. This is especially beneficial when the manager's attention is focused on the portfolio's inadequate timing abilities. If the upcoming convention is ignored, it is possible that managers may encounter significant transaction costs when they try to readjust a portfolio due to altered market predictions (Chiou & Su, 2007).

The risk associated with a company's stock and its return characteristics may undergo changes due to management decisions pertaining to the firm's financial options, operational decisions, and financing sources. However, it is important to note that these changes primarily affect the overall risk faced by investors, known as systematic risk (Breen & Lerner, 1973). The earnings to price ratio elucidates the correlation between the earnings per share and the price of a given firm. In order to address the concern of a stock having zero earnings per share, we are use the reciprocal of the price earnings ratio in our computations. The majority of investors refer to this ratio when choosing equities for future investments in order to make well-informed judgements. The authors also propose the notion of providing insight into organizations characterized by significant growth, subsequently noting that their earnings are correspondingly high. Conversely, companies exhibiting limited growth are shown to report lower earnings.

The objective of this endeavor is to provide you with an understanding of the corporations that embody substantial expansion. Conversely, in cases where multiple companies exhibit identical earnings, size, and industry affiliation, it is plausible for their earnings to price ratios to exhibit significant disparities. It has been postulated that these disparities may arise as a consequence of divergent investor expectations pertaining to the future profitability of a specific firm. When investors hold optimistic expectations, it leads to elevated earnings and subsequently a higher earnings-to-price ratio. Conversely, when expectations are pessimistic (or negative), it results in diminished earnings and ultimately a lower earnings-to-price ratio. Both of these scenarios would have identical outcomes (Arslan, Zaman, & Phil, 2014).

The accurate identification and classification of factors contributing to systematic risk are essential for making informed investment decisions and implementing effective risk management strategies. This is particularly important when comparing systematic risk to unsystematic risk, as the latter can be mitigated through portfolio diversification techniques. To conduct a comprehensive analysis and delineate the attributes of non-diversifiable risk, it is imperative to consider the comprehension of beta and the factors that contribute to its magnitude (Ali, Liu, & Su, 2022).

3. Methodology and Data

To quantify the risk the current study has utilized the Capital Asset Price Model (CAPM)[1]. This was accomplished by investigating the connection that exists between the stock volatility and returns keeping in view the special focus on the risk factor. In order to obtain the beta values that are necessary for the CAPM model, a regression analysis was performed prior to the implementation of the model and the calculation of the anticipated stock return. An analysis of a time series with a single factor was used to derive an estimate of the beta values. Below is described the model for determining the beta value.

$$E(R_i) = R_f + \beta_i\left[E(R_M) - R_f\right]$$

Where RM-Rf is the excess return on the market portfolio. R_i is the stock return for company i. The current study has used monthly stock price data of Pakistan Stock Exchange. The two main categories of energy sector, Oil & Gas exploration companies and Oil & Gas marketing companies are selected. The Oil & Gas exploration companies include four firms, "Mari Petroleum Company Ltd (MARI)", "Oil and Gas Development Company Ltd (OGDC)", "Pakistan Oilfields Limited (POL)" and "Pakistan Petroleum Limited (PPL)". While Oil & Gas marketing companies includes ten firms, "Attock Petroleum Limited (APL)", "Burshane LPG (Pakistan)

1 The CAPM was firstly developed by Sharpe (1964). It was further modified by Lintner (1969).

Limited (BPL)", "Hascol Petroleum Limited (HASCOL)", "Hi-Tech Lubricants Limited (HTL)", "Oilboy Energy Limited (OBOY)", "Pakistan State Oil Company Limited (PSO)", "Shell Pakistan Limited (SHEL)", "Sui Northern Gas Pipelines Limited (SNGPL)" and "Sui Southern Gas Company Limited (SSGC)".

4. Results

The results of summary statics of variables are shown in Table 1. The mean value of Mari Petroleum Company Ltd (MARI) is 20.2373, Oil and Gas Development Company Ltd (OGDC) is 10.1373, Pakistan Oilfields Limited (POL) is 40.4373 and Pakistan Petroleum Limited (PPL) is 33.0773. While the mean value of Attock Petroleum Limited (APL) is 34.0387, Burshane LPG (Pakistan) Limited (BPL) is 4.9780, Hascol Petroleum Limited (HASCOL) is 4.4044, Hi-Tech Lubricants Limited (HTL) is 18.4442, Oilboy Energy Limited (OBOY) is 18.4777, Pakistan State Oil Company Limited (PSO) is 20.2373, Shell Pakistan Limited (SHEL) is 40.6484, Sui Northern Gas Pipelines Limited (SNGPL) is 50.5373 and Sui Southern Gas Company Limited (SSGC) is 17.4927.

Table 1: Summary Statics of Variables

Company	Mean	Variance	Standard deviation	5 % percentile
Mari Petroleum Company Ltd (MARI)	20.2373	343.8997	08.3984	8.9373
Oil and Gas Development Company Ltd (OGDC)	10.1373	313.8997	08.3981	8.9373
Pakistan Oilfields Limited (POL)	40.4373	343.8997	08.3984	8.9373
Pakistan Petroleum Limited (PPL)	33.0773	470.4984	20.7040	7.4402
Attock Petroleum Limited (APL)	34.0387	494.7900	22.2439	00.7474
Burshane LPG (Pakistan) Limited (BPL)	4.9780	9.9270	3.0307	2.2940
Hascol Petroleum Limited (HASCOL)	4.4044	29.4440	4.4274	0.4940
Hi-Tech Lubricants Limited (HTL)	18.4442	490.9724	19.7740	4.9472
Oilboy Energy Limited (OBOY)	18.4777	81.4747	9.0207	9.4298
Pakistan State Oil Company Limited (PSO)	20.2373	343.8997	08.3984	8.9373
Shell Pakistan Limited (SHEL)	40.6484	444.4200	21.0846	11.8124
Sui Northern Gas Pipelines Limited (SNGPL)	50.5373	343.8997	08.3984	8.9373
Sui Southern Gas Company Limited (SSGC)	17.4927	91.2444	9.4417	6.4481

Source: Author's Calculation

The results of Systematic Risk using Capital Asset Price Model (CAPM) are shown in Table 2. The beta value of Mari Petroleum Company Ltd (MARI) is 0.013 and 0.3221, Oil and Gas Development Company Ltd (OGDC) is 0.0057 and -0.0443, Pakistan Oilfields Limited (POL) is 0.0057 and -0.0335 and Pakistan Petroleum Limited (PPL) is 0.009 and 0.1736.

Table 2: Results of Systematic Risk using Capital Asset Price Model (CAPM)

Company	β_0	β_1	R^2	Mean	Variance	Standard deviation
Mari Petroleum Company Ltd (MARI)	0.013	0.3221	0.0174	0.0687	0.0028	0.0530
Oil and Gas Development Company Ltd. (OGDC)	0.0057	-0.0443	-0.0036	0.0595	0.0026	0.0507
Pakistan Oilfields Limited (POL)	0.0057	-0.0335	-0.0038	0.0540	0.0021	0.0462
Pakistan Petroleum Limited (PPL)	0.0091**	0.1736*	0.0076	0.0519	0.0020	0.0449
Attock Petroleum Limited (APL)	0.0056	0.0363	-0.0030	0.0356	0.0009	0.0294
Burshane LPG (Pakistan) Limited (BPL)	0.0034	0.0015	-0.0042	0.0515	0.0016	0.0396
Hascol Petroleum Limited (HASCOL)	0.0093*	-0.0660	-0.0027	0.0556	0.0023	0.0478
Hi-Tech Lubricants Limited (HTL)	0.0088*	0.0743	-0.0026	0.0621	0.0025	0.0503
Oilboy Energy Limited (OBOY)	0.0069	0.0974	-0.0023	0.0537	0.0018	0.0422
Pakistan State Oil Company Limited (PSO)	0.0153**	0.2018	0.0027	0.0810	0.0045	0.0673
Shell Pakistan Limited (SHEL)	0.0035	0.0130	-0.0044	0.0558	0.0023	0.0477
Sui Northern Gas Pipelines Limited (SNGPL)	0.0056	-0.0047	-0.0042	0.0427	0.0013	0.0357
Sui Southern Gas Company Limited (SSGC)	0.0082	0.1413	-0.0001	0.0727	0.0039	0.0628

Source: Author's Calculation. Note: (*,**):different from zero at a 10% and 5% significance level respectively.

The study establishes a relationship between systematic risk and the government surplus so that, in the event that a nation state maintains a surplus, the tax burden and the interest

rate after tax will be there to support possibly on an additional profitable stage, as opposed to a nation state redeploying a shortfall or deficit.

While the beta value of Attock Petroleum Limited (APL) is 0.0091 and 0.1736, Burshane LPG (Pakistan) Limited (BPL) is 0.0034 and 0.0015, Hascol Petroleum Limited (HASCOL) is 0.0093 and -0.0660. It has been expressed and figured out that more steady the incomes that have been procured from the activities that are being performed which will prompt the decrease in the methodical gamble is made plans to the end that it because of the administration's capacity to oversee the property in a productive way.

The results further show that beta value of Hi-Tech Lubricants Limited (HTL) is 0.0088 and 0.0743, Oilboy Energy Limited (OBOY) is 0.0069 and 0.0974, Pakistan State Oil Company Limited (PSO) is 0.0153 and 0.2018, Shell Pakistan Limited (SHEL) is 0.0035 and 0.0130, Sui Northern Gas Pipelines Limited (SNGPL) is 0.0056 and -0.0047 and Sui Southern Gas Company Limited (SSGC) is 0.0082 and 0.1413. These results are aligning with theory of corporate finance and risk because our hypothesis upholds that bigger the organizations, better is their capacity to reduce the probable effects of the progressions in the political, social and practical climate which will lead the organizations to have a low systematic risk.

5. Conclusion and Policy Recommendations

The objective of this study was to assess the financial risk exposure of comparable energy corporations and the extent to which they have been exposed to systematic risk. This study examined the sensitivity and relationship of a sample of major oil and gas corporations to different financial risk factors. The study excludes global general variables such as the euro term structure and world dividend yields because, these global variables have less explanatory power than individual nation variables.

The results establish a relationship between systematic risk and the government surplus so that, in the event that a nation state maintains a surplus, the tax burden and the interest rate after tax will be there to support possibly on an additional profitable stage, as opposed to a nation state redeploying a shortfall or deficit. These results are aligned with theory of corporate finance and risk because our hypothesis upholds that bigger the organizations, better is their capacity to reduce the probable effects of the progressions in the political, social and practical climate which will lead the organizations to have a low systematic risk.

The study has important policy implication. To assisting investors in deciding where to invest, the study's findings aid government policymakers in defining their policies by capturing the entire market's dynamics and statistical information. This helps the government understand how policies implemented from an external perspective affect the market. For instance, the government's surplus reserves should exceed the deficit. Additionally, the excess results in a reduced beta value and low tax rates.

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