Exploring Philosophy of Co-Movements Between Stocks and Macroeconomic Variables

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Abstract
This study's background is to explore how significant are macroeconomic variables (MEV) in explaining stock movements in the developing economy for every sector and each firm of those sectors. To overcome the deficiencies of traditional index base studies, which provide only cumulative impact and response of MEV and Stock movements, fill the gap of existing literature that is not available for all Pakistan stock exchange (PSX). Panel ARDL Model with Co-Integration is using to achieve this objective. The results show that the overall sector response for changing independent variables was different from the firms from the same sectors in many cases. These results show superiority over the conventional method of using a stock index as the dependent variable, which shows only cumulative response, which was not comprehensive for taking the right portfolio and designing policy for economic development. This study has general applicability to developing economies.

Keywords:
portfolio, sectorial analysis, macroeconomic variables, stock market performance, panel ARDL model

Introduction

The stock market provides a platform for the participants interested in issuance buying and selling stocks of public limited companies. A stock market is a place where risk and rewards for a set of investments happen simultaneously, whereas most of the time, it also serves as a quick estimator to judge the country's economic condition. Official statistics for the 2020 first quarter of PSX reveals that overall investment stood around 6733 billion rupees in all sectors. This investment involves the, directly and indirectly, financial and physical participation of thousands of people. Stock markets hold investments of millions of participants in the country, thus keeping this fact in mind that it is pertinent to understand the overall mechanism, movements, and cause-effect relationship of this particular avenue by its relevant or proposed stakeholders.

Out of many available MEV tested as explained in past studies discussed in upcoming paragraphs, the most significant take for the current study and were; Inflation (IF), Foreign direct investment (FDI), Foreign exchange reserves (FOREX), Exports (EXP), and Interest rate (IR). When we look at the past literature, it finds that MEV had both negative and positive impact upon Stock market performance, like Boyd et al. (2001) by taking IF as an independent variable deduced that there is a significant and negative relationship of IF with banking sector development. Rapach et al. (2005) examined the predictive power of MEV for SR with a sample of 12 industrialized countries. The results indicate that IF was the most consistent and reliable predictor of stock return in all countries. Hondroyiannis & Papapetrou (2006) conclude that there is no SR on expected and unexpected IF Rates. The model used for the study was Markov switching autoregressive model.

Hasan (2008) shows that there exists a bidirectional relationship between SR and IF. Bekaert & Engstrom (2010) studied the impact of "IF" on the stock market with the fed model's impact. Their study mentioned a high temporal correlation between the yield on equity and yield on bonds in the United States, mainly attributed to co-movement between these yields and "IF." They provide results that countries with a high incidence of stagflation should have a high correlation between bond yield and equity yields, and this was proven right for international data.

Akbar et al. (2012) examine the relationship between "IR, ER" and SMR by using a multiple regression model on kse-100 index from 1998 through 2009; results show both the change in "IR & ER" has a significant impact upon SR for the period under consideration. Arouri &Rault (2011) tested long-run links between stock markets and Gulf Cooperation Council's oil prices. Using bootstrap panel co-integration techniques and seemingly unrelated regression (SUR) method, they suggest evidence for co-integration between oil prices and the stock market in GCC countries. The seemingly unrelated regression results indicate that oil price increase positively impacts stock prices except in Saudi Arabia.

Tiwari et al. (2017) studied the determinants of co-movement in stock returns for the 2007–2008 emergency. Given that the United States (US) was the emergency

epicenter, they dissect the variables driving the movement between US stock market returns and stock returns in 83 nations. The examination recognizes between the periods sometime recently and after the collapse of Lehman Brothers. The discoveries show that monetary linkages drove co-movement generally. There is also proof of 'demonstration effects' during the initial stage of the emergency.

Espinoza et al. (2012) show that in the past, the US business cycle leads the European one by a few quarters, and as a result, it will be useful in predicting the euro area gross domestic product. Their study investigated whether additional predictive power can gain by adding additional financial variables. The results indicate that additional financial variables do not increase GDP's predictive power; instead, it predicts US GDP with a slight error. Akbar et al. (2012) found a long-run equilibrium relationship between the KSE index and MEV. The study using co-integration after taking IR, MS, ER, FER, and IPI as independent variables, whereas The SP, shows positive relations with IR and MS and the negative relationship of FER and IF, whereas ER and IPI were considered insignificant.

While explaining investors' opinions, Jacobs & Levy (2013) explain that an investor's mindset or the understanding of the market by the investor determines investment approaches. They are of the view that investors who believe that markets are efficient, for the variation in prices are random and unpredictable and a wise approach is a passive investment, whereas those investors who believed that there is a clear-cut pattern in the stock movement consider a simple approach of buying stock with lower-price earnings ratios. Ramli et al. (2018) investigated intra-country comparison for finding the impact of MEV on the performance of SR. The countries selected for this study were South Africa, Brazil, China, Russia, and India, whereas MEV took as MS, ER, and IR. The results indicate that all the selected variables significantly impact the performance of SR in all countries under consideration.

Parab & Reddy (2020), using the Bai-Perron test, examines the impact of selected MEV on stock market returns and causal relationships. The results indicate a significant impact of MEV on stock market returns, varying across structural breaks. In Pakistan's context, Naz & Siddiqui (2020) explains that stock markets are of prime importance for a stable economy, and it is of utmost importance to know the short Run and long association between stock market performance and MEV to design stable economic policies. For this purpose, they tested the association of IR, IF, and ER, and they found that IR & ER positively effects Stock prices, whereas IF negatively impacts stock returns. Likewise, the impact of MEV varies from sector to sector or country to country. As explained in the above literature, when the same variable test on one sector, its outcome was entirely different from other sectors of the same country, or in other words, MEV turns out to be significant and insignificant for the same country but different sectors.

The discussion regarding causality between stock market performance and macroeconomic variables has provided different results for different economies. In the context of PSX, the prime focus of the earlier studies was to test the relationship between the overall performances of the stock market with the selected macro-economic

indicators, or in the case of sectors, only those sectors that were explored so far has the highest market capitalization. However, the individual firms or sectorial importance of the stock market is not exploring comprehensively yet. Considering above stated facts specifically in the context of Pakistan, one can easily understand the main crux of the earlier studies is to test the performance of overall index or indices from large selected sectors with MEV (Khan 2018; Akbar et al., 2012; Pervaiz et al., 2018)

As the existing literature covers either the stock index's overall performance or the selected sectors with the macro-indicators, it allows exploring all the firms' performance and test those sectors that have not taken in the same scenario. This condition will provide a new avenue to the policymakers, relevant participants, regulators, and other stakeholders to understand how they could respond when something is likely to happen in the future about the macroeconomic environment.

The novelty of the study is shown from its objectives, as the study will explore the role of MEV in explaining stock price movements by covering not only overall sector movement of all 35 sectors of PSX but for all selected individual firms from the same sectors as well, whereas in the past only stock index or few selected sectors were explored. This condition will provide not only how the overall sector responds to changing MEV but also how firms' share prices respond to these changes, which is very much significant for investors as investors do not make investments in all sectors and all firms they make investments in selected firms of selected sectors. It will give a better direction to stakeholders, and hence the decision-makers adjust the likely changes in case of expected movements in the macro-economic environment not at the sectoral level but for the firm level.

The study's objectives are: first, to find the impact of selected MEV upon each sector of PSX's overall performance. Second, to find the impact of selected MEV upon the performance of each firm of PSX. Third, fill the gap in the literature for PSX at both macro and micro levels for responsiveness with changing MEV.

Methods

For the current study, the research methodology adopted is research onion. It develops by sounders et al. (2007). The benefit of research onion is, it provides a detailed and systematic step for the research process. The essential fundamental research onion acts as an onion, as every layer has detailed information about the research methodology.

The research philosophy is positivism, which explained that reality is stable and cannot be changed. It can only be observed and described. The facts or the reality under the philosophy of positivism can be measure quantitatively. The research approach deals with the testing of facts and findings with the aid of a suitable design.

The deductive approach is selected for the current study as it is based upon predefined theory. The research strategy is archival research. For the sake of research choice, a mono method will be used, which considers only a single type of method as our current study will be only quantitative so that the mono method will be used. The

time horizontal for the study is 15 years from 2005 to 2020, and the data is longitudinal, and the nature of data is of secondary. The dependent variable data will be collected from the PSX website, whereas the data for MEV will be taken from the State bank of Pakistan. The selection of the sample was made in two steps. For the sector-wise study, 100% sample i.e., all 35 sectors, will be selected at the first instance. Second, for a firm-wise study, the essential criteria for firm selection are selecting all firms of every sector, provided that firm must have at least one complete year of monthly data available for any year that falls in the selected period. The total numbers of firms registered at PSX were 540, and out of these, 512 firms meet the selection criteria.

The Panel ARDL Model with Co-integration is used (Pesaran et al., 2001). The reason to adopt this technique is that it is suitable not only for a large set of samples but also for a small set of the sample as well, besides this benefit of sample size it provides information about the structural break in data. It supports in the correction of problems regarding residual serial correlation and endogeneity in variables. It is an ordinary least square-based model that is applicable for non-stationary time series as well as for those time series which has mixed order of integration. Moreover, it takes a sufficient number of lags to capture the data generating process from general to specific modeling framework..

Model is consistent of one dependent variable (SMR) and five independent variables i.e. EXP, FDI, FOREX, IF and IR. PMG estimator is used to find long run and short run co-integration and significance of variables.

$$\Delta SMR_{it} = \alpha_i + \alpha_{1i} \Delta EXP_{it} + \alpha_{2i} \Delta FDI_{it} + \alpha_{3i} \Delta FOREX_{it} + \alpha_{4i} \Delta IF_{it} + \alpha_{5i} \Delta IR_{it} + \gamma_i SMR_{it-j} + \beta_1 EXP_{it-j} + \beta_2 FDI_{it-j} + \beta_3 FOREX_{it-j} + \beta_4 IF_{it-j} + \beta_5 IR_{it-j} + \mu$$

Model is based upon one dependent variable such as stock prices of individual firm shown as IFP and five independent variables i.e. EXP, FDI, FOREX, IF and IR. MG estimator is used to find long run and short run co-integration and significance of variables.

$$\Delta IDFP_{it} = a_i + a_{1i} \Delta EXP_{it} + a_{2i} \Delta FDI_{it} + a_{3i} \Delta FOREX_{it} + a_{4i} \Delta IF_{it} + a_{5i} \Delta IR_{it} + \gamma_i IDFP_{it-j} + \beta_1 EXP_{it-j} + \beta_2 FDI_{it-j} + \beta_3 FOREX_{it-j} + \beta_4 IF_{it-j} + \beta_5 IR_{it-j} + \mu$$

Result and Discussion

This study conducts for all 35 sectors of PSX and 512 firms from those sectors that fulfill the selection criteria. After applying the ARDL model to every sector and then for each selected firm of the same sector for both short-run and long-run relationships. Table 1 and Table 2 shows both short run and long results for the role of MEV in determining stock price movements for every sector. These tables show sector-wise results and indicate that out of 35 sectors, it was significant was every MEV in explaining stock movements.

Table 1 shows the overall sector response for changing MEV in the short run. IR was positively significant for two sectors and negatively significant for 30 sectors. Next, Exp was positively significant for 22 sectors and negatively significant for 11 sectors.

FER was positively significant for 27 sectors and negatively significant for four sectors. IF was positively significant for 24 sectors and negatively significant for six sectors. FDI was positively significant for 27 sectors and negatively significant for six sectors. By positively significant, it is mean that with a change in the independent variable, the change in the dependent variable is also in the same direction. By negatively significant, it means that with a change in the independent variable, the change in the dependent variable is opposite.

Table 1. Overall sector response for changing MEV in Short Run

Short Run	Interest Rate	Exports	Foreign Exchange Reserve	Inflation	Foreign Direct Investment
Insignificant	3	2	4	5	2
Positive Significant	2	22	27	24	27
Negative Significant	30	11	4	6	6
Total Sectors	35	35	35	35	35

Table 2 shows the result for sector response for changing MEV in the long run. IR was positively significant for three sectors and negatively significant for 29 sectors. Export positively significant for 18 sectors and negatively significant for 13 sectors. FER was positively significant for 17 sectors and negatively significant for 12 sectors. IF was positively significant for four sectors and negatively significant for 29 sectors. FDI was positively significant for 24 sectors and negatively significant for eight sectors. By positively significant, it is mean that with a change in the independent variable, the dependent variable changes are also in the same direction. By negatively significant, it means that with a change in the independent variable, the change in the dependent variable is opposite.

Table 2. Overall sector response for changing MEV in Long Run

Long Run	Interest Rate	Exports	Foreign Exchange Reserve	Inflation	Foreign Direct Investment
Insignificant	3	4	6	2	3
Positive Significant	3	18	17	4	24
Negative Significant	29	13	12	29	8
Total Firms	35	35	35	35	35

Table 3 and Table 4 show both short run and long results for the role of MEV in determining stock price movements for 512 firms. These tables show firm, wise results and indicate that out of 512 firms, every MEV in explaining stock movements. In the long run (Table 3), FER was positively significant for 268 firms and negatively significant

for 81 firms. IR was positively significant for 127 firms and negatively significant for 317 firms. IF was positively significant for 54 firms and negatively significant for 318. EXP was positively significant for 265 firms and negatively significant for 95 firms. FDI was positively significant for 157 firms and negatively significant for 54 firms. By positively significant, it is mean that with a change in the independent variable, the change in the dependent variable is also in the same direction. By negatively significant, it means that with a change in the independent variable, the change in the dependent variable is opposite.

Table 3. Individual firm response for changing MEV in Long Run

Long Run	Interest Rate	Exports	Foreign Exchange Reserve	Inflation	Foreign Direct Investment
Insignificant	68	152	162	140	301
Positive Significant	127	265	268	54	157
Negative Significant	317	95	81	318	54
Total Firms	512	512	512	512	512

In the short run IR (Table 4), FER was positively significant for 237 firms and negatively significant for 72 firms. IR positively affects 285 firms and negatively affect 37 firms. Otherwise, IF positively influence 225 firms and negatively influence 68. Next, EXP positively affects 195 firms and negatively affect 63 firms. FDI was positively significant for 102 firms and negatively significant for 77 firms. By positively significant, it is mean that with the change in the independent variable, the change in the dependent variable is also in the same direction. By negatively significant, it means that with a change in the independent variable, the change in the dependent variable is opposite.

Table 4. Individual firm response for changing MEV in Short Run

Short Run	Interest Rate	Exports	Foreign Exchange Reserve	Inflation	Foreign Direct Investment
Insignificant	190	254	203	219	313
Positive Significant	285	195	237	225	102
Negative Significant	37	63	72	68	77
Total Firms	512	512	512	512	512

The overall sector's response to this MEV in both the short run and long run was different. Some variables which were proved significant in the short run turned into insignificant in the long run, or in many cases, it was positive in the short run and negative in the long run. The Selected firms in the same sector show just like overall sector response, they show a different performance for both the short and long run. Some variables that were proved significant in the short turned into insignificant in the

long run. While comparing results for firms within the same sector, it finds that the impact of MEV was not the same for all firms. Some significant variables for some firms came out to be insignificant for other firms of the same sector. While comparing each selected firm's result with the overall sector outcome, the response was different for both the overall and individual firms for the same variable.

The results of this study are consistent with the studies of (Saleem et al., 2013; Adjasi et al., 2008; Hamrita et al., 2009; Bai, 2014; Giri & Joshi, 2017; Hussain et al., 2012; Kalyanaraman & Tuwajri, 2014; Paramati et al., 2016). All these studies show the impact of this MEV were either positive or negative, whereas the results obtained are not in line with the findings of (Quadir, 2012; Hasan, 2008; Humpe & Macmillan, 2009; Akbar et al., 2012; Ho & Odhiambo, 2019).

Conclusions

This research will fill the literature gap with a more comprehensive explanation of the role of MEV in stock movements applicable beyond the sample country's geographical boundaries. There are almost 130+ developing economies, and one common feature of developing economies is they have identical characteristics in economic and financial structure. As the study conducted in Pakistan is also a developing economy, these results can be generalized conveniently in the same countries.

The practical implication for this study is multifold. For policymakers, it provides guidelines that one economic policy for all sectors is not the right strategy. The results suggest that if we take an example of FDI, it positively impacted 24 sectors and negatively impacted eight sectors, so the government must devise different policies for both sectors. The policies emphasize having more and more foreign direct investment in PSX in all sectors, as some sectors showed a negative response, which will not be suitable for those having an interest in them. Similarly, in both the short and long run, the responses were different, so key policymakers must consider these time frames before designing and implementing new policies.

It is of utmost importance for investors to keep an eye on changing MEV and its impact upon stock movements. This study provides firm, wise details so if any firm from the constructed portfolio shows any negative impact due to changing MEV or if there is an expectation of change in MEV which can adversely impact the portfolio based upon the information provided by this study.

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