

# **Determinants of Profit and Profitability of Rwanda Commercial Banks: A Profit Function Approach**

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## **Abstract**

*The banking literatures on profits and profitability of the bank(s) have used macroeconomic and bank specific performance indicators to predict the profit and profitability of bank(s). Other literatures in the banking research also emphasized with cost efficiencies to determine the profit and profitability. The present study employs the profit function approach by disaggregating the factors into input, output, risk, macroeconomic factors and social factors and examined these factors' effect on profit and profitability of a commercial bank in Rwanda. The relevant data related to the variables are taken from the annual reports of the selected commercial bank for the period between 2001 and 2015. The findings reveal that the employee cost is most significant factor affecting the profit as well as profitability of the selected commercial bank in Rwanda. Followed by interest and non-interest income also contributes to the profit and profitability along with deposit per branch and risk factor namely credit to total assets.*

**Keywords:** Profit Function; Profitability; Commercial bank; Employee cost; Rwanda

## **1. Introduction**

The financial sector is the catalyst agent for the overall development of an economy, especially the commercial banks in an economy contributes the economic well-being of the society by providing loans and advances to the various sectors, individual entrepreneurs etc. The financial sector literature provides a strong evidence on the relationship between growth and positive performance of financial sector especially banking industry and economic growth of a country (Akinlo, Anthony Enisan and Egbetunde, Tajudeen 2010). As of end June 2016, the financial sector was composed of seventeen banks, fifteen insurance companies, eighty-eight forex bureaus, 494 microfinance institutions and

63 Pension schemes including 1 public pension. Banks as a financial intermediary plays a catalyst role in economic growth of a nation. The effect of bank-related variables and economy related variables on bank profit and profitability is studied in both developing and developed nations.

Rwanda's banking systems is kind of oligopolistic market situation and competition between domestic public and private sector banks, and foreign banks. Additionally, these commercial banks need to compete with the microfinance institutions. The main activity of credit and deposit creation by these commercial banks are subject to the earning capacity namely the profitability of banks as well as the bottom line – profit of the banks. The profit and profitability of commercial banks are determined by many factors like size, diversification, risk and ownership type, as well as dynamic effects (J Goddard et al., 2004); capital, cost decisions, operating expenses and labour productivity (Panayiotis Athanasoglou et al., 2005); bank specific variables along with macroeconomic conditions (Guru, B K et al., 2002; Kosmidou, K., et al., 2005; Fotios Pasiourasa and Kyriaki Kosmidou, 2007; Kosmidou K 2008; A Anbar and D Alper, 2011). J P Hughes & LJ Mester (2008) noted that the different risks are often influence the bank performance. The cost and traditional profit function models ignored the risks and advocated the incorporation of the risk related variables yields interesting insights on the bank performance.

Many of the banking literatures on profits and profitability of the bank(s) have initially used bank specific performance indicators and later macroeconomic indicators also incorporated to find out the most important determinant and predicted the profit and profitability of bank(s). On the other hand, the literatures in the banking industries also emphasized with cost efficiencies. However, there is still dilemma exists which indicators are the better predictors of the bank performance in terms of profit and profitability of the commercial bank. The present study employs the profit function approach by disaggregating the factors into input, output, risk, macroeconomic factors and social factors and examined these factors' effect on profit and profitability of a commercial bank in Rwanda. In the profit function theory, an individual commercial bank is viewed as an economic unit, whose goal is to maximize profits (Mullineaux, DJ 1978; Akhavein, J. D et al., 1997). The profit function allows that the profit of a firm varies by varying both input and output variables (Berger and Loretta; 1997)

In this context, the present study attempt to answer the following research questions (a) are there increase in the performance indicators of commercial banks after the merger and /or entry of private sector and foreign banks into Rwandan Economy? and (b) what are the important determinants of profit and profitability of selected commercial banks in Rwanda?

## **2. Financial Sector and Economic Growth – An Overview**

The panel data result MZA Karim (2000) indicates that bank inefficiency has a negative effect on GDP growth in the short-run while only persistent increases/decreases in bank inefficiency affect long run GDP growth. The results also show that while non -competitive banking market can have positive effect on short run GDP growth, it has a detrimental effect in the long run if concentration persists over time.

J Zhuang et al., (2009) reviewed the theoretical and empirical literature on the role of financial sector development, with a view to deepening understanding of the rationale of development assistance to the financial sector of developing countries. The review leads to the following broad conclusions: (i) there are convincing arguments that financial sector development plays a vital role in facilitating economic growth and poverty reduction, and these arguments were supported by overwhelming empirical evidence from both cross-country and country specific studies; (ii) there are however disagreements over how financial sector development should be sequenced in developing countries,

particularly the relative importance of domestic banks and capital markets and, in developing the banking sector, the relative importance of large and small banks; (iii) while broadening the access to finance by microenterprises, small and medium-sized enterprises (SMEs), and vulnerable groups is recognized as critically important for poverty reduction, it is also widely believed that microfinance and SME credit programs need to be well designed and targeted to be effective. In particular, these programs need to be accompanied by other support services such as provision of training and capacity building, assistance in accessing markets and technologies, and addressing other market failures; and (iv) financial sector development and innovation will bring risks, and it is therefore essential to maintain sound macroeconomic management, put in place effective regulatory and supervisory mechanisms, and carry out structural reforms in developing the financial sector.

Medyawati & Yunanto (2011) study analysed the influence of banking development indicators, agriculture sector and manufacturing industry sector on economic growth in Indonesia and to examine the relationships between banking development and economic growth. Based on the two-stage data processing, the research reveals empirical evidence that banking development, agriculture sector and manufacturing industry sector affects the economic growth although the percentage of the contribution are relatively small.

Aurangzeb (2012) studied the contributions of banking sector in economic growth of Pakistan. The Granger-Causality test confirms the bidirectional causal relationship of deposits, advances and profitability with economic growth. On the other side we found unidirectional causal relationship of investments and interest earnings with economic growth runs from investments and interest earnings to economic growth.

Ho SY & Odiyambo NM (2013) examines the dynamic relationship between bank-based financial development and economic growth in Hong Kong. The researcher attempts to answer one critical question: Does the relationship between bank-based financial development and economic growth in Hong Kong follow a supply-leading or a demand-following response. The finding shows that the relationship between bank based financial development and economic growth in Hong Kong is sensitive to the proxy used to measure the banking sector development. When domestic credit provided by the banking sector is used as a proxy for bank-based financial development, a distinct supply-leading response is found to prevail. However, when the banks' deposit is used as a proxy for bank development, a demand following response is found to predominate. These results hold, irrespective of whether the causality is estimated in the short run or in the long run.

Garba Salisu Balago (2014) examines the relationship between financial sector development and Economic Growth in Nigeria. The result shows that development in financial sector variables viz: banking sector credits, total market capitalization and foreign direct investment positively affect economic growth variables – Real Gross Domestic Product.

The thesis of Tsolmon Altantulkhuur (2014) aims to analyse the causal relationship between financial sector development and economic growth in a case of Mongolia. It is found that financial indicators cause economic growth in different time horizons. Among the financial deepening indicators, an increase in broad money drives to economic growth in short term while growth in private sector credit and capital market lead to economic growth in long term. It is emphasized that the improvement in access to the finance followed by economic growth in short term, while financial sector efficiency causes economic growth in long term.

Kapingura & Alagidede (2016) examines the dynamic relationship between financial development and economic growth in South Africa in terms of financial intermediaries and financial markets

based structure. The results suggest that financial intermediaries and financial markets have different impacts on economic growth given their different roles in the economy. In particular, there is bidirectional causality between stock market and economic growth. Also, a unidirectional causality from the bond market to economic growth was established. However, as for financial intermediaries, causality runs from economic growth to financial intermediaries.

Celik & Citak (2016) tested the relationship among competition in the Turkish Banking Sector, financial liberalization and economic growth over 1990-2014 period using annual time-series data. The findings suggest that over the study period, competition is positively and liberalization is negatively related to economic growth in Turkey.

### **3. Financial System in Rwanda**

Rwanda financial sector has been growing and contributing to the accelerated economic growth. A number of bank and non-banking institutions, forex bureau, insurance companies and financial services providers consists of financial sector of Rwanda.

A key element of the financial sector growth strategy in Rwanda is creating an enabling environment for financial institutions to provide a broader range of low cost financial services to households and business community as well. This includes savings and deposit products for historically excluded clients, mobile money transfers, mobile and internet banking, agent banking, micro finance. Much of the innovation has come from non-traditional players.

The financial sector was composed of 17 banks, 15 insurance companies, 88 forex bureaus, 494 micro finance institutions, 63 pension schemes including 1 public pension, 3 mobile money operators and a capital market.

As of June 2016, total assets of the financial sector expanded by 13.7%, to reach FRW 3.4 trillion. The size of the financial sector as measured by total assets relative to GDP increased to 55% as of June 2016.

The banking sector was comprised of 12 commercial banks, 3 micro finance banks, 1 development bank and 1 cooperative bank with a total assets of RWF 2.3 trillion. The number of bank branches stood at 1,367 which includes 820 branches of micro finance institutions.

The total assets of the insurance companies stood at RWF 333 billion with a capital base of RWF 238 billion. The pension sub sector was composed of the mandatory public pension scheme and voluntary pension schemes. The voluntary pension scheme comprises 62 complimentary occupational pension schemes and some personal retirement savings accounts managed in-house and by insurance companies.

The Rwanda Stock Exchange Limited was incorporated on October 2005, but it was officially launched on January 2011. The market capitalization stood at USD 3.7 billion dominated by Government bond transactions.

There are three mobile money operators in Rwanda. These operators provide money transfer, deposit and withdrawal, buy airtime, buy utilities, pay for utilities services. There are 6,763,467 mobile money subscribers as on December 2015. Number of transactions by the end of December 2015 stood at 209,132,834 for a value of RWF 1,444,642 million.

#### 4. Earlier Studies

Sudin Haron (2004) noted that internal factors like liquidity, total expenditures, funds invested in Islamic securities, and the percentage of the profit-sharing ratio between the bank and the borrower of funds and external determinants such as interest rates, size of the bank and market share determines the Islamic bank's profitability. However, the author has used OLS based multiple regression method without any classification of determinants as input and output variables of a bank, and risk factors. Athanasoglou et al (2008) found the profitability of Greek Banks are determined by capital, credit risk, labour productivity and operating expenses. By taking into account only internal factors, Rajveer Rawlin et al (2014) identified that business per employee, advances and bank size are the key determinants of profitability of leading banks in India.

Tobias Olweny and Themba Mamba Shipho (2011) described that the bank-specific factors are the strong influencers of Kenya banks' profitability compared to the macroeconomic factors. With Tobit regression analysis, Kiyota, Hiroyuki (2011) and confirmed the results and observation of Tobias Olweny and Themba Mamba Shipho (2011). A similar finding was noted by VO Ongore and GB Kusa (2013). On the contrary, Munyambonera Ezra Francis (2013) revealed that the both bank related and macro factors explains the changes in the profitability of commercial banks in sub-saharan Africa. Evans Ovamba Kiganda (2014) concluded with OLS estimation that the macroeconomic factors are insignificant factors in explaining the variation in Kenyan bank profitability. Susan Moraa Onuonga (2014) analysed Kenyan banks' profitability with internal factors and concludes bank size, capital strength, ownership, operations expenses, diversification do significantly influence profitability by applying GLM regression. Nsambu Kijjambu Frederick (2015) examined the effect of internal factors on Uganda banks' profitability and concludes operational efficiency, asset quality, equity to total assets, ratio of interest income to total income and inflation are the significant factors influences the bank's profitability. With translog cost function, Abraham Mwenda and Noah Mutoti (2011) identified that bank liquidity, profit, loan portfolio quality and bank ownership type have negative effects on cost efficiency. Sanderson Abel and Pierre Le Roux (2016) studied the determinants of profitability of Zimbabwe's banking industry and found that compared to the external factors, the bank-specific factors such as previous year profit, liquidity risk and non- and performing loans.

Eric Kofi Boadi et al (2016) examined the commercial bank profitability's determinants of Ghana and found that along with macroeconomic variables and bank specific variable, the risk factors like funding risk and bank resilience risk are the important influencers of Ghanaian commercial bank.

An empirical study with regression analysis, Dickson Pastory and Janeth Patrick Swai (2013) found that the banks' profitability of EAC (including Rwanda) is affected by internal factors like total liabilities and deposit, total assets and loan, and shareholders' funds and the external determinants such as bank regulations and interest rate negatively affected the bank profitability. A perception study on financial performance of Rwandan Commercial banks by Magnifique, Ugirase Josiane (2013) concludes that credit related risks are the strong influencers of the financial performance of the commercial banks in Rwanda. Another perception study on financial performance by P Mwangi King'ang'ai et al (2016) found that low transaction cost and market share influence the financial performance indicator namely profitability.

Gisanabagabo, Sebhuzu, and Harold Ngalawa. (2016) measured the efficiency of Rwanda's commercial banks with a Stochastic Frontier Analysis and concluded that capital is more expensive factor compared to the price of labour.

A bank efficiency study by Berger et al (1993) indicates the main advantages of the application of profit function are: (a) in banking industry, the measurement of output especially results with misspecification and mismeasurement of output variable, the profit function reduces this type of issues; and (b) the profit function clearly specifies the sources of inefficiency. While critiquing the cost-based model for measuring the efficiency of the banks, DeYoung and Nolle (1996) informed that the inefficiency of the bank may be misrepresented by this cost-efficiency model and proposed profit-function model. Akhavein et al., (1997) describes that the profit efficiency approach includes the cost efficiency by incorporating the output and input variables and their effect on profit and also noted this approach has received little academic attention. Akhavein et al (1997) empirically estimated the profit function for US banks and found that a failure to produce the output variables level optimally resulted in failing to achieve maximum profit than the input variables.

Berger and Loretta; (1997) argues that the profit efficiency model is superior than the cost efficiency models and explains Profit efficiency accounts for errors on the output side as well as those on the input side.

Maudos et al (2002) emphasizes that the profit function is superior to cost function because it accounts the effect of vector of production in a given industry on both costs and revenues, and describes bank maximises profit by adjusting the amount of inputs and outputs.

## 5. Theoretical Model and Hypotheses

An attempt is made to empirically test the two models of profit function namely, conventional and risk adjusted profit function.

Under the conventional profit function, net profits as well as net profit to total assets were considered as dependent variable and the following independent variables are input variables, output variables and fixed factors of production. Accordingly, (a) input variables – price of deposit (interest expenses to deposit - P1), and employee cost (P2) were considered as input factors, (b) output variables – interest income (IY); and income from other sources (OY), (c) fixed factors of production – number of branches (B), fixed assets per branch (FAB) and deposit per branch (DB).

Conventional Profit Function:

$$(1) \text{ Net Profit (Net profit to Total Assets)} = a + \alpha_1 P1 + \alpha_2 EC + \beta_1 IY + \beta_2 OY + \delta_1 B + \delta_2 FAB + \delta_3 DB + \mu$$

With respect to Risk Adjusted Function, along with input variables, output variables and fixed factors of production, bank's risk factors were included as independent variables namely, Credit to Total Assets (CAT) and Borrowing / Total Liabilities (BTL). The proposed model is as follows:

Risk Adjusted Function:

$$(2) \text{ Netprofit (Net profit to Total Assets)} = a + \alpha_1 P1 + \alpha_2 EC + \beta_1 IY + \beta_2 OY + \delta_1 B + \delta_2 FAB + \delta_3 DB + \lambda_1 CAT + \lambda_2 BTL + \mu$$

The hypotheses of the independent variables on dependent variable namely profit / profitability is given in Table 1.

**Table 1: Hypotheses**

Hypotheses	Variable	Expected Sign
H1a	Interest Paid / Deposits etc. (P1)	-ve
H1b	Employee Cost (EC)	-ve
H2a	Interest Income (IY)	+ve
H2b	Other Income (OY)	+ve
H3a	Branches (B)	+ve
H3b	Fixed Assets / Branch (FAB)	+ve
H3c	Deposit / Branch (DB)	+ve
H4a	Credit / Total Assets (CAT)	+ve / -ve
H4b	Borrowing / Total Liabilities (BTL)	+ve / -ve

## 6. Methodology

The selected commercial bank is one of the leading bank in Rwanda with as asset value of 580.7FRw billion in 2016(Q1) from 197.7FRw billion in 2010. The shareholder's equity was 31.9FRw billion in 2010 and increased to 104.6FRw billion in 2016(Q1). Apart from the commercial activities, the bank actively involved in social responsible activities by introducing financial inclusion policies, friendly loan policies for the access of education, quality health services, and income generation activities.

In order to test the effect of input, output and risk related variable on profit and profitability of selected commercial bank in Rwanda, the data on (a) input variables such as deposits, interest on deposits, number of employees, salary cost; (b) output variables like interest income, other income; (c) fixed factors of production namely, number of branches, fixed assets, (d) selected risk factors such as credit, total assets and borrowings are taken from the annual reports of the selected commercial bank for the period between 2001 and 2015.

## 7. Results

The performance of the selected commercial bank is measured with various banking indicators and presented in Table 2. During the period between 2001 and 2015, the deposit of the bank was RWF32718 in 2001 and has increased to RWF384714 with 11.76 per cent, the loans and advances was RWF 313926 in 2015 from RWF19695 in 2001 with 15.95 time increase during the period between 2001 and 2015. IMF Country Report (2011) observed that the concentration of loans and advances with few corporate and institutional clients. It is observed from the percentage change of deposits and loans and advances that the disbursement of loans and advances was 15.95 times compared to that of deposit mobilisation of 11.76 times. The same scenario is found at the national level with all commercial banks in Rwanda that is, during 2014-15 the percentage change of loans and advances was 22.32 per cent whereas the deposit mobilisation was only 11.03 per cent (BNR Annual Report 2014/15). The total assets and branches rose with 11.88 times and 9.38 times respectively during the study period 2001 - 2015.

**Table 2: Performance of the Commercial Bank (in RWF million)**

<b>Selected Banking Indicators</b>	<b>2001</b>	<b>2015</b>	<b>% change</b>
Deposit	32718	384714	11.76
Loans and Advances	19695	313926	15.94
Total Assets	47223	561226	11.88
Branches	8	75	9.38
Interest Expenses	1058	13727	12.97
Employee Cost	1526	10824	7.09
Interest Income	5803	59967	10.33
Other Income	1048	17710	16.90
Fixed Asset per Branch	168.7	419.79	2.49
Deposit per Branch	4090	5129.5	1.25
Credit to Total Assets	0.417	0.5594	1.34
Borrowing to Total Liability	0.125	0.0403	0.32
Net Profit	724	20484	28.29
ROA	1.533	3.6499	2.38

*Note: All figures except (a) credit to total assets; (b) borrowing to total liability and (c) ROA are measured in RWF million*

On the major expenditure variable, Interest Expenses has recorded 12.97 per cent and Employee Cost is with 7.09 per cent during 2001 – 2015. With respect to the income side, Interest Income is with 10.33 per cent and income from other sources is 16.90 per cent. The difference between interest income and interest expenses known as interest spread and it is noted from the simple comparison of percentage difference between 2001 and 2015, the variation in interest income is less than the interest expenses that results with a negative interest spread. Thomas Kigabo Rusuhuzwa et al (2016) found that the interest spread of Rwandan commercial banks influenced by operating costs and credit risk. At individual bank level also, the loan portfolio and reduction of operating costs is inevitable to have sizeable interest spread.

Regarding some selected performance indicators, Fixed Asset per Branch, Deposit per Branch, Credit to Total Assets, Borrowing to Total Liability have increased with 2.49 per cent, 1.25 per cent, 1.34 per cent, and 0.32 per cent. The net profit rose by 28.29 per cent between 2001 and 2015 and ROA has increased by 2.38 per cent in the same period of study.

## **8. Estimation of Profit Function and Discussion**

It is noted that out of two input variables, interest cost is not statistically significant and H1a is not supported and employee cost ( $\alpha_2 = -0.866$ ,  $t = -2.369$ ) is negatively affecting the net profit of the bank's net profit and the co-efficient value is statistically significant and H1b is accepted. Under the competition scenario, the banks need to pay more attention to reduce the costs of every

operations of the bank especially the direct costs like employee cost and enhance the labor productivity. It is noted that when other things remain constant, the employee cost significantly affects the bank's net profit that is, for every RWF 100 increase in the employee cost, the net profit reduces by 0.866. This result is not in line with the earlier findings of Athanasoglou, Panayiotis P., (2008) and Samir Abderrazek Srairi (2010).

The Adj.R<sup>2</sup> (0.993) explains the 99.30 per cent of variation of the commercial bank net profit is explained by the selected three factors namely, input, output and fixed factors of production (Table 3).

**Table 3: Conventional Function:**

$$\text{Net Profit} = a + \alpha_1 P1 + \alpha_2 EC + \beta_1 IY + \beta_2 OY + \delta_1 B + \delta_2 FAB + \delta_3 DB + \mu$$

	Variable	Unstandardized Coefficients		t	Sig.
		B	Std. Error		
	(Constant)	-1779.86	3200.898	-.556	.595
Input	Interest Paid / Deposits etc. (P1)	-182.66	415.805	-.439	.674
	Employee Cost (EC)	-.866	.366	-2.369	<b>.050</b>
Output	Interest Income (IY)	.214	.052	4.126	<b>.004</b>
	Other Income (OY)	.448	.246	1.822	<b>.111</b>
Fixed Factors of Production	Branches (B)	127.425	69.667	1.829	<b>.110</b>
	Fixed Assets / Branch (FAB)	-1.351	2.344	-.576	.582
	Deposit / Branch (DB)	.480	.441	1.088	.313
<b>R<sup>2</sup></b>	<b>0.997</b>	<b>Adj.R<sup>2</sup></b>	<b>0.993</b>		
F Value	304.064*	D-W stat	3.144		

With respect to the output factors of the bank, both interest income and income from other sources are positively and significantly affect the net profit of the selected commercial bank. The co-efficient value of interest income ( $\beta_1=0.214$ ,  $t=4.126$ ) is positive and statistically significant at 0.01 level which suggests that for every increase of RWF100, the net profit increases 0.214. That is, the selected commercial bank for the study effectively allocates its loans and advances as well as maintains the loan quality among sectors of the Rwandan economy and earns adequate income through interest, which in turn contributes positively to the net profit of the firm. Kosmidou K., (2008) describes, 'Bad asset quality may have a negative impact on bank profitability by reducing interest income revenue and by increasing the provisions costs'. A similar scenario is witnessed with income from other sources. The regression co-efficient of other income ( $\beta_2=0.448$ ,  $t=1.822$ ) is positive and statistically significant at 0.15 level. Hence H2a and H2b are supported with the beta-coefficients of interest income and other income.

On the fixed factors of production, out of three variables namely branches (B), fixed assets per branch and deposit per branch, the co-efficient of branches ( $\beta_2=127.425$ ,  $t=1.829$ ) is positive and statistically significant at 0.15 level and H3a is supported. The BNR Report (2016) indicates, 'as at the June 2016, the banking system had 177 branches (June 2015: 161), 187 sub-branches (June

2015: 196), 183 outlets (June 2015: 164) and 4,342 agents (June 2015: 2,978). The IMF Financial Access Survey indicates that the commercial bank branch per 100,000 adults has increased from 5.5 in 2011 to 6.1 in 2015 which is comparatively lower than other EAC countries – Uganda (3), Tanzania (2.5), Kenya (5.9) and Burundi (2.9).

When the profitability in terms of net profit to total assets considered as dependent variable, the variables of all three factors – input factors, output factors and fixed factors of production are not significantly contributing the profit efficiency of the selected commercial bank of Rwanda (Table 3). However, the employee cost and non-interest income are statistically significant at 0.20 level. It is noted that except H1b, all other hypotheses are not supported.

**Table 4: Net Profit / Total Assets =  $a + \alpha_1P1 + \alpha_2EC + \beta_1IY + \beta_2OY + \delta_1B + \delta_2FAB + \delta_3DB + \mu$**

	Variable	Unstandardized Coefficients		T	Sig.
		B	Std. Error		
	(Constant)	3.050	3.605	.846	.426
Input	Interest Paid / Deposits etc. (P1)	-.479	.468	-1.022	.341
	Employee Cost (EC)	-.001	.000	-1.399	<b>.205</b>
Output	Interest Income (IY)	-5.041E-05	.000	-.863	.417
	Other Income (OY)	.000	.000	1.448	<b>.191</b>
Fixed Factors of Production	Branches (B)	.056	.078	.709	.501
	Fixed Assets / Branch (FAB)	-.002	.003	-.683	.516
	Deposit / Branch (DB)	.000	.000	.404	.699
R <sup>2</sup>	0.773	Adj.R <sup>2</sup>	0.525		
F Value	3.211	D-W stat	2.594		

The inclusion of risk factors namely, (a) credit to total assets, and (b) borrowings to total liabilities with the conventional profit function enhances the explanatory power of the independent variables on the variation in the net profit of the selected bank in Rwanda. That is, the value of R<sup>2</sup> was 0.993 with conventional profit function and improved to 0.995 in risk adjusted profit function (Table 5). The negative coefficient of the employee cost suggests that the growing expenditure on the employees in terms of wages and salaries along with other benefits negatively affects the profit of the commercial bank.

**Table 5: Netprofit = a +  $\alpha_1$ P1 +  $\alpha_2$ EC +  $\beta_1$ IY +  $\beta_2$ OY +  $\delta_1$ B +  $\delta_2$ FAB +  $\delta_3$ DB +  $\lambda_1$ CAT +  $\lambda_2$ BTL +  $\mu$** 

Variable		Unstandardized Coefficients		t	Sig.
		B	Std. Error		
	(Constant)	-6316.794	2958.007	-2.135	.086
Input	Interest Paid / Deposits etc. (P1)	52.410	670.011	.078	.941
	Employee Cost (EC)	-.522	.290	-1.801	<b>.132</b>
Output	Interest Income (IY)	.215	.050	4.275	<b>.008</b>
	Other Income (OY)	.363	.215	1.687	<b>.152</b>
Fixed Factors of Production	Branches (B)	85.830	61.881	1.387	.224
	Fixed Assets / Branch (FAB)	-1.238	2.587	-.478	.653
	Deposit / Branch (DB)	.757	.405	1.869	<b>.121</b>
Risk Factors	Credit / Total Assets (CAT)	5491.104	1965.765	2.793	<b>.038</b>
	Borrowing / Total Liabilities (BTL)	2570.592	17715.028	.145	.890
<b>R<sup>2</sup></b>	<b>0.999</b>	<b>Adj.R<sup>2</sup></b>	<b>0.995</b>		
F Value	454.934	D-W stat	2.996		

Out of two input factors, employee cost (EC) has negative sign and statistically significant at 0.15 level confirms here too theoretical expectation of negative sign of employee cost effect on the net profit.

It is also noted from the positive but statistically insignificant coefficient of interest paid on deposits that the competitive environment of Rwandan banking system and the perception of the customers on their deposits with the bank is safe and secure results with lower interest paid on deposit which contributes to the net profit of the bank.

Similar to conventional profit function, the output factors – interest income from loans and advances along with income from other operations have positive coefficients and also statistically significant. Out of these two variables, interest income ( $\beta_1 = 0.215$ ,  $t = 4.275$ ) emerge as a significant contributor to the net profit of the bank compared to that of other income ( $\beta_1 = 0.363$ ,  $t = 1.687$ ). The higher contribution of interest income to net profit is due to (a) higher lending rates of the commercial banks (at the economy level the lending rate is 16.96 as on June 2016) and (b) effective and efficient loan allocation to the sectors and (c) increase in the number of borrowers of loans from the banks. At the national level, it is noticed that the number of borrowers from the financial system has increased from 20,763 in June 2011 to 132,625 in June 2016 and the selected bank for the study as a leading bank could have experienced the same.

Regarding the fixed factors of production, only deposit per branch ( $\beta_1 = 0.757$ ,  $t = 1.869$ ) is positive and found to be statistically significant at 0.15 level. With the annual average growth of deposits of the bank 19.71 per cent, the deposit per branch has resulted in positive sign on the bank's net profit.

With respect to the risk factors, the parameter of the credit to total assets of the bank ( $\lambda_1 = 5491.104$ ,  $t = 2.793$ ) is as per the theoretical expected positive sign. It emphasizes the commercial bank

effectively and efficiently manages the flow of credit into different sectors and able to control the bad loans of the bank. The African studies like Boahene SH., et al (2012) and Kargi HS (2011) noted that the mismanagement of credit resulted in increasing non-performing loans and erode the profit of the bank. The regression coefficient of other risk factor namely borrowing to total liabilities did not have any statistically significance.

**Table 6: Netprofit / Total Assets =  $a + \alpha_1P1 + \alpha_2EC + \beta_1IY + \beta_2OY + \delta_1B + \delta_2FAB + \delta_3DB + \lambda_1CAT + \lambda_2BTL + \mu$**

	Variable	Unstandardized Coefficients		t	Sig.
		B	Std. Error		
	(Constant)	-3.515	2.159	-1.628	.165
Input	Interest Paid / Deposits etc. (P1)	-.640	.489	-1.309	.247
	Employee Cost (EC)	.000	.000	-.713	.508
Output	Interest Income (IY)	-7.530E-05	.000	-2.050	<b>.096</b>
	Other Income (OY)	.000	.000	2.450	<b>.058</b>
Fixed Factors of Production	Branches (B)	.028	.045	.626	.559
	Fixed Assets / Branch (FAB)	-.003	.002	-1.685	.153
	Deposit / Branch (DB)	.001	.000	2.483	<b>.056</b>
Risk Factors	Credit / Total Assets (CAT)	6.595	1.435	4.596	<b>.006</b>
	Borrowing / Total Liabilities (BTL)	17.058	12.932	1.319	.244
<b>R<sup>2</sup></b>	<b>0.963</b>	<b>Adj.R<sup>2</sup></b>	<b>0.896</b>		
F Value	14.408	D-W stat	2.760		

The dependent variable namely profitability of the selected commercial bank of Rwanda is explained the input, output, fixed factor of production and risk factors associated with bank explains 89.60 per cent of variation and the model is also with good fit (F = 14.408).

The parameters of input factors – interest paid on deposit along with employee cost are statistically insignificant. Out of two output variables, interest income ( $\beta_1 = -7.530E-05$ ,  $t = 2.050$ ) negatively contributes to the profitability of the bank compared to that of other income ( $\beta_1 = 0.000$ ,  $t = 2.450$ ).

Regarding the fixed factors of production, only deposit per branch ( $\beta_1 = 0.001$ ,  $t = 2.483$ ) is positive and found to be statistically significant at 0.05 level. Fixed assets per branch (FAB) negatively ( $\beta_1 = -0.003$ ,  $t = 1.685$ ) contributes profitability of the selected commercial bank and statistically significant at 0.015 level.

With respect to the risk factors, the parameter of the credit to total assets of the bank ( $\lambda_1 = 6.595$ ,  $t = 4.596$ ) is as per the theoretical expected positive sign. The regression coefficient of other risk factor namely borrowing to total liabilities did not have any statistically significance.

## 9. Conclusion and Implication

The main aim of this research is to understand and comprehend the significant contributor to the profit and profitability of selected commercial bank in Rwanda. Rather cost function approach, the study adapts the profit function approach to find out the significant factor among input, output, fixed factors and risk factors on the profit or profitability. Bank efficiency is estimated with two forms of profit function estimated namely, traditional profit function and risk adjusted profit function.

The results of both function clearly indicates that the employee cost is most important factor affects the profit as well as profitability of the selected commercial bank in Rwanda. This supports the hypothesis H1b and reveals constant and continuous increase in employee cost along with various benefits provided to the employees of the bank directly erodes the profit and profitability of the bank. Indirectly, the productivity of the employees is not at the level of increase in their costs to the bank. The management of the bank has to look into this very seriously and focus on enhancing the productivity of employees of the bank and there is a great scope for studying the employee intensity and employee efficiency of the commercial banks in Rwanda. Of the two output factors, the bank's profit and profitability is positively and significantly influence by the interest as well as non-interest income earned by the bank. Since the Rwandan economy is a developing and steadily growing compared to other counter part of East Africa, it is necessary to have a strongly control on the interest rates by the Central Bank namely National Bank of Rwanda, however, the banks are in need to widen their services to increase the non-interest income.

Out of the fixed factors of the bank, a marginal effect is witnessing with the deposit per branch. The banks need to take necessary steps to mobilize the deposits from the public and device strategies to meet the competition from the microfinance institutions (18 institutions as on 31/3/2017) and SACCOs (416 LICENSED MFIs (UMURENGE SACCOs) and 36 LICENSED MFIs (Non UMURENGE SACCOs) as on 31 March 2017) which are very close to the heart of the rural Rwandans. The deposit mobilisation is a real challenge not only for the selected commercial bank for the study, but for all commercial banks in Rwanda.

The results on risk factors namely credit to total assets and borrowings to total liabilities provides an insight that the bank's credit to total asset significantly influence the profit and profitability of the bank signifies that higher the unproductive credit to total assets affects the profit and profitability of the commercial bank. The proper allocation of loans to the different sectors as well as to the borrowers reduces the credit risk and creates positive effect on the profit and profitability of the bank. The role of BNR and Government of Rwanda in the allocation of loans is inevitable and both can specify how much loan to be distributed to different sectors of the economy.

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