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Risk - Return Relationship: Nigerian Stock Market during Pre and Post 2007-2009 Financial Meltdown

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Abstract

Financial crises are economic phenomena often heralded by asset and credit booms or bubbles. This study examines risk-return relationship in the context of Nigeria during pre and post financial meltdown of 2007-2009. GARCH-in-mean models under three error distributional assumptions were used. The data span from January 2010 to December 2016. Findings shows negative risk- return relationship in the pre and post meltdown, indicting investor face higher risk in relation to return in the Nigerian stock market. The study recommended strict monitoring, restriction and regulations to discourage desperately optimistic noise (rumour) traders (investors) in the market, shorting to make money.

Key words

Risk, return, financial meltdown

JEL Codes: G01, G17, G32

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1. Introduction

Financial crises are economic phenomena in both advanced and emerging countries which are often heralded by asset and credit booms or bubbles that ultimately turn into bursts. Economic theory postulates that booms or bubbles and crisis are partially related to economic fundamentals of markets and non-fundamental, variances or random element (Chari and Kehoe, 2003). Economic fundamentals and non-fundamentals (irrational causes) such as imbalance macroeconomy, external and internal shocks, sudden runs on banks, spillovers among financial markets, credit crunches, relating to financial market malady seems to be inconsistent with theories of asset-pricing behavior (Cipriani and Guarino, 2008; Evanoff *et al.,* 2012; Scherbina, 2013). Ajakaiye and Fakiyesi (2009) discuss that foreign portfolio investment withdrawals/withholdings and the prospects of reduced Foreign Direct Investment (FDI) are some of the explanations for the meltdown in Nigerian stock market that affected investor's confidence. Evidence shows that total foreign portfolio inflow to Nigeria between 2007 and 2008 increased by 21% while it fell by 38.6% between 2008 and 2009.

There has been the debate concerning the traditional risk-return relationship of stock returns and behavioural finance (Bekaert and Wu 2000; Karolyi, 2001; Olowe, 2009). The traditional risk-return relationship was established by Sharpe (1964), Lintner (1965) and Mossin (1966) that there exist positive linear relationship between risk and return. Due to the impact of the meltdown on the stock market, the Nigerian stock market regulators introduce some policies as response. Some of these responses are the introduction of new market segmentation, new pricing policy, delisting of inactive stocks, review of the rule book, and introduction of uniform accounting year for the financial services sector. Therefore, there is the need to undertake an evaluation of the risk-return relationship in the pre and post financial meltdown of 2007-2009 This will reveal the difference in the risk-return of stock with regards to the policy responses and measures in the market as a result of the meltdown of 2007-2009.

The objective of this study is to determine the risk-return relationship of stocks on the Nigerian stock market in pre and post 2007-2009 financial meltdown. The evaluation of the risk-return relationship of stock is of particular interest in Nigeria because of its implication for policy makers, practitioners and investors who make decision based on current values and the expected risk-return trade-off that are associated with investments. The study employed the weekly data of the All Share Index for the period of January 2001 till December 2016. The scope of the study is on risk-return relationship of stocks quoted on the Nigerian stock exchange in the pre and posts 2007-2008 financial meltdowns. Nigeria economy experiences another economic phenomenon in the name of economic recession.

2. Literature Review

The relationship amongst risk and return is the basic behind of the field of financial economics. When the rates of returns are independent and identically dispersed there is an expected positive relationship between return and risk given the risk aversion of investors. When returns are not independent and identically dispersed, the relationship between return and risk will include additional terms to recognize the hedging behavior of investors (Merton, 1973). Empirical viewpoint has found both positive and negative relationship between return and risk (Alonso and Restoy, 1995; Campbell, 1987; Campbell and Hentschel, 1992; French *et al.*, 1987; Glosten *et al.*, 1993; Guo and Whitelaw, 2003; Leon, Nave and Rubio, 2007; Lettau and Ludvigson, 2003; Nelson, 1991; Raputsoane, 2009). Theoretically, the Arbitrage Pricing Theory (APT) is an asset pricing model that states that stock return is a linear function of various financial market and macro-economic indices represented by factor-specific beta (β_i) coefficients. The APT propounded by Ross (1976) claims that stock returns on assets are approximately linearly linked to the factor loadings (betas) which are proportional to the returns' covariance with the factors, thus, equilibrium prices offer no arbitrage opportunities over static portfolios of the assets. APT insinuates that every investor believes that the stochastic properties (shock or error term) of returns are consistent with a factors (β_i).

APT proclaims that there is linear relationship between stock returns and the return's covariance with other random variables (stochastic properties). The covariance (error term) is construed as risk size that investors cannot diversify while the slope coefficient (in the linear relationship) is interpreted as the risk premium, which is strictly tied to mean-variance efficiency. The resulting estimates of return from the model are used to value the asset, and it should equal the expected end period value of the asset discounted at the rate implied by the model. If the asset value deviates then arbitrage activities (short selling) should correct the deviation in value. The practice of earning returns from overvalued or undervalued stocks in an inefficient market without any additional risk and investments is known as Arbitrage. Arbitrage involves the trading in at least two mispriced assets (each over valued and undervalued). The arbitrageur sells the overvalued asset and uses the proceeds to buy an undervalued asset. The linear model of returns following a factor intensity structure is expressed as:

$$R_i = \alpha_i + \beta_1 f_1 + \beta_2 f_2 + \beta_3 f_3 + \beta_4 f_4 + \cdots + \beta_n f_n + \varepsilon_i \quad (1)$$

Where α_i is constant (slope coefficient) for asset i, f are specific factors, β are the factor loading (sensitivity) of asset i and ε_i are random shock (error term) of asset i with zero mean and ε_i is assumed to be uncorrelated across assets and with the factors. The number of assets is assumed to be much larger than the number of factors and there must be perfect competition in the market. The resulting linear estimates of expected return and the factor sensitivities are expressed as:

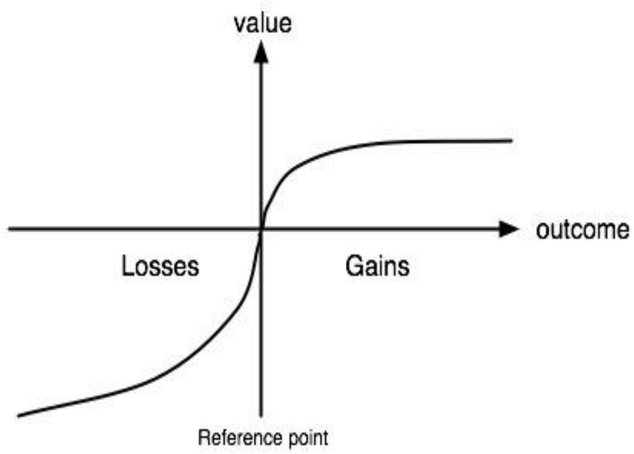
$$E(R_i) = r_f + \beta_1 Rp_1 + \beta_2 Rp_2 + \beta_3 Rp_3 + \beta_4 Rp_4 + \cdots + \beta_n Rp_n \quad (2)$$

Where R_p is the risk premium of each factor and r_f is the risk-free rate.

Asset is overvalued or undervalued if current price departs from the price predicted by the APT model. Current price of asset should equal the addition of discounted future cash flows (at the APT rate), when the return of the asset is sensitivity to changes in the factor estimated by the specific beta (β_i) coefficient. Arbitrage is possible by creating portfolio and identifying assets that are rightly priced (one per factor plus one), then weighting the assets to ascertain that the portfolio beta per factor is the same for both rightly priced assets and for mispriced assets. When prospect for positive expected return is recognized (the difference between asset return and portfolio return) with zero exposure to any sensitivity factor (risk free) the arbitrageur thus has a position to make risk-free return by short selling. Where stock or portfolio is undervalued, the suggestion of APT is that at the end of the period, the portfolio would have appreciated at the rate implied by the APT estimates but the mispriced asset would have value more than the APT rate. Therefore, the arbitrageur is predicted to short sell the portfolio and buy the mispriced asset with the earnings. At the end of the period, the arbitrageur sell the mispriced asset, use the earnings to buy back the portfolio and earn the difference as return.

Identified macro-economic factors that are significant in explaining stock returns are inflation, financial crisis, Gross National Product (GNP), change in premium in corporate bonds, yield curve. Market indices that are recognized include short-term interest rates, the difference in long-term and short-term interest rates, expanded stock index, oil prices, gold prices, foreign exchange rates, among others (Chen *et al.*, 1986). The prospect theory is a theory developed by Kahneman and Tversky (1979) as a critique of the expected utility theory (rational choice) as descriptive (bahavioural) model of decision making under probability and risk. The theory model real life choices and was based on the pervasive effect exhibit when making choice among risky prospects. The certainty effect (underweighing outcome that is probable in comparison with outcome that is certain) contributes to risk aversion choices involving sure gains or losses and the isolation effect (people discard information component that are shared by all) lead to inconsistent preferences when faced with same choice in different form.

The essential feature of the prospect theory is that value are measure by changes in wealth rather than final states (absolute magnitude) which is compatible with the basic principles of perception and judgment of information. For example, the same level of wealth to someone may imply abject poverty to another person depending on their current state of wealth. Value is treated as a function of the asset position of the reference point and the magnitude of the change from the reference point thus, representing value in one argument provides an approximation. The difference in value between a gain of 100 and 200 appears to be greater than the difference between an again of 1,100 and 1,200 and the difference between a loss of 100 and 200 appears to be greater than the difference between a loss of 1,100 and 1,200 unless the larger loss is not acceptable. Therefore, the value function for changes in wealth is concave above the reference point $(v''(x) < 0,$ for $x > 0)$ and often convex below it $(v''(x) > 0,$ for $x < 0$. That is, the marginal value of gains and losses decreases with their magnitude.



Source: Kahneman and Tversky (1979)

Figure 1. Value Function Passing Through Reference Point

The formula that Kahneman and Tversky (1979) assume for the evaluation phase is given by:

$$V = \sum_{i=1}^{n} \pi(p_i) v(x_i) \quad (3)$$

Where *V* is the overall utility of the outcomes to the individual making the decision, $x_1, x_2, x_3 \ldots\ldots x_n$ are the potential outcomes with p_1, p_2, p_3, p_n their respective probabilities and is a function that assigns a value to an outcome. The value function that passes through the reference point is S-shaped and asymmetrical depicting that loss hurt more than gain feel good (loss aversion) which differs from expected utility theory, where rational agent is indifferent to the reference point (do not care how the outcome of losses and gains are framed). π is the probability weighting function which captures the individual's overreaction to small probability events and under-reaction to large probability events. The value function is thus defined on deviations from the reference point as concave for gains, convex for losses and steeper for losses than for gains.

This means that for a fixed ratio of probabilities the decision weights are closer to unity when probabilities are low than when they are high thus π is never linear, it is possible that prospect A dominates B, B dominates C and C dominates A, but direct violations of dominance never happen in prospect theory.

Empirically, studies on risk-return relationship provides results in support of both positive and negative relationship (Brandt and Wang, 2010; Guo and Whitelaw, 2006; Ludvigson and Ng, 2007; Lundblad, 2007; Salvador *et al.*, 2014; Leon *et al.*, 2005; Chiang *et al.*, 2015; Sehgal and Pandey, 2018; Degiannakis *et al.*, 2012). Leon *et al.* (2005) studied the relationship between risk and return using mixed data sampling of several European stock indices and find significant negative relationship between risk and expected return when both symmetric and asymmetric GARCH models for conditional variance were employed. Salvador *et al.* (2014) re-examine risk-return relationship in 11 European stock markets and find a significant positive risk-return relationship for low volatility states and insignificant during high volatility periods. Chiang *et al.*, (2015) examine the intertemporal risk-return relationship in 14 international markets (7 emerging and 7 advanced markets) and find positive risk-return relationship which is more pronounced in the non-crisis period.

Aslanidis *et al.* (2016) test intertemporal risk-return relationship for 13 European stock markets and find negative risk-return relationship with time-variation connected to the state of the economy. Wang and Khan (2017) re-examine the risk-return relationship in United States of America equity market and find that risk-return relationship is powerfully time varying with state of the market. Liu and Wysocki (2017) empirically estimates risk-return relationship for 12 international markets and finds it to be significantly positive after controlling for higher order moments. Sehgal and Pandey (2018) test the risk-return relationship in developed, emerging and frontier markets in the pre and post global financial crisis and find absence of risk-return relationship in pre-crisis period, significant negative risk-return relationship in post-crisis period. Degiannakis, Floros and Livada (2012) evaluate Value-at-Risk Models in five international developed and emerging stock market before and after the Financial Crisis and find that ARCH models provide satisfactory forecasts for the pre-2008 and during high volatility return.

4. Analysis and Discussions

The population of the study is the Nigerian Stock Exchange, using the All Share Index as the sample. The return series was defined as:

$$ASI_{rt} = \frac{(ASI_t - ASI_{t-1})}{ASI_{t-1}} \quad (4)$$

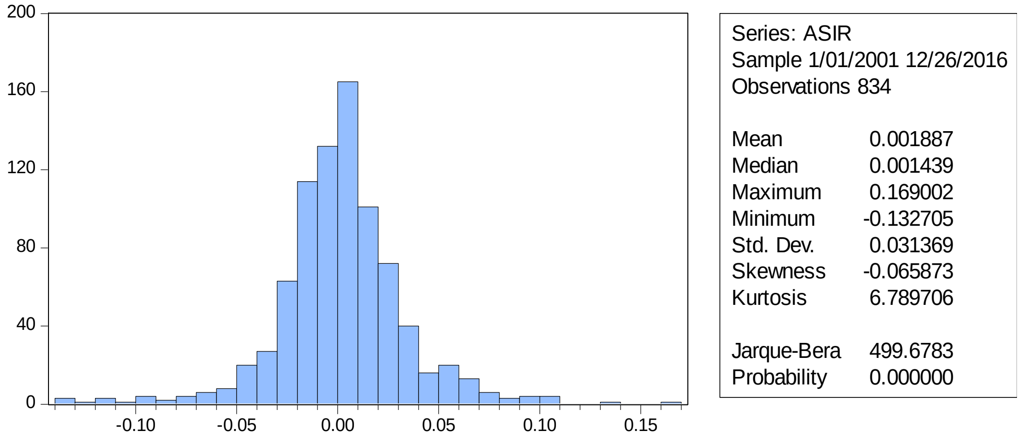
Where ASI_t is All Share Index at time *t* (current week in this case) and ASI_{t-1} is All Share Index at time t-1 (a week before the current week). The All Share Index return series covering the periods of Jan 2001 till Dec. 2016 was tested for unit root to determine the order of integration using the Phillips-Perron (PP) unit root test statistics.

Table 1. Phillips-Perron (PP) Unit Root Test Result of All Share Index Return Jan.2001-Jan2016

ASIR (2001-2016)	t-Statistics	P-Value
PP test statistics	-27.58421	0.0000
Critical values: 1%	-3.437976	
5%	-2.864796	
.10%	-2.568558	

Source: Author's computations, 2018.

The unit root test results (Table 1) of the All Share Index return series (Jan. 2001 till Dec. 2016) specifies the rejection of the by the P-values of the Phillip-Perron statistics at 0.0000 this indicates that the return series has no unit root at level.



Source: Author's computations, 2018.

Figure 2. Descriptive Statistics of All Share Index Return (2001-2016)

The weekly returns series in Figure 4.5 shows positive mean 0.001887 and the standard deviation (risk measure) of the return was 3.14%. The level of price variability is 21.5%, the skewness and kurtosis are -0.065873 and 6.789706 respectively, indicating non-symmetric and leptokurtic return series. The Jarque-Bera statistics value is 499.68 with p-value of 0.0000 indicating that the null hypothesis of normal distribution cannot be accepted for the returns series on the Nigerian Stock Exchange from 2001 till 2016.

Table 2. GARCH-in-Mean Result for All Share Index Return (Jan 2001-Dec 2016)

Parameters	Gausian Distribution		Student's-t Distribution		Generalised Error Distribution	
	Estimates	P-Value	Estimates	P-Value	Estimates	P-Value
μ	0.145401	0.0000	0.125644	0.0005	0.135335	0.0001
σ	-0.267666	0.0188	-0.207513	0.0473	-0.233618	0.0234
ω	0.000062	0.0000	0.000102	0.0005	0.000085	0.0005
α_i	0.199746	0.0000	0.294216	0.0000	0.251381	0.0000
β_j	0.743873	0.0000	0.637449	0.0000	0.673263	0.0000
AIC	-4.349147		-4.425761		-4.422708	
SC	-4.315145		-4.386093		-4.383039	
HQ	-4.336111		-4.410552		-4.407499	

Source: Author's computations, 2018.

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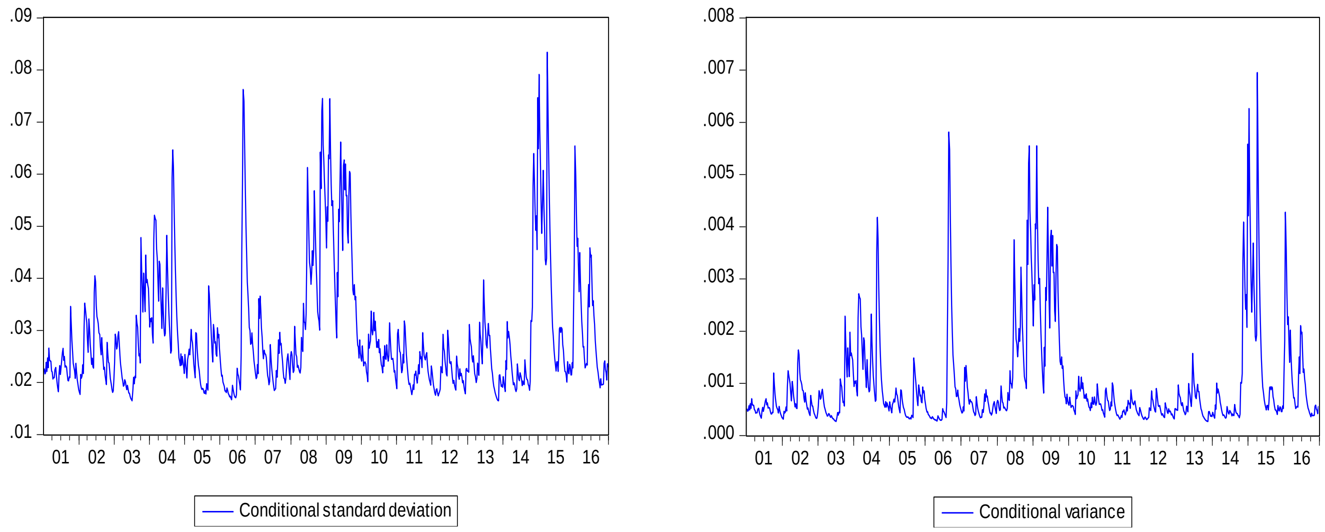
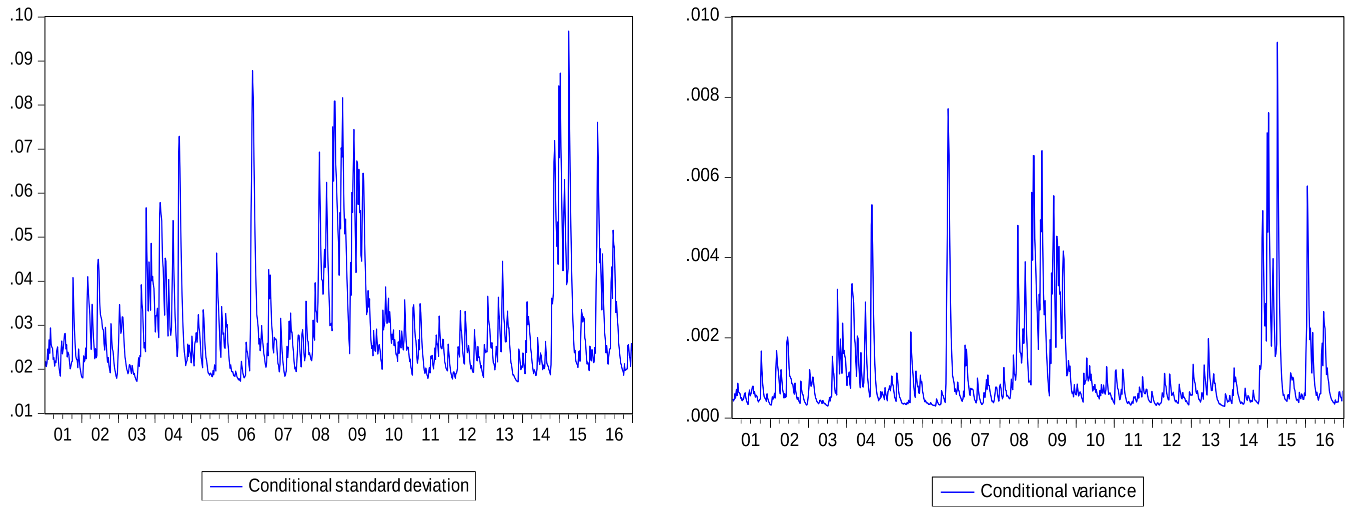
The result of the GARCH-in-mean model in table 2 indicates that σ (standard deviation) as a measure of risk is negatively signed under the three (3) distributional assumptions. The P-value is 0.0188, 0.0473 and 0.0234 under the distributional assumptions indicating that the negative risk relationship is statistically significant at 5%. This simply implies that there exists significant inverse risk-return relationship for All Share Index return on the Nigerian Stock Exchange from Jan. 2001 till Dec. 2016. An increase in risk will lead to a decrease in return and vice versa. The graphical representation of the risk (standard deviation) and return (variance) relationship is presented in figures 3a-c for the three (3) distributional assumptions. The Akaike Information, Schwarz and the Hannan-Quinn Criterions (Table 2) have similar values with no significant difference but the student's-t distribution has the lowest criterion values which indicates that the predictive ability of the GARCH-in-Mean model under the student's-t distributional assumptions provide the best estimate of weekly risk-return relationship of All Share index on the Nigerian Stock Exchange for the period of Jan. 2001 till Dec. 2016.



Source: Author's computations, 2018

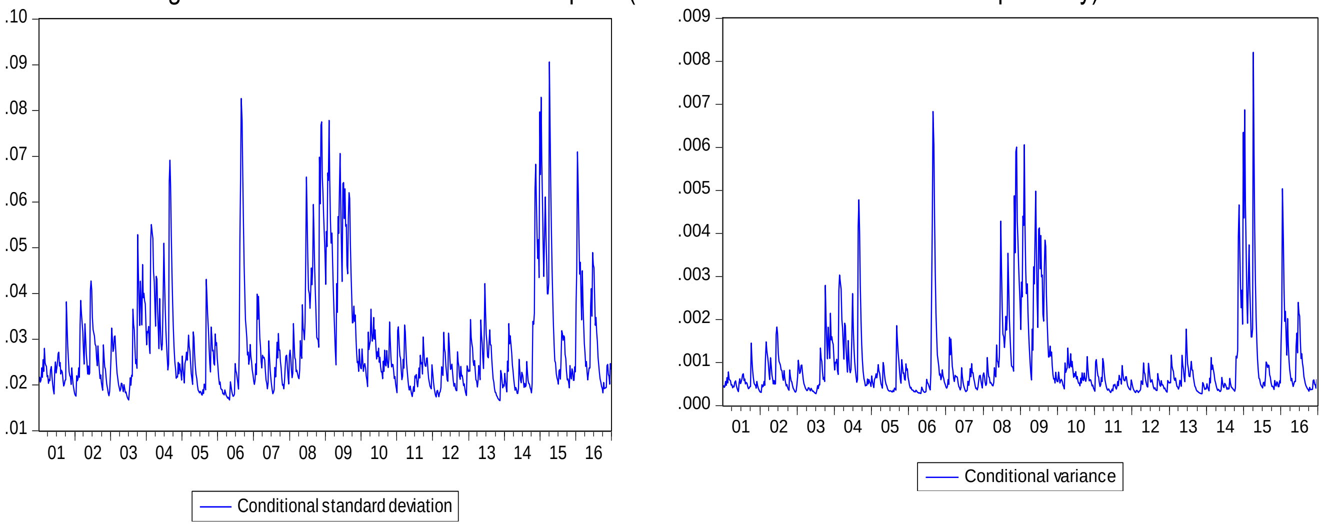
Figure 3a. Standard Deviation and Variance under Normal Distribution (2001-2016)



Source: Author's computations, 2018

Figure 3b. Standard Deviation and Variance under Student's t Distribution (2001-2016)

The GARCH-in-Mean model result (Table 3) shows that σ (standard deviation) is negatively signed, indicating statistical negative relationship between risk and return before the meltdown of 2007-2009. The negative relationship is statistically significant (P-value = 0.0023) under the Gausian (Normal) distributional assumption but statistically insignificant under the student's t and generalized error distributional assumption (P-values = 0.2157 and 0.3153 respectively).



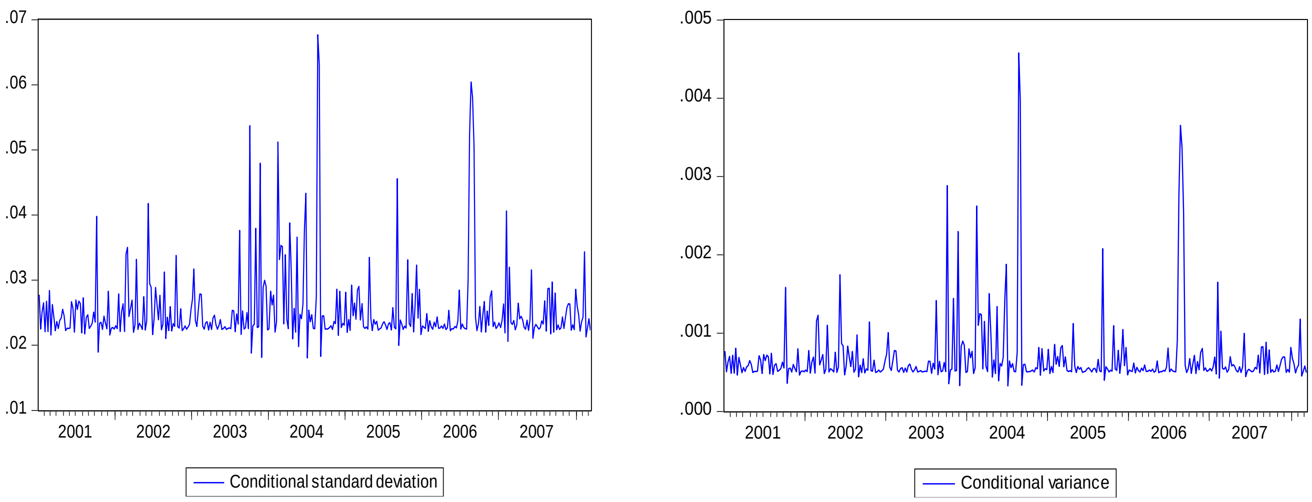
Source: Author's computations, 2018

*Figure 3c.*Standard Deviation and Variance under Generalised Error Distribution (2001-2016)

Table 3. GARCH-in-Mean Result for the All Share Index Return before the Meltdown

Parameters	Gausian Distribution		Student's-t Distribution		Generalised Error Distribution	
	Estimates	P-Value	Estimates	P-Value	Estimates	P-Value
μ	0.173348	0.0043	0.103481	0.0728	0.110138	0.0372
σ	-0.919469	0.0023	-0.294432	0.2157	-0.252137	0.3153
ω	0.000576	0.0000	0.000348	0.0102	0.000384	0.0064
α_i	0.284892	0.0000	0.350119	0.0211	0.314871	0.0232
β_j	-0.138679	0.3012	0.231895	0.2577	0.143345	0.5375
AIC	-4.511607		-4.603074		-4.598345	
SC	-4.448776		-4.529772		-4.525043	
HQ	-4.486662		-4.573973		-4.569244	

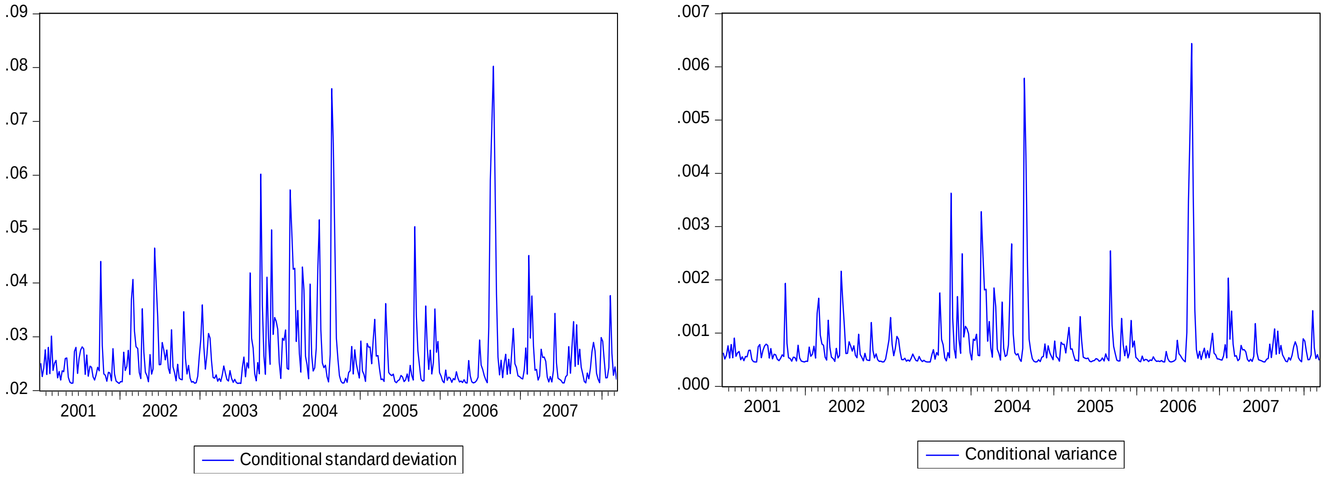
Source: Author's computations, 2018.



Source: Author's computations, 2018

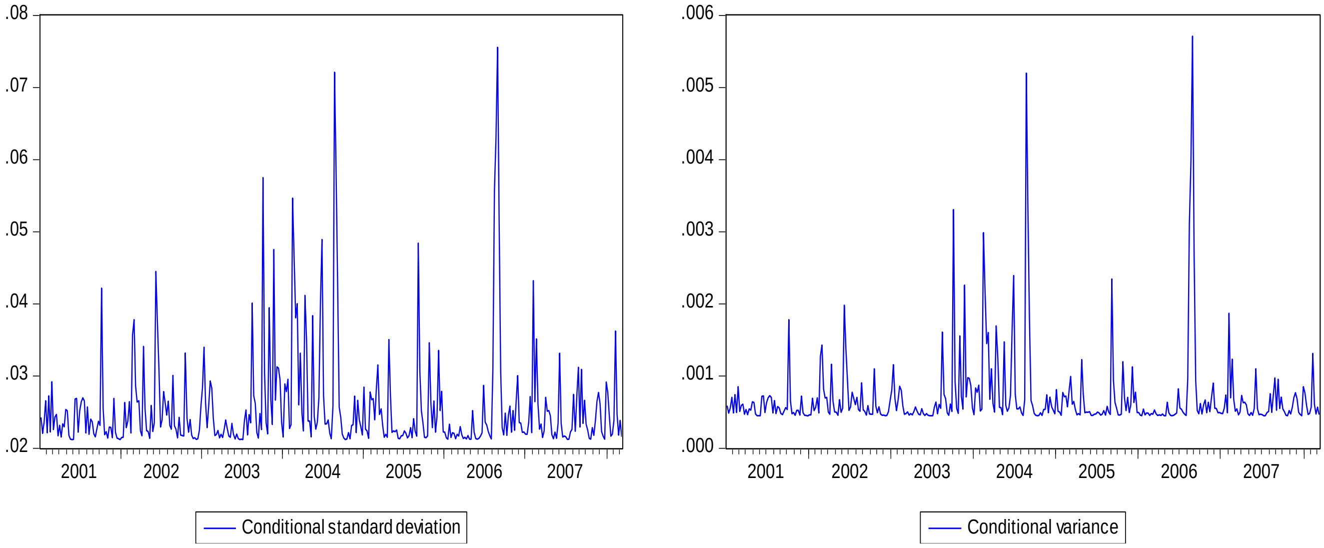
Figure 4a. Standard Deviation and Variance under Normal Distribution before the Meltdown

The graphical representation of the risk (standard deviation) and return (variance) relationship is presented in figures 4a-c under the three (3) distributional assumptions. The Akaike Information, Schwarz and the Hannan-Quinn Criterions shows that the estimates on weekly risk-return relationship of All Share index return on the Nigerian Stock Exchange before the meltdown under the student's-t distribution has the lowest criterion values, indicating that the predictive ability of the GARCH-in-Mean model under the student's-t distributional assumptions is the best.



Source: Author's computations, 2018

Figure 4b. Standard Deviation and Variance under Student's t Distribution before the Meltdown



Source: Author's computations, 2018

Figure 4c. Standard Deviation and Variance under Generalised error distribution before Meltdown

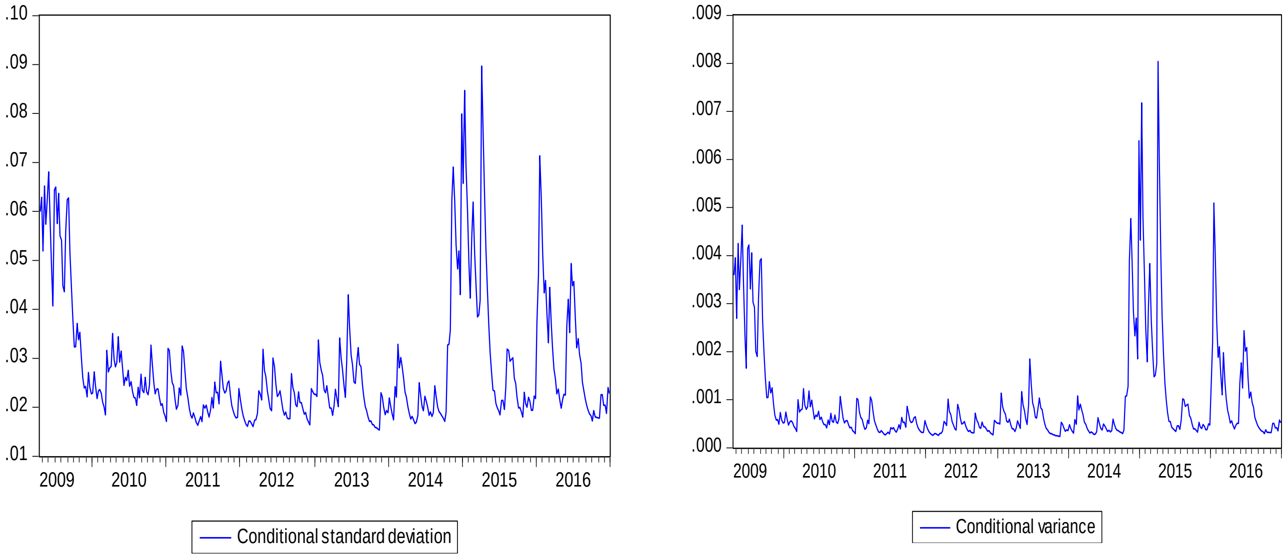
Table 4. GARCH-in-Mean Result for the All Share Index Return after the Meltdown

Parameters	Gausian Distribution		Student's-t Distribution		Generalised Error Distribution	
	Estimates	P-Value	Estimates	P-Value	Estimates	P-Value
μ	0.193016	0.0005	0.133941	0.0149	0.140503	0.0084
σ	-0.120140	0.4110	-0.032694	0.8379	-0.111328	0.4669
ω	0.000076	0.0001	0.000084	0.0082	0.000079	0.0069
α_i	0.259118	0.0000	0.249891	0.0019	0.246734	0.0012
β_j	0.65755	0.0000	0.659479	0.0000	0.661926	0.0000
AIC	-4.428739		-4.465335		-4.466197	
SC	-4.369091		-4.395745		-4.396607	
HQ	-4.405122		-4.437782		-4.438644	

Source: Author's computations, 2018.

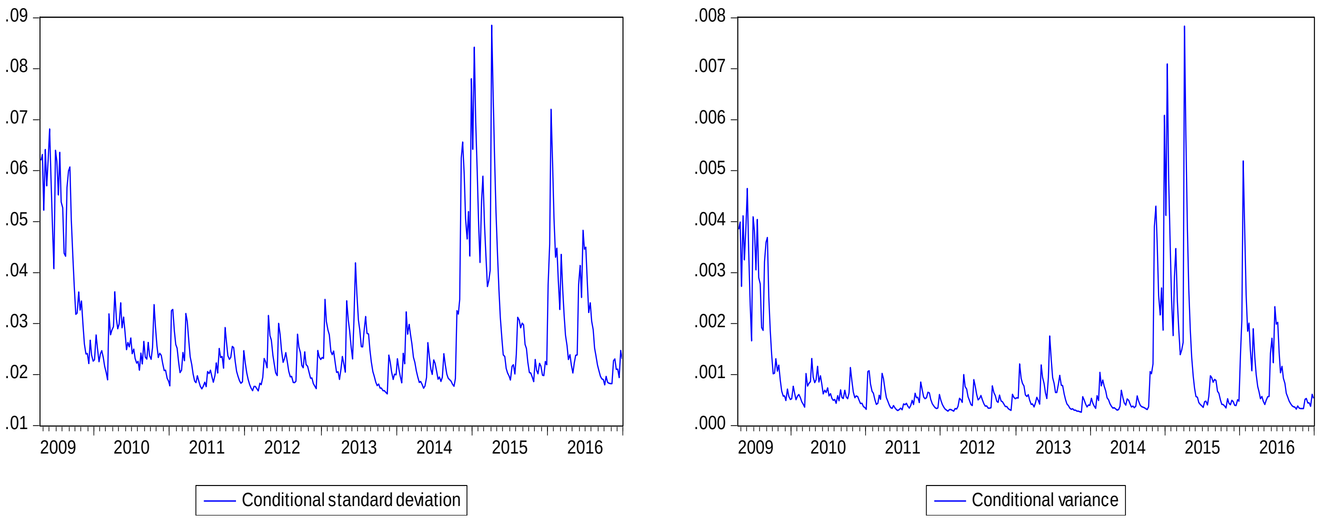
Table 4 is the result of GARCH-in-Mean model for All Share Index returns after the meltdown. σ (standard deviation) as a measure of risk is negatively signed with the P-value of 0.4110, 0.8379 and 0.4669 under the distributional assumptions indicating that the negative risk relationship is statistically insignificant at 5% level. This simply implies that there is insignificant inverse risk-return relationship in the All Share Index on the Nigerian Stock Exchange after the meltdown. An increase in risk will lead to a decrease in return and vice versa. The graphical representation of the risk (standard deviation) and return (variance) relationship is presented in figures 5a-c for the three (3) distributional assumptions.

The Akaike Information Criterion, Schwarz Criterion and the Hannan-Quinn Criterion all have similar values with no significant difference but the generalised error distribution has the lowest criterion values which indicates that the predictive ability of the GARCH-in-Mean model under the generalised error distributional assumptions provide the best estimate of weekly risk-return relationship of All Share index on the Nigerian Stock Exchange after the meltdown.



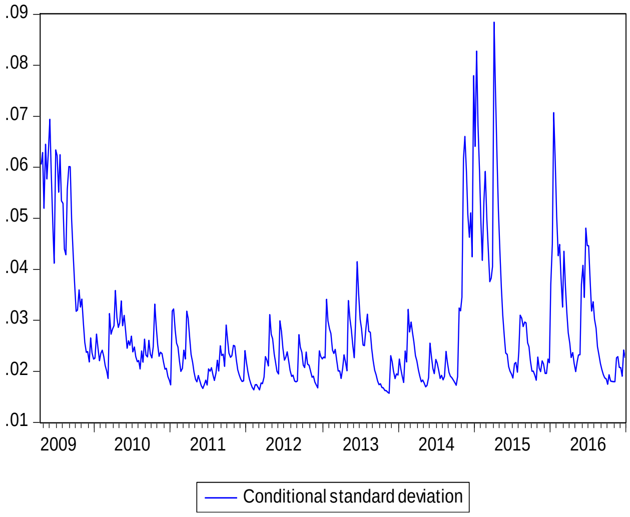
Source: Author's computations, 2018

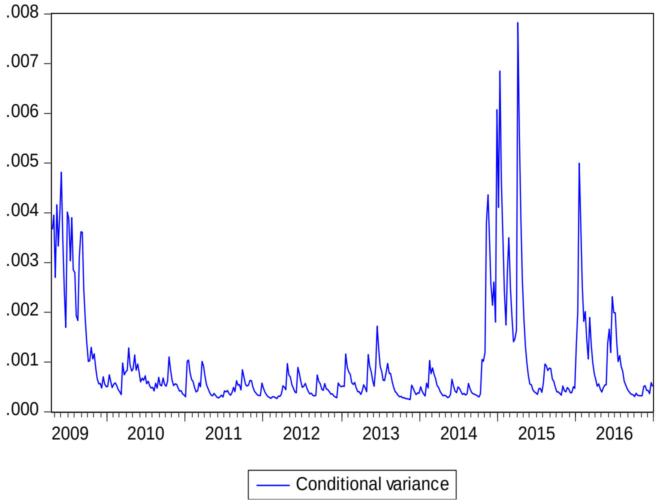
Figure 5a. Standard Deviation and Variance under Normal Distribution after the Meltdown



Source: Author's computations, 2018

Figure 5b. Standard Deviation and Variance under Student's t Distribution after the Meltdown





Source: Author's computations, 2018

Figure 5c. Standard Deviation and Variance under Generalised Error Distribution after Meltdown

Table 5. ARCH Effect Test Result of Fitted GARCH-in-Mean Models

Test Statistics	GARCH-in-mean 2001 - 2016		GARCH-in-mean before meltdown		GARCH-in mean after meltdown	
	Student's t Distribution		Student's-t Distribution		Generalized Error Distribution	
	Estimates	P-Value	Estimates	P-Value	Estimates	P-Value
F-statistics	0.136692	0.7117	0.050803	0.8218	0.210305	0.6468
Observed R^2	0.136998	0.7113	0.051069	0.8212	0.211247	0.6458

Source: Author's computations, 2018.

Table 5 is the result of ARCH effect test on the fitted model residuals of the GARCH-in-mean models. The p-values of the f-statistics and the observed R^2 are more than 5% significant level for the fitted GARCH-in-mean models residual ARCH test result. Thus, the null hypothesis of no ARCH effect is accepted. This indicates that the GARCH-in-mean fitted models under the selected distributional assumptions have no ARCH effect.

Table 6. Correlogram of Standardized Residual Square Test Results for Fitted Models

	GARCH-in-mean Model 2001 – 2016				**GARCH-in-mean Model before meltdown**				**GARCH-in-mean Model after meltdown**			
Lag	AC	PAC	Q-Stat	P	AC	PAC	Q-Stat	P	AC	PAC	Q-Stat	P
1	-0.013	-0.013	0.1376	0.711	-0.012	-0.012	0.0516	0.820	-0.023	-0.023	0.2133	0.644
2	0.021	0.021	0.5241	0.769	-0.025	-0.025	0.2890	0.865	0.030	0.029	0.5705	0.752
3	-0.039	-0.038	1.7776	0.620	-0.010	-0.011	0.3266	0.955	-0.017	-0.016	0.6909	0.875
4	-0.052	-0.053	4.0066	0.405	-0.015	-0.016	0.4179	0.981	-0.026	-0.028	0.9710	0.914
5	-0.035	-0.035	5.0503	0.410	0.024	0.023	0.6349	0.986	-0.034	-0.034	1.4438	0.919
6	-0.051	-0.051	7.2198	0.301	-0.066	-0.067	2.3174	0.888	-0.021	-0.021	1.6249	0.951
7	0.074	0.070	11.842	0.106	0.123	0.123	8.0917	0.325	0.100	0.101	5.7429	0.570
8	-0.003	-0.004	11.849	0.158	0.061	0.061	9.5299	0.300	-0.024	-0.021	5.9881	0.649
9	0.032	0.022	12.737	0.175	0.028	0.036	9.8357	0.364	0.008	-0.001	6.0174	0.738
10	0.010	0.010	12.824	0.234	-0.006	-0.003	9.8519	0.454	0.006	0.008	6.0320	0.813
11	-0.049	-0.047	14.838	0.190	-0.007	0.003	9.8709	0.542	-0.111	-0.109	11.133	0.432
12	0.034	0.037	15.827	0.199	0.030	0.022	10.210	0.598	0.053	0.055	12.285	0.423
13	-0.000	0.013	15.827	0.259	0.022	0.038	10.407	0.660	-0.039	-0.029	12.935	0.453
14	0.037	0.031	17.022	0.255	0.064	0.058	11.994	0.607	0.068	0.051	14.861	0.388
15	0.015	0.018	17.211	0.306	0.045	0.039	12.773	0.620	0.002	0.008	14.862	0.461
16	-0.046	-0.051	19.000	0.269	-0.036	-0.044	13.295	0.651	-0.058	-0.073	16.284	0.433
17	-0.031	-0.034	19.815	0.284	-0.048	-0.051	14.221	0.651	-0.019	-0.021	16.434	0.493
18	-0.039	-0.024	21.092	0.275	-0.017	-0.016	14.331	0.707	-0.048	-0.023	17.423	0.494

L, AC, PAC, Q-Stat and P indicate the lags, the autocorrelation function, the partial correlation function, the Ljung–Box Q–Statistic and the probability respectively.

Source: Author's computations, 2018.

The serial correlation test result in Table 6 shows the autocorrelation function, the partial correlation function, the Ljung–Box Q–Statistic and the probabilities with lag 1 to lag 18 for the residuals of the fitted GARCH-in-mean models. The probability values from lag 1 to 18 are all more than 5% significant level, suggesting that the null hypothesis of no serial correlation should be accepted. Thus, the diagnostic test of ARCH effect and serial correlation indicates that the fitted GARCH-in-mean model estimates and findings are good for policy consideration, implementation and professional practice.

Therefore, there exist negative risk-return relationship on the Nigerian Stock Exchange during the sample period (2001 till 2016), before the meltdown and after the meltdown. This suggests that investor face higher risk in relation to return as a result of the insignificant inverse risk-return relationship on the Nigerian Stock Exchange. The finding is supported by Salvador, Floros and Arago (2014), Mahmood and Shah (2015), Jegers (1991), Treacy (1980), Feigenbaum and Thomas (1985), Bettis and Mahajan, (1985), Brockett, Cooper, Kwon, Ruefli (2003), Godlewski (2007), Han (2013), Song, An, Yang, and Huang (2012) and Lettau and Ludvigson (2003). This is in tandem with the assertion of prospect theory, found empirically by Fisher and Hall (1969); Neuman, Bobel and Haid (1979), Kahneman and Tversky (1979), Raputsoane (2009), Guo and Whitelaw (2006) but in contrast with the standard finance studies of positive risk-return relationship.

5. Summary, conclusions and recommendations

The results of GARCH-in-mean model shows that σ (standard deviation) as a measure of risk, has significant negative relationship with the All Share Index return on the Nigerian Stock Exchange for the whole period but insignificant negative relationship before and after the meltdown under the student's t and generalised error distributions. The implication of this is that investors on the Nigerian Stock Exchange underweight stock return because it is not certain compared to returns that can be obtained with certainty. This certainty effect contributes to the risk adverse position of the investors in choosing sure return against risky investment choices involving losses.

Therefore, the blame for financial crisis shouldn't be the reason of the negative risk-return relationship on the Nigerian stock exchange. This study recommends that short selling activities (started in 2012) on the Nigerian stock market needs to be strictly monitored, restricted and regulated to discourage desperately optimistic noise (rumour) traders (investors) in the market, shorting to make money. Short selling should be restricted from officers, directors, and large shareholders of quoted companies, and should only involve stocks that are inventoried by institutional investors because of their long-term plans that are not expected to be negatively affected by liquidity constraints. Only large capitalised stocks should be offered for short selling (they likely to be easy and cheap to borrow) while small capitalised stocks with slight institutional ownership may be difficult and expensive. This will prevent increase in the price of already overvalued stocks.

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