

# Impact of Liquidity Management on Profitability of Selected Manufacturing Firms in Nigeria

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## Abstract

This study examined the impact of the liquidity management on the performance of the 10 (ten) manufacturing firms selected for the period of five years 2012-2016. Secondary data were collected from the annual reports and accounts of these firms. Descriptive statistics, correlation and regression analyses were used for data analysis. The study revealed that current ratio has negative and significant impact on profitability (ROA) of the selected firms while quick and cash ratios have positive but insignificant relationship with ROA. Therefore, it is recommended that attention should be purposely paid to Liquidity management in the manufacturing firms in Nigeria in order to enhance their profitability.

**Keywords:** Liquidity, Profitability, Trade-off Theory, Return on Assets.

**DOI:** 10.7176/EJBM/12-27-11

**Publication date:** September 30<sup>th</sup> 2020

## 1. Introduction

Efficient liquidity management is essential for the growth and profitability of a firm. Good liquidity management is therefore an important focus for all companies in order to avoid insolvency and eventual bankruptcy as a result of poor financial performance (Goodhart, 2008). Jenkinson (2008) noted that liquidity is an important financial indicator that measures whether the company has the ability to meet its short-term liabilities or not without incurring undesirable losses. According to Bhunia (2010) liquidity plays a significant role in the successful functioning of a business firm. A firm should ensure that it does not suffer from lack of liquidity to meet its short-term demands. Also, keeping excess liquidity is not beneficial to the company because idle fund does not generate any income or returns to the company. It can be inferred that a well-managed firm will neither suffer inadequate liquidity, nor experience excess liquidity.

Profit maximization is a major objective of a firm in the short-term while maximization of shareholders wealth is the long-term and desirable objective of all companies. The profitability of the company may be affected by liquidity risk which arises when a company is unable to meet its current business obligations (Jenkinson, 2008). It occurs due poor liquidity management and sometimes unfavorable economic situation. Also, mismatching of current assets and liabilities can cause liquidity problems that would lead to drastic liquidity crisis (Goodhart, 2008). Liquidity and profitability trade-off are viewed as the two corners of a straight line as progression to one causes the sacrifice of another Saluja and Kumar (2012). The implication is that liquidity risk may be low in firms with high liquidity, but keeping more assets in liquid form may hinder good investment projects as a result of fund shortage, therefore, the firms have to accept low profit. Contrarily, firms may face difficulty in managing day to day operation if they employ all of their funds in profit generating projects. It must be noted that to run a firm in sustainable manner, there is the need for effective and efficient management of liquidity and profitability trade-off. For that reason, a firm must seek an optimal level of liquidity and profitability and maintain its position around that level for ensuring long term success of the business. Liquidity management ensures that the firm has the ability to meet current obligations and profitability management makes sure that the firm is able to earn revenue that exceeds its cost.

Panigrahi (2013) observed that whenever a financial analysis of companies is done, more emphasis is given on the profitability of the business rather than on its liquidity. This is quite obvious, as the most important financial objective of any business is to earn profit. So, the managers lay more emphasis towards profitability. Profitability is the capacity to make a profit. In the financial analysis profitability is measured through profitability ratios. According to Brealey (2012) profitability ratios include net profit margin, return on assets (ROA), return on equity (ROE) and payout ratio. While, liquidity is measured through a set of ratios that are used to calculate the liquidity position of an entity. These ratios are current ratio, quick ratio and cash ratio which help to determine whether an entity will be able to meet its financial obligations in the short-term. Low liquidity level will cause an organization to struggle to meet the obligations of business operations and therefore is forced to seek debt financing to support its operations. Zygmunt (2013) noted that the significance of liquidity to company performance might lead to the

conclusion that it determines the profitability. It means liquidity is important in company performance and might influence on its profitability.

Managing trade-off between liquidity and profitability is a crucial issue in today's cut throat competition in every industry. The profitability of the company would increase, if it decreases its liquidity and vice-versa. Empirically, a number of studies had supported the liquidity/profitability trade-off theory. These include; Deloof (2003); Eljelly (2004); Lazaridiss & Tryfonidis (2005); Akella (2006), Reheman & Nasr (2007); Dash & Hanuman (2008); Uyar (2009); Falope & Ajilore (2009); Ashokkumar and Manohar (2010); Bhunia and Brahma (2011) and Siame (2012). In these works, significantly negative association between liquidity management and profitability were the results. For instance, Siame (2012) analyzed the influence of liquidity on the profitability for 120 listed companies from different industries of South African between 2000-2009 and concluded that for all industries i.e. consumer goods industry, industrial firms, resources industry, and service sector, there existed a negative relationship between profitability and liquidity of the sampled companies. Inversely, some studies reported that there exist a direct and positive relationship between liquidity and profitability which render the profitability-liquidity trade off invalid. Among such findings are Shin & Soenen, (1998); Lyroudi & Lazaridis (2000) and Deloof, (2003). Bolek & Wilinski (2012); Nimalathasan (2013) and Khaldun (2014). It is interesting to note that there are some studies that neither supported the negative relationship nor positive relationship between liquidity and profitability. For instance, Niresh (2012) in his study on the cause and effect relationship between liquidity and profitability for 31 listed manufacturing firms from 2007-11 in Sri Lanka found no significant relationship between current ratio, quick ratio, and cash ratio and profitability ratios proxied by net profit, return on capital employed, and ROE. Also, in their study, also, Hamid and Akhi, (2015) found that there was no significant association between liquidity and profitability in pharmaceuticals and chemicals sector of Bangladesh.

Therefore, based on the divergent results from the findings of the empirical reviewed, there is a need to carry on further research in order to establish the relationship between liquidity and profitability of manufacturing firms and hence the need for this study. The nature of the relationship exists between liquidity and performance may vary from sector to sector, but the existence of a relationship cannot be ignored. This study aims at identifying the nature of the relationship between liquidity and profitability variables. This identification will help to carefully devise trade policies. Further, this study will help management to know the how important these variables are so as to help them to make sound decisions for better management of liquidity and profitability matters. The study will specifically establish if there is a significant relationship between return on asset as proxy for dependent variable and liquidity as independent variables proxies by current ratio, quick ratio and cash ratio. The study therefore, focused on performance of ten manufacturing firms in Nigeria ranging from Consumer goods, Health care and Industrial goods. These firms are : Cadbury Nigeria Plc., Unilever Nigeria Plc., Nestle Nigeria Plc., P.Z Cussons Nigeria Plc. Guinness Nigeria Plc. Nigerian Breweries; May & Baker Nigeria Plc., Neimeth Pharmaceuticals Plc, Lafarge Cement Plc. and Dangote Cement Plc. The firms were purposefully selected because of their active participation in form of trading activity on the Nigerian Stock Exchange and accessibility to their financial statements. The study covered a period of five years spanning between 2012 and 2016. The study will establish whether there is a negative relationship in line with Trade-off theory and it will further provide answer to the question "Does Liquidity impact on Profitability?"

The paper structure is as follows: The first section is introduction, section two deals with literature review, the third part is methodology while the fourth section is on results and discussion. The last part deals with conclusion and recommendations.

## 2. Literature Review

Prominent among the theories that emphasize the evaluation of the costs and benefits of different liquidity levels are Trade-off theory and Pecking order theory. Trade-off theory emphasis that firms' management focus on favorable liquidity level to balance the costs and benefits of cash holdings. Frank and Goyal (2005) noted that in trade-off theory, there is an evaluation of the cost and benefits of alternative capital structure plans. The implication is that, cost and benefit raise the importance of funds that have least cost, reasonable benefits and readily available. This is indicated in the liquid assets. According to Ismail (2016) the cash holding approach reduces the probabilities of financial problems and reduces the cost of external financing. Further, cash holdings help to respond different opportunities without entirely depending external fund capital (Abushammala & Sulaiman, 2014).

Myers and Majluf (1984) presented the pecking order theory which helps to understand the importance of internally maintained liquid assets. The pecking order theory describes the need of cash holdings for performance enhancement. According to the theory, firms first prefer retained earnings (available liquid assets), being the easiest to obtain as a source of finance for investments, next the debt, and finally the equity financing (Copeland, Weston & Shastri, 2005). Principally, the focus of this theory is on the use of internal resources or least expensive resources of the firm. In a nutshell, Tradeoff and pecking order theories center the importance of the thought of liquid assets. Trade-off advocates an inverse relationship between liquidity and profitability that center the cost

and benefit of every decision. Whereas, pecking order advocate the positive relationship between liquid assets and performance (Ismail, 2016).

The results of some empirical studies concluded that liquidity had negative impact on company profitability while some studies affirmed the positive relationship between the two variables. In a different dimension, some researchers argue that relationship between liquidity and profitability might be both positive and negative. Abuzar and Eljelly (2004) investigated the relationship between profitability and liquidity on a sample of joint stock companies in Saudi Arabia. Liquidity was measured by current ratio and cash conversion cycle. The study found significant negative relation between the firm's profitability and its liquidity level, as measured by current ratio. This relationship is more evident in firms with high current ratios and longer cash conversion cycles. In the same direction, Saluja and Kumar (2012) in their study on the liquidity and profitability trade off of Airtel Bharti Limited for 5 years. They found a negative relationship between liquidity and profitability. Supporting (Abuzar & Eljelly, 2004; Saluja & Kumar, 2012). In a similar study, Siame (2012) analyzed the influence of liquidity on the profitability for 120 listed companies from different industries in South African for a period of ten (10) years spanning from 2000-2009. The study found that for all industries which consist of consumer goods industry, industrial firms, resources industry, and service sector, there existed a negative relationship between profitability and liquidity as measured by the cash conversion cycle. In the study, Reddy (2015) analyzed the financial position of the Tata Steel Company in India in terms of liquidity and profitability and affirmed a negative relationship between liquidity and profitability. He concluded that it is essential for every firm to maintain equilibrium between profitability and liquidity in order to get optimum returns.

Contrary to the inverse relationship between liquidity and profitability, Bolek and Wilinski (2012) found a positive relationship between the quick ratio and return on assets. Also, Priya and Nimalathasan (2013) found that the current ratio and cash ratio are significantly associated with return on assets. Another study that supported positive impact of liquidity on profitability is Ajanthan (2013) who carried out empirical study on 8 listed trading companies of Sri Lanka from 2008 to 2012 using descriptive statistics, correlation and regression analysis and found a significant relationship between liquidity and profitability among the listed trading companies in Sri Lanka. According to the study, current ratio had a significant correlation with ROA and ROE and quick ratio was only significant with ROA. In the same direction, Khaldun (2014) noted that there is a positive and significant relationship between current ratio, quick ratio, cash ratio, and gross profit margin, and those ratios together impact significantly on the growth of profit of industrial companies in sector food and drink listed on the IDX period 2010-2012.

However, there are some studies that neither supported the negative relationship nor positive relationship between liquidity and profitability. For instance, Niresh (2012) in his study on the cause and effect relationship between liquidity and profitability for 31 listed manufacturing firms from 2007-11 in Sri Lanka found no significant relationship between current ratio, quick ratio, and cash ratio and profitability ratios proxied by net profit, return on capital employed, and ROE. Also, in their study, also, Hamid and Akhi, (2015) identified the relationship between liquidity and profitability in pharmaceuticals and chemicals sector of Bangladesh. From correlation analysis, this study found positive relation of QR and WCR with ROA, ROE, and ROCE. But, from regression analysis, it was found that there was no significant association between liquidity and profitability in pharmaceuticals and chemicals sector of Bangladesh.

Divergent results on the findings from the empirical reviewed literature created gaps for further research on manufacturing companies in Nigeria in order to establish the relationship between liquidity and profitability in these manufacturing firms.

### 3. Methodology

The study focused on Impact of Liquidity management on the profitability of ten (10) manufacturing firms in Nigeria. The firms were purposefully selected because of their active participation in form of trading activity on the Nigerian Stock Exchange and accessibility to their financial statements. Data sources of the study are audited annual reports of the firms for a period of five years (2012-2016). To derive the results of the study; descriptive statistical analysis, correlation analysis and multiple regression analysis were applied.

#### 3.1 Model Specification

The study adapted the model used by Ismail (2016) which expressed profitability proxy by return on asset (ROA) as functions of the efficiency of the liquidity management. This is given below:

$$ROA = f(CURR, QUR, CR, CCC) \dots\dots\dots (3.1)$$

Where **ROA** is return on assets, **CRR** is current ratio, **QUR** is quick ratio, **CR** is cash ratio and **CCC** is cash conversion cycle. **Ut** is the error term.

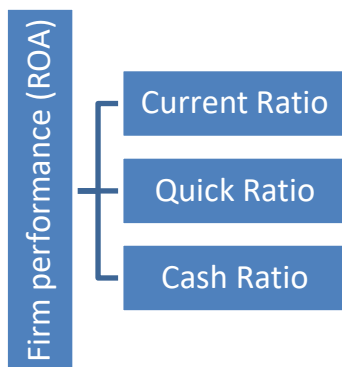
The liquidity (independent) indicators of the study are current ratio, quick ratio, cash ratio, and the cash conversion cycle, whereas profitability (dependent) indicator is return on assets.

The model was modified to reflect the objective of this study as follows:

$$ROA = f(CURR, QUR, CR, \dots) \dots \dots \dots (3.2)$$

In order to estimate the coefficients of the independent variables, the multiple regression is expressed as follows.

$$ROA = \beta_0 + \beta_1CRR + \beta_2QUR + \beta_3CR + Ut. \dots \dots \dots (3.3)$$



**Fig. 3.1: Link between ROA and other Variables**  
 Source: Author’s Design.

**3.2 Measurement of Variables used in the study**

**Return on Assets (ROA)**

It is a ratio of income to total asset. It measures the ability of the firm management to generate income by utilizing company assets at their disposal. It shows how efficiently the resources of the company are used to generate the income. A higher return on asset shows that the company is more efficient in using its resources.

$$\text{Return on assets} = \frac{\text{Net Profit after taxes}}{\text{Total Assets}} \times 100$$

**Current ratio**

Measure the company’s ability to pay short-term liabilities such as payable accounts and short-term loans, which represents the ratio of current assets to current liabilities. The magnitude of this ratio expresses high liquidity of the company, thus a greater capacity to meet the short-term liabilities.

$$\text{Current Ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}}$$

**Quick ratio**

This ratio only includes the most liquid of current assets to current liabilities. The rise in the value of this ratio expresses high liquidity of the company. This ratio excludes prepaid expenses and inventory from current assets being difficult conversion into cash (Sinha, 2012).

$$\text{Quick Ratio} = \frac{\text{Current Assets} - \text{Inventories}}{\text{Current Liabilities}}$$

**Cash ratio**

This ratio of current assets depends only on short-term marketable investments plus its cash attributed to current liabilities (Gibson, 2009).

$$\text{Cash Ratio} = \frac{\text{Cash Equivalents} + \text{Marketable Securities}}{\text{Current Liabilities}}$$

**4. Results and Discussion**

**Descriptive Analysis**

**Table 4.1 Descriptive analysis of liquidity and profitability variables.**

Descriptive Statistics							
	N	Minimum	Maximum	Sum	Mean	Std. Deviation	Variance
<b>ROA</b>	50	-.0904995	.30235690	6.78079490	.1356158981	.09278206	.00860851
<b>CUR</b>	50	.4086579	2.59366724	53.80245325	1.07604906	.54985157	.30233675
<b>ACTR</b>	50	.2066773	1.80531155	34.94729108	.6989458216	.38579373	.14883680
<b>CARA</b>	50	.0362994	1.23371288	10.32643512	.2065287024	.23685604	.05610078

**Source: Computed output (SPSS, Version 16)**

The descriptive statistics presented in table 4.1 shows the minimum, maximum, mean, standard deviation and variance of all the variables under consideration. The table indicates that the selected manufacturing firms in Nigeria generate a mean value of 13.56% for ROA while the minimum value is -.090% and maximum value is 30%. For the CUR a mean value of 1.08, which is below the standard current ratio of 2:1. The minimum value is

0.40 while the maximum value is 2.59. ACTR has a mean value of 0.70 which is not up to the benchmark of 1.1. The minimum value is 0.20 while the maximum value is 1.80. The cash ratio has a mean value of 0.21, minimum of 0.03 and a maximum of 1.23. These results indicate the need for improvement in the liquidity management of the selected manufacturing firms used in this study.

**Table 4.2 Correlation Matrix between liquidity and profitability variables**

	ROA	CUR	ACTR	CARA
ROA	1	-.527	-.379	.099
CUR	-.527	1	.927	.301
ACTR	-.379	.927	1	.560
CARA	.099	.301	.560	1

**Source: Data Analysis 2018.**

The correlation matrix in table 4.2 reveals the relationship among the variables used in the study. As a rule, the correlation coefficients between 0 and 0.30 marks a weak correlation, from 0.30 to 0.60 a moderate correlation, and between 0.60-1.00 a strong correlation. There is moderate negative correction of -0.527 between ROA and current ratio. Also, there is a moderate negative correlation of -0.379 between ROA and acid test ratio (ACTR). The positive correlation of 0.099 between ROA and CASA is very weak. The inverse relationship between ROA and CUR is an indication of inefficient liquidity management. Also, the negative relationship of ACTR with ROA confirmed liquidity problems in the selected manufacturing companies in Nigeria. It can be observed that CASA has positive and direct relationship with ROA, the implication is that, the companies kept cash to support their operational activities, though the correlation was not strong enough.

**Table 4.3 Regression Analysis**

Model	Coefficients				t	Sig.
	Unstandardized Coefficients		Standardized Coefficients			
	B	Std. Error	Beta			
1 (Constant)	.229	.024			9.344	.000
CUR	-.182	.074	-1.080		-2.454	.018
ACTR	.135	.122	.561		1.107	.274
CARA	.043	.078	.109		.547	.587

**a. Dependent Variable: ROA**

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.606 <sup>a</sup>	.367	.326	.07618285115

**a. Predictors: (Constant), CARA, CUR, ACTR, F-Test: 8.893 Sig.000**

**Source: Data Analysis 2018**

The results of regression analysis shows that there is a significant negative relationship between current ratio and return on assets. The coefficient and probability value of -1.080 (p=.018) proved the significance of this variables. The negative relationship between current asset and profitability is in line with trade-off theory. This means, there is liquidity problem in the selected manufacturing companies which evidence in poor liquidity management and its consequent negative impact on the return on assets (ROA). This result is consistent with the result of the study of Abuzar and Eljelly (2004) who evaluated the relationship between profitability and liquidity on a sample of joint stock companies in Saudi Arabia and found significant negative relation between the firm's profitability and its liquidity level, as measured by current ratio.

Quick ratio and Cash ratio indicate insignificant relationship with return on assets. The coefficient and probability value of 0.561 (p=0.274) for quick ratio, and coefficient and probability value of 0.109(p=0.587) confirmed the insignificance of these variables. The effect of Quick ratio and Cash ratio supported pecking order theory that liquidity is expected to have positive relationship with the profitability. Though, the results were positive but insignificant. The results of this study regarding quick ratio and cash ratio agree with the study of Khaldun (2014) which found out that there is a weak significant relationship between quick ratio, cash ratio and profitability of industrial companies in sector food and drink listed on the Indonesia Stock Exchange in period 2010-2012.

The R square of 36.7% explains that variation in the dependent variable was as a result of changes in independent variables used in this study. F-Stat is 8.893 with prob<0.05 indicates the model good fit. The implication of this is that the estimated equation can be relied upon in making valid inference about the influence of the explanatory variables on performance of the selected manufacturing firms in Nigeria.

## 5. Conclusion and Recommendations

Adequate profitability and efficient liquidity management are so essential to the successful management of any

business in order to meet the objectives of the organization and to fulfill both its short-term and long-term goals through its strategic planning. Managing trade-off between liquidity and profitability is therefore a crucial issue, so it is essential for every firm to maintain equilibrium between profitability and liquidity in order to get optimum returns. This study was set out to explore the seemingly controversial profitability/liquidity trade off theory. Interestingly, the study found that liquidity ratio had both negative and positive impact on the profitability of the selected manufacturing firms used in this study. Current ratio had negative and significant relationship with return on assets (ROA). This is line with trade-off theory and it is consistent with the result of the study of Abuzar and Eljelly (2004) who evaluated the relationship between profitability and liquidity on a sample of joint stock companies in Saudi Arabia and found significant negative relation between the firm's profitability and its liquidity level, as measured by current ratio. While there is positive relationship between quick ratio, cash ratio and ROA. This agrees with pecking order theory, though the impact is insignificant and in agreement with the study of Khaldun (2014) which found out that there is a weak significant relationship between quick ratio, cash ratio and profitability of industrial companies in sector food and drink listed on the Indonesia Stock Exchange in period 2010-2012.

Based on the findings of this study, it is recommended that management should pay attention to liquidity management in order to generate more sales to the business which will translate to profitability. In addition, the government should provide enabling environment for manufacturing firms to have access to finance at moderate cost from financial institutions and industrial development institutions in order to improve the liquidity position and enhance ability to generate more profit. It is also suggested that further research be conducted on the similar topic however, with different sector and extending the years of the sample.

## References

- Abushammala, S. N., & Sulaiman, J. (2014, Sep). Cash holdings and corporate profitability: Some Evidences from Jordan. *International Journal of Innovation and Applied Studies*, 8(3), 898-907.
- Abuzar M.A. & Eljelly, (2004) "Liquidity - profitability tradeoff: An empirical investigation in an emerging market", *International Journal of Commerce and Management*, 14(2),48 – 61.
- Ajanthan, A. (2013). A Nexus between liquidity & profitability: A Study of Trading Companies in Sri Lanka. *European Journal of Business and Management*, 5(7).
- Bhunja, A. (2010). A trend analysis of liquidity management efficiency in selected private sector Indian steel industry. *International Journal of research in Commerce and Management*, 1(5), 9-21.
- Bolek, M., Wilinski, W. (2012). The influence of liquidity on profitability of polish construction sector companies. *Financial Internet Quarterly*, 8(1), 77-89.
- Brealey, R. A. (2012). *Principles of corporate finance*. Tata McGraw-Hill Education. *commerce and management*, 1(5), 213.
- Copeland, T. E., Weston, J. F., & Shastri, K. (2005). *Financial Theory and Corporate Policy* (Fourth ed.). New York America: Addison Wesley.
- Frank, M. Z., & Goyal, V. K. (2005). *Trade-off and Pecking Order Theories of Debt*. Center of Corporate Governance.
- Gibson, C. (2009), *Financial Reporting and Analysis* (11th ed.) Mason, OH, México: Cengage Learning.
- Hamid, M.K., & Akhi, R. A. (2015). Liquidity and profitability trade-off in pharmaceuticals and chemicals sector in Bangladesh. *International Journal of Science and Research (IJSR)*, 5 (9), 420-423. ISSN, 49-61.
- Ismail, R. (2016). Impact of liquidity management on profitability of Pakistani firms: A case of KSE-100 Index. *International Journal of Innovation and Applied Studies*, 14(2), 304-314.
- Jenkinson, N., Stability, F., & England, B. (2008). Strengthening regimes for controlling liquidity risk – some lessons from the recent turmoil. *Euromoney Conference on Liquidity and Funding Risk Management*, London, 1–9.
- Khaldun, K. (2014). The influence of profitability and liquidity ratios on the growth of profit of manufacturing companies' study of food and beverages sector companies listed on, Indonesia stock exchange (period 2010-2012). *International Journal of Economics, Commerce and Management*, 2(12), 1-17.
- Myers, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of financial economics*, 13(2), 187-221.
- Niresh, J. A. (2012). Trade-off between Liquidity & Profitability: a Study of Selected Manufacturing firms in Sri Lanka. *Researchers World -Journal of Arts, Science & Commerce*, 3(4-2), 2012.
- Panigrahi, A. K. (2013). Liquidity Management of Indian Cement Companies–A Comparative Study. *IOSR Journal of Business and Management (IOSR-JBM) e-ISSN*, 49-61.
- Priya, K., Nimalathasan, B. (2013). Liquidity management and profitability: A case study of listed manufacturing companies in Sri Lanka. *International Journal of Technological Exploration and Learning*, 2(4), 135-151.
- Reddy, B.M. (2015). Trade-off between liquidity and profitability- A Study on Tata Steel Ltd. *IRACST-International Journal of Commerce, Business and Management (IJCBM)*, 4(2), 1096-1100.

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- Saluja, P., & Kumar, P. (2012). Liquidity and profitability trade-off (A Study on Airtel Bharti Limited). *International Journal of Advanced Research in Management and Social Sciences*, 1(3), 77-84.
- Siame, C. (2012). The Relationship between profitability and liquidity in South African Listed Firms”, University of Cape Town.
- Zygmunt, J. (2013). Does Liquidity Impact on Profitability? *In Proceedings of the Conference of Informatics and Management Sciences*. 247-251.