The Impact of Virtual Banking Services Cost on Profitability: Applied Study on Jordanian Commercial Banks

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Abstract: - This research aimed to investigate the virtual services effective provided by the Jordanian commercial on banks' profitability; particularly banks listed at Amman Stock Exchange (ASE). This study adopted an explanatory research design depending on the secondary method of data collection via financial report analysis, panel, and quantitative approach was used. The data were analyzed using descriptive and multiple linear regression used to provide an answer to the research questions. All commercial banks listed at Amman Stock Exchange were included in the research sample and the study time period covers the years from 2010-2019. Specifically, the study used Net Profit Margin (NPM) and Tobin's Q to measure profitability, ATMs, Smart Cards, and Mobile & Internet Banking Services to measure virtual bank services. Moreover, control variables were considered including liquidity and financial leverage. The study findings supported a statistically positive relationship between the two variables, indicating that using virtual banking tools leads to an increase in bank profitability. The study recommends that banks need focus on the disclosure of transparent and clear information concerning the cost of virtual banking services and promote such services among the main sector's actors. This research contributes to the body's knowledge in two methods. First, the profitability of banks was examined using virtual banking activities, and second, it was found that ATMs, Smart Cards, and Mobile & Internet Banking Services affect banks' profitability measured by NPM and Tobin's Q. Thus, financial technology innovation could encourage the profitability of the Jordanian Commercial Banks.

Key-Words: - Virtual Banking Services, profitability, ATMs, Smart Cards, Mobile Banking, Internet Banking.

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1 Introduction

The banking sector has a notable contribution towards the facilitation of transactions, which particularly aligns with the commercial banks' attempt toward profitability achievement and enhancement.

In relation to the above, banking services have come to depend on digital transformation in the face of dynamic technological environmental forces, urging them to adopt and use digital forms of virtual banking to meet the demands of financial services users, [18].

Among the studies dedicated to this line of knowledge is the study, [9], that investigated how Internet banking intensity affects the profitability of banks, their study includes both private and public banks operating in India. They collect data from 67 commercial banks during the period from 2011-2020. The intensity of online banking is presented by the online banking transaction value and volume, while the bank profitability is presented by Return on Assets (ROA) and Return on Equity (ROE) ratios. The results show that the intensity of Internet banking (value and volume) increase the bank's profitability measured by ROA and ROE. This positive impact is higher in public sector banks as a result of economies of scale of operation.

Generally speaking, a virtual bank refers to a bank that offers retail banking services online or through various types of E-Channels as opposed to through physical entities. In other words, this type of banking service encompasses online transactions using the web, e-mail, and ATMs, which takes the banking services to another level using financial technology and developments to enhance the experience of users and banking customers, [6]. Moreover, in the banking sector, new delivery methods for depositor services have been introduced throughout the years, including ATMs, online banking, and phone centers and these have contributed to greater scale economies than their conventional equivalents, [19]. The study thus aims to examine and determine the effect of virtual banking services cost on Jordanian commercial banks' profitability using data gathered from 2010 to 2019. Specifically, the study aims to develop and propose a theoretical framework for the cost of virtual banking services and Jordanian commercial banks' profitability and to assess the relative significance of virtual banks in terms of importance among the banks.

2 Literature Review

2.1 Digital Transformation and Banks Digitalization

The virtual bank concept can be traced back to the virtual corporation analogy, where banks devoid of branches and offices have legal addresses. In other words, the website of the bank is the primary and only department it has, through which data is received concerning its services/products, their uses, account status confirmation, and online specialists' advice, [28].

Moreover, the shift from traditional to digitalized banking was made by banks to bring about the offering of multiple services through the Internet, as customers' demands for electronic services have grown throughout the years. Transformation into digitalization began in financial institutions through call centers and online branches that mimic the services of physical branches. More importantly, virtual banks offer applications through smartphones referred to as mobile banking facilitate to customers' management of accounts through such phones at their convenience. They can also conduct their dayto-day financial transactions and avail of various features, which is the main reason that prompted banks to adopt digitalized processes. Generally speaking; virtual banking has improved the efficiency level of services provided by banks to their customers.

The increase in the use of virtual services in banks requires the determination of the needs of customers and the reasons behind their inclination towards adoption of virtual banking and services offered and as such, banks continuously seek to search for suitable channels through which services can be offered for maximized profitability and shareholders' equity – in other words, virtual banking services has a key role in lowering banks costs and in reaching their objectives in profitability, [2].

Furthermore, digital banking services offer several advantages including but not limited to reasonable cost and price as the services are offered through digital channels at reasonable prices. Costs are decreased through the internet's ability to lower service prices. Also, new services can be availed from the customers' convenience through ease of use. Banks can also direct customers to third-party services like e-commerce, invoice payments, and tax payments via digital banking, while effortlessly collecting and processing customer information. In other words, digital banking greatly contributes to the achievement of customer satisfaction, loyalty confirmation, and profitability enhancement, [1].

2.2 Digital Transformation and Banks Profitability

Banks' profitability can be classified based on twofactor groups, namely internal and external factors, with the former being those that management can control through quality decision-making concerning the banks' size, capital adequacy, credit risk, effective administration, and revenue sources of banks, [4].

[20], found that using tools of financial technology in banking services significantly and positively affects the bank performance measure by Return on Equity (ROE) and the Nominal Interest Rate Margin, while an insignificant but positive impact was founded on Return on Assets.

On the other hand, [5], examining the financial technology tools impact (Mobile banking, Virtual teller machine (VTM), and Automated teller machines (ATM),) on banks' performance for non-financial using data from China, the findings indicate that financial technology products have a significant positive effect on banks' non-financial performance. These products improve the bank's service quality, and employee performance efficiency and increase customer satisfaction, at the same time, these products help reduce the perception of defects related to the difficulty of use.

More importantly, the development of banks went hand in hand with the revolution and development of information communication technologies (ICTs), which brought about the transformation of procedures and processes among banks. The method by that customers access financial products and services is changing as a result of digital development, [25]. New scenarios and horizons for the financial service industry have been opened through internet penetration. Financial organizations are now providing their services majorly via electronic mediums. Having a substantial effect on financial performance is considered due to the adoption of the Internet by financial organizations, [16].

Suffice it to say, potential and current customers' satisfaction and the bank's performance were the focus of the banking system's digitalization. Consequently, e-banking was introduced as an e-payment system enabling banks or financial institutions' customers to carry out various financial transactions through electronic channels and means as opposed to conventional brick-and-mortar visits. online banking system connects to the core banking system that the bank operates, unlike the traditional banking physical provision of banking services, [23].

Literature has focused on the impact of banking transactions' effect on profitability using different banks' data plus they have generally supported a positive and statistically significant correlation between ATMs of old and new-generation banks and their performance. It is evident that through the adoption of new technologies, banks can respond efficiently to customer demands for their satisfaction. In this regard, online or e-banking provides easy access, security of transactions, and 24/7 banking transactions, which ensure daily operations, [14].

In relation to the above, automated routine bill payments have minimized the physical presence of clients in the banks' premises, and on top of this, they can easily transact at a lower cost incurred by banks. Notably, banking digitalization is not confined to banking or mobile banking, yet it also covers new technologies used in order to introduce innovative business modules to the business model of the banks.

3 Research Methodology

3.1 Population and Sampling

The research population includes all commercial banks listed on Jordan's Amman Stock Exchange (ASE). The banking sector was found to be suitable owing to its economic development role of the country and the easy access to reliable financial statements, from which data was gathered to examine Net Profit Margin and Tobin's Q (dependent variables) and financial leverage and liquidity (control variables). The sample comprised banks that have been active in the market and listed in the ASE from 2010-2019. Data was gathered from the banks' annual reports as well as from the annual bulletins in ASE accessible through the database of ASE, [32].

3.2 Variables Definition

The study's dependent variable is commercial banks' profitability, which has several measurements; but in this paper, two measurement proxies were used, Tobin's Q in market-based performance plus Net Profit Margin (NPM) in accounting-based performance, following prior studies, [31], [15], [30], the calculation of which involves the use of the following formulae;

$$NPM_{it} = NI_{it}/IC_{it}$$

In the above formula, NPM $_{it}$ denotes the Net Profit Margin ratio for bank i for the year t, NI_{it} denotes Net Income for bank i for year t, whereas IC_{it} denotes interest, commissions, and other bank income for bank i for year t.

The market-based performance proxy; Tobin's Q was determined using the below formula;

Tobin's Q _{it} =
$$(MV_{it} + TD_{it})/TA_{it}$$

In the above formula, Tobin's Q $_{it}$ denotes the second profitability measurement, MV $_{it}$ denotes the Equity of Market Value (JD) for bank i and year t, while TD_{it} denotes total debt for bank i in year t. Lastly, TA_{it} denotes bank i total assets for year t.

Moving on to the control variables – such variables were included to overcome the bias of bank size – they included financial leverage and liquidity, and they were included in the regression model owing to their use in extensively applied measurement of virtual banking services cost, serving as a proxy for the ability of the bank towards profit generation, [7], [22]. The formula used is as follows;

$$FLEV_{it} = TD_{it}/TA_{it}$$

In the above formula, $FLEV_{it}$ denotes the debt to total assets ratio of bank i, in year t, while TD _{it} denotes the total debt of bank i in year t. TA_{it} denotes the total assets of bank i in year t and it goes to show that liquidity is a representation of current assets, fewer inventories, to current liabilities of bank i, in year t.

3.3 Regression Model and Hypotheses

The research used two empirical models to test the main and sub-hypotheses and to determine the effect of the cost of virtual bank services including its three components, namely, Mobile & Internet Banking, Smart Cards, and ATM (MBI Cost), on profitability(NPM and Tobin's Q). The models are represented in the following formulae;

$NPM_{it} = \beta_0 + \beta_1 MBI Costs_{it} + \beta_2 ATMs Cost_{it} + \beta_3 Cards Costs_{it} + \beta_4$ $Quick_{it} + \beta_5 FLEV_{it} + \varepsilon_{it}$ model (1) $TobinsQ_{it} = \beta_0 + \beta_1 MBI Costs_{it} + \beta_4$ $Quick_{it} + \beta_5 FLEV_{it} + \varepsilon_{it}$ model (2)

Following a thorough literature review, the study contends that the cost of virtual banking services significantly affects Jordanian commercial banks' profitability and accordingly, the objectives are achieved by testing the following hypotheses;

 H_{0a} : The cost of virtual banking services does not have a significant impact on profitability measured by Net Profit Margin as a proxy.

 H_{0a-1} : The cost of mobile & internet banking does not have a significant impact on profitability, measured by Net Profit Margin as a proxy.

 H_{0a-2} : The cost of ATMs does not have a significant impact on profitability, measured by Net Profit Margin as a proxy. H_{0a-3} : The cost of cards does not have a significant impact on profitability, measured by Net Profit Margin as a proxy.

 H_{0b} : The cost of virtual banking services does not have a significant impact on profitability, with Tobin's Q as the proxy.

 H_{0b-1} : The cost of mobile & internet banking does not have a significant impact on profitability, with Tobin's Q as the proxy.

 H_{0b-2} : The cost of ATMs does not have a significant impact on profitability, with Tobin's Q as the proxy.

 H_{0b-3} : The cost of cards does not have a significant impact on profitability, with Tobin's Q as the proxy.

4 Results and Discussion

4.1 Descriptive Statistics

The descriptive statistics analysis of the findings of the research variables concerning 130 firm-year observations culled from 13 Jordanian ASE-listed commercial banks are tabulated in Table 1, dating from 2010-2019. Based on the figures in Table 1; Tobin's Q has a maximum value of 1.198, while the minimum value is 0.904, averaging at 1.006, and with a standard deviation of 0.060. This is indicative of the variation among the commercial banks in Jordan in light of their investment opportunities based on their sizes. On the other hand; the ratio of Net Profit Margin, has a maximum value of 46.8% while the minimum value is 1.3%, averaging at 28.3%, and with a standard deviation value of 9.3%. Indicating that; the sample banks average a positive ratio of net income to the income of commissions and net interest.

Table 1. Descriptive statistics of Jordanian
commercial banks' variables, 2010-2019, with 130
firm-year observations

Infin-year observations				
	Min	Max	Mean	Std. Dev.
Mobile &	5			
Internet	187.6	21 141 0	5 274 0	5 215 0
Banking	407.0	21,141.0	5,274.0	5,215.0
(000) JOD				
Mobile &	:			
Internet				
Banking to)			
total				
assets.	0.03%	0.78%	0.24%	0.21%
ATMs				
Costs	272.2	40 107 0	5 756 1	8 600 1
(000)	525.5	40,197.0	5,750.4	8,090.4
JOD				
ATMs				
Costs	1 270/	26 220/	0 170/	0.000/
to	1.57%	50.22%	0.17%	9.08%
total Costs				
Cards Cost	t			
(000)	64.1	34,045.6	5,454.0	9,270.0
JOD				
Cards				
Costs	0.210/	12 4704	0.570/	2 60%
То	0.21%	12.47%	9.37%	2.09%
total Costs				
NPM	1.39%	46.83%	28.39%	9.34%
Tobin's O	90.43%	119.84%	100.69%	6.04%
Financial				
Leverage	80.91%	93.50%	86.06%	2.58%
Ouick				
ratio	11.88%	51.71%	29.89%	8.50%

4.2 Multi-collinearity

Multicollinearity is an issue that happens when the explanatory variables show a strong correlation with one another, which means they are measuring a distinct single thing, [10], and thus, t through the correlations between the independent and control variables, tests are run to ascertain the existence of multicollinearity.

4.2.1 Independent and Control Variables Correlation

The independent-control variables correlation matrix is presented in Table 2, and in this regard, [8], stated that multicollinearity becomes an issue when high correlation exists between the independent variables (r=0.9 and above). On the other hand, [10], claimed that the issue of collinearity arises with correlation constant of 0.80 or 0.90. Based on the values on the table, the independent and control variables correlation remained below 0.80 and thus, multicollinearity is not an issue.

	Mobile &	ATMs	Cards		Quick
	Internet	Cost	Costs		Ratio
	Banking	to	to		
	to	total	Total	Financial	
	Total assets	Costs	Costs	Leverage	
Mobile					
&	1				
Internet	1				
Banking					
ATMs	0.266**	1			
Costs	0.300***	1			
Cards	0.451**	0 205**	1		
Costs	0.431	0.505***	1		
Financial	0.025	0.070	0.016	1	
Leverage	0.025	0.079	0.016	1	
Quick	0.100	0.110	0.025	0.000*	1
ratio	0.108	0.119	0.025	-0.202*	
Notes:					
** Correla	tion is signific	ant at the	0011	aval (2 tai	(bal

** Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).

4.2.2 Variance in Inflation Factor Test

Given that a lack of high correlation does not always imply the absence of multicollinearity, the matrix is also helpful in identifying potential multicollinearity problems between explanatory variables, [10].

The problem is dealt with by using the variance inflation factor test and obtaining the values of the independent variable. The criterion is such that indicative of multicollinearity presence is tolerance factor value which is near zero and variance inflation factor higher than 10, [10].

Table 3. The independent and control variables
using Collinearity Statistics

	Tolerance	VIF
Mobile &		
Internet	0.672	1.487
Banking		
ATMs Costs	0.415	2.412
Cards Costs	0.492	2.031
Financial	0.042	1.060
Leverage	0.945	1.000
Quick ratio	0.929	1.077

Based on Table 3, the variance inflation factor values ranged between 1.060 till 2.412 while tolerance factors ranged between 0.415 till 0.943, indicating the absence of multicollinearity between independent variables and their control counterparts.

4.2.3 Outliers

Predictive analytics is used in data collection to explain the form of normal data and to observe unusual forms that deviate from the normal pattern – such unusual forms are referred to as outliers. In this study, Cook's distance was used to detect outliers, whereby the study obtained the regression coefficient's difference between the one obtained from the data, and another obtained from the sample, with the exclusion of a case from the process of estimation, [3]. In addition, if a case has more than 1.0 Cook's distance value, it is deemed as an outlier as suggested by [26]. The Cook's distance calculated values are tabulated in Table 4.

Table 4.	Cook's	Distance	Test for	Outliers'
		Detection	-	

	D	election		
	Min	Max	Mean	Std. Dev.
Cook's Distance Model (1)	0.000	0.315	0.012	0.037
Cook's Distance Model (2)	0.000	0.079	0.006	0.011

4.2.4 Normality

Normal distribution of data is also referred to as rectangular distribution and it has equally distributed values ranging between the smallest and the largest one. In this regard, [13], stated that normal distribution does not necessarily take a symmetrical shape, as it can be bell-shaped (suggesting the bell-profile). More specifically, the Melville-Bell-shaped data represents that the mean is the point at which most of the continuous variable values are clustered. The Melville-Bellshaped data normal distribution reduces the chance that extremely large or small values will occur, despite the fact that the normal distribution can run from negative infinity to positive infinity The Melville-Bell shaped data normal distribution reduces the chance that extremely large or small values will occur, despite the fact that the normal distribution can run from negative infinity to positive infinity, [3]. Large-scale sample data from this research was examined – a condition that may not lead to the distortion of the outcome as a considerable deviation from non-N may be ignored owing to the sample size (over 100 observations), [29], [11], [12], [3].

4.2.5 Testing the Autocorrelation

If the residuals are reliant on one another or if there a correlation between adjacent residues, is autocorrelation occurs in the model. Due to the correlation, this ultimately affects the validity of the linear regression analysis by increasing the influence of the independent variables on their dependent counterpart. This problem is verified using the Durbin-Watson test in this study – this is one of the most commonly utilized methods among statisticians, with values ranging between 0 and 4. According to [10], values closer to 0 are indicative of a significant positive correlation between the contiguous residues, whereas those closer to 4 are indicative of a significant negative correlation. The same author added that the optimal result, which shows the absence of autocorrelation among contiguous variables, ranges between 1.5 and 2.5. Also, values calculated (D-W) closer to 2 show no autocorrelation problem.

Table 5. The Durbin-Watson tests for autocorrelation

Model	D-W
Model (1)	1.933
Model (2)	1.818

In Table 5, (D-W) statistics for the two models were near 2, which indicates the absence of autocorrelation.

4.3 Hypotheses Testing and Results Discussion

4.3.1 Hypotheses Testing

The regression analysis conducted between profitability and the independent variables, using control variables yielded the findings tabulated in Table 6. The model's strength was demonstrated by its 35.0% R-square and 32.4% Adjusted R-square values, which indicate that all independent variables together explained 32.4% of the variation in profitability across the control variables for the complete sample of Jordanian commercial banks. The results also show the F-statistic value to be 13.375, with 0.000 as the Sign. F. Therefore, the model is significant at the level of 1%, and the null hypothesis is rejected, while the alternative hypothesis, stated as profitability measured by net profit margin is affected positively via the cost of virtual banking services, is accepted. This result is aligned with that reported by past studies (e.g., [27], [21], [17]).

Table 6. Multi Regression Results for the first main	
hypothesis (Model #1)	

Variable	Coefficient	p-Value
Mobile & Internet	747.360	0.009
Banking		
ATMs Costs	14.136	0.024
Cards Costs	8.178	0.000
Financial Leverage	-0.417	0.002
Quick Ratio	14.750	0.000
Model (1)	R Square	Adjusted
Widdel (1)	_	R Square
	0.350	0.324
F-statistic	Sign.F	
13.375	0.000	

Dependent Variable: Net Profit Margin

Based on the research results, the investigated dimensions of banking service costs have a positive and significant impact on the profitability (approximately net profit margin) of commercial banks in Jordan.

In the same way, to assess the second hypothesis, Panel Multi Regression was used, the findings in Table 7; showed that the model's strong explanatory power was demonstrated by its 64.3% R-square and 62.8% adjusted R-square, which show that all independent variables together were explained 62.8% of the variation in profitability.

throughout the control variables for the total commercial banks sample in Jordan.

In Table 7, the f-statistics value is 44.629, with 0.000 as Sign. F, confirming the significance of the model at the level of 1%.

Variable	Coefficient	p-Value
Mobile & Internet	6.876	0.000
Banking		
ATMs Costs	0.237	0.003
Cards Costs	0.063	0.002
Financial Leverage	-8.760	0.916
Quick Ratio	0.136	0.000
	R Square	Adjusted
Model (2)		R
Model (2)		R Square
Model (2)	0.643	R Square 0.628
Model (2) F-statistic	0.643 Sign.1	R Square 0.628 F
Model (2) F-statistic 44.629	0.643 Sign. 0.000	R Square 0.628 F

Table 7. Multi Regression Findings for the second
main hypothesis (Model #2)

Dependent Variable: Tobin's Q

Based on Tobin's Q results show that profitability measured by Tobin's Q is significantly impacted via virtual banking services cost, which is accepted. In other words, the results supported the significant impact of virtual banking services cost, through all its dimensions, on profitability (Tobin's Q) in the context of commercial banks in Jordan.

5 Conclusion

The research sought to assess the effect of virtual banking services cost on the profitability of the ASE-listed Jordanian commercial banks from 2010 till 2019. The results showed that virtual banking services costs, through its three components (mobile & internet banking, ATMs, and cards), do have a positive and significant impact on the bank's profitability, peroxide by net profit margin and Tobin's Q. The obtained findings have implications to bank management, policymakers, shareholders, and bank regulators in Jordan, as well as, other relevant parties and entities.

Discussion: The effects on net profit margin may signal that; investment in virtual banking services will improve the standard that banks offer, plus the efficiency of daily work which leads to operating cost savings and increasing the net profit. Savings in operating costs can be explained by the great completion between the financial technology providers who were forced to decrease their commission to satisfy the customer (banks) preferences and increase their market share, this result is consistent with that of [24], Innovative Financial Technology Solutions Significantly Impair Current Performance of Indonesian Banks. The positive impact on Tobin's Q indicates that the firm value improved by increasing the investment in information technology to enhance the standard of services offered to clients.

Limitations: One of the limitations of this study is the refusal of the banks to disclose clear data

regarding their virtual services costs, thereby urging the researcher to depend on financial reports' explanations as an additional information source and on the discussions with financial managers of the banks.

Recommendations: This study recommends that the banking sector focus on information disclosure when it comes to the virtual banking services cost and on promoting the sector actors' investment in them for positive developments and outcomes.

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