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Pakistan Stock Exchange's Causal Relationship with Mutual Fund Industry in Pakistan. Benchmark: KSE100 Index & Equity Mutual Funds

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Abstract:
This research paper studies the causal relationship between Pakistan Stock Exchange and Mutual Fund Industry in Pakistan. KSE100 – Index and Equity mutual funds has been selected as benchmark to check the relationship between them. A causality and Vector Auto Regression technique has been used to see the impact of stock returns over mutual funds flows and vice versa. The Johansen test showed that variables under study are not cointegrated in long run. Granger causality and Vector Auto regression Model test shows unidirectional relationship of KSE100 index over Mutual fund flows. KSE100 index return significantly affected by its own lags and mutual funds lags, although impact of mutual funds lags and KSE100 index lags on Mutual fund flow is not significant. Based on results it could be concluded that improved Pakistan stock exchange performance improves the performance of mutual fund industry in Pakistan.

***Key words*:** Granger causality, KSE100 index, Mutual funds flows, Vector Auto Regression Model

1- Introduction

Mutual funds Asset Management Companies (AMCs), pool the money from many small investors and then invest that money into public and private companies' stocks, debentures, bonds, short term securities, T-bills, saving and fixed deposits etc., under the supervision of professional managers. Due to features of small investments, diversification, high return with minimum cost, flexible trading, professional management, and last but not least tax exemption feature makes mutual funds more attractive over other investments. Stock market investment is becoming more and more

risky with each coming day due to unpredictable and uncontrollable external environmental forces. In contrast mutual funds due to diversification generates more returns with less risk. Looking at the growth of mutual fund companies, mostly well reputable financial institutes have started introducing their own mutual funds companies to get funds from small investors as well.

Open-ended funds and close-ended companies are the two most commonly known categories of funds. Close-ended funds means those funds which initially offered by companies directly or through banks to the public for a fixed maturity date, and then further trading (buying & selling) of those funds will be through stock exchanges as a secondary security like normal stocks. While, Open-ended funds means the funds which bought and sold by companies directly through its portfolio managers. Price/NAV of open-ended and close-ended mutual funds vary based continuously on its demand and supply.

Mutual Funds in Pakistan

Mutual funds introduced in Pakistan in 1960s by state with name Investment Corporation of Pakistan (ICP) and National Investment Trust (NIT).Mutual fund industry is at top among Non-Banking Financial Institutions (NBFI) with average rise of more than 6% percent in last three years, closing NAV at PKR. 460 billion in the year 2017. Mutual funds not just invests inside Pakistan, but State Bank of Pakistan has permitted AMCs to invest in foreign markets as well up to 30% of aggregate funds or US$15 million, whichever is lower. Looking at the Table 1 (in appendix), we can see that number of AMCs has decreased from 2010 to 2019, although number of funds in existing AMCs has increased from 135 in 2010 to 288 in 2019. Major capitalization is in open-ended funds, which keep on increasing from PKR. 168,001 (million) from 2010 to PKR. 553,885 (million) in 2019, and close-end fund decreases from PKR. 30,748 (million) from 2010 to PKR. 16,887 (million) in 2019(www.mufap.com.pk).

Equity fund, growth fund, Islamic fund, asset allocation fund, sector fund, balanced fund, money market fund, tracker fund, fund by fund, income fund, are the major types of funds in which investors invest their money. Banks are the major competitors of AMCs, because of having high volume of assets, multiple fund products and wide branch network.

Looking at the Figure 1 and Table 2, we can see total net assets are continuously increasing from PKR. 200,048 million in 2010 to PKR. 609,757 million in 2018, more than 200 percent in 8 years. Top five investments are in equity market, money market, income market, and Shari'ah compliant equity and Shari'ah compliant funds of fund mutual funds. Figure 1 also indicate that till 2012 people preference were towards money market funds and after that preference shifted towards equity fund from money market funds till 2019 (www.mufap.com.pk). Equity funds are pool of investments invested in companies' stocks specially. The investor by investing in equity funds earns in long term through capital gains, capital appreciations and through dividends. In this study equity funds has been used as a benchmark on behalf of whole mutual fund industry due to having major portion of investment in it and closely linked with Stock Exchanges in Pakistan.

Pakistan Stock Market (PSM)

There are many leading stock markets of world, Pakistan stock market is also one of them. Stock exchange is the category of capital markets that facilitate the investors to trade second hand financial instruments. Pakistan stock market (PSM) established after merging three major Pakistan's stock markets namely Lahore Stock Exchange (LSE), Karachi Stock Exchange (KSE) and Islamabad Stock Exchange (ISE) into single stock market on January 11, 2016. Principle motivation behind this merger was to reduce market disintegration and attract strategic partners for long-term investments. It is expected that integration of stock exchanges will be treated as rising stock market by potential investors. Before PSX, KSE was foremost and largest established stock exchange of Pakistan since 1947.

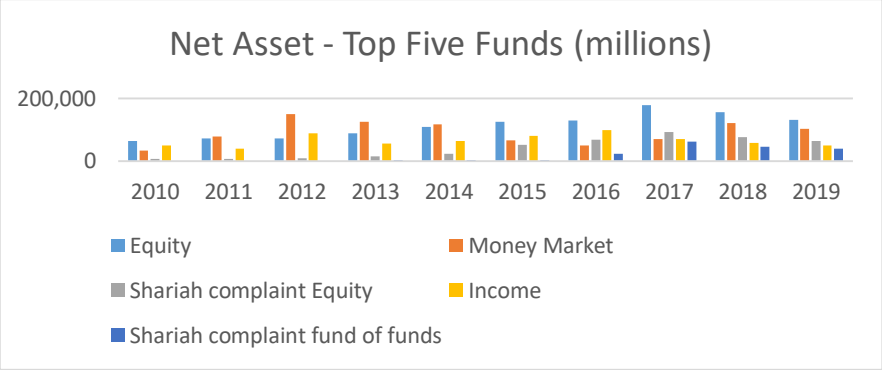

Figure 1 Total Net Assets (in millions) 2010-2019

In 2015, KSE was among the leading 10 stock exchanges of world. In the start of study period on Jan 01, 2010, total listed companies were 591 while on Dec 31, 2019 total companies were 534, which shows rise in fall in number of listed companies in whole period depicted through Figure 2. As per Figure 3 and 4, on Jan 01, 2010, total listed capital was PKR. 1,069,840 million and market capitalization was PKR. 3,818,140 (million), while at end of the period total listed capital was PKR. 1,386,599.24 (million) and market capitalization was PKR. 7,811,812.42 (million), both depicting upward trend which makes KSE, 3rd best performer exchange of world since 2009 according to Bloomberg. KSE100 – index: It was announced in Nov 1991 with 1000 base value points, comprised of 100 best performing companies, representing different sectors with free float capitalization listed on the stock exchange. KSE100 index worked as benchmark for companies in Pakistan to compare its performance with index in a certain period. We can see in Figure 5 that during the study period in start of 2010 KSE100 index price was 11,979.88 points which shows upward trend in study period, touch new high 52,876 in 2017 and ended on Dec, 2019 at 40,735.98.

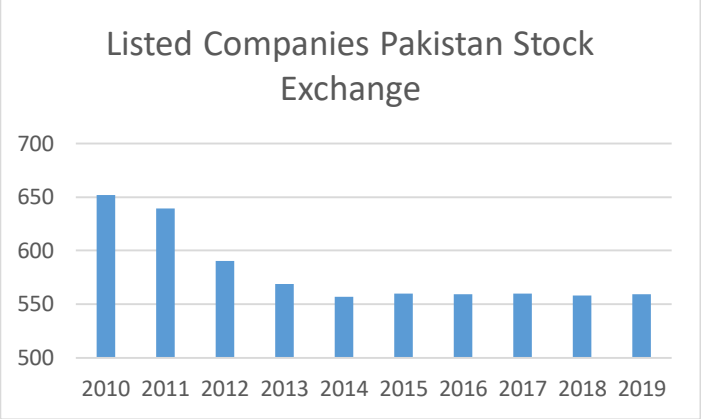

Figure 2 Listed Companies PSX (2011-2019)

There are various determinants which influence performance of stock exchange, and in contrast stock exchange performance influences various sectors. Various studies are available performed individually to see the impact of Stock Exchanges on Mutual funds in Pakistan, although no any such study is accessible to see their causal (interdependence) relationship between them tested with granger causality test in Pakistan. So in this study we will see the impact of KSE100 – index on Equity Mutual Funds and vice versa.
Remaining part of study is organized as follows: the next section of this study discusses the related theoretical background on impact of Stock exchanges and mutual fund industries and vice versa in different contexts. Then following section of this study is of research methodology namely material and methods, focusing on sample selection, study model and methodology adopted to test the model. Then after methodology the subsequent section is of results and discussions, providing descriptive, stationary, cointegration, and VAR tests, that presents the results of study. In the end study has been concluded with author recommendation and suggestions.

Previous Studies Relating Mutual Fund Returns With Stock Returns.

Most of the studies have studied the connection between stock exchange returns and flows of mutual fund primarily concentrated on stock markets of developed countries. Although there are few studies focusing on developing stock markets and none so far accessible related to Pakistan stock market with mutual fund industry.
Two different approaches has been followed by researchers to find out relationship between stock returns and flows of mutual funds: Firstly mutual funds are analyzed at micro level means individual level i.e., funds generating losses as compared to funds earning profit. Secondly at macro level where researchers consider aggregate fund flows coming in or going out of mutual fund industry.
Looking at the micro level, studies shows that individual fund flows attracts new money based on its past performance. Such as, Tufano and Sirri (1993), Zeckhauser, Patel and Hendrics (1994), Ippolito (1992) shows investors respond negatively towards poor performance and positively to good performance of mutual fund flows by working on annual data.

On the other side studying at macro level, most of the researchers focuses on association of stock returns with fund flows. Mostly, many research studies reveal that stock market returns are greatly correlated with mutual fund returns. Various theories are available mentioning positive return generating positive flows. As per theory of "price pressure" increase in inflows into mutual funds create the demand into individuals to keep stock that further increases the share price. Another hypothesis, "information revelation" states that mutual fund holders' information related to market will trigger the behavior of buying and selling of mutual funds that will signal to less informed new investors to behave in same way, so ultimately if will affect the stock market prices to fluctuate. According to them market will respond based on market information not on the basis of changes in mutual funds. Along with it, sentiment of investors also consider as an important element that influences the fund flows and stock returns changes. Few researchers suggest that individual based their trading decisions on sentiments who lack access to market information.

Grose, Dasilas & Alexakis (2013), studied the connection between stock prices in Japan with mutual funds covering period Jan, 1998 to Dec, 2007 by using crouching error correction model. They concluded that, bidirectional association is available of stock market returns with flows of mutual fund, direct association of market returns with flows of mutual funds, market returns affect fund flows positively and vice versa, in contrast inverse relationship exist only in one way from fund flow to stock prices only.

Pramod and Puja (2012), studies the association between stock market and institutional flows of fund in India from Jan 2002 to Jul 2012 by utilizing structural vector auto regression model, they sum up that domestic institutional investors inflows significantly affect the market return but not by foreign institutional investors. It was also concluded that fund flows at India affected by its own lagged and stock market return lagged values.

In (2012) Watson & Wickramanayake conducted study at Australia from period Jan 1990 to Sep 2009 on correlation of share market returns with flows of mutual fund, they concluded that share market return do granger cause flows of fund however flows of fund do not granger cause share market returns.

Shahadath, Rahman and Rajib (2010), conducted study on dynamics between flows of mutual fund and share market return, from period Jan 2008 to Dec 2010 in Bangladesh with the help of vector autoregressive causality analysis. They summarized that demand of mutual funds derived by demand of stock return and very minor change occur in the demand of mutual funds by its lagged values.

In (2006) Parwada and Natalie conducted research over association of return of stock market with mutual fund flow at Korea covering period 1996 to 2003. They concluded by using causality method that direct association occur of share market returns with flows of mutual funds in both directions.

Sunil, Patra, Niarchos and Christos (2004) conducted study related to dynamics between flows of mutual fund and share market returns at Greece. They concluded bidirectional connection occur between flows of mutual fund with return of stock market by using error correction model means lagged values of stock return Granger cause fund flows and vice versa.

Warther (1995) studies the impact of previous performance of flows on the mutual funds individually, along with it relationship with stock returns. Based on study from Jan 1984

to June 1993, monthly data. He categorized into expected and unexpected fund flow elements. It was concluded that unexpected flows of funds are relatedat large extent with stock market return although market returns are not as correlated with fund flows.

Association between stock return and flows of fund not necessarily mean, one will positively influence other or vice versa, although it may be explained in other way as well. Such as in bivariate causal relationship existence, in which flows of mutual fund and stock return could be influenced by third variable as well. According to Potter (1996) the flows of mutual fund and stock return relationship is not as much clearly driven based on his lead-lag study between flows and return of various equity funds.

Gruenstein, Kleinman and Ramelona (1997) also studies the relationship of flows of fund and market return. They concluded that short term impact of return on fund is weak. Specifically past performance of return do not affect fund flows, which bond flows were influenced by current stock market returns.

Study conducted by Fortune (1998) concluded the positive association between securities return with fund flows holding same securities under study by using unrestricted vector auto regression model. Fortune further finalized that flows of equity mutual fund were derived not by lagged values of stock returns but through contemporaneous stock returns, although bond flows were influenced by both lagged and contemporaneous market returns. He concluded the connection between flows of fund and market return is mixed and not clear.

Material and Methods

MATERIAL: In this research study aggregate net flows data of Pakistani equity mutual funds has been used by transforming the net change of mutual funds units as previously used by (Christos, Apostolos and Chris, 2013). Mutual fund units are computed by dividing the total market value of mutual fund assets capitalization with Net Asset Value (NAV) each share on monthly basis. The market capitalization data was monthly and daily NAV data was available. NAV data has been converted into monthly to match with market capitalization. To find out the aggregate influence of flow over stock prices and vice versa, units of fund were aggregated for calculating monthly differences subsequently. Finally natural logarithms (log) of monthly fund flows return were calculated. Daily data on the equity mutual funds has been obtained from online source of Pakistan's Mutual Fund Association. Second variable in this study was market return, so we computed the natural log of monthly Karachi Stock Exchange – 100 (KSE-100) closing prices of index being the main trading and benchmark index of Pakistan Stock Exchange. Monthly index price data were obtained by calculating average of daily closing price. Then after converted into stock index return as

$R_t = \{\ln(P_t)/\ln(P_{t-1})\}$

where, R_t means compounded rate of return at period t, P_t and P_{t-1} shows monthly stock indexes of two consecutive months t and t-1 respectively, and ln is natural log of data. Daily data on Pakistan Stock Exchange are obtained from online Business Recorder Magazine of Pakistan. The KSE100 index reflects the changes due to stock dividends, related stock splits, reverse stock splits etc in its prices. The time series data period into this study was from January 2010 till December 2019. Year periods were converted into monthly making 120 monthly observations.

METHODS: Cointegration and causality method are most common used methods and techniques as per mutual fund literature, using data such as NAV, flow of funds, stock prices and other macroeconomic variables. For calculating the temporal relationship among study elements, most widely used statistical technique is (Granger, 1969) Granger's causality test. This test is superior in testing relationship among variables due to statistical reasoning as: we study two time series such as X_t and Y_t, so X misses to Granger cause Y, in a regression of Y as well as lagged value of Y and lagged values of X, the coefficients of later are found statistically insignificant.

Series under study should be stationary to perform Granger causality test. Sometimes we obtained stationary in our data by first difference transformation, although it strains out long run (low frequency) data, so to save the valuable data, researchers use cointegration test as an alternative instead of performing differencing of data which is also statistically recognized approach. Cointegration test is based on the idea that when two or more than two series goes closely together although they may contain trends in the long run, so difference among them would be stationary. So long run statistical relationship obtained by equilibrium of series under study could be obtained by cointegration test. (Hall & Hendry, 1988) explained equilibrium means relationship which maintained by study variables on average in the long run. Temporal "causality" in the Granger sense is must at least from one side so to perform cointegration of variables in bivariate case.

Following Granger (1988) and Engle and Granger (1987), in two time series $Y_t$and X_t that both are non stationary and if their linear arrangement is as

$$Z_t = X_{t-a}\, Y_t$$

found stationary, I~(0),the X and Y are found correlated, where a is the cointegrating factor,

If two constructs found correlated then as per Granger's demonstration theorem, their exist error correction representation of the below given form

$$\Lambda X_t = -P_1 Z_{t-1} + \sum a_i \Lambda X_{t-1} + \sum b_j \Lambda Y_{t-1} + \varepsilon_{1t}$$

$$\Lambda Y_t = -P_2 Z_{t-1} + \sum y_i \Lambda Y_{t-1} + \sum \lambda_j \Lambda X_{t-1} + \varepsilon_{2t}$$

here Z_{t-1} in implicitly explained in Eq(1), $\left| P_1+P_2 \right| \neq 0$ where ε_{1t} and ε_{2t} are finite moving averages. Thus, variations in construct X_t and Y_t are partially derived from the previous figures of Z_t.

According to literature there are many flaws in Granger Causality and Vector Error correction mechanism model used through Vector autoregression (VAR). Checking the stationary of data and cointegration may leads towards refusal of null hypothesis in Granger causality test (Mirza and Giles, 1999). Differencing of data either first or second in VAR model present unsatisfactory output (Enders, 2004). If the constructs found of dissimilar order of integration and non-cointegrated then Vector error correction model could not be employed (Gujarati, 1995).

To see the stationary of study constructs Augmented Dickey-Fuller (ADF) is used in this research study based on Akaike Info Criterion (AIC) optimal lag selection criteria. Also optimal lags are selected though lag length criteria of AIC. Although cointegration test is used to see long-run equilibrium relationship of Johansen cointegration test. Finally VAR framework has been used to find out coefficients affecting the flows and return and its significance, as:

$$R_t = a_1 + \sum b_{1i} R_{t-1} + \sum y_i Flow_{t-1} + \varepsilon_t{}^R$$

$$Flow_t = a_2 + \sum Y_{2i}\, Flow_{t-1} + \sum B_{2i}\, R_{t-1} + \varepsilon_t^{Flow}$$

Results & Discussions

Descriptive Statistics: 120 observations are in this study of 10 years period. According to Table 3 Return of KSE100 index and Equity Mutual Fund Flow on average are 577577.3 and 97353639223.14 respectively. While standard deviations shows that kse100 index returns are more volatile as compared mutual funds. Skewness and kurtosis value are away from 0 & 3 which shows lack of symmetric distribution also means that fund flow distribution is at peak although kse100index is flat relative to normal distribution.

Stationary test (Unit root): Table 4 present the Augmented Dickey-Fuller unit root test. In this test Null Hypothesis is data series is non-stationary means it contain unit root, although alternative hypothesis states Data is stationary it possess no unit root.

Table 4 Augmented Dickey-Fuller (ADF) Test

	t-Statistic	Prob.
KSE100 Index	-3.080205	.1163
TCV 1%	-4.045263	
5%	-3.451959	
10%	-3.151440	
KSE100 Index – 1st D	-5.723754	.0000
TCV 1%	-4.046925	
5%	-3.452764	
10%	-3.151911	
Fund Flow	-13.75525	.0000
TCV 1%	-4.036983	
5%	-3.448021	
10%	-3.149135	

So Table 4 shows KSE100 index probability figure is above 5% so null hypothesis could not be rejected, although KSE100 index series is stationary on first difference looking at probability value. Fund flow series is stationary at level depicting probability value below 5%. Another criteria of deciding that series is stationary that t-statistic value should be less than critical values, so we can easily decide while look at the values in Table 4.

Figure 6 also indicate that values of KSE100 index and fund flow mean and variance during difference time period seems same so we can say series is stationary. Due to having stationary of data at different levels we perform Johansen cointegration test to see long run equilibrium that either series move together in long run or not without driving stationary of series. But before Johansen cointegration test, finding optimal lags in study is important so based on AIC criteria lags has been selected using VAR model. Figure 7 shows that optimal lags for study are 6 based on Akaike Info Criterion (AIC), and Final Prediction Error (FPR) criteria. Now based on optimal lag selection now we can perform Johansen cointegration test, Granger Causality and Vector Auto regression Analysis.

Figure 8, in this paper shows the Johansen integration test. Null hypothesis in Johansen Integration test says, series are cointegrated and Alternate hypothesis is, series are not

cointegrated. If the probability values are less than 5% we will reject null hypothesis otherwise fail to reject. So in both tests of Johensen cointegration, Max-Eigen test and Trace Statistic probability value are less than 5% at none, and at most 1, level, which means series are not cointegrated. Another criteria of deciding that either series are cointegrated are not is, if Max-Eigen and Trace Statistics values are larger than .05 critical value then series are not cointegrated, else series are cointegrated. So looking at the values in Figure 8, both tests values are more than critical values which means series are not cointegrated.

Based on Johansen cointegration test, VAR model has been used to calculate coefficients of variables and its lags to see their relationship, but before VAR model, Granger causality test has been used to see short term causal impact of constructs under study with each other.

Pairwise Granger Causality Tests
Date: 01/10/20 Time: 20:57
Sample: 2009M12 2019M12
Lags: 6

Null Hypothesis:	Obs	F-Statistic	Prob.
SERIES does not Granger Cause FUND_FLOW	113	4.18799	0.0008
FUND_FLOW does not Granger Cause SERIES		1.53871	0.1733

Figure 9 Granger Causality test

Figure 9, indicate the Null hypothesis, F statistic and probability values of Granger Causality test. Probability value if found below 5% means null hypothesis will be failed to accept or else null hypothesis will be accepted. So 1st hypothesis in Figure 9 is Series (1st difference KSE100 Index series) has been created that does not Granger Cause Fund Flow. Probability value of 1st hypothesis is less than 5%, so null hypothesis will be rejected means KSE100 index return does cause fund flow, which could also be verified from Figure 10, that Chi-sq value of 1s hypothesis is 25.13, where independent variable is KSE100 index and dependent variable is Fund flow. If probability is below 5% so alternate hypothesis will be accepted, that KSE100 index do cause fund flows. 2nd hypothesis in Figure 9 is Fund flow does not Granger Cause Series (1st difference KSE100 Index series). Probability value of 1st hypothesis is more than 5%, so null hypothesis fail to reject, means Fund flow return does not cause KSE100 Index return, which could also be verified from Figure 10, that Chi-sq value of 1s hypothesis is 9.23, where independent variable is Fund Flow and dependent variable is KSE100 Index is probability is more than 5% so alternate hypothesis will be rejected and null hypothesis will be approved, that Fund flow does not cause KSE100 Index.

Based on Johansen cointegration test, that no cointegration exist between both series, following two VAR models will be used together to drive coefficients of variables and its lags. Assumption of VAR model is series must be stationary and one variable should

Granger cause another variable at least from one side. So both assumption are available in this series, so VAR model could be used. By separating combined models used in VAR, there will be two model separately given below: Results of models are given just below models, the lags in bold characters indicate the significant lags affecting models, so first five lags of KSE100 index model and 12th lag is significantly affecting KSE100 index. Although no lag is significantly affecting fund flow which indicate that second model in not fit for study.

Model 1

KSE100INDEXSTAT = C(1)*KSE100INDEXSTAT(-1) + C(2)*KSE100INDEXSTAT(-2) + C(3)*KSE100INDEXSTAT(-3) + C(4)*KSE100INDEXSTAT(-4) + C(5)*KSE100INDEXSTAT(-5) + C(6)*KSE100INDEXSTAT(-6) + C(7)*FUND_FLOW(-1) + C(8)*FUND_FLOW(-2) + C(9)*FUND_FLOW(-3) + C(10)*FUND_FLOW(-4) + C(11)*FUND_FLOW(-5) + C(12)*FUND_FLOW(-6) + C(13)

Model 2

FUND_FLOW = C(14)*KSE100INDEXSTAT(-1) + C(15)*KSE100INDEXSTAT(-2) + C(16)*KSE100INDEXSTAT(-3) + C(17)*KSE100INDEXSTAT(-4) + C(18)*KSE100INDEXSTAT(-5) + C(19)*KSE100INDEXSTAT(-6) + C(20)*FUND_FLOW(-1) + C(21)*FUND_FLOW(-2) + C(22)*FUND_FLOW(-3) + C(23)*FUND_FLOW(-4) + C(24)*FUND_FLOW(-5) + C(25)*FUND_FLOW(-6) + C(26)

Model1 = Result

KSE100INDEXSTAT = -1.39510408372*KSE100INDEXSTAT(-1) - 1.21629405481*KSE100INDEXSTAT(-2) - 0.76699219879*KSE100INDEXSTAT(-3) - 0.584904129005*KSE100INDEXSTAT(-4) - 0.482714022805*KSE100INDEXSTAT(-5) - 0.187737353608*KSE100INDEXSTAT(-6) + 0.0120287603356*FUND_FLOW(-1) - 0.0070514750079*FUND_FLOW(-2) - 0.0986264621778*FUND_FLOW(-3) + 0.0252658205177*FUND_FLOW(-4) + 0.0642195253322*FUND_FLOW(-5) + 0.444943928892*FUND_FLOW(-6) - 0.000734282429541

Model2 = Result FUND_FLOW = -0.100493936078*KSE100INDEXSTAT(-1) - 0.0049917400817*KSE100INDEXSTAT(-2) + 0.0740832894216*KSE100INDEXSTAT(-3) + 0.114845167664*KSE100INDEXSTAT(-4) - 0.0897883071264*KSE100INDEXSTAT(-5) - 0.0169490385999*KSE100INDEXSTAT(-6) - 0.157272884995*FUND_FLOW(-1) - 0.0757582879312*FUND_FLOW(-2) - 0.0118510653715*FUND_FLOW(-3) - 0.0972121333467*FUND_FLOW(-4) + 0.0031380959892*FUND_FLOW(-5) - 0.018319869335*FUND_FLOW(-6) + 0.00565870485153

Figure 11 shows the coefficients, t statistic and standard error of both study variables in contrast with 6 lags of KSE100 index and 6 lags of Fund flow and one constant. Checking the model fitness R-square value, KSE100 index model is fit than fund flow

model due to having higher value. Although to find out which lag is significant and driving dependent variable value we will find out probabilities values. Figure 12 shows the significance of lags' coefficients along with standard error and t-statistic, so all those lags whose p vales are less than 5% are significantly affecting dependent variables, so first 13 coefficients values are related with KSE100 index as dependent variable contain most of significant values, last 13 coefficients values related to Fund flow as dependent variable contain no any significant level which indicate that model 1 is more fit than other.

Conclusion

The prime intention behind this research study was to see the dynamics of Pakistan Mutual Funds return in relation with Pakistan Stock Exchange, although monthly data was taken KSE100 index and Equity mutual Funds of Pakistan from Period Jan, 2010 to Dec, 2019. Based on Augmented Dickey-Fuller test it was concluded fund flow was stationary at level, although KSE100 index was stationary at 1st Difference based on Akaike Info Criteria (AIC), although a new series by name SERIES has been created on 1st difference of KSE100 Index to perform further tests. Johansen cointegration test result suggest that variables are not cointegrated in long run equilibrium relationship. Granger Causality test which is most widely used technique to find out cause and effect relationship found uni directional relationship of KSE100 index driving Fund flow means lagged values of KSE100 index Granger cause mutual fund flows, as previously concluded by (Pramod & Puja, 2012) (Watson & Wickramanayake, 2012). Although increase in mutual fund flows not directly improve stock exchange return these results are consistent with (Cha and Kim, 2010). These result conclude that mutual fund performance would improve if the Pakistan stock exchange performance will improve.

Portfolio investors and asset management companies could benefit from this study, as keeping an eye on stock exchange movements, they can make healthy decisions for their businesses. Increase or decrease in NAV values signals the performance of Mutual funds which help investors of Funds to take timely decisions.

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APPENDICES

Table 1 Number of AMCs / Investment Advisors and Funds (in millions)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
AMCs	28	26	27	26	21	21	20	20	19	19
Number of Funds	135	144	159	158	170	184	204	233	259	288
Open-Ended Funds (OEF)	105	118	133	138	152	164	184	211	237	269
Market Capitalization – OEF	168,001	223,936	354,309	332,702	386,568	411,655	452,770	574,290	563,995	553,885
Close-Ended Funds (CEF)	21	16	15	9	5	3	3	3	3	3
Market Capitalization – CEF	30,748	25,263	23,488	24,165	21,417	18,231	18,796	22,804	19,624	16,887
Pension Funds	9	10	11	11	13	17	17	19	19	19

Category	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Equity	63,195	71,240	71,352	88,909	109,345	125,899	129,753	177,907	155,748	131,767
Money Market	32,050	77,312	150,509	124,418	117,385	66,681	49,658	70,549	121,873	103,108
Shari'ah complaint Equity	6,005	7,027	8,104	14,116	23,363	51,167	67,215	92,788	75,095	63,532
Income	49,085	39,954	87,620	56,438	63,336	80,476	98,037	69,960	57,967	49,042
Shari'ah complaint fund of funds	NA	NA	NA	699	927	3,269	23,679	61,411	45,585	38,566
Shari'ah compliant income	6,132	20,888	29,944	36,414	36,783	21,028	29,692	31,508	31,273	26,458
Shari'ah complaint asset allocation	1,196	1,264	1,120	870	1,116	4,784	10,818	31,193	29,088	24,609

Shari'ah compliant fund of fund – CPPI	NA	NA	NA	NA	11,533	20,671	9,168	379	14,006	11,849
Asset Allocation	1,552	2,277	3,136	4,290	6,406	8,342	10,843	15,388	13,754	11,636
Conv. Vol. Pensions Scheme	571	655	1,101	1,865	3,263	7,989	7,302	9,115	9,305	7,872
Shari'ah compliant money market	5,224	6,353	7,762	7,088	5,189	13,483	5,920	7,337	8,927	7,552
Aggressive Fixed Income	14,019	9,340	7,862	10,130	12,345	11,694	14,056	13,887	8,231	6,964
Shari'ah complaint balance fund	2,189	2,290	2,334	3,772	6,955	3,493	4,822	9,516	7,843	6,635
Balanced	6,349	4,841	4,147	4,092	3,731	4,645	4,489	5,976	4,255	3,600
Fund of Funds	1,182	1,223	1,291	1,190	141	171	1,739	4,178	4,012	3,394
Capital Protected	8,551	3,368	853	605	NA	2,675	2,871	697	2,153	1,821
Shari'ah complaint index tracker	NA	NA	289	901	1,176	1,159	882	1,881	1,687	1,427
Shari'ah compliant aggressive fixed income	1,157	725	688	1,178	2,253	2,157	3,209	1,105	796	673
Fund of Funds – CPPI	NA	NA	NA	NA	2,306	4,276	1,804	NA	497	420
Index Tracker	223	374	343	315	419	460	452	520	461	390
Shari'ah compliant commodities	NA	NA	NA	NA	NA	NA	321	457	243	206
Shari'ah Complaint Capital Protected fund	637	724	443	1,304	2,972	3,015	1,771	244	127	107
Shari'ah Compliant Vol. Pensions Scheme	729	903	1,640	2,957	4,912	5,596	11,502	16,142	16.833	14
Total	200,046	250,758	380,538	361,551	415,856	443,130	490,003	622,138	592,943	501,646

Table 2 Net Assets - Mutual Funds in Pakistan (in millions)

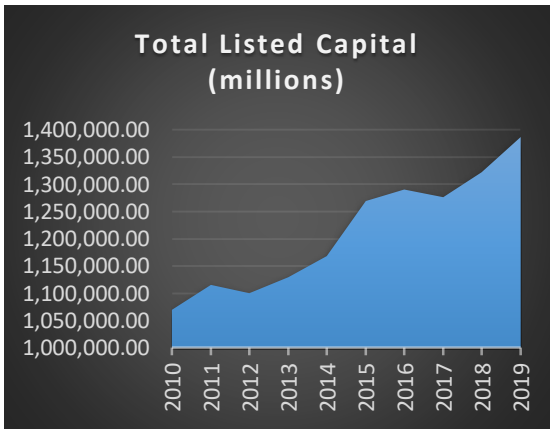

Figure 3 Total Listed Capital (r

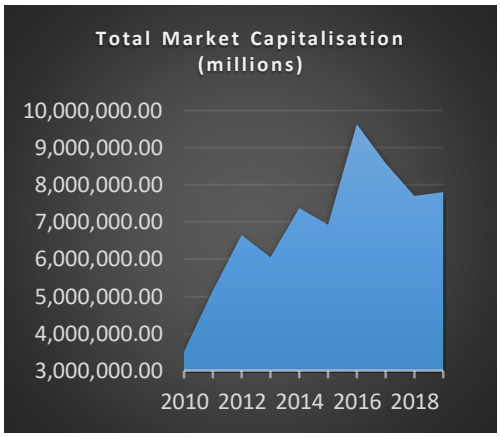

Figure 4 Total Market Capitalization (millions)

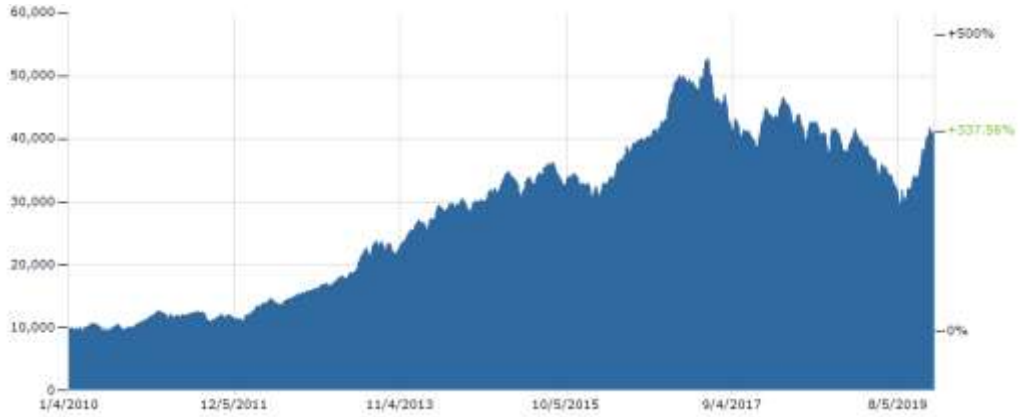

Figure 5 KSE100 index performance Jan 01, 2010 to Dec 31, 2009

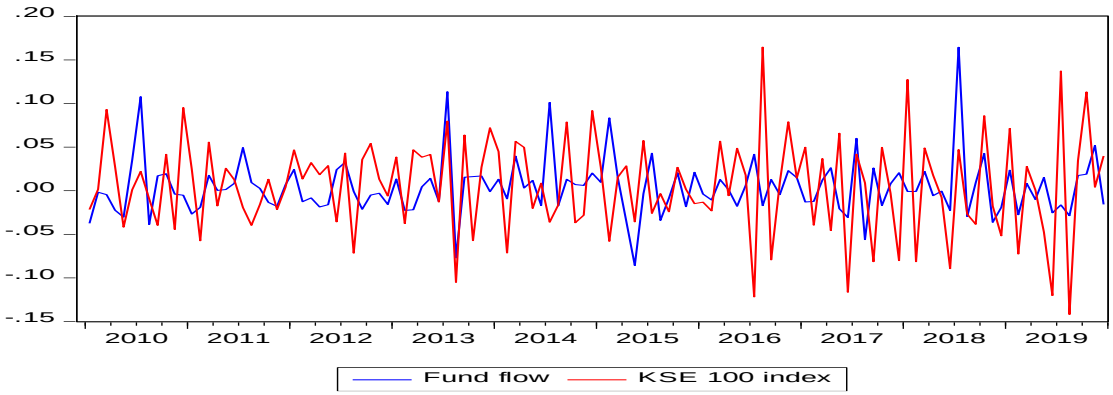

Figure 6 KSE100 index & Mutual Fund Flow series at log

Table 3 Descriptive statistics of variables

	KSE100 Index	Log (KSE100 Index)	Fund Flow	(Log) Fund Flow
Mean	577,577.3	.005562	97,353,639,223.14	.003889
Median	616,686.8	.009162	100,252,909,000	-.000103
Maximum	1,126,216	.164768	177,449,186,000	.164496
Minimum	174,983.8	-.141981	43,514,235,000	-.085691
Std. Dev.	266,303.3	.055671	39,660,131,877.61	.033449
Skewness	.004816	-.085682	.23596336749844	1.456134
Kurtosis	1.739115	3.212293	1.712081715527816	8.361802
Jarque-Berra	8.015861	.372168	9.485635434691465	186.1511
Probability	.018171	.830204	.008714	.000000
Observation	120	120	120	120

VAR Lag Order Selection Criteria
Endogenous variables: FUND FLOW KSE 100 INDEX
Exogenous variables: C
Date: 01/10/20 Time: 20:54
Sample: 2009M12 2019M12
Included observations: 112

Lag	LogL	LR	FPE	AIC	SC	HQ
0	390.5980	NA	3.32e-06	-6.939251	-6.890706	-6.919555
1	411.4172	40.52294	2.46e-06	-7.239592	-7.093958*	-7.180504*
2	416.1186	8.983054	2.43e-06	-7.252117	-7.009394	-7.153637
3	417.5918	2.762264	2.54e-06	-7.206996	-6.867184	-7.069123
4	422.3884	8.822323	2.51e-06	-7.221221	-6.784320	-7.043956
5	430.5174	14.66126*	2.33e-06	-7.294954	-6.760963	-7.078297
6	435.5807	8.951275	2.29e-06*	-7.313942*	-6.682862	-7.057893
7	437.1225	2.670555	2.39e-06	-7.270045	-6.541876	-6.974603
8	441.6714	7.716825	2.37e-06	-7.279846	-6.454587	-6.945012

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Figure 7 VAR Lag selection criteria

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.179564	38.88991	15.49471	0.0000
At most 1 *	0.136049	16.52502	3.841466	0.0000

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.179564	22.36489	14.26460	0.0021
At most 1 *	0.136049	16.52502	3.841466	0.0000

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Figure 8 Johansen Cointegration Test

VAR Granger Causality/Block Exogeneity Wald Tests
Date: 01/11/20 Time: 11:54
Sample: 2009M12 2019M12
Included observations: 113

Dependent variable: KSE100INDEXSTAT

Excluded	Chi-sq	df	Prob.
FUND_FLOW	9.232290	6	0.1609
All	9.232290	6	0.1609

Dependent variable: FUND_FLOW

Excluded	Chi-sq	df	Prob.
KSE100INDEXSTAT	25.12792	6	0.0003
All	25.12792	6	0.0003

Figure 10 VAR Granger Causality / Wald Test

Vector Autoregression Estimates
Date: 01/11/20 Time: 11:11
Sample (adjusted): 2010M08 2019M12
Included observations: 113 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	KSE100IND...	FUND_FLOW
KSE100INDEXSTAT(-1)	-1.395104	-0.100494
	(0.09595)	(0.05586)
	[-14.5405]	[-1.79892]
KSE100INDEXSTAT(-2)	-1.216294	-0.004992
	(0.16384)	(0.09539)
	[-7.42372]	[-0.05233]
KSE100INDEXSTAT(-3)	-0.766992	0.074083
	(0.19947)	(0.11614)
	[-3.84518]	[0.63789]
KSE100INDEXSTAT(-4)	-0.584904	0.114845
	(0.20665)	(0.12032)
	[-2.83037]	[0.95449]
KSE100INDEXSTAT(-5)	-0.482714	-0.089788
	(0.17661)	(0.10283)
	[-2.73324]	[-0.87319]
KSE100INDEXSTAT(-6)	-0.187737	-0.016949
	(0.11271)	(0.06563)
	[-1.66564]	[-0.25827]
FUND_FLOW(-1)	0.012029	-0.157273
	(0.16296)	(0.09488)
	[0.07381]	[-1.65755]
FUND_FLOW(-2)	-0.007051	-0.075758
	(0.16600)	(0.09665)
	[-0.04248]	[-0.78382]
FUND_FLOW(-3)	-0.098626	-0.011851
	(0.16288)	(0.09483)
	[-0.60553]	[-0.12497]
FUND_FLOW(-4)	0.025266	-0.097212
	(0.15682)	(0.09131)
	[0.16111]	[-1.06465]
FUND_FLOW(-5)	0.064220	0.003138
	(0.15457)	(0.09000)
	[0.41548]	[0.03487]
FUND_FLOW(-6)	0.444944	-0.018320
	(0.15085)	(0.08783)
	[2.94955]	[-0.20858]
C	-0.000734	0.005659
	(0.00518)	(0.00302)
	[-0.14163]	[1.87459]
R-squared	0.766445	0.276244
Adj. R-squared	0.738419	0.189394
Sum sq. resids	0.251242	0.085171
S.E. equation	0.050124	0.029184
F-statistic	27.34711	3.180681
Log likelihood	184.8031	245.9220
Akaike AIC	-3.040762	-4.122513
Schwarz SC	-2.726992	-3.808743
Mean dependent	0.000157	0.003720
S.D. dependent	0.098004	0.032415
Determinant resid covariance (dof adj.)		2.14E-06
Determinant resid covariance		1.68E-06
Log likelihood		430.7364
Akaike information criterion		-7.163477
Schwarz criterion		-6.535936
Number of coefficients		26

Figure 11 Vector Auto Regression Test

System: UNTITLED
Estimation Method: Least Squares
Date: 01/11/20 Time: 11:12
Sample: 2010M08 2019M12
Included observations: 113
Total system (balanced) observations 226

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-1.395104	0.095946	-14.54048	0.0000
C(2)	-1.216294	0.163839	-7.423723	0.0000
C(3)	-0.766992	0.199468	-3.845181	0.0002
C(4)	-0.584904	0.206653	-2.830371	0.0051
C(5)	-0.482714	0.176608	-2.733244	0.0068
C(6)	-0.187737	0.112712	-1.665643	0.0974
C(7)	0.012029	0.162962	0.073813	0.9412
C(8)	-0.007051	0.166001	-0.042479	0.9662
C(9)	-0.098626	0.162878	-0.605525	0.5455
C(10)	0.025266	0.156824	0.161109	0.8722
C(11)	0.064220	0.154568	0.415479	0.6782
C(12)	0.444944	0.150852	2.949548	0.0036
C(13)	-0.000734	0.005185	-0.141629	0.8875
C(14)	-0.100494	0.055864	-1.798917	0.0735
C(15)	-0.004992	0.095393	-0.052328	0.9583
C(16)	0.074083	0.116138	0.637889	0.5243
C(17)	0.114845	0.120321	0.954488	0.3410
C(18)	-0.089788	0.102828	-0.873187	0.3836
C(19)	-0.016949	0.065625	-0.258271	0.7965
C(20)	-0.157273	0.094883	-1.657553	0.0990
C(21)	-0.075758	0.096652	-0.783824	0.4341
C(22)	-0.011851	0.094834	-0.124967	0.9007
C(23)	-0.097212	0.091309	-1.064648	0.2883
C(24)	0.003138	0.089995	0.034870	0.9722
C(25)	-0.018320	0.087832	-0.208580	0.8350
C(26)	0.005659	0.003019	1.874590	0.0623

Determinant residual covariance 1.68E-06

Equation: KSE100INDEXSTAT = C(1)*KSE100INDEXSTAT(-1) + C(2)
*KSE100INDEXSTAT(-2) + C(3)*KSE100INDEXSTAT(-3) + C(4)
*KSE100INDEXSTAT(-4) + C(5)*KSE100INDEXSTAT(-5) + C(6)
*KSE100INDEXSTAT(-6) + C(7)*FUND_FLOW(-1) + C(8)
*FUND_FLOW(-2) + C(9)*FUND_FLOW(-3) + C(10)*FUND_FLOW(-4) +
C(11)*FUND_FLOW(-5) + C(12)*FUND_FLOW(-6) + C(13)
Observations: 113

R-squared	0.766445	Mean dependent var	0.000157
Adjusted R-squared	0.738419	S.D. dependent var	0.098004
S.E. of regression	0.050124	Sum squared resid	0.251242
Durbin-Watson stat	1.866860		

Equation: FUND_FLOW = C(14)*KSE100INDEXSTAT(-1) + C(15)
*KSE100INDEXSTAT(-2) + C(16)*KSE100INDEXSTAT(-3) + C(17)
*KSE100INDEXSTAT(-4) + C(18)*KSE100INDEXSTAT(-5) + C(19)
*KSE100INDEXSTAT(-6) + C(20)*FUND_FLOW(-1) + C(21)
*FUND_FLOW(-2) + C(22)*FUND_FLOW(-3) + C(23)*FUND_FLOW(-4)
+ C(24)*FUND_FLOW(-5) + C(25)*FUND_FLOW(-6) + C(26)
Observations: 113

R-squared	0.276244	Mean dependent var	0.003720
Adjusted R-squared	0.189394	S.D. dependent var	0.032415
S.E. of regression	0.029184	Sum squared resid	0.085171
Durbin-Watson stat	1.994054		

Figure 12 Least Square Probability values