IMPACT OF MACROECONOMIC FACTORS ON EQUITY PREMIUM: VALIDATION THROUGH ARBITRAGE PRICING THEORY EVIDENCE FROM PSX

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ABSTRACT

Current study explores the relationship of macroeconomic variables and firm level equity premium of 349 Pakistan stock exchange listed firms. Theoretically underlying model is supported by Arbitrage pricing theory. Panel random effect method result concludes that government stability, terrorism, climate change, and financial crisis negatively significantly impact the firm level equity premium. While Pedroni panel co-integration shows long run association among underlying variables. Results of current study provides theoretical and practical research implications for academia and decision makers.

Keywords: Macroeconomic factors, Terrorism, Government stability, Climate change, APT, Equity premium.

Jel Classification: B12, C23, G01, G12, P34, Q54

INTRODUCTION

In domain of advance corporate finance and financial economics investors returns has been always remains a key issue. In context of asset pricing and risk handling determination of stock returns are studied widely in literature. Investors returns in other words equity premium is an extra compensation asked by investors for investing in risky stocks. (Welch (2000). In investment choices investors are more concerned about risk compensation or equity premium. Referring to asset pricing theory higher the risk higher the return. Therefore, investors always asked for high premium for bearing high risk. Which is directly linked with cost of equity and cost of capital. Savings, spending behavior and distribution of portfolio among risk free and risky assets are associate with equity premium. (Damodaram, 2012). Macroeconomic variables play an important role in stocks markets. Over the time equity premium majorly influenced by several macroeconomic factors (Madsen, Kyriacou, Mase 2006). Financial economics literature confirms the relationship between macroeconomics factors and stock returns (Lanne 2002, Campbell and Yogo 2003, Jansen and Moreira 2004, Donaldson and Maddaloni 2002,

Goyal 2004), and. GDP inflation interest rates, current account balance and unemployment are factors which has been discussed in the past studies which build the association among macroeconomic variables and stock returns (Ang & Maddaloni 2005) In Developed and emerging economics most of studies measured the underlying relationship of macroeconomic effects on stock markets returns. Multiple internal and external variables was investigated in order to pin point the volatility of stock returns. These researches include Mukherjee & Naka (1995), Kwon, Shin, & Bacon (1997), Nasseh & Strauss (2000) and Anyaduba & Idolor (2015). Another finding from Nigeria confirms the long run association of macroeconomic variables on stock returns. (M. Josiah & E. B. Akpoveta 2019).

Investors ask for high premium when uncertainty increased in environment due to terrorism because investors moves towards safe investments which reduces the anticipated returns. Numerous factors named as economic, social, political, demographic and environmental plays an important role in financial markets development which in turns influence stock returns and equity premium.

(Mengyun et al., 2018: Imran et al., 2019) . According to literature terrorism significantly affects equity premium.

Another factor that induces uncertainty in to financial market is political instability. Mostly developing countries are suffering from political misbalance. Which negatively affect GDP. Decrease in GDP influence stock markets and investors equity premium (Imran et al.2019).

It also adversely affects foreign investor's interest and reduces the foreign direct investment because markets are highly volatile due to uncertain political events which adversely affect returns on investment. While stable political conditions reduce the risk, which increases the rate of return (Mengyun et al. 2018),

Researchers are more focusing on environmental uncertainties like climate change constraints and prospects in context of industry. Theoretical literature related to financial performance and environment concludes that climate ratings are playing vital economic role in determination of stock markets returns (Portney 2008). Stock prices reacts to positive or negative signals of environment news (Hamilton 1995, Klassen and McLaughlin 1996, Konar and Cohen 1997, Khanna et al. 1998).

Current study is significant because past researchers have investigated the relationship of economic variables and stock market returns but they ignored the firm level equity premium and its predictors. 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) .In context of Pakistan most studies are based on determinants of stock market returns (Hassan and Javeed, 2011; Imran and Abbas, 2013; Khan, 2014; Zeshan, 2016) . Association among macroeconomic variables growth, exchange rate, inflation is found to be positive and adverse in case of interest rate. Moreover, firm level variables and their impact on stock markets are established in several studies in different economics (Fama and French, 2002: Damodaram, 2012, 2016)

Equity premium is a vital element of stock returns which was ignored in past researches. This study will fill the gap by investigating the underlying relationship of macroeconomic variables terrorism financial crisis government stability climate change and firm level equity premium. Previously these factors were examined in terms of stock returns in developed economies (Apergis, 2016). Referred to Fama and French (2002) equity premium is affected by few invisible economic factors. Another Significance of current study is this will include these macro-economic factors which may be those variables indicated by Fama French. In past studies by (Mengyun et al., 2018; Imran et al., 2019) economic and non-economic variables are not theoretical discussed. While current study will explain arbitrage pricing theory to develop a single model and which will optimize the underlying model for valuation of stocks in Pakistan.

Based on previous literature this study will answer the research question does macroeconomic factors holds relationship with equity premium of Pakistan stock exchange listed firms. The objective of current study is to determine the macroeconomic factors that affect firm level equity premium which provides reasonable corrective decision-making bases to investors, policy makers. Another theoretical contribution of current study it explains relationship of underlying model through arbitrage pricing theory. Long run association among underlying variables are checked through panel Pedroni co-integration analysis. Rest of the paper is based on literature review, research methodology, result discussion and conclusion.

Literature Review

Returns on an investment are proportional to how risky stocks are. Riskier the stocks, higher are the returns compared to less risky stocks which yield low returns. Equity premium, as discussed in literature that exists till date, is believed to be low in stock markets of developed countries as compared to developing countries where it is high. (Shackman, 2006: Erbas & Mirakhor, 2007).

The reason for this differing behavior is as per the high risk, high return principle. Since markets in emerging economies are prone to high risk – hence, expected return is high there in lieu of higher risk they have. Damodaram (2008) described equity premium as the excess return investors expect on an investment in stock market as compared to investment in money market as the former has higher risk.

Again recently, Damodaram (2016) through empirical evidence reasserts how important equity premium is by considering the data for period 1926 to 2015 where analysis showed 1.91 percent standard

deviation, average equity premium for this duration came out to be 3.68 percent only.

Equity premium is measured in number of asset pricing models including Capital Asset Pricing Model (CAPM), Arbitrage Pricing Theory (APT), multifactor models and three factor models.

Markowitz conducted research in 1952 which for the first time - foundation for this kind of analysis was laid down.

The CAPM model has been examined empirically in multiple capital markets in many studies. (Elton & Gruber, 1995: Joshi, 2003: Ross et. al, 2005; Brealey, 2006, Mengyun et. al, 2018) Treynor (1961), Linter (1965) Sharpe (1964) & Mossin (1966) worked further on Markowitz theory developing and constructing it into Capital Asset Pricing Model Experts of financial research extensively use CAPM. In portfolio management, it is used as a standard in rating the portfolio managers' performance.

Beta is used in calculating the market risk as discussed by Fama and French (2003). Total equity premium is outcome of beta and market premium for an investor. Models of risk and return includes arbitrage pricing theory and Fama and French. Risk factors explained by risk and return models named as arbitrage pricing theory and multi factor model have individual risk premium. Therefore Calculation of betas under these models are based on individual market risk factors instead of single beta of portfolio. There are many elements that determine the equity premium, as highlighted by literature and can be characterized into two major groups named as economic factors and noneconomic factors of equity premium . Current research considered micro economic (company level) and macroeconomic alongside non-economic factors.

Roll (1976) and Rose (1977) claimed about CAPM being a single index risk model proxy as lacking to truly capture the size of risk in the market. Hence, a substitute method to Capital Asset Pricing Model was introduced by Ross in 1976 known as Arbitrage Pricing Theory.

From a theoretical perspective, arbitrage pricing theory hypothesizes that economic assets, especially stocks, can be affected by macroeconomic variables like inflation, real level of economic activity, interest rate, and exchange rate. These macro factors are causes systematic risk that influenced the entire stock market, unlike the unsystematic risks that are stock-specific.

APT estimates the connotation among portfolio returns and a single asset returns through a linear combination of multiple macroeconomic factors, for example, interest rate, gross domestic products, prices of merchandises & oil prices. Arbitrage pricing theory varies from capital asset pricing model because it has less conventions.

APT allows interpretation (instead of counting) of the return on assets model. Its underlying postulation is that there will be unique portfolio with the investor, its own beta family, instead of same "market portfolio". Therefore, in some ways, CAPM can be considered as a "special case" of APT, where the safety market line represents a single factor model of asset prices where the value of β is exposed to changes in market value (Mengyun et al. 2018).

Vast literature focuses on economic analysis and impact of terrorism (G, Bird, Bloomberg and Hess, 2008; Bruck, 2005, 2007; Enders & Sandler, 2006; Bruck and Wickstrom, 2004; Sandler and Enders, 2004; Sandler, 2003) .Empirically past literature has provided the evidence of negative impact of terrorism on stock returns (Hobbs et al 2016, Essaddam and Mnasri 2015, Aslam and Kang 2015, Essaddam and Karagianis 2016, Eldor et al 2012, Drakos 2010, Karolyi and Martell 2010, Zussman and Zussman 2006). Terrorist events results into multiple economic costs that may unfavorably affect a number of economic figures, sectors and activities including growth and investment; fiscal policy; FDI movements and the apportionment of industrious capital across open economies; increased economic uncertainty; investor's decision making process; the stock markets via a reduction to firms' expected profits; the foreign exchange market (C. Kollias et al 2011, Drakos 2010).

Studies concluded that political uncertainty has adverse effect on stock returns, and it increase volatility due to higher uncertainty. (Frey and Waldenstrom 2004) have explains that political events strongly influence stock market returns and trading volume of stocks. Further studies conclude that positive political news induces positive signal and impact stock returns positively while bad political news induces negative impact (Chan and Wei 1996, Beaulieu et al.2006, Bailey et al. 2005). Another study from Pakistan has shown that's adverse association exist among political instability and stock returns. The effect of political event is short run and markets recover within 15 days. (Arzu 2011. Raza and Malik 2013 Nazir et al. 2014).

In last few years literature on climate change economy is increasing excessively. The opportunities and threats to industry due to climate change are greater.in terms of cost it increases the cost, legislation and regulatory burdens. Climate ratings are an important factor which effects stock market returns. Extensive theoretical literature links environmental performance and financial performance green preferences is on of example (Portney 2008)

Climate changes are termed as increase in sea level rise and weather-related natural catastrophes like droughts, storms, heat waves and heavy rainfalls (Stern, 2008). The outcomes of climate risk for investors are adverse and is hard to hedge. According to Mark Carney investors bear significant losses due to climate change outcomes in context of physical risk, liability risk, and it creates uncertainty for financial stability which in turns leads towards revaluation of firm assets. Due to climate change uncertainty increases in capital market (Beatty and Shishak 2010).

Two type of Literature exist on environmental change first one states that corporate social responsibility provides mechanism to firms to be environmentally responsible which in turns increase their financial performance (Margolis et al. 2007 & Reinhardt et al. 2008). Second strands of literature explain the impact of environmental information news on stock prices. Most studies find evidence that stock prices tend to show positive response when positive environment information strikes and decreasing trend when negatives information comes in capital market (Hamilton 1995, Klassen and McLaughlin 1996, Konar and Cohen 1997, Khanna et al. 1998).

Financial system is vital element of any economy in today's world capital markets provide liquidity to savers and investment opportunities for investors. Several studies provide evidence that equity market is most essential part of economic system which helps in maximizing economic development and growth (Levine and Zervos 1996; Levine, 2002; Nieuwerburgh et al., 2006; Enisan and Olufisayo 2009) These markets are responsive to national and international events (unpleasant or agreeable) and react instantly after their occurrence one of example are financial crisis. Financial crisis increase volatility in markets which in turns decreases the investor confidence and increase financial risk due to change in asset prices. While volatility is plays important

role while decision making related to portfolio or diversification (Rafaqet and Muhammad 2012).

According to above literature macroeconomic factors namely as interest rate inflation industrial production and other effect the equity risk premium. Those economies which have low volatility in terms of macroeconomic variables have low equity risk premium. Study conducted in U.S provides evidence that volatility caused in U.S capital markets is due to macroeconomic factors. Lettau, et al. (2007). The studies of Daniel and Martin (2018), Neely et al. (2014), Fama (1981) and Kaim (1986) investigated the association among inflation and equity premiums and found very weak. The study of Wang (2003) explained that increase in inflation cause increase in equity risk premium. Kizys (2007), Macmillan (2007), Lamont (2001) examined that portfolios developed to follow the growth rates of real income (GDP), consumption, and labor income earned abnormal positive expected returns. Interestingly, (Tajudeen et el.2018) investigated the relationship of different economic and non-economic factors on public health expenditure and concluded that non-economic factors cannot be ignored.

Previous researches are mostly related to impact on multiple macroeconomic factors on stock returns. In context of Pakistan macroeconomic variable names ad interest rate, GDP, inflation, unemployment, consumption balance of payment public debt and several others are associated with stock returns. To the best of researcher knowledge, no study explained the relationship of macroeconomic variables and equity premium at firm level of non-financial firms. Another gap filled by this study is theoretical linkage of arbitrage pricing theory.

Research Methodology

KSE100 Pakistan stock exchange listed non-financial firms 2006-2016are included in the study. Data is collected from Pakistan stock exchange, Business recorder and country risk guide.

Current study calculates the equity premium for firms listed on Pakistan Stock Exchange (KSE100) Index.

Asset prices are used for return calculation based on following formula

Future value=present value*e^n

Compounded returns are computed for each asset by using the following formula:

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

Where Rt is the compounded return Pt
"T," is the price of asset at period
P-t is price of asset at period "1− T"
Ln is the natural logarithm
EP is calculated as follow Fama and French (2002)

$$EP = RM - RF \ldots\ldots..$$

Where EP is equity premium, RM is the return of the market, RF Is the risk-free rate of return

In this study panel data estimation will be used. Panel data techniques fix effect method and panel co-integration is used for result interpretation.
The APT regression model is

$$Ep = \beta_0 + \beta(Rm - Rf) + \beta1(terrosim) + \beta2(financial\ crsis) + \beta3(climate\ change) + \beta4(governament\ stability) + \mu it$$

Result Discussion

Table II Correlation

	CO2	EP	FC	GSI	T
CO2	1				
EP	-0.009864	1			
FC	-0.785996	-0.019624	1		
GSI	-0.127557	-0.02696	-0.13094	1	
T	-0.501513	0.009952	-0.37277	-0.55244	1

Table 1 (Appendix) reports of descriptive state and table 2 results of correlation. According to results there is significant correlation among underlying variables while government stability and Co2 depicts negative relationship. While few variables report insignificant values but those VIF reported for those variables are 0.362508 which is less than 5% which shows insignificance level is between the tolerable limit. Which resolves the issue of multi-collinearity

Table III Panel Unit root test

Variable Name	P value (Levin, lin, chu)
CO2	0.000 1st level
Equity premium	0.000 1st level
government stability index	0.000 1st level
terrorism index	0.000 1st level
financial crisis	0.000 1st level

Panel unit root test is performed in order to check data is stationary or not according to results all series are stationary at 1st level which meets the criteria. Table 3 reports the significance P values of Levin, Lin, and Chu which are significant and states series are stationary.

Table IV
Random effect method

Variable	coefficient	P Value
FC	-0.98569	0.0005
GSI	-0.24816	0.0068
T	-0.32161	0.086
CO2	-16.1931	0.0002

*P<0.05

Table V Hausman Test results

Test cross section random effects			
Test summary	Chi-sq. Statistic	chi-Sq.d.f.	Prob
cross-section random	0.00000	4	1.000

**P<0.05

Hausman test results are incorporated in this study in order to select the appropriate model selection for results reporting. This test states if the P value is insignificant than Random effect method is batter then fix effect method. In current study table 5 results of Hausman test are insignificant therefore this study selects random effect method for result interpretation. Table 4 reports results of random effect method. According to results all macroeconomic variables shows significant relationship with firm level equity premium of Pakistan stock exchange listed firms. Multiple factors affect the equity premium therefore values of R (0.462955) is less. Financial crisis significance level 0.0005 shows that in times of financial crisis firms level equity premium is affected by crisis. Negative coefficient of financial crisis shows that I percent increase in financial crisis decrease 0.98 % firm level equity premium. While in times of financial crisis firms are unable to pay high returns and liquidity of stocks are also less therefore equity premium will tend to decrease. Similarly, negative coefficient of government stability shows that increase in government stability will decrease firm level equity premium by 0.24%. When government stability is not strong it generates negative signal that government will not survive therefore firm level equity premium will decrease. (Adghirni et al., 2017, Hillier et.al 2019, Dimic et.al 2015, lehkenon 2015, DI Vortilons 2016). Terrorism coefficient value is negative which shows 1 % increase in terrorism will decrease the firm level equity premium by 0.32%. Terrorism significantly associated with stock returns and equity premium although this association proved to be short run and negative (Laila et.al 2019, hadek et.al 2019, Fatma et.al 2019, javaid 2018)**.** Coefficient value of CO2 emission shows that 1 percent increase in CO2 will decrease the firm level equity premium by 16.19%. Climate change is a serious threat to firms' revenues and returns. according to past studies companies with low level of carbon emissions offers high returns while companies with high level or carbon emission offers

less stock returns in this context when in overall environment when CO2 emissions increased equity premium will decreased (Bernardini, Enrico, et al 2019).Results of these studies are in line with past studies of Qureshi (2010), Tabassum et al. (2016) and Mengyun et al. (2018). Table 6 (Appendix) reports the Pedroni residual co-integration test which states long run association of underlying variables. ADF and PP values are significant in current study.

Conclusion

In finance literature several studies shade light on equity premium which is one of vital factor. Equity premium also effects investor's choices of investment on the other hand it also considered while estimating the cost of equity and expected returns. Current study investigated the effect of macroeconomic variables on equity premium. For this purpose, equity premium of 349 Pakistan stock exchange listed firms are calculated for the period of 2006-2016**.** Current study explains this underlying relationship of macroeconomic variables through arbitrage pricing theory which explains firm level equity premium is determined through multiple factors. Panel data techniques random effect method reports negative significant relationship of all four macroeconomic variables financial crisis, government stability and terrorism and climate change. While results of Pedroni panel co-integration shows long run association of variables. Results of this study concludes that investors should consider macroeconomic factors also while making the investment decision with firm level fundamentals. While firms can also increase the efficiency of management decision.

(Appendix)

Table 1 Descriptive state

	CO2	EP	FC	GSI	T
Mean	0.931727	0.999061	0.181818	6.401515	8.42
Median	0.93	0.971364	0	6.375	8.61
Std.dv	0.029855	5.454845	0.385745	1.070616	0.60076
Skewness	2.341227	272.9644	3.722222	3.647962	3.968148
kurtosis	2.341227	272.9644	3.722222	3.647962	3.968148

Table VI Co-integration Test

Pedroni Residual Co-integration Test	
	P Value
Panel PP statistic	0.000
Panel ADF-Statistic	0.000
Group PP-Statistics	0.000
Group ADF-Statistic	0.000

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