

Effect of transitions in standards on the value predictive power of financial information of listed Oil and Gas Firms in Nigeria

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ABSTRACT

Corporate entities are under obligations to provide information about the financial position and performance and are expected to be in accordance with laid down standards and other statutory regulations. Studies showed that several reports of financial manipulations exposing firms which proved to be profit-making became insolvent, this poses a big question as to whether reporting under GAAP is value relevant. This study examined the influence of relevance of financial information on the value of listed Oil and Gas firms in Nigeria before and after the adoption of IFRS. The study was an ex-post-facto research using all the listed six (6) petroleum marketing firms as published by the Nigerian Stock Exchange (NSE) on 1st March, 2019 as sample subjects for a period of twelve (12) years, which was 6 years (2006-2011) prior adoption and 6 years (2012-2017) after adoption of IFRS. Data obtained from published audited financial statements already validated by external auditors were used and analyzed using multiple regression with the aid of Stata/IC 11.0 software. The study discovered that financial information (Earnings Per Share (EPS), Book Value Per Share (BVPS) and Operating Cash flow Per Share (OCFS)) significantly affect value of listed oil and gas companies in Nigeria before and after the adoption of IFRS, and that the predictive power of financial information improved after the adoption of IFRS (Pre: $Adj. R^2 = 0.46$, $Wald_{(3)} = 22.03$, $p < 0.05$; Post: $Adj. R^2 = 0.66$, $F_{(3, 32)} = 23.64$, $p < 0.05$; Combined: $Adj. R^2 = 0.50$, $F_{(3, 32)} = 11.57$, $p < 0.05$). The study concluded that transition in accounting standards has improved the predictive powers of earnings, operating cash flow and book value of asset of companies. Standard setters should continually update the standards and firm managers should improve on the level of compliance to improve the quality of the financial information.

Keywords: Financial information, Book value per share, Earnings per share, Modified Tobin's Q, Operating cash flow per share, Relevance

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INTRODUCTION

According to Obaidat (2016), value relevance is shown as evidence of the quality and usefulness of accounting numbers and as such, can be interpreted as the usefulness of financial data for decision making process of investors and its existence is usually evidenced by a positive association between market values and book values. Herbert *et al.*, (2013) asserted that since financial information is a medium of communicating the effects of financial transactions, it became necessary that accounting standards of various nations be harnessed to set a unified accounting standards so as to enhance the level at which investment and credit decisions are considered and boost international comparability of firms' performance both within and outside the reporting nations.

Information is understood to be relevant when it communicates to various users the interwoven relationship of the accounting figures in determining its value per time; its ability to simultaneously represent and express events considered important by market participants when pricing shares in time; and the information content expressing the disclosure of financial information on share prices (Okafor *et al.*, 2017). Corporate entities are under obligation to provide information about the financial position, performance and changes in financial position of their activities that is useful to a wide range of users in making economic decisions. This should be in conformity with standards and other stipulated regulatory frameworks. According to Ioan-Bogdan *et al.*, (2016), standards entail principles and concepts which serve as bedrock for the preparation and presentation of financial statements.

In Nigeria, the Oil and Gas sector is germane to the growth and development of the economy. It constitutes firms from which highest proportion of government revenue is being derived. Therefore, improving the investment in the Oil and Gas sector has the tendency of boosting the economy (Adegbie & Fakile, 2015). Contrarily, no substantial investment could occur in any company without having quality financial information in respect to its stock price and other efficiency measures. From the agency theory assumption, investors being differed from the management of the firms, only depend on the information made available in the annual reports and accounts, in assessing the risk, return and value of a firm in taking crucial decision on what, when and where to invest or disinvest (Ogundajo *et al.*, 2019).

Globally, over the past four decades, there has been interests among policymakers, regulators, standard-setters, professional accountancy bodies, academia and other stakeholders in improving the fundamental and enhancing qualities of firm's financial reports. This led to the global harmonization of local standards into a unified world-wide accepted International Financial reporting Standards (Nwaobia *et al.*, 2016). Sharma *et al.*, (2012) posits that standards are widely recognized for producing more accurate, comprehensive and timely financial information leading to more informed valuation in the equity markets and hence lower risk for investors.

According to Oraby (2017), Nigerian firms have been preparing and presenting their financial statements for decades based on the nation's local standards as far back as the establishment of National Accounting Standard board in 1982. The standards have been reviewed and updated severally to reflect the current situation of the Nigerian market and also to meet the needs of the users. Based on the reports on the Observance of Standards and Codes (ROSC) conducted in 2004, an assessment of the degree to which an economy observes internationally recognized standards and codes; the World Bank reported that Nigerian accounting and auditing reporting suffered a serious setback, neglect, non-update of domestic accounting standard, non-compliance, and disclosures of accounting reporting by the companies as NASB lacks the financial and human resources as well as the infrastructure for monitoring and enforcing compliance with its standards.

The ROSC team also observed from a review of published financial statements that there are compliance gaps between the SAS and actual practice (World Bank, 2004). The recommendations of the ROSC team led to the creation of Financial Reporting Council (FRC) in 2011, with its Bill put into Law to monitor and enforce accounting and auditing requirements with respect to general-purpose financial statements. The FRC is a unified independent regulatory body for accounting,

auditing, actuarial, valuation and corporate governance. FRC is saddled with the responsibility of issuing and regulating accounting, actuarial, valuation and auditing standards and it is expected that financial statements published by firms in Nigeria will reflect a meaningful and decision enhancing information based on this new development.

Although the Nigerian Statements of Accounting Standards (SAS) were similar to IFRS in certain respects, many differences exist. SAS promulgated by NASB were largely based on past IAS promulgated by IASC. Due to the increasing complexity of financial reporting requirements, some of the original IASs were reviewed resulting in their amendment or withdrawal while SASs were not reviewed or updated with the IASs/IFRSs. The significant disparities between the Nigerian SASs and IFRSs have resulted in the SAS being regarded as outdated and incomplete as an authoritative and internationally accepted guide to the preparation of financial statements. This has significantly diminished the degree of confidence on Nigerian Standards especially by international users of financial statements produced in Nigeria (NASB, 2010).

In Nigeria, the first-time implementation of IFRS took place in 2011 and became effective in 2012. Prior to this period, firms had been preparing and presenting reports based on the Nigerian local accounting reporting (SAS). Nigerian capital market as reported by Nigerian Stock Exchange (NSE) in 2013 and Central Intelligence Agency (CIA) fact book 2013 happened to be the second largest capital market after South Africa and the most famous in the West African sub-region. The Nigerian equities market appreciation in 2012 to 2013 made the market to be among the best-performing markets in the world (Peter & Nnorom, 2013). Nigerian capital market is reported to be in weak-form efficiency, therefore, follows a random walk (Sule *et al.*, 2015). The growth of the Nigerian capital market attracted many investors into the capital market, this evident by the increasing number of investors in the economy. The Nigerian domestic bond registration with JP Morgan local currency index in the year 2012 is another milestone for the market. Also, the local bond in Nigeria gets another huge boost in 2013 from the inclusion in the sovereign bonds of Barcla's Emerging bond index. This contributes significantly in attracting foreign investors that have an estimated investment in the country of about USD5.6 billion in Nigerian bonds (Peter & Nnorom, 2013).

International Accounting Standards Board (IASB) is set to develop internationally acceptable and qualified financial reporting standards that would depict the total goals and usefulness of financial information to all users. Since its formation, several standards have been promulgated, amended or stepped down. However, studies on the value relevance of financial information have yielded contentious conclusions from the transitions in standard both in the advanced and emerging nations (Okafor *et al.*, 2017).

Financial statements of firms contain financial information that show the true and fair view of the firms' value. This is expected to give prospective investors the ability to assess these firms based on the reported financial information. The inability of financial statements to reflect economic and business reality leads to capital sub-optimally deployed, resource misallocation, investors paying huge opportunity cost by investing in companies with unrealistic, inflated values, and better investments by-passed (Osaze, 2007). The Enron, WorldCom and Cadbury scandals, capital market crash, and economic meltdown (Bavoso, 2012) showed that firms that were shown to be profit-making became insolvent. This pose a big question as to whether reporting under GAAP is value relevant. Over the years, Nigeria has experienced dwindling revenue from oil and gas sector of the economy and also the reported cases of misappropriations. It is disheartening that the financial statements prepared and presented by these firms were duly audited and clean audit reports were published.

Investors rely heavily on accounting figures in predicting risks and returns on their investment as well as value of the firm. Earnings per share depict the profitability status of the firm and encourages investors to invest thus increasing the value; but cases of figures manipulation as a result of information asymmetry has made this ratio lost its value in predicting value. This is also the case of other accounting figures such as book value of assets, proportion of debt to equity ratio.

Dividend is perceived to be a signaling tool reflecting good corporate governance but the case of Cadbury Nigeria Plc proved this wrong as firms were collapsing but still declared high dividend payout (Oraby, 2017).

Based on the above problems and scandals, accounting profession arose to the need of providing value relevant information by introducing a single set of accounting standards for global use known as IFRS. Nigeria as a nation is also faced with the accounting problems in question, and most researches carried out on the relevance of financial information under IFRS adoption in Nigeria (Abiodun, 2012; Adaramola & Oyerinde, 2014; Adebimpe & Ekwere, 2015; Babalola, 2012; Omokhudu & Otakefe, 2004; Omokhudu & Ibadin, 2015; Oshodin & Mgbame, 2014; Oyerinde, 2011) are based mainly on other sector of the economy except oil and gas (Petroleum Marketing) sector. From previous studies, it is observed that mixed results were reported on the relevance of financial information in predicting the value of firms. Studies have been carried out in Nigeria on the value relevance of financial information considering different sectors, but literature was not found relating value relevance of financial information to value of firms under oil and gas sector of Nigerian economy. This study is thus borne out of the desire to address aforementioned gaps and further motivated by the fact that the relevance of financial information to equity valuations in Nigeria has not been extensively addressed in empirical literature most especially in the Oil and Gas (Petroleum Marketing) sector and to determine whether the relevance of financial information prepared using IFRS is of more value than the one prepared using Nigeria GAAP, so as to help prospective investors in assessment of the firms' value

2.0 LITERATURE REVIEW

This study is hinged on the Stakeholders theory and Signaling theory, and found its root in clean surplus model developed by Feltham and Ohlson (1995). Stakeholders theory propounded by Edward was popularized by Freeman and Evan (1990) and modified by Donaldson and Preston (1995), focused on the civic duties of an organisation to all individuals or group which could be affected by the operation and existence of the company other than shareholders; the theory proposed the intrinsic value of the stakeholders as legitimate interest in the firm. Stake holder does not necessary mean owners of the business. Stakeholders include owners of the business and all other individuals that could be affected by the business objectives. Stakeholders are required to be provided with reports in order to know the actual performance and make decisions regarding the business. For this to be possible, reports are to be provided to the stakeholders, such report is expected that values are impacted to the stakeholders and that the stakeholders are enjoying the benefit for which they are entitled to.

Signaling theory propounded by Lintner (1956) emphasized that managers may need to share their knowledge with outsiders so as to have deep understanding of the real value of the firm in order to bridge the existing information gap. The financial statements should reflect the future prospects of a firm which are the only evidence of existence of a firm available to the stakeholders.

Clean surplus theory model specifies the relation between market value of equity and financial information such as earnings, cash flow and book value. Feltham and Ohlson in (1995) propounded the clean surplus theory otherwise known as the Residual Income Valuation Model (RIVM). The main importance of Feltham and Ohlson's RIVM is its assertion that the market value of an entity can be functionally linked to numbers within its statement of financial position and statement of comprehensive income components (Akileng, 2013). However, the modified Feltham and Ohlson model builds up a linear link with the market information, as market capitalization or share prices and financial information (earnings, dividends and book value of equity), it is well known in the field of market valuation.

Feltham and Ohlson (1995) based his theory of valuation on the RIVM on specific assumptions, share price of an entity's equity is equal to the book value of the equity plus the discounted value of future residual income (Beisland, 2008). Feltham and Ohlson's clean surplus theory shows that the market value of the firm can be stated in terms of income statement and

statement of financial position items (Che, 2007). The model has led to several empirical research assessing the comparative value usefulness and prediction of the statement of financial position and the income statement components. It has become prominent in the accounting literature because it has had some success in explaining and predicting actual market firm value (Babalola, 2012). Under the RIVM, the main approach used in the valuation of earnings is the price model. The model is an offshoot of the standard valuation model which posits that price is the discounted present value of expected net cash flow. It equates current earnings with abnormal earnings and book value with the present value of expected future normal earnings.

Signaling theory, and Feltham and Ohlson (1995) model were adopted as the bedrock of this study because of the defect in the Easton and Harris model using stock return. Easton and Harris Model is also a valuation predictive model but used stock return as a measure of value rather than market capitalization or stock prices as used in Feltham and Ohlson (1995) model. The Easton and Harris model measures the information content of earnings levels and changes for stock returns and thus can be described as providing evidence on the differential relationship between earnings and prices. Contrarily, stock return could be caused by several factors outside the internal environment of a firm, thus the prediction using financial information which is purely firm's data might not capture return rather the stock price itself. This study focuses also is on share price and not returns. Therefore, Feltham and Ohlson (1995) model is considered as most appropriate underpinning theory for this study.

2.1 Empirical Review

2.1.1 Evidence from Transition in Standards and Value Predictive Power of Financial information

Costa dos Santos and Nóbrega Cavalcante (2014) assessed the effect of adopting the International Financial Reporting Standards (IFRS) in Brazil on the information relevance of accounting profits of publicly traded companies. The study discovered that adoption of IFRS in Brazil improved the relationship status of accounting income; enhanced timeliness of financial report preparation; but had no impact on conditional conservatism. The study is of the opinion that IFRS adoption has contributed increased relevance of accounting income of Brazilian listed firms. The findings of the study of Costa dos Santos and Nóbrega Cavalcante (2014) was consistent with the reports of Jeong and Kimberly (2014); Lee, Walker and Zeng (2013); Florou, Kosi and Pope (2017); Uthman and Abdul-Baki (2014). On the contrary, Paananen (2008) study concluded that adoption of IFRS diminishes the value predictive power of financial information. In the same vein, Callao, Jarne, and Lainez (2007); Abubakar, Abdulsallam and Alkali (2017) are of the opinion that the value predictive power of financial information remains indifferent before and after adoption of IFRS.

2.1.2 Evidence from the Effect of Earnings on Firm Value (Before and after the Adoption of IFRS).

Okafor *et al.*, (2017) study showed that IFRS adoption has an incremental effect on the value relevance of financial information with earnings per share showing the highest increment. This finding aligned with the reports of Hung and Subramanyam (2007); Ahmed, Chalmers, and Khelif (2013); Lima (2010); Macedo, Machado, Machado, and Mendonça (2013); Ayed and Abaoub (2006); Agostino, Drago, and Silipo (2011); Chalmers, Clinch, and Godfrey (2011); Umoren and Enang (2015); Kousenidis, Ladas and Negakis (2010). While, the studies of Halonen, Pavlovia, and Pearson (2013); Asselman (2012) showed that the value predictive power of earnings reduced after the adoption; Kargin (2013); Tsalavoutas, Andre and Evans (2012) found an indifferent result.

2.1.3 Evidence from the Effect of Book-Value of Assets on Firm Value (Before and after the Adoption of IFRS).

According to the study by Ibrahim (2017), it was revealed book value per share positively and significantly influence share priced valuation of listed oil firms in Nigeria. In a similar vein, the

reports of Elbakry, Nwachukwu, Abdou, Elshandidy (2017); Ames (2013), Okafor *et al.*, (2017); Bassey, Idaka and Godwin (2016); Iqbal, Ahmed, Zaidi and Raza (2015); Ibrahim (2017); Jeong and Kimberly (2014); Tsalavoutas *et al.*, (2012) also showed a significant relationship between asset book-value and value of firms. Contrariwise, Oraby (2017) concluded that there exist an insignificant relationship between asset book-value and firm share price. In respect to the adoption of IFRS; while the studies of Hung and Subramanyam (2007); Kargin (2013); Halonen *et al.*, (2013); Agostino *et al.*, (2011) revealed an improvement in the value predictive power of asset-book value after adoption; the reports of the studies of Umoren and Enang (2015); Kousenidis *et al.*, (2010) showed a decline in the value predictive power of asset-book value on firm share price. The studies of Ahmed *et al.*, (2013); Macedo *et al.*, (2013); Chalmers *et al.*, (2011) showed that there is no difference on the effect of asset-book value on firm value before and after IFRS adoption.

2.1.4 Evidence from the Effect of Operating Cash-flow on Firm Value (Before and after the Adoption of IFRS).

Saaydah, (2012) reported that operating cash flows and discretionary accruals are better predictors of a bank's market value in an IFRS era. Likewise, the studies of Okafor *et al.*, (2017); Asselman (2012) revealed in their studies that adoption of IFRS improved that value predictive power of financial information especially the operating cash-flow. On the other hand, the result of the study of Ayed and Abaoub (2006) showed that IFRS adoption does not improve the influence of operating cash-flow on the firm value. The studies of Ames (2013), Okafor *et al.*, (2017); Bassey *et al.*, (2016) concluded that operating cash-flow significantly influence the firm value.

3.0 METHODS AND MATERIALS

This study adopted *ex-post facto* research design to examine the influence of IFRS adoption on the value predictive power of financial information all the six (6) listed Oil and Gas as Petroleum Marketing firms in Nigeria as at 1st March, 2019. Total enumeration sampling technique was used in selecting the sample subjects. Secondary data obtained from annual reports and accounts of the sampled firms for a period of twelve (12) years (six(6) years of before and after the adoption) were used in computing the ratios useful in measuring both the dependent and independent variables.

The analysis was carried out in three stages; the pre-estimation stage, estimation stage and the diagnostic stage. Correlation analysis and Variance Inflation Factor (VIF) analysis were used for the pre-estimation stage to evaluate the characteristics and the appropriateness of the series in the distribution. At the estimation stage, multiple regression analysis was used to test the hypothesis, Hausman test was carried out to determine the most appropriate estimating technique in establishing the relationship between transitions in standards and the value relevance of financial information. The study also tested for the existence of homoscedasticity, cross-sectional independence and the serial autocorrelation in the model as diagnostic tests.

Model and Variable Measurements

The Model for this study was adapted from the work of Feltham and Ohlson (1995) framework, stated as:

$$P_{it} = \delta_0 + \delta_1 E_{it} + \delta_2 BV_{it} + \varepsilon_{it} \quad (1)$$

Where: P = Share Price; E = Earnings; BV = Book Value; ε = stochastic error; while 'i' and 't' represent number of firms for the specified periods t

Feltham and Ohlson (1995) model was modified to fit the objective of this study; as Feltham and Ohlson (1995) used share price as a measure of value, this study used modified Tobin's Q (MTq) based on the premise that the extrinsic value of a firm can be accurately ascertained by its current worth rather than just its stock price, thus, the need to measure value using the market perception.

The study also includes cash flow from operating activities as one of the independent variable in accordance with Present Value Model. The model of this study is stated as:

$$MT_{qit} = \alpha_0 + \beta_1 EPS_{it(PRE-IFRS, POST-IFRS)} + \beta_2 BVPS_{it(PRE-IFRS, POST-IFRS)} + \beta_3 OCFS_{it(PRE-IFRS, POST-IFRS)} + \mu_{it} \quad (2)$$

where: MTq = Modified Tobin’s Q; EPS = earnings per share; BVPS = book value of total assets per share; and OCFS = operating cash-flow per share

The model parameter was assessed in two phases. The significance or otherwise of the isolated effects of the financial information proxies on value of listed Oil and Gas firms in Nigeria were evaluated at $\alpha = 0.05$, employing the t-statistics while the joint effect of the measures of financial information on the value of the listed Oil and Gas firms in Nigeria was assessed using F-statistics at 95% confidence level, and the coefficient of multiple determination (Adjusted R²) was used to determine the proportion of joint effect of all the independent variables on the dependent variable.

We expect that the IFRS adoption has positively impacted on the value predictive power of financial information of listed Oil and Gas firms in Nigeria. Therefore, $\beta_{1(pre-IFRS)} \neq \beta_{1(post-IFRS)}$; $\beta_{2(pre-IFRS)} \neq \beta_{2(post-IFRS)}$; $\beta_{3(pre-IFRS)} \neq \beta_{3(post-IFRS)}$

4.0 RESULTS AND DISCUSSION OF FINDINGS

Table 1. Multicollinearity Test

Variab	2006 – 2011			VIF	2012 -2017			VIF	2006 – 2017			VIF
	EPS	OCF	BVP		EPS	OCF	BVP		EPS	OC	BVP	
EPS	1.00			0.77	1.00			0.34	1.00			0.51
OCFS	0.35	1.000		0.86	0.54	1.000		0.44	0.49	1.00		0.64
BVPS	0.32	0.005	1.000	0.88	0.73	0.295	1.000	0.68	0.59	0.22	1.00	0.75
				1.20				2.23				1.63

Source: Researchers’ Work (2019).

4.1 General Interpretation

The result of the correlation test presented in Table 1 showing the minimum and maximum correlation coefficients in both periods and within the combined periods of 0.005 and 0.737 which are less than the benchmark of 0.8 (Baltagi, 2013). This shows that there is no evidence of multicollinearity problem among the variables. This result was confirmed by the variance inflation factor test with all the individual reverse factor (EPS (0.77; 0.34; 0.51); OCFS (0.86; 0.44; 0.64); BVPS (0.88; 0.68; 0.75)) being less the threshold of “1” with the average of the aggregate for all the periods being (1.20; 2.23; 1.63) less than the benchmark of 5.0. This confirmed the report of the correlation matrix which indicated that multicollinearity problem does not exist among the variables.

Table 2: Regression Result

		2006-2011				2012-2017				2006-2017			
		EPS	OCFS	BVPS	Cons.	EPS	OCFS	BVPS	Cons.	EPS	OCFS	BVPS	Cons.
Estimated	Coeff	8.46	-1.88	0.135	69.60	3.17	0.714	2.19	-2.81	7.767	-0.00	0.298	44.37
	t-stat/z-stat	4.14	-1.90	0.13	2.15	1.86	1.30	3.29	-0.16	5.92	-0.01	0.62	3.50
	Prob	0.00	0.057	0.13	0.031	0.07	0.20	0.002	0.872	0.00	0.992	0.538	0.000

		0.46; Wald Chi ² (3)=22.03 (0.00)	0.66; F(3,32)=23.64 (0.00)	0.50; F(3,32)=11.57 (0.00)
Diagnostic Test	Hausman	2.84 (0.42)	1.66 (0.65)	1.50 (0.68)
	Breusch-Pagan LM Test	5.97 (0.01)	1.39 (0.24)	24.35 (0.00)
	Breusch-Pagan Test	0.00(0.961)	0.79 (0.38)	0.50 (0.481)
	Pesaran Cd Test	1.509(0.131)	-	6.013 (0.00)
	Wooldridge Test	1.961(0.22)	0.83 (0.15)	4.028 (0.101)

Dependent Variable: MTq Significance @ *5%

Source: Researchers' Work (2019).

4.2 Pre-adoption era

The result of the Hausman test revealed the appropriateness of the random effect with ρ -value of 0.42 being greater than 5% and Breusch-Pagan Lagrangian multiplier tests also confirmed the result of the Hausman test with ρ -value of 0.01 being less than 5%. The results of the diagnostic test showed that the model is homoscedastic, has cross-sectional independence and no first order auto correlation issues, thus Random Effect is considered in estimating the relationship between the independent variables (EPS, OCFS, BVPS) and MTq during pre-adoption era.

The result of the Random Effect as depicted in Table 2, showed that Earnings Per Share (EPS) significant positive effect on Modified Tobin's Q (MTq); Operating Cash flow per Share (OCFS) has insignificant negative effect on Modified Tobin's Q (MTq) while Book Value Per Share (BVPS) has insignificant positive effect on Modified Tobin's Q (MTq) prior to the period of the adoption of IFRS (2006-2011) (EPS: t-test=4.14, $\rho_{(0.00)} < 0.05$; OCFS: t-test=-1.90, $\rho_{(0.061)} > 0.05$; BVPS: t-test=0.13, $\rho_{(0.894)} > 0.05$). The results of the analysis depicts that a naira increase in Earnings Per Share (EPS) leads to 8.46 naira increase in MTq; a naira increase in Book Value Per Share (BVPS) leads to 0.135 naira increase in MTq, while a naira increase in Operating Cash flow per Share (OCFS) leads to 1.88 naira decrease in MTq. The model having a coefficient of multiple determination (Adj. R²) of 0.46(46%) with ρ -value of F-stat = 0.00 evidenced that financial information (EPS, OCFS, BVPS) significantly affect the Modified Tobin's Q of the listed oil and gas firms in Nigeria prior the adoption of IFRS, but only 46% variation in MTq is caused by the changes independent variables (EPS, OCFS, BVPS), this implies that the remaining 54% changes in MTq can be justified by other variables that are not measured in this model.

4.3 Post-adoption era

The result of the Hausman test revealed the appropriateness of the random effect with ρ -value of 0.42 being greater than 5% and Breusch-Pagan Lagrangian multiplier tests also confirmed the result of the Hausman test with ρ -value of 0.01 being less than 5%. The results of the diagnostic test showed that the model is homoscedastic, has cross-sectional independence and no first order auto correlation issues, thus Random Effect is considered in estimating the relationship between the independent variables (EPS, OCFS, BVPS) and MTq during pre-adoption era.

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4.4 Combined Model

The result of the Hausman test revealed the appropriateness of the random effect with p -value of 0.42 being greater than 5% and Breusch-Pagan Lagrangian multiplier tests also confirmed the result of the Hausman test with p -value of 0.01 being less than 5%. The results of the diagnostic test showed that the model is homoscedastic, has cross-sectional independence and no first order auto correlation issues, thus Random Effect is considered in estimating the relationship between the independent variables (EPS, OCFS, BVPS) and MTq during pre-adoption era.

The result of the Random Effect as depicted in Table 2, showed that Earnings Per Share (EPS) significant positive effect on Modified Tobin's Q (MTq); Operating Cash flow per Share (OCFS) has insignificant negative effect on Modified Tobin's Q (MTq) while Book Value Per Share (BVPS) has insignificant positive effect on Modified Tobin's Q (MTq) prior to the period of the adoption of IFRS (2006-2011) (EPS: $t\text{-test}=4.14$, $\rho_{(0.00)} < 0.05$; OCFS: $t\text{-test}=-1.90$, $\rho_{(0.061)} > 0.05$; BVPS: $t\text{-test}=0.13$, $\rho_{(0.894)} > 0.05$). The results of the analysis depicts that a naira increase in Earnings Per Share (EPS) leads to 8.46 naira increase in MTq; a naira increase in Book Value Per Share (BVPS) leads to 0.135 naira increase in MTq, while a naira increase in Operating Cash flow per Share (OCFS) leads to 1.88 naira decrease in MTq. The model having a coefficient of multiple determination (Adj. R^2) of 0.46(46%) with p -value of $F\text{-stat} = 0.00$ evidenced that financial information (EPS, OCFS, BVPS) significantly affect the Modified Tobin's Q of the listed oil and gas firms in Nigeria prior the adoption of IFRS, but only 46% variation in MTq is caused by the changes independent variables (EPS, OCFS, BVPS), this implies that the remaining 54% changes in MTq can be justified by other variables that are not measured in this model.

The comparative analysis of the results (before and after the adoption of IFRS) showed that the predictive power of financial information (EPS, OCFS, BVPS) improved after the adoption as this could explain 66% changes in value after the adoption compared to 46% variation prior the adoption. This implies that adoption of IFRS has improved the reported accounting figures of listed oil and gas firms in Nigeria. Although, only EPS exerted significant effect on MTq period adoption; Likewise, it was only BVPS that significantly influence MTq after the adoption while OCFS was insignificant at both periods; the probability of the F-statistics and the result of the Adjusted R^2 showed that the combined measures of financial information jointly influence the value of listed oil and gas firms in Nigeria and that this influence improved after the adoption of IFRS.

4.5 Discussion of Findings

4.5.1 Effect of Earnings on Firm Value (Before and after the Adoption of IFRS).

This study found that Earnings Per Share has significant positive effect on value of listed oil and gas firms in Nigeria. It was also obtained that adoption of IFRS improved the power of earnings per share in predicting the value of firms. The report of this study supports the findings of Okafor *et al.*, (2017); Hung and Subramanyam (2007); Ahmed *et al.*, (2013); Lima (2010); Macedo *et al.*, (2013); Ayed and Abaoub (2006); Agostino *et al.*, (2011); Chalmers *et al.*, (2011); Umoren and Enang (2015); Kousenidis *et al.*, (2010) which showed that IFRS adoption has an incremental effect on the value relevance of financial information with earnings per share showing the highest increment. On the contrary, the improved positive findings of this study contradicts the results of the studies of

Halonen *et al.*, (2013); Asselman (2012) which concluded that the value predictive power of earnings reduced after the adoption; while Kargin (2013); Kargin (2013); Tsalavoutas *et al.*, (2012) reported that the value predictive power of earnings remains the same before and after the adoption of IFRS. The findings of this study aligned with the stakeholder's theory which states that Stakeholders are required to be provided with reports in order to know the actual performance and make decisions regarding the business; and that value is impacted to the stakeholders through the reports and that the stakeholders are enjoying the benefit for which they are entitled to.

4.5.2 Effect of Book-Value of Assets on Firm Value (Before and after the Adoption of IFRS).

According to the report of this study, it was revealed that book value per share positively and significantly influence Book Value Per Share (BVPS) exert a significant positive effect on the Modified Tobin's Q of the listed oil and gas firms in Nigeria. This finding is consistent with the reports of Ibrahim (2017), Kim and Key (2014); Elbakry *et al.*, (2017); Ames (2013), Okafor *et al.*, (2017); Bassey *et al.*, (2016); Iqbal, Ahmed, Zaidi and Raza (2015); Ibrahim (2017); Jeong and Kimberly (2014); Tsalavoutas *et al.*, (2012) who also showed a significant relationship between asset book-value and value of firms. On the contrary, it contradicts the findings of Oraby (2017) concluded that there exist an insignificant relationship between asset book-value and firm share price. In respect to the adoption of IFRS; The comparative analysis of the results (before and after the adoption of IFRS) showed that the predictive power of Book Value improved after the adoption, this aligned with the findings of Hung and Subramanyam (2007); Kargin (2013); Okafor *et al.*, (2017); Halonen *et al.*, (2013); Kargin (2013); Agostino *et al.*, (2011) which revealed an improvement in the value predictive power of asset-book value after adoption; but negates the reports of the studies of Umoren and Enang (2015); Kousenidis *et al.*, (2010) showed a decrease in the value predictive power of asset-book value on firm share price; while the studies of Ahmed *et al.*, (2013); Macedo *et al.*, (2013); Chalmers *et al.*, (2011); Tsalavoutas *et al.*, (2012) showed that there is no difference on the effect of asset-book value on firm value pre and after IFRS adoption.

4.5.3 Effect of Operating Cash-flow on Firm Value (Before and after the Adoption of IFRS).

This study found that Operating Cash flow per Share (OCFS) exerts a significant positive effect on the Modified Tobin's Q of the listed oil and gas firms in Nigeria which aligned with the reports of Ames (2013), Okafor *et al.*, (2017); Bassey *et al.*, (2016) which also concluded that operating cash-flow significantly influence the firm value. This study also obtained that the predictive power of Operating Cash flow improved after the adoption of IFRS. The report of this study is in accordance with the findings of Saaydah, (2012) reported that operating cash flows and discretionary accruals are better predictors of a bank's market value in an IFRS era. and the studies of Okafor *et al.*, (2017) and Asselman (2012) which showed that adoption of IFRS improved that value predictive power of financial information especially the operating cash-flow. On the other hand, the finding of this study negates the result of the study of Ayed and Abaoub (2006) showed that IFRS adoption does not improve the influence of operating cash-flow on the firm value.

4.5.4 Effect of Financial information on Firm Value (Before and after the Adoption of IFRS).

This study found that that financial information (EPS, OCFS, BVPS) significantly affect the Modified Tobin's Q of the listed oil and gas firms in Nigeria. The finding of this study is consistent with the reports of Okafor *et al.*, (2017) and Agostino *et al.*, (2011) which reported that IFRS adoption has an incremental effect on the value relevance of book value, earnings per share, and cash flow from operations, with earnings per share showing the highest increment and opined that IFRS introduction enhanced the information content of both earnings, operating cash flow and book value for more transparent banks; but negates the report of Asselman (2012) which concluded that the value relevance of earnings has decreased after the adoption of IFRS while that of cash flow has increased after the adoption of IFRS.

5.0 CONCLUSION AND RECOMMENDATIONS

We concluded that transition in accounting standards has improved the predictive powers of earnings, cash flow from operating activities and book value of asset of oil and gas companies in Nigeria. This was evidenced in the results of the coefficient of multiple determination which showed that the predictive power of financial information (EPS, OCFS, BVPS) improved after the adoption as this could explain 66% changes in value after the adoption compared to 46% variation prior the adoption. This implies that adoption of IFRS has improved the reported accounting figures of listed oil and gas firms in Nigeria. Although, only EPS exerted significant effect on MTq period adoption; Likewise, it was only BVPS that significantly influence MTq after the adoption while OCFS was insignificant at both periods; the probability of the F-statistics and the result of the Adjusted R² showed that the combined measures of financial information jointly influence the value of listed oil and gas firms in Nigeria and that this influence improved after the adoption of IFRS.

Based on the findings, the study therefore recommended that: (i) the managers should improve on the compliance with the relevant accounting standards in preparing the annual reports and accounts of companies as this helps in enhancing the relevance of the financial information in determining the value; (ii) Stakeholders should critically analyze the annual reports of companies prepared in accordance with the regulatory standards in taking crucial decisions, and (iii) The standard setters should continually update the standards in order to improve the quality of the financial information as different stakeholders rely on this information in taking diverse decisions; and (iv) The government and other regulatory bodies should enforce the firms to apply relevant standards to relating to all elements of financial statements when preparing them and ensure sanctions on areas of default.

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Appendix1: Financial Ratios Used for the Analysis

COMPUTED RATIOS FOR THE ANALYSIS						
NAME	ID	YEAR	Tq/S	EPS	OCF/S	BVPS
MOBIL	1	2006	196.64	7.14	8.09	11.90
MOBIL	1	2007	194.52	9.59	12.60	18.67
MOBIL	1	2008	339.62	12.94	16.14	21.41
MOBIL	1	2009	108.72	11.69	15.44	20.57
MOBIL	1	2010	151.91	15.5	19.62	20.88
MOBIL	1	2011	146.45	12.14	23.54	21.13
MOBIL	1	2012	111.07	8.56	14.78	19.60
MOBIL	1	2013	120.01	9.65	31.99	26.45
MOBIL	1	2014	144.00	17.73	15.62	37.58
MOBIL	1	2015	160.00	13.51	30.94	42.61
MOBIL	1	2016	279.00	22.61	30.61	59.51
MOBIL	1	2017	194.60	20.85	-1.52	79.17
CONOIL PLC	2	2006	70.51	4.05	1.88	16.28
CONOIL PLC	2	2007	82.28	3.74	1.98	17.27
CONOIL PLC	2	2008	85.97	2.62	-1.56	17.14
CONOIL PLC	2	2009	28.21	3.33	8.46	19.47
CONOIL PLC	2	2010	37.05	4.02	9.12	21.99
CONOIL PLC	2	2011	32.16	4.25	11.10	24.03
CONOIL PLC	2	2012	21.86	1.03	-34.04	22.57
CONOIL PLC	2	2013	68.69	4.42	57.31	25.99
CONOIL PLC	2	2014	45.20	1.2	-2.70	23.19
CONOIL PLC	2	2015	25.52	3.33	8.11	25.52
CONOIL PLC	2	2016	38.28	4.09	34.65	26.61
CONOIL PLC	2	2017	28.79	2.27	-10.99	25.78
ETERNA PLC.	3	2006	3.04	0.05	3.59	0.20
ETERNA PLC.	3	2007	16.33	-0.21	2.73	1.82
ETERNA PLC.	3	2008	31.15	-0.52	0.76	1.00
ETERNA PLC.	3	2009	5.97	-1.32	0.39	3.46
ETERNA PLC.	3	2010	6.19	0.55	1.95	3.55
ETERNA PLC.	3	2011	3.31	0.93	-1.70	4.47
ETERNA PLC.	3	2012	3.52	0.73	-0.25	4.91
ETERNA PLC.	3	2013	4.42	0.54	3.58	5.45
ETERNA PLC.	3	2014	3.93	0.99	3.18	6.46
ETERNA PLC.	3	2015	3.01	0.96	1.70	7.43
ETERNA PLC.	3	2016	4.06	1.13	5.90	8.30
ETERNA PLC.	3	2017	4.58	1.54	0.22	9.52

COMPUTED RATIOS FOR THE ANALYSIS CONT'D						
FORTE OIL PLC	4	2006	0.63	2.74	-7.42	3.11
FORTE OIL PLC	4	2007	207.00	7.23	7.26	9.34
FORTE OIL PLC	4	2008	293.98	6.35	-30.31	8.69
FORTE OIL PLC.	4	2009	33.51	-8.78	8.03	30.23
FORTE OIL PLC.	4	2010	21.90	-2.54	12.91	23.16
FORTE OIL PLC.	4	2011	12.28	-14.46	-3.17	9.12
FORTE OIL PLC	4	2012	8.66	0.93	2.61	7.03
FORTE OIL PLC	4	2013	105.09	4.32	0.56	39.26
FORTE OIL PLC	4	2014	231.84	2.20	0.50	40.59
FORTE OIL PLC.	4	2015	332.73	4.13	8.04	42.38
FORTE OIL PLC.	4	2016	93.03	1.99	3.60	33.07
FORTE OIL PLC.	4	2017	50.44	2.89	-0.27	42.18
OANDO PLC	5	2006	70.90	4.76	5.34	38.64
OANDO PLC	5	2007	128.17	7.51	-0.41	74.92
OANDO PLC	5	2008	115.14	9.22	-16.17	49.60
OANDO PLC	5	2009	93.99	11.32	-3.55	58.92
OANDO PLC	5	2010	94.17	8.29	-3.85	51.40
OANDO PLC	5	2011	45.69	1.62	4.56	40.65
OANDO PLC	5	2012	33.50	1.26	-26.48	40.89
OANDO PLC	5	2013	21.89	0.23	5.46	26.08
OANDO PLC	5	2014	17.92	-0.21	-11.44	52.30
OANDO PLC	5	2015	6.11	-4.23	-1.40	3.84
OANDO PLC	5	2016	11.96	0.30	-2.04	1.81
OANDO PLC	5	2017	13.01	1.13	-0.83	-0.86
TOTAL NIGERIA PLC.	6	2006	206.81	7.41	4.59	16.98
TOTAL NIGERIA PLC.	6	2007	190.38	9.59	5.00	18.67
TOTAL NIGERIA PLC.	6	2008	212.13	12.94	8.58	21.41
TOTAL NIGERIA PLC.	6	2009	158.94	11.69	20.57	20.57
TOTAL NIGERIA PLC.	6	2010	240.49	16.01	18.00	26.30
TOTAL NIGERIA PLC.	6	2011	195.87	11.23	37.60	29.53
TOTAL NIGERIA PLC.	6	2012	121.19	13.76	-24.82	33.29
TOTAL NIGERIA PLC.	6	2013	178.84	15.71	37.11	39.00
TOTAL NIGERIA PLC.	6	2014	159.24	13.03	45.96	41.03
TOTAL NIGERIA PLC.	6	2015	157.20	11.92	31.37	47.84
TOTAL NIGERIA PLC.	6	2016	299.72	43.58	50.24	69.42
TOTAL NIGERIA PLC.	6	2017	238.25	23.62	22.55	83.14

Appendix 2: OUTPUT OF STATA/IC 11.0

– PRE-ADOPTION OF IFRS

```

name: <unnamed>
log: C:\Users\Grace Ogundajo\Desktop PRE1.log
log type: text
opened on: 10 Mar 2019, 16:50:19
    
```

```

. xtset id year
    panel variable: id (strongly balanced)
    time variable: year, 2006 to 2011
        delta: 1 unit
    
```

```
. estat vif
```

Variable	VIF	1/VIF
eps	1.30	0.770407
ocfs	1.16	0.861877
bvps	1.14	0.880095
Mean VIF	1.20	

```
. correlate eps ocfs bvps
(obs=36)
```

	eps	ocfs	bvps
eps	1.0000		
ocfs	0.3531	1.0000	
bvps	0.3258	0.0053	1.0000

```
. reg tqc eps ocfs bvps
```

Source	SS	df	MS	Number of obs =	36
Model	150134.394	3	50044.7979	F(3, 32) =	11.57
Residual	138419.167	32	4325.59896	Prob > F =	0.0000
Total	288553.561	35	8244.38745	R-squared =	0.5203
				Adj R-squared =	0.4753
				Root MSE =	65.769

tqc	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
eps	10.81863	1.948044	5.55	0.000	6.850595 14.78667
ocfs	-.6659832	1.029597	-0.65	0.522	-2.763204 1.431238
bvps	-.5388746	.7020306	-0.77	0.448	-1.968864 .891115
_cons	64.74647	18.94837	3.42	0.002	26.14991 103.343

```
. xtreg tqc eps ocfs bvps, re
```

```

Random-effects GLS regression
Group variable: id
Number of obs = 36
Number of groups = 6
    
```

```

R-sq:  within = 0.3936
        between = 0.5393
        overall = 0.4576
Obs per group: min = 6
                avg = 6.0
                max = 6
    
```

```

Random effects u_i ~ Gaussian
corr(u_i, X) = 0 (assumed)
Wald chi2(3) = 22.03
Prob > chi2 = 0.0001
    
```



```

Estimated results:
      |          Var      sd = sqrt(Var)
-----+-----
    tq |      8244.387      90.79861
     e |      2647.388      51.45277
     u |      2757.052      52.50763
    
```

```

Test:  Var(u) = 0
      chi2(1) = 5.97
      Prob > chi2 = 0.0145
    
```

. xtcsd, pesaran abs

Pesaran's test of cross sectional independence = 1.509, Pr = 0.1314

Average absolute value of the off-diagonal elements = 0.417

. xtserial tqe eps ocfs bvps

Wooldridge test for autocorrelation in panel data

H0: no first-order autocorrelation

```

F( 1, 5) = 1.961
Prob > F = 0.2203
    
```

. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: fitted values of tqe

```

chi2(1) = 0.00
Prob > chi2 = 0.9611
    
```

. xtreg tqe eps ocfs bvps, re

```

Random-effects GLS regression           Number of obs   =   36
Group variable: id                     Number of groups =    6
    
```

```

R-sq:  within = 0.3936           Obs per group: min =    6
      between = 0.5393           avg =    6.0
      overall = 0.4576           max =    6
    
```

```

Random effects u_i ~ Gaussian           Wald chi2(3)    =   22.03
corr(u_i, X) = 0 (assumed)             Prob > chi2     =   0.0001
    
```

tqe	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
eps	8.464615	2.043085	4.14	0.000	4.460243 12.46899
ocfs	-1.877018	.9856694	-1.90	0.057	-3.808894 .0548587
bvps	.1347806	1.014912	0.13	0.894	-1.854411 2.123972
_cons	69.59659	32.31491	2.15	0.031	6.260528 132.9326
sigma_u	52.507634				
sigma_e	51.452774				
rho	.5101457	(fraction of variance due to u_i)			

- POST ADOPTION OF IFRS (2012-2017)

. correlate eps ocfs bvps
 (obs=36)

	eps	ocfs	bvps
eps	1.0000		

```

ocfs | 0.5452 1.0000
bvps | 0.7371 0.2947 1.0000
    
```

. estat vif

Variable	VIF	1/VIF
eps	2.95	0.338887
bvps	2.27	0.440329
ocfs	1.48	0.677633
Mean VIF	2.23	

. reg tqc eps ocfs bvps

Source	SS	df	MS	Number of obs =	36
Model	221429.183	3	73809.7277	F(3, 32) =	23.64
Residual	99925.4877	32	3122.67149	Prob > F =	0.0000
Total	321354.671	35	9181.56202	R-squared =	0.6890
				Adj R-squared =	0.6599
				Root MSE =	55.881

tqc	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
eps	3.166828	1.699418	1.86	0.072	-.294773	6.628429
ocfs	.7143657	.5481796	1.30	0.202	-.4022397	1.830971
bvps	2.192598	.6662216	3.29	0.002	.8355487	3.549647
_cons	-2.80747	17.23388	-0.16	0.872	-37.91173	32.29679

. xtreg tqc eps ocfs bvps, fe

```

Fixed-effects (within) regression      Number of obs   =   36
Group variable: id                    Number of groups =    6

R-sq:  within = 0.4107                 Obs per group:  min =    6
      between = 0.8534                   avg   =   6.0
      overall  = 0.6832                   max   =    6

corr(u_i, Xb) = 0.4069                 F(3,27)         =    6.27
                                          Prob > F         =   0.0023
    
```

tqc	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
eps	3.435184	2.055162	1.67	0.106	-.7816601	7.652027
ocfs	.6069322	.51135	1.19	0.246	-.4422714	1.656136
bvps	1.413826	.6966535	2.03	0.052	-.0155886	2.843241
_cons	20.07338	19.9946	1.00	0.324	-20.95215	61.09892
sigma_u	36.359424					
sigma_e	50.447814					
rho	.34186999	(fraction of variance due to u_i)				

```

F test that all u_i=0:   F(5, 27) =    2.45           Prob > F = 0.0589
    
```

. est store fixed

. xtreg tqc eps ocfs bvps, re

```

Random-effects GLS regression      Number of obs   =   36
Group variable: id                 Number of groups =    6

R-sq:  within = 0.4101                 Obs per group:  min =    6
      between = 0.8606                   avg   =   6.0
      overall  = 0.6861                   max   =    6
    
```

Random effects u_i ~ Gaussian Wald chi2(3) = 39.31
 corr(u_i, X) = 0 (assumed) Prob > chi2 = 0.0000

```
-----+-----
```

tqs	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
eps	3.575848	1.769902	2.02	0.043	.1069031	7.044793
ocfs	.6642311	.4969469	1.34	0.181	-.309767	1.638229
bvps	1.700311	.6543229	2.60	0.009	.4178618	2.98276
_cons	9.819697	21.79083	0.45	0.652	-32.88954	52.52894

```
-----+-----
```

sigma_u	32.131743					
sigma_e	50.447814					
rho	.28860066	(fraction of variance due to u_i)				

```
-----+-----
```

. est store random

. hausman fixed random

```
-----+-----
```

	---- Coefficients ----			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	fixed	random	Difference	S.E.
eps	3.435184	3.575848	-.1406646	1.044574
ocfs	.6069322	.6642311	-.0572988	.1205098
bvps	1.413826	1.700311	-.2864849	.2391393

```
-----+-----
```

b = consistent under Ho and Ha; obtained from xtreg
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

$$\begin{aligned} \text{chi2}(3) &= (b-B)'[(V_b-V_B)^{-1}](b-B) \\ &= 1.66 \\ \text{Prob}>\text{chi2} &= 0.6464 \end{aligned}$$

. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

$$tqs[id,t] = Xb + u[id] + e[id,t]$$

Estimated results:

```
-----+-----
```

	Var	sd = sqrt(Var)
tqs	9181.562	95.82047
e	2544.982	50.44781
u	1032.449	32.13174

```
-----+-----
```

Test: Var(u) = 0
 $\text{chi2}(1) = 1.39$
 Prob > chi2 = 0.2392

. xtserial tqs eps ocfs bvps

Wooldridge test for autocorrelation in panel data

H0: no first-order autocorrelation

$$\begin{aligned} F(1, 5) &= 22.627 \\ \text{Prob} > F &= 0.1513 \end{aligned}$$

. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: fitted values of tqs

```

    chi2(1)      =    0.79
    Prob > chi2 =    0.3753
. reg tq5 eps ocfs bvps
    
```

Source	SS	df	MS	Number of obs =	36
Model	221429.183	3	73809.7277	F(3, 32) =	23.64
Residual	99925.4877	32	3122.67149	Prob > F =	0.0000
				R-squared =	0.6890
				Adj R-squared =	0.6599
Total	321354.671	35	9181.56202	Root MSE =	55.881

tq5	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
eps	3.166828	1.699418	1.86	0.072	-.294773	6.628429
ocfs	.7143657	.5481796	1.30	0.202	-.4022397	1.830971
bvps	2.192598	.6662216	3.29	0.002	.8355487	3.549647
_cons	-2.80747	17.23388	-0.16	0.872	-37.91173	32.29679

COMBINED ANALYSIS - (2006-2017)

```

. correlate tq5 eps ocfs bvps
(obs=72)
    
```

	tq5	eps	ocfs	bvps
tq5	1.0000			
eps	0.7183	1.0000		
ocfs	0.3508	0.4959	1.0000	
bvps	0.4690	0.5963	0.2215	1.0000

```

. estat vif
    
```

Variable	VIF	1/VIF
eps	1.98	0.505296
bvps	1.57	0.637192
ocfs	1.34	0.745556
Mean VIF	1.63	

```

. reg tq5 eps ocfs bvps
    
```

Source	SS	df	MS	Number of obs =	72
Model	318162.83	3	106054.277	F(3, 68) =	24.40
Residual	295513.245	68	4345.78301	Prob > F =	0.0000
				R-squared =	0.5185
				Adj R-squared =	0.4972
Total	613676.075	71	8643.325	Root MSE =	65.923

tq5	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
eps	7.767276	1.350061	5.75	0.000	5.073271	10.46128
ocfs	-.0047906	.5358865	-0.01	0.993	-1.074135	1.064554
bvps	.2983833	.4989634	0.60	0.552	-.6972826	1.294049
_cons	44.37453	13.04791	3.40	0.001	18.33782	70.41124

```

. xtreg tq5 eps ocfs bvps, re
    
```

Random-effects GLS regression	Number of obs =	72
Group variable: id	Number of groups =	6
R-sq: within = 0.2739	Obs per group: min =	12
between = 0.7549	avg =	12.0

overall = 0.5146 max = 12

Random effects u_i ~ Gaussian Wald chi2(3) = 31.31
 corr(u_i, X) = 0 (assumed) Prob > chi2 = 0.0000

tqs	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
eps	6.404251	1.453634	4.41	0.000	3.55518	9.253321
ocfs	-.2889655	.4670899	-0.62	0.536	-1.204445	.6265139
bvps	.1049024	.4868267	0.22	0.829	-.8492603	1.059065
_cons	59.92337	23.1749	2.59	0.010	14.5014	105.3453

sigma_u	48.492245					
sigma_e	54.999153					
rho	.43737367 (fraction of variance due to u_i)					

. est store random

. xtreg tqs eps ocfs bvps, fe

Fixed-effects (within) regression Number of obs = 72
 Group variable: id Number of groups = 6

R-sq: within = 0.2743 Obs per group: min = 12
 between = 0.7548 avg = 12.0
 overall = 0.5119 max = 12

corr(u_i, Xb) = 0.4455 F(3,63) = 7.94
Prob > F = 0.0001

tqs	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
eps	5.932239	1.546195	3.84	0.000	2.842415	9.022063
ocfs	-.35901	.475371	-0.76	0.453	-1.308963	.5909432
bvps	.1128625	.5024072	0.22	0.823	-.8911182	1.116843
_cons	63.14593	12.59286	5.01	0.000	37.98111	88.31075

sigma_u	47.598027					
sigma_e	54.999153					
rho	.42823574 (fraction of variance due to u_i)					

F test that all u_i=0: F(5, 63) = 6.94 Prob > F = 0.0000

. est store fixed

. hausman fixed random

	---- Coefficients ----			
	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
eps	5.932239	6.404251	-.4720118	.5269406
ocfs	-.35901	-.2889655	-.0700445	.0883436
bvps	.1128625	.1049024	.0079602	.1241485

b = consistent under Ho and Ha; obtained from xtreg
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic
 $\chi^2(3) = (b-B)'[(V_b-V_B)^{-1}](b-B)$
 = 1.50
 Prob>chi2 = 0.6831

. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

$$tqs[id,t] = Xb + u[id] + e[id,t]$$

Estimated results:

	Var	sd = sqrt(Var)
tqs	8643.325	92.96948
e	3024.907	54.99915
u	2351.498	48.49225

Test: Var(u) = 0

chi2(1) = 24.35
 Prob > chi2 = 0.0000

. xtcsd, pesaran abs

Pesaran's test of cross sectional independence = 6.013, Pr = 0.0000
 Average absolute value of the off-diagonal elements = 0.448

. xtserial tqs eps ocfs bvps

Wooldridge test for autocorrelation in panel data

H0: no first-order autocorrelation

F(1, 5) = 4.028
 Prob > F = 0.1010

. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: fitted values of tqs

chi2(1) = 0.50
 Prob > chi2 = 0.4810

. xtgls tqs eps ocfs bvps

Cross-sectional time-series FGLS regression

Coefficients: generalized least squares

Panels: homoskedastic

Correlation: no autocorrelation

Estimated covariances	=	1	Number of obs	=	72
Estimated autocorrelations	=	0	Number of groups	=	6
Estimated coefficients	=	4	Time periods	=	12
			Wald chi2(3)	=	77.52
Log likelihood	=	-401.6765	Prob > chi2	=	0.0000

	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
eps	7.767276	1.312024	5.92	0.000	5.195757 10.33879
ocfs	-.0047906	.520788	-0.01	0.993	-1.025516 1.015935
bvps	.2983833	.4849052	0.62	0.538	-.6520135 1.24878
_cons	44.37453	12.68029	3.50	0.000	19.52161 69.22745