3. DO MUTUAL FUND FLOWS INFLUENCE STOCK MARKET VOLATILITY? FURTHER EVIDENCE FROM EMERGING MARKET

Fiza QURESHI[1]
Saba QURESHI[2]
Sobia Shafaq SHAH[3]

Abstract

This study investigates the dynamic relationship between 27 different classes of mutual funds and stock market volatility in Pakistan. Using wavelets at multiple time horizons, the findings reveal both positive and negative association between the majority of mutual fund classes and stock market volatility, which implies momentum and contrarian feedback behavior of mutual funds in response to high stock market fluctuations. The results confirm that the relationship between variables is assorted in nature. The correlation between variables confirms the short-term relationship. Moreover, the Granger coherence results are momentous for some of the mutual fund classes, which reflect long-run components holding the forecasting ability. These conclusions assist in foreseeing and hedging strategies against market losses and have important policy implications for investors, portfolio managers, market analysts, and policymakers.

1. Introduction

The development of financial sector has been closely linked with the economic growth of any country. Among other factors, mutual funds as a financial intermediary and stock market variables as a basic indicators of earning potential could be conceptualized as important drivers of financial sector development. Primarily, one strand of   extant literature

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[1] *Institute of Business Administration, University of Sindh, Jamshoro, 76090, Sindh, Pakistan. Email: fiza.qureshi@usindh.edu.pk. *Corresponding Author. ORCID: https://orcid.org/0000-0002-3730-6084.*

[2] *Institute of Business Administration, University of Sindh, Jamshoro, 76090, Sindh, Pakistan. Email: qureshisaba1990@gmail.com. ORCID: http://orcid.org/0000-0002-7732-958X.*

[3] *Institute of Business Administration, University of Sindh, Jamshoro, 76090, Sindh, Pakistan. Email: sobiashah@hotmail.com. ORCID: http://orcid.org/0000-0002-4923-7354.*

documents that mutual funds, being the institutional traders, help in controlling the market risk and volatility through diversification and liquidity, and follow the market performance rationally (*e.g.*, Dennis and Strickland, 2002; Kaniel *et al*., 2008). On the contrary, it has also been argued that institutional investors depict concurrent reaction with the stock market and raise their trading activities in times of high market volatility (Sias, 1996). This reflects that being institutional investors, mutual funds may engage in herding the stock market activity that may accelerate price movements and increase volatility. In this regard, some empirical studies indicate a positive relationship between mutual funds and stock market volatility (such as Sias, 1996; Brown *et al.*, 1996; Dennis and Strickland, 2002), while other reported a negative association between the professional trading and stock market volatility (Reilly and Wachowicz Jr, 1979; Reilly, 1977; Grier and Albin, 1973). Thus, the previous literature documents the mixed and contradictory evidence pertinent to the underlying nexus between mutual funds and stock market volatility.

The notion of mutual funds' significant influence on lowering market volatility draws impetus from the rationale that mutual funds, being the institutional investors, help in risk mitigation and volatility reduction through information and diversification. It has been argued that being an institutional investor, mutual funds could greatly influence the stock market variables through their trading activities (Edwards and Zhang, 1998). Although the underlying phenomenon of stock market returns and stock market volatility have been extensively studied[4] in developing countries' context, the literature on the nexus between mutual funds and market volatility is limited and has received scant attention, particularly in the emerging economies, where security market mechanisms are mostly fragile and unpredictable. There is a handful of studies that looked into mutual funds and equity market dynamics in Pakistan; however, these studies are primarily focused on evaluating mutual funds growth and performance at firm/sector level or micro level (Shah *et al.*, 2005; Khalid *et al.*, 2010). In addition, the findings of these studies are generally descriptive in nature and endorse the upside potential of mutual fund industry. Nevertheless, there is hardly any literature on the mutual funds and market volatility at the macro or industry level in Pakistani context according to the best estimate.

Generally, mutual funds are considered as viable solution in complex circumstances by offering numerous benefits and services to investors over direct investment in financial markets. The global financial outlook witnessed that the asset management industry has made remarkable progress in providing financial services to its valued customers and has expanded tremendously worldwide from the last two decades (Qureshi *et al.*, 2017a). The mutual funds industry in Pakistan also witnessed considerable growth during the last two decades. Primarily, the mutual fund industry holds 53 percent of the total asset of non-banking financial institutions (NBFI) in Pakistan.[5] Currently, Pakistan is being viewed as an attractive destination for global investors due to recent policy reforms, liberalization, financial market reforms and preferential treatments to foreign investors, which have attracted the foreign direct investment from all around the globe after 1990 (Shah *et al.*, 2019). Although the mutual fund industry of Pakistan has grown as one of the most preferred investment option for all categories of investors in the developing markets, however, stock market volatility has emerged as the main challenge for the sustainable development of the Pakistan stock market in recent times. Notably, Pakistan is confronting this problem largely due to the absence of efficient investments, regulations and proper market mechanisms over the

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[4] *Studies such as Luo et al. (2016); Bannigidadmath et al. (2016); Chakraborty et al. (2016).*

[5] *See Figures 4A and 5A, available online in supplementary appendix.*

securities' market (Khan and Ahmed, 2019). The unpredictable market patterns and volatility in securities' prices warrants the need for studying and understanding the technical and analytical scrutiny of financial securities for rational and profitable investment decision making. This study begs the fundamental question of whether mutual funds can bring stability in the Pakistani stock market given its riskiness. The underlying rationale that as mutual funds undertake various strategies to tradeoff between risk and return (depending on the objective of funds) there is need to examine and offer the empirical evidence concerning the overall effect of mutual funds trading on stock market fluctuations. Drawing on the work of Qureshi *et al.* (2017a, 2017b, 2019), this study examines the association of mutual funds-volatility nexus   in a time and frequency framework. Qureshi *et al.* (2017a, 2017b, 2019) focused on few mutual fund classes (equity, bond, balanced, money market funds) in a VAR setting; however, this study investigates 27 various mutual fund classes, and thus, provides empirical evidence of comparative analysis of several active mutual fund classes with stock market volatility in Pakistan at different time scales.

The contributions of the present study to the strand of financial economics are extensive. First, this study investigates the relationship of 27 diverse classes of mutual funds and stock market volatility in the context of Pakistan. It investigates the investment behavior of each mutual fund class and the impact of their trading on stabilizing stock market risks and uncertainties, thus explores and compares the role of different mutual fund classes with stock market volatility in Pakistan. The comparative analysis provides meaningful implications in determining the driving force of mutual fund industry in the Pakistan's emerging financial market. Second, the present study's methodology and analysis departs from the previous work   – in particular, that of Qureshi *et al.* (2017a, 2017b, 2019) – on mutual fund-market volatility association. The study employs distinct methodology as its estimation approach which is different from the one used in the existing literature. Our study is the first empirical work, to the best of our knowledge, which adopts the Wavelet-based analysis in evaluating the relationship of fund flows and financial market volatility, contrary to the earlier approach of Vector Autoregressive (VAR) model.[6] The Wavelet-based technique determines and segregates the components that capture information across various time scales and identify at which time horizon the relationship is more prominent, whereas previous studies follow Vector Autoregressive (VAR) model to determine the causal relationship between mutual fund flows and stock market variables (*e.g.*, Edwards and Zhang, 1998; Ben-Rephael *et al.*, 2012; Jank, 2012; and Qureshi *et al.*, 2017b). However, the VAR models used in the previous literature do not reflect in-depth association at different time scales. The estimations from VAR model are generalized and concluded based on whole sample data and the results depict average analysis. The wavelet-based techniques used in this study offer a comprehensive, thorough and detailed analysis by separating the data into numerous time scales. The choice of applying wavelet analysis is due to gaining better and in-depth insight from high frequency data (daily data) to examine both short-run and long-run aspects of the association between mutual funds and market volatility and segregate components that encompass information across diverse time-scales/frequencies (Qureshi *et al.*, 2020b). Hence, our results show detailed and in-depth analysis on the mutual fund-market volatility nexus at different time scales.

Third, the findings of this study supplement previous literature, particularly Qureshi *et al.* (2017a, 2017b, 2019), with respect to lead-lag association and short/long run dynamics

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[6]*Qureshi et al. (2020b) employed Wavelet based methodology in determining the relationship between mutual funds and predictive economic indicators only.*

between various fund classes and stock market volatility. In particular, our findings suggest varied linkages between the different mutual fund classes and stock market volatility, which imply both momentum and contrarian feedback behavior of mutual funds during adverse financial market conditions. The diverse relationship is observed which could be due to various nature and objectives of mutual fund classes and trading behavior in financial markets. It is observed that few mutual funds and volatility pairs show significant bidirectional relationship, which implies that asset management sector in Pakistan needs to develop and progress and commove with financial market moments. Further, the empirical findings on different time scales are expected to shed further light on the role of mutual funds in the diverse stock market and economic conditions when making rational decision making, thus provide thorough knowledge about flight-to-quality strategies among different classes in the context of an emerging economy.

The rest of the paper is organized as follows. Section 2 proceeds with the estimation technique. Data and variables are discussed in Section 3. Section 4 presents results and discussion of the results. Finally, Section 5 concludes the paper.

2. Empirical Model

2.1. Estimation Technique – The Wavelet Analysis

The study employs the wavelet technique to produce structural data, containing fragments of assorted lengths. Different applications of wavelet methodology in finance and economics have been incorporated by Percival and Walden (2000), Gençay *et al*., (2001b), and Gençay *et al*., 2001a). One of the advantages of this analysis is the time series decomposition into underlying functions that provides serial information (Qureshi *et al*., 2018). The various scales of time series retrieve functional information from the data. This study investigates the interdependence of stock market volatility and mutual fund flows based on multiple time scales to examine the extent of interaction using daily data. The study examines whether investment by mutual funds can help in stabilizing stock market volatility. If the mutual fund flows are found to have negative feedback/lagging behavior, it would imply that mutual funds' trading can reduce the market volatility by decreasing market trading activity and switching for alternative safer avenues. Moreover, leading negative behavior would imply negative price pressure in the market, which entails a decline in market trading; thus, decrease in the market price fluctuations. The wavelet-based analysis gave a detailed analysis and estimation of the causal relationship between market volatility and mutual fund flows. The detailed discussion on Discrete Wavelet Transformation, Continuous Wavelet Transformation and Wavelet Granger Coherence Analysis are available online in the supplementary appendix.

3. Data and Variables

To assess the mutual funds' association with stock market volatility in Pakistan, we extracted the daily data from 2006 to 2020, *i.e.*, the data of mutual funds and market returns from various databases. However, due to the non-availability and missing data problem of mutual funds, various sample time periods are selected and analyzed. The details of the total number of firms and observations of each mutual funds and sample time period are given in Table 1.

Mutual Funds Data Description

	Total Number of firms	Sampling time period		Total observation for the analysis	Total firms' observations
Classification based on General Category					
Open ended mutual funds	233	4/23/2008	12/31/2020	2658	619314
Close-ended mutual funds	11	5/16/2006	12/31/2020	3817	41987
Fund of Funds	10	4/30/2009	12/31/2020	2392	23920
Classification based on Investment objectives					
Balanced Funds	68	5/16/2006	12/31/2020	3164	215152
Bond funds	80	10/3/2006	12/31/2020	3064	245120
Money Market Funds	41	5/2/2008	12/31/2020	2651	108691
Equity funds	87	8/10/2006	12/31/2020	3102	269874
Classification based on Fund rating class focus					
AAA rated mutual funds	10	6/2/2008	12/31/2020	2630	26300
BBB rated mutual funds	10	10/3/2006	12/31/2020	3064	30640
Classification based on Market capitalization focus					
Broad market cap mutual funds	8	5/5/2008	12/31/2020	2650	21200
Large market cap mutual funds	5	1/1/2009	12/31/2020	2477	12385
Classification based on Maturity band					
Short term mutual funds	10	5/2/2008	12/31/2020	2651	26510
Intermediate mutual funds	5	1/4/2010	12/31/2020	2215	11075
Classification based on Strategy					
Aggressive mutual funds	5	6/2/2008	12/31/2020	2630	13150
Conservative mutual funds	3	9/5/2011	12/31/2020	1780	5340
Blend mutual funds	44	8/10/2006	12/31/2020	3103	136532

	Total Number of firms	Sampling time period		Total observation for the analysis	Total firms' observations
Aggregate mutual funds	71	8/24/2007	12/31/2020	2832	201072
Government mutual funds	15	5/2/2008	12/31/2020	2651	39765
Inflation-protected mutual funds	2	11/1/2007	12/31/2020	2782	5564
International/global mutual funds	1	7/4/2011	12/31/2020	1825	1825
Global allocation strategy mutual funds	7	4/24/2008	12/31/2020	2657	18599
Growth Strategy	12	8/10/2006	12/31/2020	3103	37236
Classification based on General Attributes.					
Index funds	5	1/12/2009	12/31/2020	2470	12350
Islamic funds	92	4/24/2008	12/31/2020	2657	244444
Classification based on equity style based					
Blend funds	21	8/11/2006	12/31/2020	3101	65121
Growth funds	13	6/2/2008	12/31/2020	2630	34190
Value funds	53	5/16/2006	12/31/2020	3164	167692
Total	922			73920	2635048

Table 1 shows that total data of 922 mutual funds under eight different classes have been taken for analysis separately. This selection of period is based on data availability. We feel this sample is large enough to capture the multi-horizon behavior of the variables. To calculate the total/aggregate mutual fund flows, we follow Ferreira *et al*. (2012) and Ferson and Kim (2012).

$$Flows_{i,t} = [TNA_{i,t} - TNA_{i,t-1}(1 + R_{i,t})]/TNA_{i,t-1} \qquad (1)$$

where: $TNA_{i,t}$ stands for the total net asset of fund *i* in the dollar amounts at the end of time period *t*, and $R_{i,t}$ stands for fund *i*'s return in time period *t*. The TNA and return data of each mutual fund (firm) are extracted on daily basis to calculate the total mutual fund flows of each fund (firm). Then, the flows of each firm were calculated based on the formula in equation 1. After generating flows of all funds (firms) under each class (for instances, open end fund), all flows are summed up to generate the tot2al fund flows of that class (for instance summation of all flows under open end mutual funds). The study adopts the aggregation method following Qureshi *et al*. (2017a). Qureshi *et al*. (2017a) aggregated flows of all firms of each period to find out total net sales/trading by each mutual fund.

Our sample consists of Pakistan and noted that the mutual fund industry has experienced immense growth over the past years. The total sample consists of 27 different classes of mutual funds.[7] The market index return (PSX) data is obtained from DataStream. The details

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[7] *The different classes of mutual funds taken under this study are shown in Table 1.*

of data sources, definitions and variables taken under this study are given in Table 6A (available online in the supplementary appendix). The calculation of returns is based on the first difference of log of prices. The stock market volatility is calculated by estimation of the GARCH (1,1) model and conditional variances are predicted from the model following Cao *et al.* (2008) and Qureshi *et al.* (2017b; 2019).

4. Results and Discussion

4.1. Descriptive Statistics

Table 2A (available online in the supplementary appendix) reports the descriptive statistics of mutual fund classes and stock market volatility.[8] The Jarque-Bera (JB) test results show that the hypothesis of normality is rejected for all the variables. The average value of closed-end flows and global strategy fund flows is negative, implying the negative trend of the flows. It is noted that the average value of money market flows, open-end flows and Islamic fund flows is high as compared to other variables. Further, the higher standard deviation of open-end flows indicates higher volatility persistence. The coefficients of skewness for all the variables exhibit positive skewness except broad market fund flows, inflation-protected fund flows and closed-end flows. The coefficients of kurtosis confirm the presence of leptokurtic properties.

Figure 1A (available online in the supplementary appendix) displays the plots for empirical data. It is observed that the fund of fund flows, open-end flows, money market flows, conservative fund flows, global strategy fund flows and inflation-protected fund flows are characterized by low variability of returns, whereas the stock market volatility, Islamic fund flows, blend strategy flows, balanced fund flows, closed-end flows, equity fund flows, value fund flows, blend equity flows and growth strategy fund flows are characterized by high variability of returns and clusters of volatilities. Moreover, one may see that the mutual fund flows are highly volatile from mid-2007 until the end of the period. The flows fluctuated more after the global financial crisis. The stability in fund flows is observed on average for the 2006 period. Further, the persistent trend of fluctuations is noticed in the majority of the fund flows and stock market volatility series throughout the sample period. The change in variances over time is followed by large or small changes in either sign. However, the phenomenon of the volatility clustering is particularly strong in the stock market returns. It is further noticed that the intermittent volatility clusters persist for blend strategy flows, balanced fund flows, bond fund flows, equity fund flows, closed fund flows, blend equity flows, value fund flows and large-cap fund flows.

4.2. Results of Wavelet Correlations

The series is decomposed into detailed and smooth timescales (mother and father wavelet, respectively) capturing highest frequency components. Thus, D1, D2, D3 is followed by medium term and long-term variations corresponding to changes in 1-2, 2-4, 4-8, 8-16, 16-32, 32-64, 64-128, 128-256 and scale beyond 256 days (Qureshi *et al.*, 2020a).

Table 3A (available online in the supplementary appendix) provides the wavelet correlations for DWT of mutual fund classes and stock market volatility. It is observed that the degree of correlation of stock market volatility with balanced fund flows, large-cap fund flows, blend

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[8] *Descriptive statistics of all mutual fund classes are not shown for brevity purpose. The result will be provided upon request.*

fund flows, money market flows, aggregate fund flows, government strategy fund flows and BBB fund flows decreases until D4 scale and increases for subsequent two scales (D5 and D6). However, it is interesting to see that the magnitude declines at D7 and D8 scale indicating an inconsistent pattern. Similarly, this unpredictable pattern of stock market volatility is also observed with growth strategy fund flows and inflation-protected fund flows, since each scale reveals a different magnitude of increase and decrease in the correlation coefficients, thus confirming uncertainty of interrelation with stock market volatility. The fund flows in general either have contrarian or momentum behavior, implying that they can go against the stock market and may move together.

Moreover, the correlation coefficients of stock market volatility are weak with closed-end flows, fund of fund flows, money market flows, index fund flows, and conservative fund flows. The plausible reason is that all these funds do not invest directly in the portfolio of the stock market, except the index fund. For index funds, the study observed that currently, only five mutual fund companies are active in Pakistan,[9] which shows a declining trend of index mutual fund firms and thus, reduced stock market investment. However, there is a high degree of correlation at higher time scale of stock market volatility with fund of fund flows, broad market fund flows, index fund flows, blend strategy fund flows, global allocation fund flows and global strategy fund flows, revealing the strong association of stock market volatility and fund flows in the long run. It is noticed that overall, there is a negative correlation between stock market volatility and mutual fund classes, except for intermediate and Islamic fund flows, suggesting that intermediate and Islamic funds increase their trading with the rise in stock price fluctuations. However, this relation diverges to positive over brief time spans.
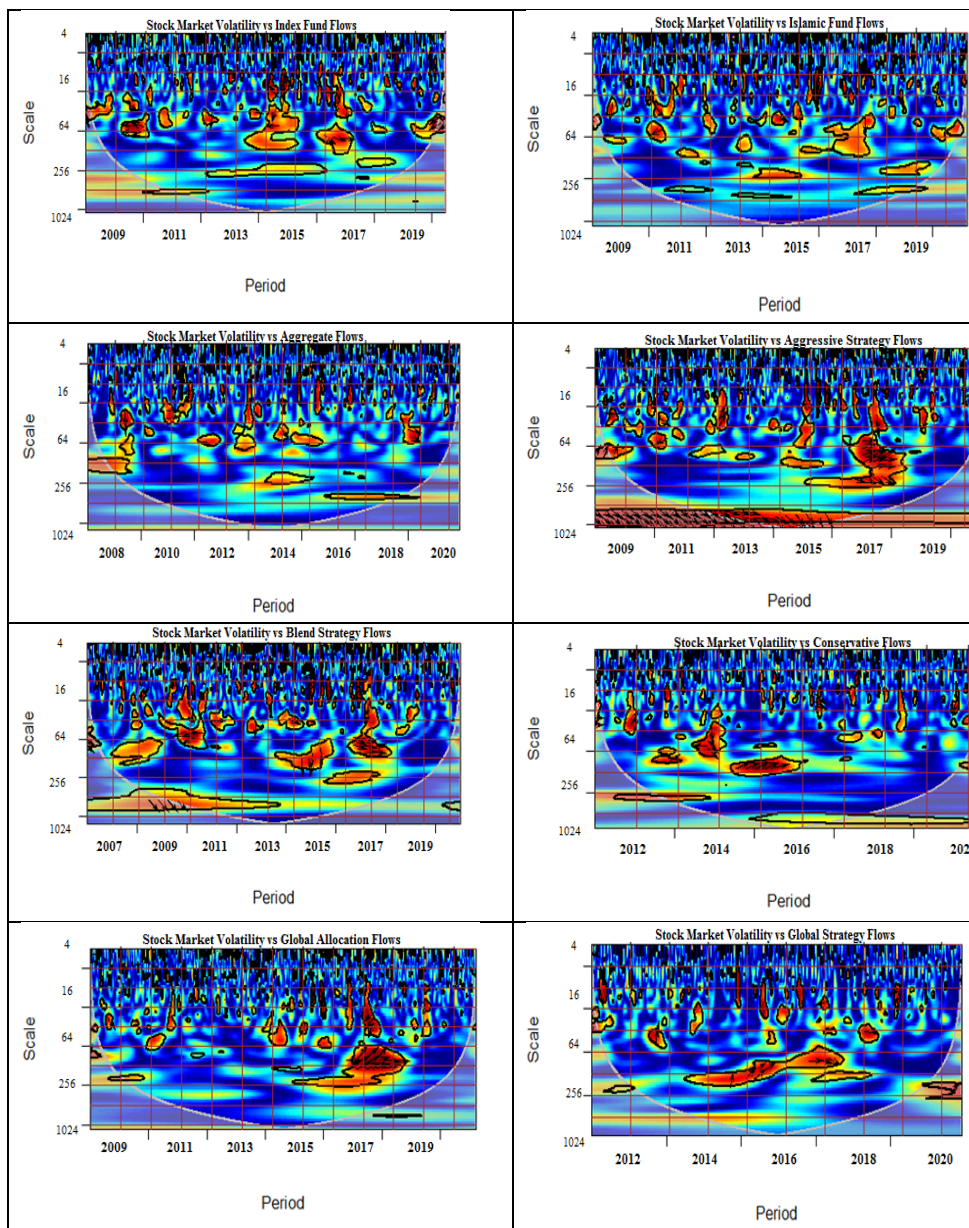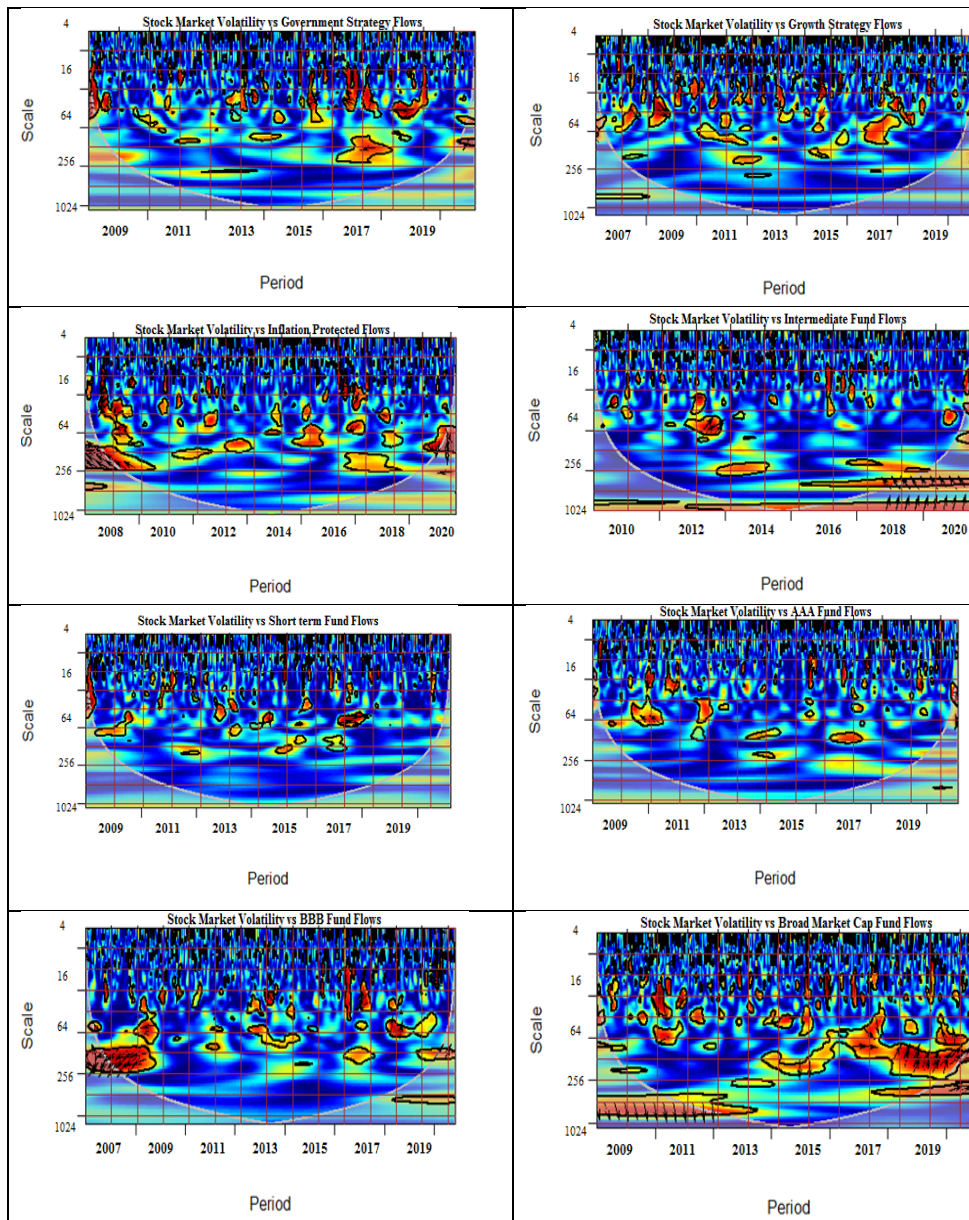
4.3. Results of Wavelet Coherence

Figure 1 illustrates the wavelet coherence transforms of the variables, based on the Continuous Wavelet Transformation (CWT). The strong interdependence is represented by the red area. The plots also provide relative time series phasing by means of phase arrows, which signify the cause and effect interactions among mutual fund classes and stock market volatility. The positive correlation is indicated by arrows, pointing to the right, while the negative correlation is indicated by arrows pointing to the left. If an arrow points to left-up or right-down, it means that the first variable is leading, whereas, if an arrow points to left-down or right-up, it means that the second variable is leading.

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[9]*The names and details of each mutual fund firm have not been provided for brevity purpose. They may be provided on request.*
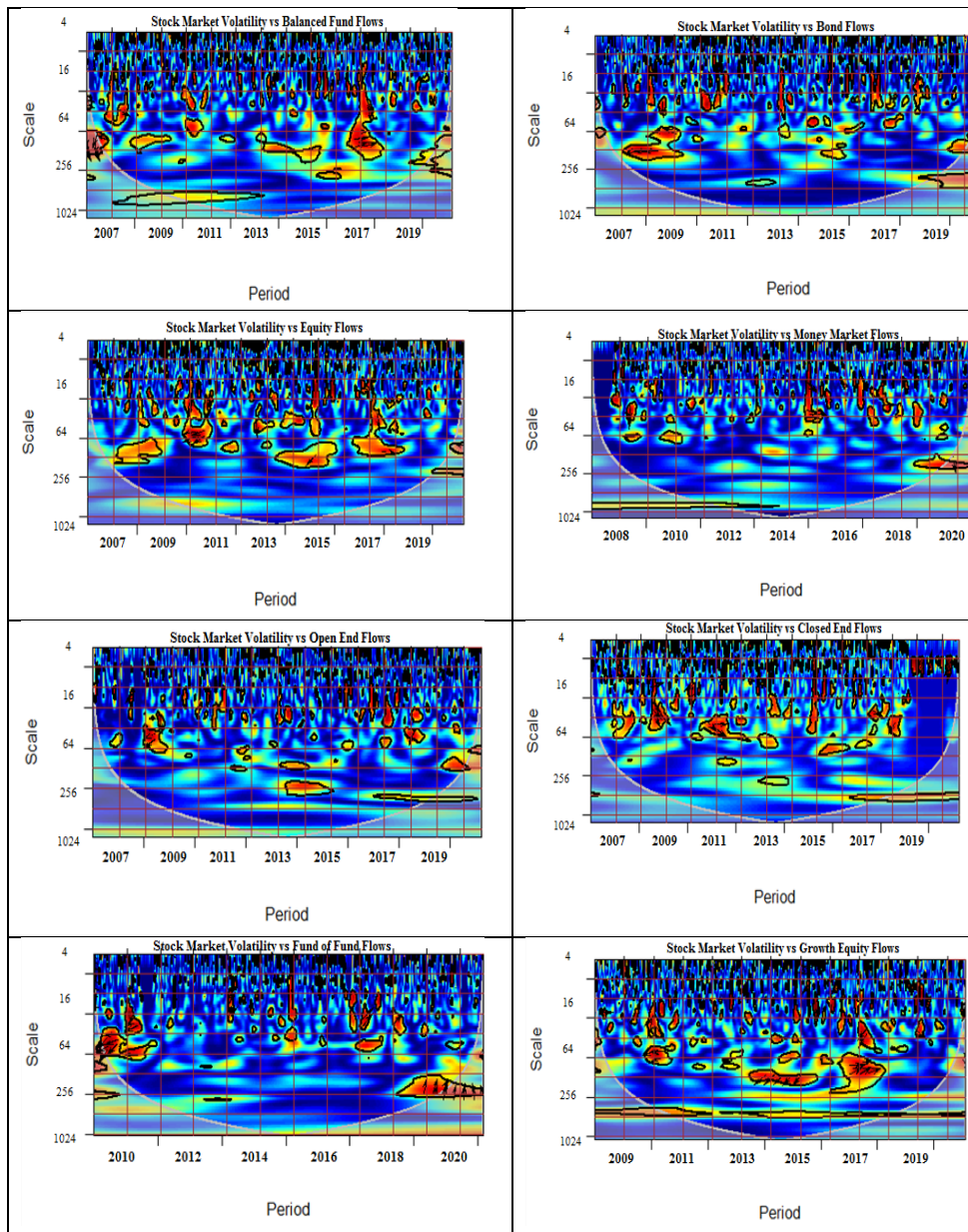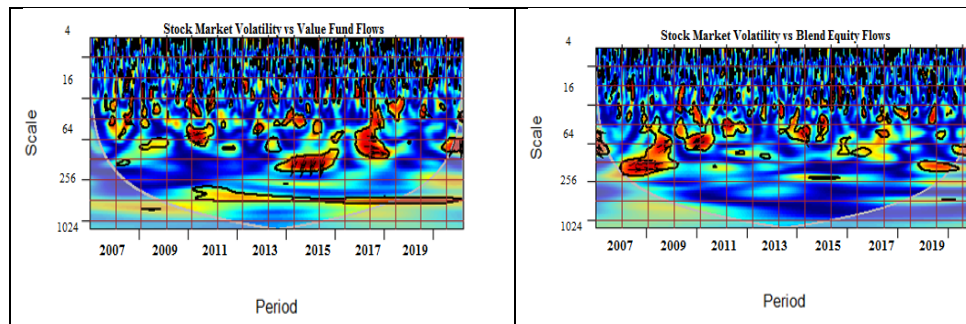
Figure 1

Wavelet coherence plots of mutual fund classes and stock market volatility

We find instances of high association between stock market volatility and balanced fund flows existing up to 256 days scale during 2007-2009 and 2016-2018. Thus, it implies that the stock market volatility greatly mirrors that of the balanced flows in the long run during market turbulences. Moreover, the diverse periods' coherence is observed particularly at 32 days scale. The arrows indicates that balanced fund flows can be predicted accurately, based on the volatility of the stock market because balanced flows strongly chase the previous patterns of the stock market. Moreover, the coherence plot shows high correlation among stock market volatility and BBB fund flows during the start and end of the sample, particularly from 16 to 256 days scale; hence, pointing to a broader nature of correlation. The predictive content of fund flows is further confirmed.

The dependence of stock market volatility and blend equity fund flows is witnessed from 2007 to 2011 over different frequency scales. Besides, a mixed pattern of lead and lag relation is found. The blend equity flows lead stock market volatility in the mid-run, while fund flows lag behind the stock market volatility in the long run. Furthermore, the strong significant coherence is evidenced between stock market volatility and broad market fund flows throughout the sample, whereby increased co-movements are seen from 2018 to 2020. The prolonged relationship is manifest up to 512 days scale. Further, it is revealed that the stock market volatility controls broad market fund flows.

The relationship between stock market volatility and fund of fund flows shows significant interrelationship only during 2011, 2017 and 2018 at high frequency scales indicating presence of short term traders. While at 256 days scale, the significant relation is observed around 2020. Similarly, the relation of stock market volatility with growth strategy, Islamic flows, aggregate and closed end flows shows that the relation is limited to short run and transitory. However, the stock market volatility and growth equity flows show significant interrelation in the short and medium term. It is noticed that the coherence is persistent among market volatility and growth equity flows from 2013 to 2018. It is seen that the correlation is negative during 2013-2015 and later becomes positive after 2016. The change in direction of arrows reveals that both variables preside over each other at different scales.

With regard to stock market volatility-equity flows, we note significant short run coherence predominantly from 2008 to 2018. The stock market volatility leads equity fund flows. Similarly, the interdependence of stock market volatility with open-end flows, money market flows and government strategy flows is insignificant in the long run. However, momentary significant areas are evinced at higher frequency scales from 2007 to 2009 and 2014 to 2017, where the movement of arrows shows that the fund flows lag behind stock market volatility. It is observed that for stock market volatility-open end flows pair, open-end flows

lead stock market volatility. In addition, the relation between stock market volatility and global allocation flows is particularly dominated from 2014 to 2018. However, the relation is limited on short and medium term.

The coherence of value fund flows and stock market volatility shows significant interrelation in different periods till 512 days scale. It is noticed that pointing of arrows divulge the leading position of fund flows and stock market volatility in 2015 and 2017. Moreover, for the stock market volatility-bond flows, we find that few significant areas cover different scales, thereby explaining the distractions in high integration of the pair. It is found that the degree of correlation increased during the financial crises, thus indicating the effect of financial contagion and implying investors' switch towards fixed and safer investment securities.

The stock market volatility and conservative fund flows exhibit significant positive correlation during the period of 2014 to 2018 and in the various time scales. Further, there is evidence of intermittent mid-run association between market volatility and inflation protected fund flows. However, the correlation is found to be negative and market volatility leads fund flows. The relationship is significant from 2008 to 2010 and in 2017. Similarly, stock market volatility and global strategy flows exhibit long-run dependence from 2014 to 2018. However, it is interesting to note that the flows lead the stock market volatility. In addition, the interdependence of market volatility with aggressive strategy and blend strategy flows show strong dependence in the medium and long run. These fund flows strongly lag behind stock market volatility over various periods.

The association of stock market volatility and AAA fund flows display infrequent weak episodes of coherence. Further, the coherency of market volatility with intermediate, short term and large cap is mostly negligible.[10] In general, we observe dynamic and time varying dependence between market volatility and fund flows. The interrelation is mostly short run and alternating with the leading role of market volatility. However, few pairs exhibit long run dependence. Both positive and negative correlations are found indicating that the mutual fund trading activities mostly reflect that of the stock market volatility and can increase or reduce it. Table 4A (available online in the supplementary appendix) presents the summary of fund flows classes with stock market volatility.

4.4. Results of Granger Causalities

We next examine the Granger causalities at various frequencies to scrutinize the forecasting ability and alternating causalities among variables. The Granger coefficients of coherence are displayed in Figure 3A (available online in the supplementary appendix).[11] The coherence coefficients identify the magnitude, to which stock market volatility Granger causes mutual fund classes at diverse frequencies. The higher Granger causality pertains to the higher value of estimated coefficients over a definite frequency. Further, the bottom line of the figures is the critical value at 5% probability level for no Granger causality. An unswerving trend is observed for most of the pairs, which reveals that the statistical significance is hardly reached. However, the causality for index fund flows, broad market fund flows, blend equity fund flows, growth fund flows, balanced fund flows, fund of fund flows, inflation-protected fund flows, global allocation fund flows and global strategy fund

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[10] *The wavelet coherence plot of large market cap fund flows and market volatility are not reported due to highly insignificant results.*

[11] *Tables are not reported for brevity purpose. The complete list of tables of the Granger coefficients of coherence for mutual fund classes is available on request.*

flows is evident. There is an increase in the Granger causality around 0.5 and 1.5 frequencies for fund of fund flows, broad market fund flows, blend equity fund flows, BBB fund flows, and global allocation fund flows. In contrast, causalities of intermediate fund flows, large-cap fund flows, aggressive strategy fund flows and government strategy fund flows are observed to rise over 3 term frequencies. In addition, balanced fund flows, growth fund flows and inflation-protected fund flows causalities are significant throughout the higher and lower frequencies.

4.5. Robustness Check

The study applies vector autoregressive model for robustness check. To check stationarity before applying VAR model to the data, the Fisher-type augmented Dickey-Fuller unit root test is performed. The result indicates that all variables are at level, I (0) and stationary. Based on the selection criteria, a first-order VAR model was found to be fit for model. The small length is selected in order to obtain a parsimonious model.

Table 5A (available online in the supplementary appendix) presents the VAR estimates on determining the relationship between various mutual fund classes and stock market volatility. We identified that equity funds and balanced funds have significant lagged association with stock market volatility and follows the market volatility. In contrast, no significant association is observed between bond flows, money market fund flows and stock market volatility as witnessed in the VAR analysis. This result is consistent with wavelet analysis. Further, it is evident that value funds, growth funds and blend funds depict significant interrelation with stock market volatility as witnessed in the Wavelet analysis. In addition, the causal association between aggressive strategy funds, blend strategy flows and market volatility is also witnessed, which is in line with the results reported under Wavelet analysis.

Islamic funds and index funds have negligible association with market volatility. Similarly, no significant relationship is evidenced of BBB funds, open-end flows, aggregate funds, inflation protected funds, government strategy funds with stock market volatility. Further, the linkage of market volatility with intermediate funds, short term funds and large cap funds is mostly negligible as found in VAR analysis. On the other hand, the strong linkage is observed between stock market volatility and broad market fund flows throughout the sample. Stock market volatility influences the broad mutual fund flows in VAR estimations. Closed funds are found to have short run bidirectional relationship with stock market volatility. Conservative funds and global strategy funds are observed to have positive lagged relationship with stock market volatility.

The overall findings are consistent with the results reported in the Wavelet analysis. The results depict varied linkages between the different mutual fund classes and stock market volatility which suggest both momentum and contrarian feedback behavior of mutual funds in the adverse financial market conditions. The diverse relationship is observed which could be due to various nature and objectives of mutual fund classes and trading behavior in the financial markets.

5. Concluding Remarks and Policy Implications

This study investigates the relationship between different classes of mutual funds and stock market volatility in Pakistan. The findings of wavelet correlation suggest that there is both positive and negative correlation between mutual fund classes and stock market volatility,

indicating coupling and contrarian behavior of mutual funds in response to high stock market fluctuations. It is witnessed that the correlation is significant and momentary at higher frequencies for most of the pairs, implying greater short term effect between pairs. The coherence analysis is inferred in terms of three main conclusions; explicitly, fund flows lead stock market volatility, stock market volatility leads fund flows, and the relationship keeps varying. For most of the sample pairs, fund flows are lagging against stock market volatility, supporting the feedback trading hypothesis, which implies that mutual funds trace the stock market's previous performance and then take the decision. With the contrarian approach of mutual funds, they can lessen the market volatility to the next period.

The findings of the study have significant implications for market players, portfolio manager, investors, and policymakers. Market players may get a benefit over various time horizons by matching their investment heterogeneity. These consequential strategies may be derived from wavelet coherence which pertains to the decomposition of causal links. Moreover, the results confirm that the interaction among variables is diverse in nature. For most of the pairs, transient coherences are seen at higher frequencies. However, few pairs evince strong coherence for low and medium frequencies, which grasps the attention of portfolio managers and speculators, respectively. The Granger coherence results are momentous for index fund flows, broad market flows, blend equity flows, growth equity flows, balanced fund flows, fund of fund flows, inflation protected flows and global allocation flows, suggesting that the long-run constituents possess forecasting ability.

The study assists policymakers and portfolio managers to make better planning, hedging, and forecasting decisions and to implement their investment and asset allocation decisions. The findings could be of help to investors and portfolio managers in making efficient investment and asset allocation decisions at the worldwide and international level, particularly in regional developing countries. Future research could be conducted for other classes of mutual funds in other developing regions.

Acknowledgement

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