PERFORMANCE OF BANKING SECTOR- A CASE OF SELECT DEVELOPED NATIONS

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ABSTRACT

Purpose: The purpose of this paper is to look at productivity and different efficiency aspect of five developed nations in the light of phasing in of Basel III capital adequacy norms.
Design/ Methodology/ Approach: The authors used data envelopment analysis technique (DEA) to measure relative efficiencies and Malmquist productivity index (MPI) to measure average total factor productivity (TFP) of 25 banks in 5 countries for the period 2013 to 2019.

Findings: D-SIBs performed better in terms of technical, cost, allocation, scale, and managerial efficiency. G-SIBs ranked second while CBs ranked third in terms of relative efficiency. In terms of SE, the banks in Canada performed better while in terms of TE, ME, CE, and AE banks in USA performed better. In terms of productivity, Germany, France, and UK showed positive growth. While, USA remains constant in terms of average productivity, only Canada showed a decline in average TFP.

Originality Value: Studies measuring relative efficiency of different countries that is in the same stage of implementing Basel norms are quite rare. This paper will help administrators and central bank supervisors to know how the performance of their regional counterparts is progressing and motivate them to keep at par.

Keywords: Benchmarking, DEA, Efficiency, Bank Performance, Developed Nations, Malmquist Productivity Index.

INTRODUCTION

A general consensus exists among people that financial sector plays an important part in explaining the concept of sustainable economic growth (Wachtel, 2001). In reality, an efficient banking system plays key role in overall financial development of a country not just by altering the rate of savings but also by allocation of savings. This means which industry or firm is going to use society savings is determined by a financial intermediary. Since commercial banks (CBs) play a vital role as a financial intermediary, it can help to strengthen and contribute to the economy to grow. The global financial crisis (GFC) of 2007-08 already has shown the limitations of banking sector as a whole. Capital inadequacy and improper liquidity management are two major reasons for a failure of bank which is proven by global financial crisis of 2007-08 (Bologna, 2015). In response to the situation faced by banks, Basel III Accord (2010-11) introduced new capital reforms that impose potentially binding constraints on liquidity and quality of capital. Banks are expected to comply with these norms in a phased manner in most countries.

After the phasing in of reforms, the quality of capital has improved. The study focuses on the changes in the efficiency and productivity of commercial banks after the phasing in of new reforms. This study will help the supervisors of central banks to know how their regional peers

Citation Information: Dhawan, D., & Mehta, S.K. (2022). Performance of banking sector- A case of select developed nations. *Academy of Marketing Studies Journal, 26*(S5),1-11.

are progressing in terms of productivity and efficiency. Where are they lacking and in which area can they improve? The study focuses on answering following three key questions. First, how well the selected developed countries fare in terms of technical efficiency (TE) and cost efficiency (CE)? Second, what effect does a definition of bank has on its relative efficiency? Third, how well the sample banks fare in terms of productivity? These three questions will help the banks, regulators of central banks and investors in banks to better utilize resources and improve their performance.

The paper fills up the research gap on the performance of banks in the Basel III regime in developed nations. In the study an in-depth analysis of different efficiencies is done through data envelopment analysis (DEA). To compute the change in productivity, Malmquist productivity index (MPI) is used.

The rest of paper is sorted out in 5 sections. Section 2 reviews related literature. Section 3 explains the approach, data and sources of data. Section 4 presents results and discussion. Section 5 includes concluding remarks.

REVIEW OF LITERATURE

There are different studies done over time that focus on comparing the efficiencies of banking sector in different countries. The underlying reason is that policy design is based on the efficient resource allocation by banks. Some studies use ratios to measure performance of financial institutions. But these ratios sometimes do not reveal true picture because these ratios do not divulge production process. For example, skilled personnel are reflected in high operating cost that can generate high quality loans. So, to measure performance, production process has to be considered. Farrell (1957) gave an original method to measure technical efficiency based on production frontier. Based on Farrell concept, Charnes et al. (1978) developed DEA (CCR Model). Later, this model got extended by to assimilate VRS for production technology also known as BCC model. Previously, CCR model focus on constant returns to scale (CRS). With the help of these models, different studies are conducted to evaluate efficiency in different sectors. Mainly, these studies focus on developed nations as they have the technology and means to implement the changes faster. Also, the method and techniques are both limited to stochastic frontier analysis (parametric approach) and DEA (non-parametric approach). Due to its non-parametric nature, DEA is widely used and preferred method for the banking sector.

Sherman and Gold (1985) first used DEA method to analyze branch efficiency and found it complementary to other methods for measuring efficiency. Several studies are done to investigate the same nexus. For example, Coughlan et al.(2010) for UK; Azizi and Ajirlu (2010) for Iran; Cook and Bala (2007) for Canada; Camanho and Dyson (2005)for Portugal; Das et al. (2009) for India; Dekker and Post (2001) for Netherlands; Deville (2009) for France; Hartman et al. (2001) for Sweden; Oral et al. (1990) for Turkey. Afterwards a lot of scholar applied the DEA for performance evaluation of banks. For example, Bhattacharya et al (1997),Sathye (2003), Goswami et al. (2019) for India; Ebrahimnejad et al. (2014) for East Virginia, Novickytė and Droždz (2018) for Lithuania, Partovi and Matouskek (2019) for Turkey; Pasiouras et al. (2008)for Greece; Wong and Deng (2016) for ASEAN;Ullah (2020) for Pakistan; Drake et al. (2006) for Hong Kong; Casu and Molyneux (2003) for Europe.

The authors found so many studies for different regions but failed to find comparative study for different countries' bank efficiency in the same stages of Basel III implementation. Considering the fact above, this study will be valuable input in the existing stock of knowledge.

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RESEARCH METHODOLOGY

In the study, the researchers follow the term "*efficiency*" in the economic sense. It means to measure how well a DMU is utilizing its resources in the form of input to produce the output. The efficiency is analyzed in two ways. First is input-oriented approach which follows the rule of reducing the inputs without changing the output. Second is output-oriented approach which follows the rule of increasing the output without changing the input. With the scarcity of resources, following input-oriented approach is better. As the business thrives in a world of chaos, variable returns to scale (VRS) approach is used to get the results on relative efficiency.

In this study, DEA (CCR, BCC) model is used to evaluate the relative efficiencies of 25 CBs of 5 developed nations (DN). Let's first explain about the DEA. It is a linear programming method. With the help of input and output, different constraints are presented in the equation form to calculate the relative efficiencies of a DMU. To calculate relative efficiency, the DMUs should have similar inputs and outputs. All DMUs then make up an efficient frontier. Efficient frontier means a linear set of most efficient inputs. Usually, all DMUs either fall on or below efficient frontier. The DMUs that fall on efficient frontier are the most efficient DMUs and are standard to which other DMUs are compared. That is the reason for the saying "efficiency is relative term".

In this study, to calculate efficiency input-oriented approach is used. To calculate productivity, output-oriented approach is used. MPI is used to evaluate the average TFP for the 5 developed nations. This method can calculate change in average TFP owing to either technology change or efficiency change; which can be further bifurcate into pure change and scale change. These two methods are used for their wider application in the sense both are non-parametric in approach.

Data and Descriptive Statistics

In the research, the period taken for the study is from the year 2013 to 2019. The sample countries include five developed nations namely, USA, UK, Canada, Germany and France. These five countries are in the same stage of implementing Basel norms (FSB, 2018). The study will help to evaluate the efficiency of banks after the US sub-prime crisis. Due to time and funds constraints, five commercial banks are chosen from each of the sample countries to represent the banking sector. The dataset is balanced. The official websites and annual reports of the banks are the source for data, so only those banks are selected in the sample for which data for all variables are available. The intermediation approach is taken for the selection of variables. The total cost includes sum total of personnel expenses, interest on deposits and other physical capital expenses (land, building, etc.). The input price includes unit price of personnel (personnel expense per employee), unit price of financial capital (expense on interest per dollar of deposits) and unit price of physical capital (expenses on land, building, etc. to physical capital). The total output includes total amount of loans to customers, deposits and investment and securities. For calculation of efficiency, the researchers have taken total output as the output and total cost as the input.

The descriptive statistics for the variables is given in Table I. The representation of data is in USD (in thousands). The average asset size for the banks in the dataset is US $ eight hundred and twenty billion. With one trillion and two hundred and twenty-six billion, French banks are largest average bank asset-wise and with three hundred and one billion, Canadian

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banks are the smallest average bank asset-wise. Also, input price-wise, French banks scored highest while Canadian banks scored lowest Table 1.

Table 1
DESCRIPTIVE STATISTICS FOR THE VARIABLES

	Mean	SD	Minimum Value	Maximum Value
A. All Sample				
Assets	820062723	909972474	303632	4424909723
Loans	305402531	334798654	734687	1643347689
Deposits	376063952	457876565	745392	2254922975
Investment	331139868	448417455	3606	1766526420
Total Cost	20022967	22784058	68272	92064000
Interest on Deposits	7047936	7541827	22124	32139257
Price of Input	142.57	157.92	37.13	1418.54
B. Germany				
Assets	639163114	610526387	1.57E+08	2221088904
Loans	2059972775	144963095	30250840	519065472
Deposits	256499454	227157262	48601695	727429359
Investment	300342492	361885678	16596170	1348762233
Total Cost	18113937	15317351	4073409	53979325
Interest on Deposits	8479276	6014623	1593886	28992419
Price of Input	132	59	93	457
C. Canada				
Assets	301265183	289107344	17459313	824786240
Loans	162517951	151016449	14888298	449907358
Deposits	203326281	198106372	14804225	556906371
Investment	53516838	48873376	1273075	143851469
Total Cost	8178103	7818757	495594	24560710
Interest on Deposits	3158324	3202479	271232	11851318
Price of Input	86.45	21.8	57.25	140.5
D. France				
Assets	1225717748110	12594625	303632	36249860
Loans	387883961	46174126	40586683	904452801
Deposits	425708897	300614214	38211501	936880682
Investment	593285465	510539682	6961051	1521316646
Total Cost	26263687	18950426	1739689	59039283
Interest on Deposits	11925349	77904029	305907	24143349
Price of Input	246	238	50	815
E.USA				
Assets	622910240	973550876	16453000	2687379000

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Loans	247047188	322392628	19750238	984497000
Deposits	367446043	530405885	20876790	1562431000
Investment	188092654	314580912	3606	907684000
Total Cost	19107484	29470504	836299	92064000
Interest on Deposits	3391896	6318427	109408	26795000
Price of Input	141	223	56	1419
F. UK				
Assets	1311257332	1365830795	3628721	4424909723
Loans	523566279	510456826	734687	1643347690
Deposits	627339081	705217613	745392	2254922975
Investment	520461892	571895855	25032	1766526420
Total Cost	28451626	29512534	68272	89794600
Interest on Deposits	8284836	9299457	22124	32139257
Price of Input	107.19	36	37	175

DISCUSSION

In the subsequent section, the researchers tried to assess the impact of Basel III norms on the productivity and efficiency of the sample banks. The variable returns to scale (VRS) is selected to evaluate the Managerial efficiency (ME), scale efficiency (SE) and Technical efficiency (TE). The constant return to scale (CRS) is selected to evaluate the allocative efficiency (AE) and cost efficiency (CE). From Table 2 it can be seen the overall efficiency for all sample is 0.827 with Germany having the lowest TE with 0.678 while Canada having the highest TE with 0.869.

In terms of SE, Canada banks are most efficient (0.936) followed by USA (0.914), UK (0.899), France (0.854), and Germany (0.742). In all years in the sample period, the least value is scored at 0.674 by banks in Germany in the year 2015 and highest value at 0982by banks in UK in the year 2017.

In terms of ME, USA banks are most efficient (0.965) followed by banks in Germany (0.930), Canada (0.928), UK (0.897), and France (0.893). In the year 2013, banks in Germany possess ME 1.000. Even the lowest value scored is 0.832 in the year by the banks in UK. In terms of CE, banks in USA are most efficient (0.894) followed by banks in Canada (0.796), Germany (0.698), France (0.682), and UK (0.678). The highest value scored by the banks in USA in the year 2018 is 0.921 and least value scored by banks in the UK in the year 2017.

In terms of AE, banks in USA are most efficient (0.944) followed by banks in Canada (0.825), France (0.778), Germany and UK (0.736). The highest value scored by banks in USA in the year 2016 is 0.998 whereas; the least value scored bythe banks in UK in the year 2017 is 0.607. Table 2.

Table 2
EFFICIENCY OF BANKS

Particulars	Year	TE	SE	ME	CE	AE
All sample	2019	0.816	0.958	0.850	0.584	0.654
	2018	0.841	0.948	0.890	0.640	0.724

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	2017	0.896	0.948	0.945	0.610	0.667
	2016	0.901	0.938	0.961	0.728	0.778
	2015	0.902	0.942	0.957	0.659	0.707
	2014	0.523	0.698	0.766	0.396	0.611
	2013	0.911	0.954	0.954	0.662	0.668
	Mean	0.827	0.912	0.903	0.611	0.687
Canada	2019	0.857	0.931	0.921	0.815	0.843
	2018	0.848	0.929	0.913	0.809	0.839
	2017	0.870	0.919	0.948	0.806	0.823
	2016	0.875	0.911	0.960	0.799	0.810
	2015	0.867	0.950	0.912	0.772	0.801
	2014	0.884	0.955	0.925	0.769	0.808
	2013	0.882	0.959	0.919	0.800	0.848
	Mean	0.869	0.936	0.928	0.796	0.825
USA	2019	0.866	0.913	0.952	0.795	0.828
	2018	0.875	0.906	0.967	0.921	0.991
	2017	0.899	0.930	0.968	0.917	0.971
	2016	0.865	0.884	0.978	0.921	0.998
	2015	0.901	0.924	0.977	0.881	0.943
	2014	0.892	0.936	0.955	0.921	0.946
	2013	0.866	0.908	0.958	0.904	0.934
	Mean	0.881	0.914	0.965	0.894	0.944
Germany	2019	0.666	0.762	0.903	0.724	0.793
	2018	0.613	0.675	0.927	0.697	0.778
	2017	0.778	0.891	0.877	0.695	0.749
	2016	0.591	0.707	0.878	0.684	0.737
	2015	0.617	0.674	0.933	0.694	0.694
	2014	0.737	0.745	0.991	0.735	0.742
	2013	0.741	0.741	1.000	0.656	0.656
	Mean	0.678	0.742	0.930	0.698	0.736
United Kingdom	2019	0.832	0.926	0.882	0.618	0.705
	2018	0.742	0.841	0.892	0.701	0.785
	2017	0.874	0.982	0.892	0.562	0.607
	2016	0.832	0.924	0.904	0.771	0.816
	2015	0.823	0.876	0.943	0.686	0.747
	2014	0.811	0.872	0.933	0.758	0.791
	2013	0.720	0.872	0.832	0.652	0.701
	Mean	0.805	0.899	0.897	0.678	0.736

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France	2019	0.687	0.760	0.906	0.599	0.733
	2018	0.701	0.773	0.909	0.608	0.741
	2017	0.778	0.891	0.877	0.739	0.811
	2016	0.814	0.910	0.898	0.747	0.825
	2015	0.793	0.885	0.899	0.710	0.792
	2014	0.768	0.889	0.866	0.691	0.772
	2013	0.775	0.871	0.893	0.680	0.771
	Mean	0.759	0.854	0.893	0.682	0.778

Efficiency changes of DN banks according to type

In these categorizations, banks are divided into three parts. First, Global Systemically Important Banks (G-SIBs) followed by Domestic Systemically Important Banks (D-SIBs) and Commercial banks (CB). G-SIBs are banks that are classified important globally after ranking in the top 30 for 12 indicators. D-SIBs are banks that are considered important for the health of financial economy of a country by their respective central banks. CBs are banks that offer services to companies and individuals equally.

Usually, it is very difficult for a bank to be efficient in all the aspects. In all the aspects of efficiency, D-SIBs are most efficient followed by G-SIBs and CBs (Table 3).

Table 3
EFFICIENCY ACCORDING TO TYPE

	Year	TE	SE	ME	CE	AE
Global Systemically Important Banks (G-SIBs)	2019	0.586	0.745	0.783	0.517	0.622
	2018	0.631	0.741	0.854	0.536	0.621
	2017	0.819	0.963	0.856	0.676	0.777
	2016	0.805	0.953	0.849	0.685	0.759
	2015	0.807	0.985	0.819	0.660	0.751
	2014	0.853	0.985	0.865	0.658	0.711
	2013	0.775	0.941	0.828	0.650	0.729
	Mean	0.754	0.902	0.836	0.626	0.710
Domestic-Systemically Important Banks (D-SIBs)	2019	0.663	0.817	0.821	0.686	0.711
	2018	0.758	0.894	0.850	0.683	0.699
	2017	0.816	0.911	0.896	0.679	0.693
	2016	0.889	0.939	0.948	0.811	0.842
	2015	0.936	0.968	0.967	0.757	0.772
	2014	0.943	0.979	0.964	0.720	0.724
	2013	0.943	0.984	0.959	0.705	0.714
	Mean	0.850	0.927	0.915	0.720	0.736
Commercial Banks (CBs)	2019	0.650	0.811	0.828	0.657	0.731
	2018	0.659	0.799	0.848	0.635	0.704

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	2017	0.667	0.787	0.868	0.574	0.649
	2016	0.671	0.767	0.891	0.623	0.687
	2015	0.696	0.778	0.908	0.656	0.821
	2014	0.723	0.826	0.886	0.646	0.716
	2013	0.691	0.804	0.876	0.529	0.591
	Mean	0.680	0.796	0.872	0.617	0.700

Table 4 reveals the average change in TFP country-wise. Overall increase in average TFP is 2%. In terms of average TFP, USA remains constant. Only banks in Canada shows decrease in average TFP by 1.7%. The banks in France show maximum increase by 6.7% followed by banks in Germany by (3.8%) and UK (1.6%) Table 4.

Table 4
MALMQUIST INDEX SUMMARY OF ANNUAL MEANS

2013-19	Efficiency change	Technical change	Pure Change	Scale change	Total factor Productivity
GERMANY	0.981	1.058	1.005	0.976	1.038
FRANCE	0.979	1.091	0.997	0.981	1.067
CANADA	0.995	0.987	1.002	0.993	0.983
USA	1.000	0.999	1.001	0.999	1.000
UK	1.024	0.993	1.029	0.995	1.016
ALL SAMPLE	0.954	1.070	0.970	0.983	1.020

CONCLUSION

The paper adds to the existing literature on DN banks by presenting an overview on the changes in efficiencies and productivity in the Basel III implementation period. The researchers evaluate efficiency of banks in USA, Canada, UK, France, and Germany. The study focus on DEA approach to calculate different efficiencies of sample banks in the study period (2013-2019). In terms of SE, the banks in Canada performed better while in terms of TE, ME, CE, and AE banks in USA performed better. In terms of definition, D-SIBs performed better in terms of technical, cost, allocation, scale, and managerial efficiency. G-SIBs ranked second while CBs ranked third in terms of relative efficiency.

To evaluate the average TFP in five countries, MPI has been employed to get an insight in the selected period. In terms of productivity, Germany, France, and UK showed positive growth. For the first two, increase in technical change was higher than a decline in efficiency resulting in increased average TFP. For the UK, efficiency change was higher than decline in technical change resulting in increase in average TFP. While, USA remains constant in terms of average productivity, only Canada showed a decline in average TFP. Both efficiency and technical change contributed to it.

Limitation and Future Scope

The banking sector is very vast in developed nations. It will be very time consuming to collect the data on all the banks through annual reports. Therefore, a representative sample is

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taken to calculate the changes in efficiencies and productivity. For future research, the data on whole banking sector can be taken with the help of paid database Appendix Table 1 & 2.

Appendix Table 1
DESCRIPTION OF SAMPLE BANKS

Developed Nations	
USA	Synovus
	Huntington Bancshares
	J P Chase
	PNC Financial Service Group
	Key Corp
FRANCE	Credit Agricole
	Societe Generale
	Crédit Industriel et Commercial
	Credit Du Nord
	BNP Paribas
CANADA	National Bank of Canada
	Laurentine Bank of Canada
	Bank of Montreal
	Canadian Western Bank
	Nova Scotia
GERMANY	HypoVereins Bank
	Deutsche Bank
	Commerz Bank
	Nord/ LW
	LBBW
UK	Lloyds PLC
	HSBC Holdings PLC
	Barclays
	BACB
	Virgin money

Appendix Table 2
ABBREVIATIONS

S.No	Description	Abbreviation
1	Allocative Efficiency	AE
2	Banker, Charnes and Cooper	BCC
3	Canada	CA
4	Charnes, Cooper and Rhodes	CCR
5	Commercial Banks	CBs
6	Constant Returns to Scale	CRS
7	Cost Efficiency	CE
7	Data Envelopment Analysis	DEA

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8	Decision-making Unit	DMU
9	Developed Nations	DN
10	Domestic Systemically Important Bank	D-Sib
11	Financial Stability Board	FSB
12	France	FR
13	Germany	GR
14	Global financial crisis	GFC
15	Global Systemically Important Banks	G-SIBs
16	Group of twenty	G-20
17	Malmquist Productivity Index	MPI
18	Managerial Efficiency	ME
19	Scale Efficiency	SE
20	United Kingdom	UK
21	Stochastic Frontier Analysis	SFA
22	Systemically Important Bank	SIB
23	Technical Efficiency	TE
24	Total Factor Productivity	TFP
25	United States of America	USA
26	US Dollar	USD
27	Variable Returns to Scale	VRS

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Received: 06-Jun-2022, Manuscript No. AMSJ-22-12084; **Editor assigned:** 08-Jun-2022, PreQC No. AMSJ-22-12084(PQ); **Reviewed:** 20-Jun-2022, QC No. AMSJ-22-12084; **Revised:** 22-Jun-2022, Manuscript No. AMSJ-22-12084(R); **Published:** 24-Jun-2022

Citation Information: Dhawan, D., & Mehta, S.K. (2022). Performance of banking sector- A case of select developed nations. *Academy of Marketing Studies Journal, 26*(S5),1-11.