Interplay Between Macroeconomic Factors and Equity Premium: Evidence Pakistan Stock Exchange

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Abstract: *This paper examine the impact of macroeconomic factors on firm level equity premium. Following the concept of macro-based risk factor model, we consider macroeconomic variable set of equity premium determinant. The macroeconomic variables include interest rate, money supply, industrial production, inflation and foreign direct investment. The macroeconomic variables are not in control of the firm's management. These are the external factors which affect the company as well as the overall market returns. The Macro-based Multifactor Model is estimated for the whole sample. It is found that the market premium and the selected five macroeconomic factors significantly affect the firm level equity premium of non-financial firms. Increase in market premium, money supply, foreign direct investment and industrial production positively affect the firm level equity premium while increase in interest rate and inflation negatively affects the firm level equity premium. These findings are beneficial for the common shareholders, institutional investors and policy makers to find more specific insight about the relationship between macroeconomic variables and equity premium of non-financial sectors.*

Key words: Macroeconomic, Equity Premium, Non-Financial Sector, Pakistan Stock Exchange

I. Introduction

Macroeconomic environment refers to those factors which are external factors in the firm's routine activities and is not concerned with the firm's immediate environment. Macro environment forces are the forces which indirectly affect company's operation and working condition. These forces are uncontrollable and the company management is incapable of exercising any type of control over these external factors. Macro environment of business can be classified into economic and non-economic business environments. Since business is basically an economic activity, economic environment of business both national and international gets importance. The non-economic environment of business is discussed in next section. The macroeconomic environment of any country includes economic system, economic parameters, financial and monetary policies of the state government.

Khan et al. (2014) among other recent studies examined the possible impact of macroeconomic variables like fiscal policies and monetary policies (interest rate) and inflation rates on stock market performance in Pakistan capital market. The study found that macroeconomic factors significantly affect the capital market returns in Pakistan. Specifically, interest rate (T-Bill rate) and government revenue have significant negative relationship with capital market returns, whereas the inflation rate and government expenditures have the opposite relationship. In the study conducted in Pakistan, the authors focused on market index. However, in the current study, we are focusing on the impact of macroeconomic factors on firm level and industry level equity premium.

Macroeconomic factors like interest rate, inflation, industrial production and other affect the equity risk premium (ERP). The ERP is lower in economies where the macroeconomic variables are more volatile. Lettau,

et al. (2007) explored that change in equity premium in US capital market is mainly caused by volatility of macroeconomic variables. The studies of Daniel and Martin (2018), Neely et al. (2014), Fama (1981) and Kaim (1986) examined the relationship among inflation and equity premiums and found very little or no correlation. The study of Wang (2003) indicates that increase in inflation cause increase in ERP. Kizys (2007), Macmillan (2007), Lamont (2001) explored that portfolios developed to follow the growth rates of real income (GDP), consumption, and labour income earned abnormal positive expected returns. Interestingly, Tajudeen et el., (2018) explored the relationship of different economic and non-economic factors on public health expenditure and concluded that non-economic factors cannot be ignored. They specifically emphasized on the understanding and stabilizing both the macroeconomic and non-economic factors. They also stated that these factors are crucial to improve public health expenditure. Tajudeen et al., (2018) investigated the impact of economic and non-economic factors on firm level equity premium. The studies conducted in Pakistan equity market are mostly related to economic factors and stock returns (Imran and Abbas, 2013; Zeshan, 2016; Mengyun et al. 2018; Min et al. 2018; Horvath, 2019).

Nishat and Rozina (2006) examined and found long-term relationships between macroeconomic variables the portfolio returns of KSE100 index. They used inflation, industrial production index, money supply and the value of an investment earning the money market rate as macroeconomic set of variables for analysis. They found a causal relationship between the stock market return and the economy. The results also witnessed that GDP proxied by industrial production is the largest positive determinant of equity return in PSX, while inflation produced negative relationship with stock prices in Pakistan. Similarly, Nishat and Saghir (1991) and Mahmood (2001) explored a unidirectional causality relationship from macroeconomic variables to stock market returns. Chou et al. (2007), (Daniel, 2017; Min et al. 2018; Horvath, 2019) conducted studies related to macroeconomic factors and equity premium in the developed financial markets. However, the literature available in developing economies like Pakistan is limited. In the current research, a set of macroeconomic factors are considered as determinant on firm level equity risk premium in Pakistan.

1.1 Research Objectives

After a detailed description of the importance of equity premium in capital market investment, this study develops the following research question and research objective related to equity premium in capital market that how macroeconomic variables affect firm level as well as industry equity premium, device the fund managers, investor's decision and policy maker in corrective decision making. The objective about this study is to identify the macroeconomic factors that affect firm level as well as industry equity premium that could help fund managers, investor's and policy maker in corrective decision making.

II. Literature Review

2.1 Macroeconomic Determinants and Equity Premium

The preference given to the macroeconomic variables has multiple reasons. It is motivated by number of research articles that have investigated the matter in detail and received worldwide appreciation. Roll et al. (1986) investigated macroeconomic influences on stock price (as well as risk premium) and proved that gross domestic product (GDP) and inflation do influence risk premium. Arnott (2002) in his research study about historical risk premium in United States of America pointed out that inflation and GDP growth have had big influence on risk premium value in USA during 1802-2002. Lettau et al. (2006) in their research about equity risk premium used the term "macroeconomic risk", which is volatility of the aggregate economy. They pointed out that changes in GDP were the most important factor in economic changes, which in its turn influenced risk premium. Neely et al. (2011) also found that inflation rate has strong correlation with changes in risk premium. According to Kizys (2007) long term government bonds can explain perception of investors about inflation much clearer than short term interest rate and also inflation is more influential in long term investment horizons than the short one. A study of macroeconomic influences on US and Japanese stock returns showed a positive relation with industrial production and a negative relation with inflation and interest rate. However, Japanese stocks were negatively related to the money supply, while US stocks had no significant relation addressed by

Macmillan (2007). Maskay and Chapman (2007) obtained results supporting hypotheses about money supply effect on risk premium and stock returns. The findings of the research reveal that most of macroeconomic variables can be used to explain the short term stock returns. However, industrial production remains the only variable which explains the stock return for even longer periods". According to Chou et al.(2007) a set of macroeconomic variable have an effect on stock prices that leads to change in equity premium and translates in total expected returns. Recently Churchill et al. (2015) reviewed 87 research studies on the effect of government expenditure on economic development and growth. In the high income countries, there is negative effect of government expenditure and GDP.

Reilly and Brown (2000) presents the general concept of modern finance which further expands the relationship of financial market performance with other variables. Changes in inflation may cause changes in the required rate of return of a stock market security. Due to the change in discount rate in response to inflation, there is an inverse relationship between interest rates and bond market pricing. This also implies a negative relationship between change in inflation and bond price returns, since as inflation increases, nominal interest rates will increase to preserve the real rate of return. Lamont (2001), Bai (2008) explored the relationship and propose a macroeconomic index that explained short-term disparity in future equity returns with more predicting capacity than the historical average returns. A significant cyclical pattern was marked with time-varying macroeconomic conditions. The observation regarding the relationship among discount rates and expected equity returns exists and proposes that an increase in discount rates may increases the opportunity cost of holding investment in money market and thus replacement between equity market instruments and interest bearing securities which causes decreasing the equity prices which translate falling the overall equity returns. The studies of Chin et al. (1976), Bodie (1976), Fama (1981), Cheski and Roll (1983), Ross (1986), Fama and French (2003), Hassan and Javeed (2009), Damodaram (2011, 2012) and Imran and Abbas (2013) have been much focused in the present study. Hsing, Phillips and Phillips (2011) examined the Brazilian equity market for the period of 1997to 2010 and found significant association among the economic variables and equity premium. The market seems to be positively affected by industrial production, the ratio of M2 money supply to GDP as well as with the US equity market index. Their results also reveal a negative impact of the domestic inflation on stock market returns.

These studies are mostly related to find out the relationship of different macroeconomic variables and stock returns. In Pakistan we have a long list of macroeconomic variables such as interest rate, inflation, money supply, GDP, unemployment, consumption, balance of payment, investment, wealth, private and public debt and several other that have a significant effect on stock market returns. However, to the author's knowledge in Pakistani context none of the study investigate the relationship between macroeconomic variables as determinants of firm level equity premium and sector wise equity premium. This research will be an initiation to reduce this gap in the literature to examine the relationship among macroeconomic variables and firm level equity premium and market premium of the Pakistani stock market. The variables which are most visible in a number of research studies are Inflation, foreign exchange rate, gross domestic product (GDP), money supply, industrial production, interest rate, balance of payment, government spending and employment.

III.   Research Methodology

3.1   Macro-Based Risk Factor Model

The Macro based multifactor model was developed by Chen et al. (1986), who explored that the equity returns are governed by many economic factors in the following manner:

$$(R_i - R_f) = \alpha_i + \beta_{i1}(R_{mt} - R_f) + \beta_{i2}(GDP_t) + \beta_{i3}(Inflation_t) + \varepsilon it$$

This model include only two macroeconomic variables to check the impact of these variables on equity premium. The extended versions of multifactor model has been tested around the world and in Pakistan at stock market level. However, in this research, the researcher calculates the equity premium at firm level rather market premium as examined in earlier studies. The firm level equity premium calculation which is

one the important number (Welch, 2000) differentiate this research from other earlier studies. The researcher extends the macro based model for a set of more relevant macroeconomic variables according to Pakistani scenario and to explore how these macroeconomic variables affect the firm level equity premium in Pakistan's capital market. Before proceed to explore this relationship, we analyse the impact of these macroeconomic factors on market premium followed by firm level equity premium. This will be the first study to be conducted on firm level premium and the researcher named this model as Firm Level Macro-factor Model(FLMM) and can be expressed as:

$$(R_{it} - R_{ft}) = \alpha_i + \beta_{i1}((R_{mt} - R_{ft}) + \beta_{i2}(InterestRate_t) + \beta_{i3}(Inflation_t) + \beta_{i4}(FDI_t)$$
$$+ \beta_{i5}(MoneySupply_t) + \beta_{i6}(GDP_t) + \varepsilon_{it}$$

R_{it} Is the return of the individual security (Firm Level)
R_f Is the risk free interest rate
R_{mt} Is the return of market
FDI is foreign direct investment
GDP is the Gross Domestic product (Annual), for monthly we use Industrial Production Index
ε_{it} Is the random error term

The macro-based multifactor model is only used for capturing the impact of macroeconomic variables and equity premium in Pakistan stock exchange. Ewijk (2010) examined that the equity risk premium tends to increase in more economic volatility and changing of economic policies. The author witnessed negative impact of interest rates on equity premiums. Mengyun et al., (2017) explored that macroeconomic factors like interest rate, inflation and exchange rate has significant negative impact on market premium followed by foreign direct investment in Pakistan. However, in this current study, the researcher is digging the return into deepen at firm level to examined that how change in macroeconomic factors influence firm level equity premium. This can help the investors in taking their investment decisions in a particular firm or industry. Some industries and firms are more sensitive to change in macroeconomic factors than others.

IV.   Empirical Analysis of Macroeconomic Variables

4.1 Data and Preliminary Evidences

Monthly data is collected from Pakistani firms for the period January 2001 to December 2015. The dependent variable is the equity premium of each non-financial sector which is calculated as the difference between the sector portfolio return and the risk free rate of return.

Table 1 contains the summary statistics for the macroeconomic variables used in this study, which may help in the interpretation of the coefficient estimates by providing the scale of the relevant variables. The result of descriptive statistics includes mean, minimum, maximum, standard deviation, skewness and kurtosis.

Table 1 Descriptive Statistics

	Mean	Median	SD	Mini	Max	Skew	Kurt
T-Bill Rates	0.0073	0.0078	0.0029	0.0008	0.0115	-0.7598	2.6268
Money Supply	8.3500	8.3982	0.5741	7.3254	9.2626	-0.1195	2.8447
Indus	4.5189	4.5834	0.2497	3.7872	4.8612	-1.1497	3.5969

Production							
Foreign D. Investment	5.1159	5.2198	0.8814	2.9071	7.1554	-0.3807	2.6964
Inflation	4.2945	4.2579	0.4078	3.7357	4.9008	0.1228	2.4914

The summary statistics of macroeconomic variables shows that the mean value of T-Bill rate is 0.007 with a range of 0.0008 to 0.0115 having standard deviation of 0.003. The mean of money supply is 8.3 with a range of 7.32 to 9.26 percent having standard deviation of 0.57. Industrial production has the mean of 4.51 which range from 3.78 to 4.86 with a standard deviation of 0.25. A similar interpretation holds for foreign direct investment which has mean value of 5.11 with a range of 2.90 to 7.15. Inflation has a mean of 4.29 with a range of 3.73 to 4.90 and standard deviation of 0.40. 5.4.3.

Table 2 contains the summary statistics for the market premium of the non-financial sectors used in this study, which may help in the interpretation of the coefficient estimates by providing the scale of the relevant variables. The result of descriptive statistics includes mean, maximum, minimum, standard deviation, Skewness and kurtosis.

2. Descriptive Statistics of Non-Financial Sectors

Sectors	Mean	Standard Deviation	Minimum	Maximum	Skewness	Kurtosis
Automobile and Parts	0.002	0.090	-0.247	0.235	-0.143	3.077
Beverages	0.006	0.135	-0.428	0.408	0.174	4.030
Chemicals	-0.001	0.073	-0.282	0.220	-0.410	4.444
Construction& Materials	-0.002	0.092	-0.262	0.306	0.332	4.077
Electronics& Electrical	0.000	0.124	-0.358	0.373	0.445	3.964
Electricity	-0.007	0.097	-0.370	0.409	0.460	6.019
Engineering	0.003	0.087	-0.256	0.253	0.146	3.296
Food Producer	0.002	0.058	-0.132	0.198	0.462	3.821
Fixed Line Telecom	-0.009	0.120	-0.567	0.345	-0.137	5.354
Health Care Equip	0.002	0.299	-1.713	1.602	-0.008	6.66
House Hold Goods	-0.004	0.064	-0.225	0.186	-0.029	4.338
Industrial Metal&Mine	-0.003	0.093	-0.377	0.340	0.170	5.795
Industrial Transport	0.019	0.152	-0.437	0.751	0.780	6.864
Multiutilities (Gas &water)	-0.004	0.122	-0.528	0.377	0.189	5.540
Pharma and Bio Tech	0.007	0.071	-0.160	0.178	0.174	2.763
Personal Goods-Textile	-0.003	0.067	-0.199	0.245	0.557	4.849
Tobacco	0.016	0.110	-0.293	0.431	0.320	4.443
Travel and Leisure	0.005	0.089	-0.419	0.287	0.042	6.710

These descriptive statistics show that the mean value of automobile sector is 0.002 with a range of -0.247 to 0.235 having standard deviation of 0.09. The mean value of beverages is 0.008 with a range of -0.428 to 0.408 percent having standard deviation of 0.135. Chemical has the mean of -0.001 between range -0.282 to 0.220 with a standard deviation of 0.073. A similar interpretation holds for all other sectors. The industrial transportation has the highest mean of 0.019 followed tobacco 0.016 with standard deviation of 0.152 and 0.110 respectively.

The descriptive statistics also show that industrial transportation and tobacco having the highest monthly premium returns are followed by automobile, beverage, engineering, food products, travel and leisure and Pharma and biotech. Among these non-financial sectors chemical, construction and material,

electronics, electricity, household, multi-utilities (Gas & Water) and personal goods (textiles) have negative premium returns and having standard deviation between 6% to 11%. The value of skewness shows that the return of the sectors are positively skewed except i.e. Automobiles, Chemicals, Fixed Line Telecom, Health Care Goods and Household Goods. The overall data is normal. Correlation of industry premiums with macroeconomic variables is provided in Table 3.

Table 3 Correlation Matrix

Sectors	Inflation	Foreign Investment	Industrial Production Index[1]	Money Supply	T.Bill Rate
Automobile Parts	-0.02	-0.09	-0.08	-0.01	-0.25
Beverages	0.09	0.03	0.12	0.11	-0.10
Chemicals	-0.06	-0.05	-0.08	-0.06	-0.23
Const& Material	-0.03	-0.17	-0.08	-0.02	-0.27
Elect &Eltrc Goods	-0.04	0.03	0.01	-0.01	-0.19
Electricity	0.00	-0.02	-0.04	0.00	-0.15
Engineering	-0.06	-0.04	-0.05	-0.04	-0.29
Food Producer	-0.08	-0.10	-0.10	-0.08	-0.26
Fixed Line Telecom	-0.06	-0.03	-0.03	-0.04	-0.21
Health Care Equipment	-0.00	0.01	-0.02	0.00	-0.06
Household Goods	-0.00	-0.09	-0.10	0.01	-0.24
Indus Metal & Mining	-0.13	-0.07	-0.11	-0.12	-0.28
Indus Transportation	-0.09	-0.07	-0.09	-0.08	-0.23
Multi (Gas and water)	-0.07	-0.09	-0.06	-0.07	-0.18
Pharma and Bio Tech	-0.01	-0.14	-0.08	0.00	-0.26
Personnel Goods (Textile)	0.04	-0.08	-0.00	0.05	-0.21
Tobacco	0.06	-0.07	0.03	0.09	-0.14
Travel and Leisure	-0.12	-0.09	-0.12	-0.11	-0.28

The results of the correlation matrix indicate that there is no serious issue. Most of these firms are negatively correlated with the macroeconomic variables. Only few variables are correlated positively.

In the present study, equity risk premium is considered as dependent variable. To assess the normality of dependent variable i.e. Industry risk premium. Kolmogorov- Smirnov test is applied. The results are presented in Table 4.

The results demonstrates that p-value of Kolmogorov- Smirnov test is insignificant which suggest that sector premium is normal. The same normality trend is also observed by constructing a Histogram (Figure 1).

Table 4 Normality test of Sector Premium

H_o: Sector (Equity) premium is normal	Kolmogorov- Smirnov	P-value	Decision
	0.659	0.076	Retain Null Hypothesis

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[1] In order to capture monthly effect, we use Industrial Production Index as proxy for GDP. There is no monthly data available for GDP in Pakistan
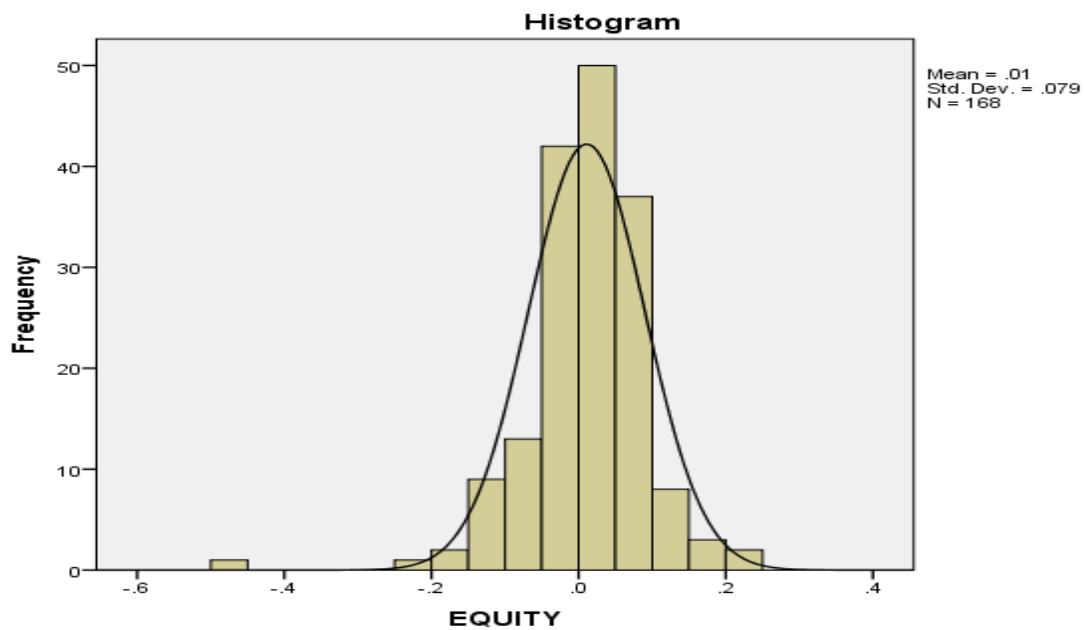
Figure 1 The normality Plot of Equity Premium

4.2   Estimation and Interpretation of Results

To estimate the model the researcher has taken the annual data and used panel data econometrics to estimate the effect of macroeconomic variables on firm level equity risk premium.

Table 5 provides the estimated results of random effect model. The results explain the impact of macroeconomic variables on firm level equity premium. The statistically significant positive coefficient of market premium indicate that one percent increase in market premium will increase the firm level equity premium by 0.15 percent in the non-financial firms listed on PSX. The market premium is thus the ability to outperform the market individual stock returns – when overall market return increases, it positively affect the individual firm returns (Acharya & Pedersen, 2005; Amihud, 2002). The negative significant coefficient of T-bill rate indicates that one percent increase in interest will decrease the equity premium by 0.53 percent. The interest rate is the main cause of affecting equity premium. These results are significant with Bucio (2009), Kazi (2009) and Imran and Abbas (2013). The statistically highly significant coefficient of inflation affect the firm level equity premium negatively. One percent increase in inflation will decrease the equity premium by 0.71 percent. The positive and highly significant coefficient of income proxy by real GDP indicate the one percent increase in income will increase the equity premium of non-financial firms by 1.09 percent. The increase in country GDP gives positive signal of the economic growth. With the increase in economic growth financial investor take more interest in stock market activities which result in increasing stock prices that further translate into increase in equity premium. These results are consistent with Chen et al. (1986) and Thmidi (2011). According to the theoretical expectation, the positive and statistically significant coefficient of money supply indicate that one percent increase in money supply increases the equity premium by more than 0.03 percent. Like money supply, the effect of foreign direct investment on equity premium is also positive and highly significant. The positive coefficient of foreign direct investment indicate that one percent increase in foreign direct investment will increase the equity premium on non-financial sectors by 0.79 percent. The heavy inflow of foreign direct investment in different services sector boom the stock market and has significantly affect the capital market investment and returns. These results are consistent with the previous studies of (Chohen, 2009; Ferreira, 2011).

Table 5 Random Effect Model- Equity Premium

Variable	Coefficient
Constant	-0.6980
	(-2.213)**
Market Premium	0.1597
	(3.5097)***
T-Bills Rate	-0.5389
	(-6.2765)***
Inflation	-0.7165
	(-14.403)***
GDP	1.0968
	(4.293)***
Money Supply	0.0380
	(11.0658)***
Foreign Direct Investment	0.7914
	(8.1112)***
R-squared	0.2754
Adjusted R-squared	0.2742
S.E. of regression	0.5354
F-statistic	232.1096
Prob(F-statistic)	0.0000
Durbin-Watson stat	2.0245
Second-Stage SSR	1050.5980
Prob(J-statistic)	0.2743

Note: *(**)(***) indicates that variable is significant at 10%(5%)(1%) level of significance.

The value of coefficient of determination (R^2) indicates that more than 27 percent variation in the model. Similarly, the value of adjusted-R^2 implies that more than 27 percent variation in equity risk premium is explained by the explanatory variables. The value of F-statistics is highly statistically significant, which implies that the model fits the data well. The value of the DW test is close to the desired value of 2, which indicates that there is not serious problem of autocorrelation in the data. The statistically insignificant value of J-statistics indicates that the instruments are valid.

V.   Conclusion

We investigate the impact of macroeconomic factors on firm level equity premium. We proposed and estimate "Macrobased Multifactor Model" and estimate firm level equity premium as dependent variables and our model also include more macroeconomic variables than the previous studies explored. The macroeconomic variables included interest rate, gross domestic product (industrial production index), inflation (consumer price index), foreign direct investment and money supply (M2). The researcher has applied panel data econometrics and two stage least square technique to examine the impact of macroeconomic variables on the firm level cross sectional data and sector premium of each non-financial sector respectively. The model includes the market premium and five more macroeconomic variables which are more related to Pakistan capital market in general and to non-financial sector at particular. The random effect model estimated results show that the macroeconomic set of variable has highly significant effect on firm level equity premium. The estimated results of the equity premium and the macroeconomic variables show that market premium and all five macroeconomic variables are highly significantly affect the firm level equity premium. According to the theoretical expectations T-bill rate and inflation has negative impact on equity premium. Increase in T-bill rate or inflation decreases the size of firm

level equity premium of non-financial firms listed on PSX. Money supply, industrial production (GDP) and foreign direct investment have positive and statistically highly significant effect on firm level equity premium. Increase in industrial production, money supply or the increase in the inflow of FDI increases investor confidence which leads to increase in the equity market prices which further translate to increase the magnitude of equity premium. The investor also need to examine the macro economic variables and its importance in investment decision. Interest rate, inflation, industrial production, money supply and foreign direct investment, these variables should be considered in asset pricing and investment decisions. The Macrobased multifactor model used in this study can help the investor and institutions in examining macroeconomic and equity premium relationship. A long term relationship between monetary factors and equity returns requires that monetary policy may have serious implications on equity markets. Therefore, investors should carefully observe the actions of State Bank of Pakistan. Specially, decisions regarding money supply and management of discount rate can create shocks in market. A well-conceived decision by State Bank of Pakistan may help to avoid any adverse shock in stock markets.

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