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Pricing of Risk, Various Volatility Dynamics and Macroeconomic Exposure of Firm Returns: New Evidence on Age Effect

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ABSTRACT

While investigating the role of age effect in detecting the risks-return tradeoff, various volatility dynamics and macroeconomic exposure of firm returns, this research study employs monthly data from Pakistani stock market for the period from 1998 to 2012. For this purpose, three generalized autoregressive conditional heteroskedasticity models (GARCH-M) were functioned: GARCH-M for risks-return tradeoff, GARCH (1, 1) for capturing different volatility dynamics and exponential GARCH for asymmetric and leverage effect. This study rests on the following outcomes. Firstly, we unravel that age effect is flag rising in the debate of risks-return tradeoff. Secondly, in the course of exploring whether the firm age matters from the context of asymmetry and leverage effect, we find that it is certainly the case. Thirdly, age effect holds considerable role in determining various volatility dynamics. Finally, we expose that macroeconomic variables affect stock returns differently depending upon firm age, signifying the role of age effect.

Keywords: Firm Age, Risks-Return Trade-off, Volatility Dynamic and Macroeconomic Exposure
JEL Classifications: G10, G11, G12

1. INTRODUCTION

The financial scholars set stock market as an integral component of the financial system of an economy (e.g., Raza and Jawaid, 2014). Hence, chase for the stock returns has attracted considerable attention in the financial press; though, the economists have usually paid little interest to the issue of firm's returns from the context of its age. This research study wishes to contribute closing this space. The subsequent parts of this section promote the inspiration for all the dimensions highlighted along with the literature survey in that.

1.1. Inspiration for Age Effect

The inspiration of age effect became well-known in the brook of influential research (e.g. Loderer and Waelchli, 2010). From theoretical perspective, financial press has documented diversified behavior of firms with respect to their ages. A cluster of financial literature has concluded that the managers of young firms might be less experienced or might lack research resources compared to the managers of the old firms (e.g. Glancey, 1998; Salman and Yazdanfar, 2012). Therefore, old firms due to more experienced and competent management and larger financial resources can diversify their investment and can benefit from economies of scale in a better way than their younger counterparts (e.g. Glancey, 1998). Further, investors may have long historic records of old, large and established firms and thus they may check how their stocks responded through different recessions, upswings, etc. They are then able to make more informed decision. On the other hand young firms may be different because investors do not have enough past data, thus they are likely to short their stocks to avoid risk even if they are better than old firms (e.g. Chun et al., 2008). Further, relaying on the conclusion of Fama and French (2004) (supported by Chun et al., 2008) that the young and small firms have less survival rate, makes them strong contestant of being more negatively sensitive to changes in economic factors, as they suggested.

Further, consistent with the argument of Glancey (1998) and Elyasiani et al. (2007); more experienced management places the large and old firms in a better position to hedge themselves against any uncertainty than their small and young counterparts. Moreover, Chun et al. (2008) theoretically stated that news (negative) regarding young and small firms have stronger impact on investor's valuation of these firms relative to the old, large and established firms, and thus the stock returns of young and small firms can be more volatile. The financial literature (e.g. Pastor and Veronesi, 2003; Chun et al., 2008) also argues that investor's uncertainty decreases with the increase in firm age.

More so, large and old firms are better in absorbing the financial losses and carrying more yawning investment pockets. Consequently, older firms are less responsive to uncertainties (Trevino and Grosse, 2002; Jiang et al., 2011). Owing to larger financial resources and strong market power, older firms hold strong and lucrative bargaining power and are better in structuring deals to their best advantages (Jiang et al., 2011). Further, financial literature also denoted that the stocks of young firms might be more risky (Wurgler and Zhuravskaya, 2002), trade costly and very difficult to short (Lamont and Thaler, 2003), and thus can be less liquid (Brunnermeier and Pedersen, 2005).

Nevertheless, on the contrary, financial press determined (e.g. Foster and Kaplan, 2001; Loderer and Waelchli, 2010); that in the case of old firms, cementation of organizational rigidity and inertia adversely affects the performance through reduction of their productive efficiency, slower growth, manifestation of higher cost, older and obsolete assets, reduction in R and D and investment activities (Loderer and Waelchli, 2010; Uhlaner et al., 2007) and strong rules and procedures weight them down (Foster and Kaplan, 2001). Further, not surprisingly, Loderer and Waelchli (2010) documented that with the increase in firm age, corporate governance worsens which raises internal conflicts, reduces internal control and results in mismanagement. Furthermore, Schumpeter (1912) theoretically stated (supported by Chun et al., 2008) that young and small firms are better in exploring and exploiting the new opportunities by mean of new technology in contrast to their large and old counterparts. The study of Fogel et al. (2008) empirically supported this argument.

It follows that since the behavior of young firms is very different from old ones, thus it is a matter of empirically testing to determine exactly what kind of differences they embrace in terms of: Effect of economic factors on stock returns; pricing of risk and various volatility dynamics of young firms versus old firms. Thus current research study is the first one specifically in emerging market to explore this phenomenon.

1.2. Inspiration for Risk-Return Trade-off

Neglecting the micro level analysis (i.e., firm level); majority of the presented financial press primarily focused either at aggregate market level and/or sectoral level stock returns to determine the pricing of risk[1]. Historically, since the landmark achievement of Markowitz (1952) centers around the idea that investors always demand higher returns on market portfolio than the investment i risk free securities, the association between risk and returns had been put under strong stress. This falls as no surprise specified the importance of risk while pricing the financial assets, financial derivatives and in the strategies of portfolio diversification (Mandimika and Chinzara, 2012).

The risk premium might be positive or negative. Although negative risk premium contradicts the fundamental portfolio theory (i.e., Markowitz, 1952), but still it has been determined in the empirical financial press (e.g. LeBaron, 1989; Glosten et al., 1993; Fraser and Power, 1997; Elyasiani and Mansur, 1998; Balios, 2008; Mandimika and Chinzara, 2012). For such negative risk premium, at least four reasons have been stated in the financial literature. Firstly, LeBaron (1989) and Balios (2008) featured such outcomes to non-synchronization of trading when the stock market is accredited by thin trading and illiquidity, motivating the investors to give up positive risk premium in chasing the successful transactions. Secondly, Koutmos et al. (1993) documented that the negative risk premium might be due to the fact that local investors are not open to the foreign exchange risk. The third and fourth reasons rest on the argument of Glosten et al. (1993) and Elyasiani and Mansur (1998) who documented that the negative risk premium might be either due to the fact that riskier period coincides with the period when investors are relatively better in bearing risk or if the investors are interested in saving more during a riskier period while holding all risky assets, contest may increase the asset prices; hence, decreases the risk premium. However, on the contrary; the study of Campbell and Hentschel (1991) in United States, Karmakar (2007) in India, Yu and Hassan (2008) in Middle East and North African region and Jiranyakul (2011) in Thailand documented positive risk premium.

More so, the latest study of Mandimika and Chinzara (2012) concluded that risk is not a priced factor at sectoral and aggregate market level stock returns in an emerging market. Thus, resting on the argument that firms are heterogeneous in nature (Ewing et al., 2005; Narayan and Sharma, 2011); it is quite possible that risk might be a priced factor at the firm level stock returns and can be subject to variations with respect to firm age.

1.3. Inspiration for Asymmetry and Leverage Effect

Presented financial press concluded that stock returns volatility increases after the stock price fall (e.g. Black, 1976; Christie, 1982; Ewing et al., 2005; Mandimika and Chinzara, 2012). At least there are four theoretical financial/economic explanations for such effect namely: (i) Leverage effect theory; (ii) asymmetric volatility of economic variables theory; (iii) time varying risk premium theory, and (iv) combination of both leverage effect and volatility feedback effect theory (for further details regarding these theories see Duffee, 1995 and Mandimika and Chinzara, 2012).

Further, Mangani (2008) determined the lack of pricing of risk accompanied by limited evidence of asymmetry and leverage effect. However, this lack of asymmetry and leverage effect is challenging the results of Ewing et al. (2005) and Karmakar (2007), Chinzara (2011) and Mandimika and Chinzara (2012), who documented the presence of strong asymmetry and leverage effect on stock returns.

1 Most of the existing studies (e.g. Campbell, 1985; Harvey, 1991; Glosten et al., 1993; Koutmos et al., 1993; Fraser and Power, 1997; Li et al., 2005; Yu and Hassan, 2008; Leon, 2008; Kovacic, 2008 and Jiranyakul, 2011) focused on aggregate market level returns while Mandimika and Chinzara (2012) targeted both the sectoral and aggregate market level data to determine the risk-return trade-off.

Ewing et al. (2005) along with Karmakar (2007) recommended the firm level analysis for determining the asymmetry and leverage effect. Thus, it is quite reasonable to argue that for the stock market players and policymakers, it is of immense importance to have detailed know how of asymmetric volatility particularly with respect to firm age. As the existing studies; principally in emerging markets (like Pakistan[2]) targeted the aggregate data, although, due to firm heterogeneity; aggregate market and even sectoral level analysis provides deceptive results (e.g. see Ewing et al., 2005). Hence, it is quite worthy to conduct firm level analysis with respect to their ages, since it has been ignored by the presented studies.

1.4. Inspiration for Various Volatility Dynamics (i.e., Volatility, Persistence and Mean Reversion)

Stock market volatility can supply financial and economic instability (Chinzara, 2011), thus it is very crucial to examine its trends over the time. Extreme stock market volatility may derail the smooth operations of other financial markets in the country, and consequently can have negative impact on investments, savings, performance of real economy and economic growth by two possible means (Mandimika and Chinzara, 2012). Firstly, stock market volatility leads to economic uncertainty which marks the capital flight (Rigobon and Sack, 2003). Secondly, knowing that the volatility is a measure of risk, therefore rise in equity market volatility is an indication of increase is equity risk, hence can consequently root the flow of funds to relatively less risky assets. This action can increase the cost of funds (Edward and Garcia, 2008). Furthermore, forecasting volatility is a critical factor in risk management, portfolio strategies, hedging and market timings for the stock market (Ewing et al., 2005).

Further, how persistence the volatility shocks are in a stock market, is a central question in detecting the association between the volatility and return, since the persistence volatility changes permit to the adjustments in risk premia (Elyasiani and Mansur, 1998). More so, Karmakar (2007) stated that volatility persistence significantly influences the hedging strategies. However, Fama (1965) reported that large change in asset price is followed by another large change whereas small change in followed by another small change. Such behavior of volatility is also documented by several other studies (e.g. Baillie et al., 1996; Engle and Patton, 2001; Ewing et al., 2005). Such volatility clustering implies that volatility shocks today will influence the future expected volatility for many future horizons. However, the study of Engle et al. (1990) and Elyasiani and Mansur (1998) stated two possible reasons for volatility clustering: (i) New arrival process, (ii) market dynamics against the news.

Next, the feature of mean reversion of stock returns volatility entails that by and large, volatility shocks hold the property of mean reversion in the stock market (Engle and Patton, 2001; Carroll and Connor, 2011). They further added that theoretical foundations for the mean reversion pattern of stock returns volatility roots from volatility clustering, implying that volatility comes and goes. Hence, the period of low volatility will finally give way to the period of high volatility and likewise the high volatile period will be traced by a normal one (Engle and Patton, 2001; Carroll and Connor, 2011). Such property of a financial asset is termed as mean reversion of volatility. However, most of the practitioners might disagree on the mean level of volatility and whether it is stable over all the time and corporate changes; yet they do agree on one common believe that there is a mean level of volatility to which the volatility steadily returns (Engle and Patton, 2001). In this regard, the studies mainly targeted the aggregate market and/or sectoral level returns[3]. However, due to firm heterogeneity; aggregate market and even sectoral level analysis provide deceptive results (e.g. Ewing et al., 2005; Chinzara, 2011). More so, Elyasiani et al. (2011) recommended that mean reversion pattern of stock return volatility should be examined by the future studies with due importance.

1.5. Inspiration for Economic Exposure of Stock Returns

Signifying the role of economic indicators in detecting the business overall systematic risk and cash flow, the connectivity between the macroeconomic factors and capital market is instinctively fascinating (Chinzara, 2011). Together, the arbitrage pricing theory and dividend discount model, set theoretical foundations that employ the conduit to root the factoring of economic variables into the stock returns. These models entail that any expected or unexpected influx of new information regarding macroeconomic variables (e.g. inflation, exchange rate [*EXR*], interest rate, gross domestic product, etc.), will impact the stock returns through discount factor, dividends or both.

Stemming from the empirical work of Chen et al. (1986), a large quantity of literature determined the substantial impact of economic factors on stock returns. Such as, the studies focusing at aggregate market level data include: Mukherjee and Naka (1995), Husain and Mehmood (1999), Maysami and Koh (2000), Ibrahim and Aziz (2003), Ratanapakorn and Sharma (2007), Rahman et al. (2009), and Le and Youngho (2011) among others. However, the scholars examining the sectoral level data include: West and Worthington (2006) and McSweeney and Worthington (2008) in Australia, Chinzara (2011) in South Africa, El-Sharif et al. (2005) in UK, Elyasiani et al. (2011) in US, Degiannakisa et al. (2013) in Europe and Arouri and Nguyen (2010) in US and Europe, etc. Similarly, from the context of Pakistan, studies have largely focused at the aggregate data (e.g. Akbar and Kundi, 2009; Butt et al., 2010 and Khan et al., 2013 are among others).

Thus, motivated from all the above sections; firstly, resting on the argument that the firms are heterogeneous in nature (Narayan

2 Despite of considerable achievements of Pakistani stock market, the studies regarding asymmetry and leverage effect together with various other volatility dynamics particularly at micro level (i.e., firm level) are very limited up-till recent. Such existing literature (Saleem, 2007; Mahmud and Mirza, 2011; Rafique and Rehman, 2011; Mushtaq et al., 2011; Arshad et al., 2012 and Ali and Afzal, 2012 are among others) examined the volatility dynamics only at the aggregate market level in Pakistan.

3 For example, Engle and Patton (2001), Ewing et al. (2005), West and Worthington (2006), Carroll and Connor (2011) and Elyasiani et al. (2011) are among others for developed markets. However, the research work of Chinzara (2011) and Mandimika and Chinzara, (2012) for the South African stock market and Goudarzi and Ramanarayanan (2010) for Indian stock market targeted the aggregate market and/or sectoral level returns.

and Sharma, 2011); this study conducts a firm level analysis. Secondly, believing that firms' behavior is different with respect to their ages; it is quite possible that their stock returns can also react differently with respect to above listed dimensions. Hence, as per author knowledge, this is first such type of study particularly in emerging markets like Pakistan.

Remaining of the paper is designed as follows. Section 2 entails the data used besides some of the descriptive statistics of the data. Section 3 presents methodology functioned. Section 4 details the discussion regarding the results. Section 5 highlights the related literature together with justifications; however, Section 6 sums up the paper and persuasive policy implications together with future research avenues.

2. DATA AND DESCRIPTION

Data used in this study consist of monthly returns series for 208 firms for the period from June 1998 till June 2012, was obtained from Karachi Stock Exchange website. However, the selection of monthly data is based on two praiseworthy reasons. At first, it enables to confine the long-term movements and to prevent the impact of delays in clearing and settlements which considerably influences the stocks over shorter interval (daily or weekly) and also prevents the issue of spurious correlation (Elyasiani and Mansur, 1998; Patra and Poshekwale, 2006; Beirne et al., 2009). Secondly, thin trading and non-trading days (i.e., holidays and weekends) together with bid-ask spread generates serious concerns regarding using daily data (Mohamed, 2011; Mandimika and Chinzara, 2012). More so, use of monthly data is consistent with the financial press (e.g. West and Worthington, 2006; Bloom, 2009; Chinzara, 2011; Khan et al., 2013).

Then as a practice in financial literature; the return series are expressed in logarithmic difference between the two successive prices acquiring the continuous compounding returns (i.e., $Ln\,(P_t P_{t-1})$. While, consistent with the existing financial press (e.g. Pastor and Veronesi, 2003; Fama and French, 2004; Chun et al., 2008; Rubin and Smith, 2011), firm age is determined from the date of listing on the stock market. Then, following Pastor and Veronesi (2003) and Chun et al. (2008); the firms are arranged in ascending order on the basis of their age, and subsequently are divided into four equal parts.

Normally, data series displays features that are consistent with financial time series (e.g. Elyaisani et al., 2011; Mandimika and Chinzara, 2012). For instance, the statistical significance of Jarque–Bera statistics coupled with the values of skewness and kurtosis unties that the distribution of data series is departing from normality.

The verity that most of the data series reflect serial correlation together with denial of normality, motivates and suggests that the application of generalized autoregressive conditional heteroskedasticity (GARCH) type models can significantly improve the explanation of the return series (e.g. Elyasiani and Mansur, 1998; Elyaisani et al., 2011). Moreover, as the Ljung–Box Q (LBQ) statistics stands significant for both majority of the (LBQ [12]) returns and (LBQ^2 [12]) square returns series. The former wires the existence of serial correlation for majority of the returns and square returns series. However, the latter case roots the existence of heteroskedasticity and volatility clustering (time varying nature), hence mitigating the use of GARCH type models (Kovacic, 2008; Mandimika and Chinzara, 2012). More so, both augmented Dickey–Fuller and Phillips–Perron unit root tests declare that all the data series are stationary[4].

3. METHODOLOGY

3.1. GARCH (1, 1)

Following the hallmark contribution of Engle (1982); later on, Bollerslev (1986) introduced a more generalized form of ARCH model, termed as GARCH-model (GARCH-M). It is indeed incredible that this one GARCH (1, 1) model can be sufficiently applied in any financial time series in order to comprehend the volatility dynamics (e.g. Elyaisani et al., 2011; Chinzara, 2011). Following the strong financial literature (e.g. Goudarzi and Ramanarayanan, 2010; Chinzara, 2011; Elyaisani et al., 2011); this research study also applied GARCH (1, 1) to estimate various volatility dynamics. Hence, GARCH (1, 1) stands as most appropriate order for this purpose. The analytical and systematic specification of the estimated multifactor model for each firm can be expressed as follows:

$$R_{it} = \beta_0 + \beta_1 KSE_t + \beta_2 EXR_t + \beta_3 RFR_t + \beta_4 CPI_t + \beta_5 IPI_t + \beta_6 M2_t + \beta_7 OIL_t + e_{it} \quad (1)$$

Equation (1) above represents *R* as a stock returns of a specific firm (*i*) at time *t*, while *KSE* - Market returns, *EXR* - Exchange rate, *RFR* - Risk free rate, *CPI* - Consumer price index (inflation), *IPI* - Industrial production index, *M*2 - Broad money supply, while *OIL* - Oil prices. Thus, it declares that the fore mentioned seven independent variables are used in the GARCH (1, 1) multifactor framework at each of firm level returns.

Following is the general univariate equation regarding GARCH-M (Chinzara, 2011):

$$r_t = \mu_i + \sum_{i=1}^{k} a_i r_{t-i} + \varepsilon_t,\ \varepsilon_t / I_{t-1} \sim N(0, h_t) \quad (2)$$

$$h_t = \omega + \sum_{i=1}^{p} \alpha_i \varepsilon_{t-1}^2 + \sum_{j=1}^{q} \beta_j h_{t-j}, \omega > 0, |\alpha_i + \beta_i| < 1 \quad (3)$$

Equation (2) is a mean equation whose current innovation is a function of previous innovation. I_{t-1} holds zero mean, a variance h_t and is serially uncorrelated. Further, lagged and current returns are denoted by r_{t-1} and r_t respectively. While, Equation (3) is the variance equation of GARCH (*p*, *q*), where the conditional variance is displayed by h_t; constant is indicated by *w*; the coefficient of lagged square residuals developed from mean equation (e_{t-1}^2) are represented by α_i but β_i holds the representation of coefficient

4 The results for descriptive statistics, unit roots tests and LBQ statistics (for each firm) are not reported here because of succinctness.

of lagged conditional variances. For the stationarity to hold, it is necessary that the sum of ARCH (α_i) and GARCH (β_i) terms must be <1 (Elyaisani et al., 2011). If their sum is equal to one, the condition is said to be integrated in variance (Karmakar, 2007). However, in the case where the sum exceeds one, then such situation declares that volatility shocks are non-mean reverting and are exploding to infinity (Elyaisani et al., 2011).

The autoregressive route leading towards the persistence of volatility shocks is the sum of ARCH and GARCH terms (e.g. Ewing et al., 2005; Elyaisani et al., 2011, who applied it to study the persistence of shocks). The more closer the sum is to one, the longer the persistence of volatility shock is. More so, another stand for measuring the persistence of volatility shock is the half-life of volatility introduced by Engle and Bollerslev (1986), which was later on applied by the financial scholars (e.g. Elyaisani et al., 2011). Following is the mathematical equation for computing the half-life:

HL = log (0.5)/log (ARCH + GARCH)

According to Engle and Bollerslev (1986), half-life of volatility represents the time taken by the volatility shock to cover half distance back towards it mean volatility after following the deviation from it.

Next, statistically, following the literature (e.g. Elyasiani et al., 2011), mean reversion of stock returns volatility is examined by mean of ARCH and GARCH terms in GARCH (1, 1) model. For the mean reversion pattern to hold, the sum of ARCH and GARCH terms must be <1 (Carroll and Connor, 2011). Further, the half-life so computed for each stock leads us to determine the speed of mean reversion model of stock returns volatility.

3.2. GARCH-M Model

The GARCH in mean model developed by Engle et al. (1987) has been a great hallmark in the field of financial literature. Technically, it is applied to determine the pricing of risk by way of testing the relationship between standard deviation or conditional variance and stock returns. In accordance with the strong stream of financial press (e.g. Jiranyakul, 2011; Mandimika and Chinzara, 2012, who applied GARCH-M model to determine the risk-return relationship), this study also applied GARCH-M model to detect the pricing of risk in an emerging market. Following general equation represents this model:

$$r_t = \mu_i + \sum_{i=1}^{k} a_i r_{t-i} + \delta_i h_{t-i} + \varepsilon_t,\ \varepsilon_t / I_{t-1} \sim N(0, h_t^2) \tag{4}$$

$$h_t = \omega + \sum_{i=1}^{p} \alpha_i \varepsilon_{t-1}^2 + \sum_{j=1}^{q} \beta_j h_{t-j}, \omega > 0, |\alpha_i + \beta_i| < 1 \tag{5}$$

Where Equation (4) is an appropriate mean equation, where r_{it} indicate the stock returns, ε_t is the error term, I_{t-1} indicate the previous period information, h_t stands for the variance and h_{t-i} denotes the conditional standard error of ε_t at time $t-i$. However, Equation (5) depicts the variance equation for a general GARCH (p, q) model. In this case, h_t marks the conditional variance for the residuals ε_t, α_i displays lagged square residuals, β_i denotes lagged conditional variance whereas w is constant. Particularly, with respect to this study, the coefficient of great importance is h_{t-i}. This coefficient (δ_i) holds the relation between conditional risk (h_t) and stock returns (r_t). In accordance with the conventional portfolio theory, the investors are compensated with higher returns for their higher risk craving; if the δ_i is positive and significant. More chiefly, it would entail that the risk has been priced for the period under concern.

3.3. Exponential GARCH-M (EGARCH-M)

Nelson (1991) made a significant contribution by introducing EGARCH; having the capability to pick the asymmetric volatility of stock returns. It separately shows that how does the stock returns volatility is affected by the good news (price rise) and bad news (price fall) of same magnitude (Ewing et al., 2005; Mandimika and Chinzara, 2012). Consistent with the financial literature (e.g. Ewing et al., 2005; Mandimika and Chinzara, 2012 are among others), this study also applied EGARCH-M to inspect the asymmetric response of stock returns volatility which is generally known as asymmetric and leverage effect. Following is the general equation representing EGARCH-M (Mandimika and Chinzara, 2012):

$$\log(h_t) = \omega + \sum_{j=1}^{p} \beta_j \log h_{t-j} + \sum_{k=1}^{m} \gamma_k \frac{\varepsilon_{t-k}}{\sqrt{h_{t-k}}} + \sum_{i=1}^{q} \alpha_i \left[\left| \frac{\varepsilon_{t-i}}{\sqrt{h_{t-i}}} - E\left(\frac{\varepsilon_{t-i}}{\sqrt{h_{t-i}}} \right) \right| \right] \tag{6}$$

$\omega > 0$, $|\alpha_i + \beta_j| < 1$; $\gamma_k < 0$, if volatility is asymmetric.

Where, in Equation (6), α_i and β_i have the same denotation as in the case of GARCH (1, 1) model. However, specifically related to this current study, the coefficient of importance is γ_k. If the coefficient $\gamma_k \neq 0$ in the above equation, the volatility is said to be asymmetric but when $\gamma_k<0$, then the negative news (price fall) has greater role in increasing stock returns volatility than positive news (price rise) of same magnitude. However, if $\gamma_k >0$, in such situation the later one has stronger impact in increasing stock returns volatility than the former one of same magnitude (Brooks, 2002).

4. EMPIRICAL FINDINGS

4.1. Results Regarding Risks-Return Tradeoff

Table 1 shows the risks-return tradeoff from the context of firm age. Results untie four new and very important outcomes. Firstly, in case of old age, for bulk of the firms, the statistically significant risks-return tradeoff is positive. Secondly, the direction effect dictates that statistically significant positive risk-return tradeoff increases with the increase in firm age from young to old. It follows the third feature of the results unraveling that the significant positive risk-returns linkage (positive risk premia) increases by almost twofold with the growth in firm age from young to old. Whereas, fourth characteristic of the results unfolds that the statistically significant but negative risk-return tradeoff (negative risk premia) decreases with the increase in firm age.

Table 1 shows number of firms in each age and their level of statistically significant and insignificant risks-return relationship with positive and negative trends (GARCH-M Coefficient [δ]). Further, results are also converted into percentage for each age and reported in parenthesis**.**

4.2. Results Regarding Asymmetry and Leverage Effect

Table 2 registers the outcomes concerning asymmetry and leverage effect. At this juncture, four new and very interesting findings are unknotted. At first, it is exposed that for young firms, for bulk of the cases, the bad news statistically significantly increases the stock returns volatility more than good news of same magnitude. Secondly, the direction effect displays that the asymmetry and leverage effect decreases with the increase in firm age from young to old. Thirdly, the asymmetry and leverage effect decreases by around one half with the increase in firm age from young to old. However, the fourth feature of the results revolve around the fact that the role of positive news (price rise) in significantly increasing stock returns volatility more than negative news (price fall) of same magnitude increases with the increase in firm age from young to old.

Table 2 indicates number of firms in each age and their level of statistically significant and insignificant γ coefficient with positive and negative trends. Further, results are also converted into percentage for each age and reported in parenthesis.

4.3. Results Regarding Various Volatility Dynamics

Table 3 presents the results regarding various volatility dynamics. Captivatingly, five new findings are exposed. Firstly, for bulk of the young firms, both the last period's shock (ARCH-short-term effect) and previous period's shocks (GARCH-long-term effect) statistically significantly increases future stock returns volatility. Secondly, the direction effect employs that the stock returns volatility both against the last period's shock (ARCH) and the previous period's shocks (GARCH) decreases with the increase in firm age from young to old. Thirdly, from the context of persistence of volatility shocks, it is discovered that persistence decreases with the increase in firm age. Fourthly, with respect to mean reversion of volatility, results have stamped that mean reverting nature of stock returns volatility decreases with the increase in firm age. The fifth and final feature entails that from the context of speed of mean reversion; it is noted that the speed increases with the increase in firm age.

Table 1: Results of GARCH-M - age effect

Significance level	Firm age			
	Young age 1	Age 2	Age 3	Old age 4
Significant (+)	12 (23.08)	19 (36.54)	18 (34.62)	24 (46.16)
Significant (−)	8 (15.38)	7 (13.46)	8 (15.38)	4 (7.69)
Insignificant (+)	15 (28.85)	17 (32.69)	16 (30.77)	10 (19.23)
Insignificant (−)	17 (32.69)	9 (17.31)	10 (19.23)	14 (26.92)

GARCH-M: Generalized autoregressive conditional heteroskedasticity model

Table 2: Results of EGARCH-M - age effect

Significance level	Firm age			
	Young age 1	Age 2	Age 3	Old age 4
Significant (−)	32 (61.55)	24 (46.15)	24 (46.15)	19 (36.54)
Significant (+)	4 (7.69)	6 (11.54)	5 (9.62)	14 (26.92)
Insignificant (−)	8 (15.38)	10 (19.23)	9 (17.31)	5 (9.62)
Insignificant (+)	8 (15.38)	12 (23.08)	14 (26.92)	14 (26.92)

EGARCH-M: Exponential generalized autoregressive conditional heteroskedasticity model

Table 3 shows number of firms in each age and their level of statistically significant and insignificant ARCH and GARCH terms with positive and negative trends together with persistence, mean reversion and speed of mean reversion of volatility. Further, results are also converted into percentage for each age and reported in parenthesis.

4.4. Results Regarding Macroeconomic Exposure of Firm Returns

Table 4 details the results related to macroeconomic exposure of firm returns with respect to their ages. Results present that the age did not seem to play considerable role in detecting the connectivity between market returns (ΔKSE) and stock returns when the age grows from young to old. Further, effect of ΔEXR on stock returns uncovers two new findings. Firstly, in the case of young age (age 1), for bulk of the firms the statistically significant influence of *EXR* is negative, whereas in the case of the old age (age 4), for most of the firms, the statistically significant impact of *EXR* is positive. The second evidence relates to the direction effect of *EXR* on firm returns. It is noted that as the firm age grows from young to old, firms where the *EXR* has statistically significant positive effect increases fourfold.

Moreover, with respect to risk free rate (ΔRFR); results uncover three new findings. Firstly, for bulk of the firms in case of young age, the statistically significant impact of *RFR* on stock returns is negative. Secondly, the direction effect discloses that both statistically significant positive and negative influence of *RFR* decreases with the increase in firm age. Thirdly, old age firms show least exposure to the changes in *RFR*. Further, results expose some new evidences with respect to inflation (ΔCPI). At first, it is displayed that in case of old age, for bulk of the firms; statistically significant impact of inflation on stock returns in negative. Secondly, the direction effect denotes that both statistically significant positive and negative impact of inflation on stock returns increases with the increase in firm age however the increase in significant negative influence is almost threefold. Furthermore, for industrial production index (ΔIPI) and stock returns, results display that there isn't any such considerable variations in both significant positive and negative impact of real activity on stock returns with the increase in firm age. Thus, denying the role of age effect in this case.

Moreover, from the aspect of money supply ($\Delta M2$) and firm age, this research study unfolds four new evidences. Firstly, for majority of the firms in case of young age, the statistically significant impact of money supply on stock returns is positive while for bulk of the cases for old age the statistically significant impact of money supply is negative. Secondly, the direction effect indicates that statistically significant positive influence of money supply on stock returns decreases whereas statistically significant but negative impact increases with the increase in firm age from young to

Table 3: Results of GARCH (1, 1) Model- Age Effect & Volatility Dynamics

Volatility	Firm age				
	Significance level	Young age 1	Age 2	Age 3	Old age 4
ARCH	Significant (+)	46 (88.46)	45 (86.54)	38 (73.08)	35 (67.31)
	Insignificant (+)	4 (7.69)	4 (7.69)	12 (23.07)	15 (28.85)
	Significant (−)	2 (3.85)	3 (5.77)	2 (3.85)	2 (3.85)
GARCH	Significant (+)	39 (75.00)	36 (69.23)	36 (69.23)	26 (50.00)
	Insignificant (+)	13 (25.00)	16 (30.77)	16 (30.77)	26 (50.00)
Persistence	HL<2	12 (23.07)	17 (32.69)	11 (21.15)	19 (36.53)
	2<HL<6	15 (28.85)	16 (30.77)	12 (23.07)	14 (26.92)
	HL>6	15 (28.85)	10 (19.23)	11 (21.15)	5 (9.61)
Mean reversion		42 (80.77)	43 (82.69)	34 (65.38)	38 (73.07)
Speed of mean reversion	HL<2	12 (28.57)	17 (39.53)	11 (32.35)	19 (50.00)
	HL>2	30 (71.43)	26 (60.47)	23 (67.65)	19 (50.00)

GARCH: Generalized autoregressive conditional heteroskedasticity

Table 4: Results of GARCH (1, 1) Model- Age Effect & Economic Factors

Macroeconomic variables	Firm age				
	Significance level	Young age 1	Age 2	Age 3	Old age 4
ΔKSE	Significant (+)	40 (76.92)	38 (73.07)	34 (65.38)	38 (73.08)
	Insignificant (+)	11 (21.15)	12 (23.08)	15 (28.85)	14 (26.92)
	Insignificant (−)	1 (1.93)	2 (3.85)	3 (5.77)	0 (0.00)
ΔEXR	Significant (+)	3 (5.77)	10 (19.23)	8 (15.38)	11 (21.15)
	Significant (−)	9 (17.31)	3 (5.77)	5 (9.62)	6 (11.54)
	Insignificant (+)	19 (36.54)	19 (36.54)	16 (30.77)	18 (34.62)
	Insignificant (−)	21 (40.38)	20 (38.46)	23 (44.23)	17 (32.69)
ΔRFR	Significant (+)	3 (5.77)	5 (9.62)	3 (5.77)	2 (3.85)
	Significant (−)	10 (19.23)	5 (9.62)	2 (3.85)	4 (7.69)
	Insignificant (+)	17 (32.69)	19 (36.54)	24 (46.16)	27 (51.92)
	Insignificant (−)	22 (42.31)	23 (44.22)	23 (44.22)	19 (36.53)
ΔCPI	Significant (+)	3 (5.77)	2 (3.85)	7 (13.46)	5 (9.62)
	Significant (−)	7 (13.46)	12 (23.08)	10 (19.23)	18 (34.62)
	Insignificant (+)	18 (34.61)	11 (21.15)	23 (44.23)	13 (25.00)
	Insignificant (−)	24 (46.16)	27 (51.92)	12 (23.08)	16 (30.76)
ΔIPI	Significant (+)	6 (11.53)	3 (5.77)	4 (7.69)	5 (9.61)
	Significant (−)	6 (11.54)	9 (17.31)	5 (9.62)	8 (15.38)
	Insignificant (+)	15 (28.85)	16 (30.77)	18 (34.61)	20 (38.46)
	Insignificant (−)	25 (48.08)	24 (46.15)	25 (48.08)	19 (36.53)
$\Delta M2$	Significant (+)	14 (26.92)	8 (15.38)	9 (17.31)	6 (11.54)
	Significant (−)	5 (9.62)	7 (13.46)	6 (11.54)	8 (15.38)
	Insignificant (+)	18 (34.62)	15 (28.85)	17 (32.69)	22 (42.31)
	Insignificant (−)	15 (28.85)	22 (42.31)	20 (38.46)	16 (30.77)
ΔOIL	Significant (+)	9 (17.31)	2 (3.85)	2 (3.85)	5 (9.61)
	Significant (−)	9 (17.31)	10 (19.23)	17 (32.69)	17 (32.69)
	Insignificant (+)	17 (32.69)	26 (50.00)	19 (36.54)	12 (23.08)
	Insignificant (−)	17 (32.69)	14 (26.92)	14 (26.92)	18 (34.62)

EXR: Exchange rate, IPI: Industrial production index, RFR: Risk free rate, CPI: Consumer price index

old. It follows with the third feature declaring that the significant positive impact of money supply on stock returns decreases while significant negative impact increases by around two-fold with the increase in firm age from young to old. The fourth and final feature registers that the significant impact of money expansion shifts from positive to negative with the increase in firm age.

More so, from the aspect of firm age, oil prices (ΔOIL) have shown some interesting and new findings which are fourfold. At first, it is discovered that for bulk of the cases in old age, the statistically significant impact of oil prices is negative. Secondly, the direction effect roots that the statistically significant negative impact of oil prices on stock returns increases with the increase in firm age from young to old. It briefly stamps that with the increase in firm age from young to old, the significant impact of oil prices on stock returns becomes more and more negative. Further, though small in number but still the statistically significant positive impact of oil prices on stock returns decreases with the increase in firm age. Thirdly, in case of young age firms, both statistically significant positive and negative impact of oil prices on stock returns is identical. The fourth and final feature registers that the significant influence of oil prices on stock returns shifts from positive to negative with the increase in firm age from young to old.

Table 4 shows number of firms in each age and their level of statistically significant and insignificant with positive and negative trends. Further, results are also converted into percentage for each age and reported in parenthesis.

5.COMPARISON WITH INTERRELATED WORK AND JUSTIFICATIONS

The similarity between the presented literature and this paper is that we have same objective (i.e., to examine the behavior of stock returns). Nevertheless, the research questions embattled in this paper are rather different. Thus, this current study enthralls fresh imminent on the volatility dynamics, pricing of risk, and macroeconomic exposure of firms returns. These differences are briefed as follows.

From the context of economic exposure, asymmetry and leverage effect, risks-return tradeoff and volatility dynamics; the existing studies mainly focused at aggregate market (most) and/or sectoral level (few). Our research study is different. For the first time, we examined these dimension at firm level with respect to their ages. We determined considerable role of age effect in conducting this exercise. So much so that risk premia is largely positive for old age firms and negative for young age. More so, asymmetry and leverage effect is largest in the case of young ones than the old ones. Similarly, former dominates the later in terms of volatility against both ARCH (short-term) and GARCH (long-term) effects, its persistence and mean reversion; however, the later ones lead the former in terms of speed of mean reversion of volatility shocks. These empirical findings are not surprising in the light of financial press. In general, building on the literature given above; old and large firms are more productive, have more experience management, have long historic record of their stocks, have more research resources, have more internal financing, hold strong market power, have access to cheaper loans, are less responsive to uncertainties, are better in absorbing losses and are more safer, liquid and credible in contrast to their young and small counterparts. More so, these results are also in line with the earlier discussed theoretical argument of Chun et al. (2008). However, in the case of old age firms, relatively, lesser mean reversion of volatility can be supported by their composition, where majority of the firms (in old age) showing non-mean reverting pattern of their stock returns volatility are related to Personal Goods and Food Producer sectors who have faced serious problem in Pakistan (for these problems see IMF Country Report, 2010; 2012; Textile Sector Report, 2012).

Lastly, with respect to macroeconomic exposure of stock returns, the age factor was ignored by the earlier studies. For the case in point, though age effect does not seem to play role in the case of impact of market returns and real activity on stock returns, but for the remaining macroeconomic factors, age appears to be flag rising. Such that for bulk of the cases in young age, the significant impact of increasing interest rate on stock returns is negative. More so, in large, the significant impact of rising general price level and oil prices on stock returns is negative for the old age firms. While young age dominates the old age in terms of significant positive response to rising oil prices and money expansion in the economy. But, in the case of currency depreciation, the pattern is reversed-relatively large quantity of old age firms are positively and large proportion of young age firms are negatively associated with currency depreciation. These empirical results are not astonishing due the following theoretical foundations built by the financial press.

Firstly, looking into the composition of old age firms, it is evident that the majority of the firms reflecting statistically significant and positive association with currency depreciation are of exporting nature. Secondly, these results might rest on the earlier discussed arguments of financial scholars. For instance, literature documented that the managers of young firms might be less experienced or might lack research resources compared to the managers of the old firms. In addition, old firms due to more experienced management and larger financial resources can diversify their investments and can benefit from economies of scale in a better way than their small counterparts. Thus the young firms might fail to hedge themselves against the possible risk of fluctuations in these economic variables, unlike the older ones, thus reflecting relatively higher negative response. Further, investors may have long and more detailed historic records of old, large and established firms thus they may check how their stocks responded through different recessions, upswings, etc. They are then able to make more informed decision. On the other hand, small and young firms may be different because investors do not have enough past data, thus in the course of fluctuations in economic factors, they are likely to short their stocks to avoid risk even if they are better than the old and established firms (e.g. Chun et al., 2008). Moreover, relaying on the conclusion of scholarly literature that the small and young firms have less survival rate makes them strong contender of being more negatively sensitive to changes in economic factors. More so, consistent with the previous argument, in the course of economic downturn (rising interest rate and currency depreciation), investors might prefer to short the stocks of young firms considering them more risky, less credible and less liquid in contrast to older ones.

Further, relative higher significant positive impact of money expansion on the stock returns of young firms, is supported by the argument of Meltzer (1960); stating that comparative to large and old firms, small and young ones perform better in the period of money expansion than the period of money contraction; thus, if it is the case, then these results are expected with respect to Pakistan, the rapid growth in money supply (over the data period) raises the profitability and so does the stock returns for the small and young firm. Lastly, financial literature argues that old and large firms hold older and obsolete assets; hence, if it is so, then they might face relatively higher cost of production in the course of rising oil prices and consequently resulting in lower stock returns. Taken together, these empirical results are also not surprising due to the fact that large proportion of the firms in case of old age; holding significant negative response to rising oil prices belongs to oil consuming sectors (i.e., personal goods, auto and parts, chemical, pharma and bio, food producer, construction and material, electricity and engineering sectors). More so, relatively higher significant positive impact of oil prices on stock returns of young age firms is acceptable due to the reality that considerable large fraction of young age firms reflecting significant positive linkage with rising oil prices belongs to oil producing sector (i.e., oil and gas sector). Moreover, for bulk of the old age firms the significant negative impact of rising general price level on stock returns is unsurprising due to the fact that rather a considerable proportion of the old age firms, displaying significant negative response to rising inflation belong to financial sectors (i.e., non-life insurance, financial services and banking sectors).

6. CONCLUSION

The main contribution of our research study is that it is the first to undertake the matter of age effect in inspecting the pricing of risk, asymmetry and leverage effect and various volatility dynamics together with macroeconomic exposure of stock returns, particularly in emerging markets. Our main contributional outcomes are as follows. At first, we deducted that for bulk of the old age firms, the risk premium is significant positive. However, for significant negative risk premium, the pattern is reversed-relatively large proportion of young age is exposed to significant negative risk premium. Further, the significant positive risk premium increased but significant negative decreased with the increase in firm age from young to old. Secondly, in the context of asymmetry and leverage effect, young ones dominated the old ones but the pattern is subject to considerable decrease with the increase in firm age from young to old. Thirdly, in the process of detecting various volatility dynamics, it is unfolded that for bulk of the cases in young age, both the last period's volatility shock (ARCH-short-term effect) and previous period's volatility shocks (GARCH-long-term effect) played significant role in increasing stock returns volatility which are quite persistent than the old age firms. More so, it is also untied that young firms dominated the old ones in terms of mean reversion of their stock returns volatility. Whereas, the later ones conquered the former ones in terms of speed of mean reversion of stock returns volatility. The fourth outcome revolved around the macroeconomic exposure of firm returns. In this view, study concurred that the interest rate signature relatively higher significant negative impact on stock returns of young firms than the old ones but is subject to substantial decrease with the increase in firm age from young to old. However, the significant negative response of stock returns to both the rising inflation and oil prices is found to be largest for the old age firms. More so, it is also determined that with the increase in firm age, the significant impact of both inflation and oil prices on stock returns become more and more negative. But in the case of rising oil prices, the significant influence is subject to shift from positive to negative with the growth in firm age. Furthermore, the money expansion held significant positive relation with stock returns of bulk of the young age firms than the old ones. The direction effect marked that significant positive impact of money expansion decreases whereas significant negative impact increases with the increase in firm age. It follows that this significant impact of money supply on stock returns shifted from positive to negative with the increase in firm age from young to old.

This research study sets the implications for both the policy makers and investors. Keeping in view the considerable role of firm age effect in determining the pricing of risk, volatility dynamics and economic exposure of stock returns; it will be quite worthy for the investors to diversify their portfolio investments between stable and risky assets. However, for the policy makers, it will be of immense importance to develop an economic policy keeping in view the role of firm age. The future research should try to address some other firm characteristics in order to build more detail insight into these dimensions.

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