

Regulatory Constraints on Financial Performance of Insurance Firms in Egypt: Structural Equation Model

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Abstract The structural equation model is used to examine the relationship between regulatory constraints measured by investment to paid capital, cash to paid capital, government securities and certificate, and firm size (algorithm of total assets) on financial performance measured by liquidity, Return on equity and Return on assets of insurance industry in Egypt. The results showed that the relationship between regulatory constraints and return on equity is such that there is a significant negative effect of the construct the independent variables in terms of investment, cash, and government securities and secure certificates (X_3), on the dependent proxy, return on equity. However, the later independent proxy of the algorithm of total assets ($\ln x_4$) has a positive impact on the dependent proxy in terms of return on equity and a significant negative impact of the independent proxies' investment, and cash on the dependent variables return on assets. However, the later independent variable of the algorithm of total assets ($\ln x_4$) has a positive effect on the dependent variable of return on assets. This validates the second research hypothesis, as the independent variables investment, cash, and algorithm of total assets ($\ln x_4$) have a significant effect on the dependent variable return on assets. Beside that there is a significant negative effect of the independent variables investment X_1 , and cash X_2 on the dependent variable liquidity. However, the later independent variable of ($\ln x_4$) has a positive effect on the dependent variable liquidity. This validates the third research hypothesis, as the independent variables investment, cash, and algorithm of total assets have a significant effect on the dependent variable liquidity, but

an insignificant relationship with government securities.

Keywords Regulatory Constraints Operating Objective (Profitability), Operating Policy (Liquidity)

1. Introduction

The insurance industry, as a financial intermediary, is very important to Egyptian economy, so, it is heavily regulated to provide efficient service and protection against financial risks. The Egyptian Financial Supervisory Authority issued bylaw (No.10) for the year 1981, amendment in 2008, to mitigate the risk of insurance sector in paid capital requirements raised up from 60M to 100M Egyptian pounds. The literature review has shown the effect of regulatory constraints of insurance industry on their performance, and products pricing, for instance **Martin F. Grace & Richard D. Phillips** [1] showed the levels of regulations in insurance sector, while for **Mathew L. Higgins & Paul Thistle** [2] tested the regulatory constraints on product pricing in insurance firms. Also **L. Nguyen & A. C. Worthington** [3] tested the industry regulation and efficiency. As for **Pablo G conzalez & Lars F. Anderson** [4] used a novel dataset to investigate financial constraints on capacity in Spanish insurance firms.

Though the regulatory constraints play a critical restricting role in insurance industry diversification

portfolio, they are perceived as regulations for how insurance firms allocate and invest their funds, especially the Capital structure which has special importance, as a clause (28) of the Egyptian Law identifies. So, the main question is whether the regulatory constraints have improved resources allocation in insurance industry in Egypt whereas the financial supervisory authority has increased paid up to (100M) Egyptian pounds although the sum of total assets for one company from 39 companies in Egypt like MISR Insurance Company is more than (10B). Nevertheless the ratios are still as the following:

In terms of the ratio of share, it is 10% to paid capital. Regarding to the bonds ratio, it is 10% to paid capital. While the investment in Real Estate ratio is 10% to paid capital; whereas the grants differences to guarantee commercial mortgages ratio is 10% to paid capital.

Although insurance firms have faced numerous challenges in the last decade, they are still required to maintain certain financial ratios. For instance, as per the regulations issued in 1981, the cash ratio should be at least 50% to paid-up capital, and the investment approved by the regulator ratio should be 10% of the paid-up capital. Additionally, firms must hold government securities and secure certificates to at least 25% of the paid-up capital.

This study draws on the impact of the financial constraints as government regulations on operating objectives (profitability) and corporate policy (liquidity). Although there is a lot of researches on this area, however in Egypt it is focused on banking sector, as **Nader Abler & Hatem Ramadan [5]** revealed the significant relationship between applying regulations and banking stability and banking efficiency, while **Lukas Ahnert et al [6]** measured banks performance in US and Europe by return on equity, return on assets and liquidity, which are consistent with the current paper.

Due to the importance of the insurance sector in Egypt, and lack of researches in this area, this study was carried out to highlight and draw attention to the role of the financial regulations on the financial performance.

2. Literature Review

A. Insurance

According to **Martin F. Grace & Richard D. Phillips [1]**, this article presented evidence of insurance demotic firms which have a great level of regulations and achieved a high level of profitability, but some of the small domestic insurance firms have less profitability than the others. **Mathew L. Higgins & Paul Thistle [2]** said the empirical results indicate the capacity constraint regarding premium surplus ratio impact on underwriting profit, but the relationship is nonlinear and dynamic profit has a negative relationship with the value of derivatives of property liability insurance firms. **Shan Ge [7]** tested the relationship between the financial constraints on product pricing in life insurance industry; the results concluded that

life insurance prices change drastically in different directions with different scenarios and decisions, and the financial constraints and change in prices are greater. Moreover, this study highlighted that the insurance plays a significant role in the market as financial intermediation. **Minhua Yang [8]** by using ordinary least square analysis, he investigated the relationship between financial innovation regulation and financial performance in listed China firms; the result shows the financial regulations have a negative effect on financial performance. **L. Nguyen & A. C. Worthington [3]** used data development analysis to examine the relationship between the industry regulation and efficiency, the result shows the regulations and size affected the efficiency of Australian private insurer. **Pablo G Gonzalez & Lars F. Andersson [4]** used novel dataset to investigate financial constraints on capacity in Spanish insurance firms, they found that the foreign insurance affected capacity of insurance firms, also most of the insurance firms raise their capital and find an approach to keeping balance their current accounts, beside that they found the knowledge became the key for growth and higher return

B. Banking

Swamy V. [9] presented a model for relationship associated between the regulations and bank profitability of Indian banks; he concluded that an increase of one percent in capital ratio to risk weighted assets affected the interest income by 17 percent, and that means the relationship between the regulations with the profitability, which measured by Return on equity is positive. **Harald Benink et al [10]** studied the role of regulatory constraints in terms of Basel II according to the analysis of this role by using risk model; he revealed that this role has a direct effect on propensity for endogenous risk, and increased financial stability. **Lukas Ahnert et al [6]** investigated the financial regulations on US and European banks performance, the results indicated that the passing banks have positive significant abnormal equity returns of 58-52 points, but failing banks have negative abnormal (174) banks point release positive performance. **Yishu Fu et al [11]** by using disequilibrium equation model to test capital regulations on bank behavior, the results showed that the regulatory constraints have a significant and positive relationship with bank behavior and well capitalized bank, but the relationship with capital level is negative and significant in China. **Clifford A. Ball & Hans R Stoll [12]** using operator training simulator model to evaluate the capital regulations requirements, they documented the regulatory constraints requirements distort the investment decision, and it is adversely affected in incentive investment in US banks. **Ansgar Walther [13]** to answer the question about how to achieve efficiency in banks, the study analyzed the relationship between banks regulations and liquidity; it revealed that the efficiency can be achieved through establishing simple banks regulations, and can change systematic risk when implementing optimal policy

with constraints in capital requirements adequacy. **Eric Monnet & Miklos Vari [14]** in terms of liquidity constraints they are used as tools to maintain low interest rate in banks to reduce borrowing that increase ability to purchase government securities, and this achieves the purpose of monetary policy. **Nader Alber & Hatem Ramadan [5]** to test the association of the impact of banking regulations with bank performance in MENA region, this paper conclusions indicated a significant impact of financial regulatory on banking performance in terms of profitability, banking efficiency and bank stability; moreover there is a significant impact of banking regulations on liquidity requirement provision policy, but there is a negative impact of non-performing loans and leverage requirements. **Prachi Mishra & Ariel Reshef [15]** investigated the effect of central bank governor in financial regulations, and the results showed that 20% form the research sample have a relationship with greater financial reform.

C. Other

This part reviews the previous studies which addressed the financial constraints on financial performance in different sectors: **Karas, M., & Režňáková, M. [16]** sought to analyze the impact of financial constraints on financial variables in predicting small and medium-sized enterprises through using Cox semi-parametric model. The results show that incorporating financial constraints variables help in predicting default. **X. Chang et al [17]** investigated the financial constraints in their paper on Australia firms, and their captured results indicated that the financial constraints minimize the sensitivity of investment to internal resources, and increase the cash in hand to internally gains funds by using regression. According to **Xiang Zhang et al [18]**, the study result showed that the relationship between business development and cash holdings is negative, besides, the financial constraint mitigated the impact of institutional development. **Aaron lane [19]** conducted a study to use a structural model to test the relationship between regulatory constraint and innovation, and whether regulatory constraints are constraining innovation. **Guohua Cao et al [20]** examined the financial constraints and short selling with corporate fraud in China corporations; however, the short selling impacts the corporate fraud, but financial constraints less likely to impact corporate fraud. **Akamah, Herita T. et al [21]** documented that the relationship between the financial constraint and volatility of cash was a positive relationship; based on that result the paper recommended the increase the financial constraint. **Siddarth Roche et al [22]**, concluded that the financial constraints reduce process innovations, so they recommended the mitigation of the financial constraints. Whereas the control variable (size of the firm) has a positive impact on process innovation in Australian firms. **Getaneh M. Ayele [23]** used panel regression model to examine the effect of the financial constraints (capital adequacy and legal reserve) with

risk-taking in Ethiopia private banking sector, the conclusions refer to a positive relationship between capital adequacy and risk taking. However, there are different results in two periods: in the first, the relationship was negative with liquidity, and in second one it was a positive relationship. For **Xin Chang et al [24]**, the regression model results of this paper showed the net cash working capital is significant, and a positive relationship with short term debt, the financial constraint has a little impact on firm investment, but the severity financial constraint is negative with cash flow in Australians corporate. **Ralston, D. [25]** based on results of the model that developed in this paper, the regulatory reform has a significant effect on the allocation efficiency of both credit union stability and samples investigated in the portfolio performance in Australian firms also the regulatory reform has a potential allocation of efficiency in portfolio. **Sasan Bakhtiari et al [26]** investigated the role of the regulatory constraint on small medium enterprises to find its effect on growth business cycle and credit access in the Organization for Economic Co-operation and Development countries (OECD). **Margaret J. Greenwood & Lei Tao [27]** put forward that the costly regulatory intervention affected financial reporting quality, but agency theory increased financial reporting quality, according to the study. **Annalisa Ferrando & Alessandro Ruggieri [28]** presented the relationship between financial constraints with productivity in Euro companies; the findings referred to a negative significant relationship between them in small medium enterprise. **Ulf Von Kalckreuth [26]** conducted in UK manufactures to test the relationship between financial constraints and capacity restrictions, the study results indicated that the financial constraints have an effect on closed capacity gap, also for small companies closed capacity gap is faster than other large companies. **Thomas S. Y. et al [30]**, the topic of this article was to identify whether the regulatory constraints improved real allocations resources; it concluded that the regulatory constraints system succeeded in limiting system fragility and reducing the capital requirements. The important result in this paper determines the optimal size of the financial sector, using macro dynamic model. **Ornella W. Matetta & Vania Sena [31]** used the efficiency frontier to analyze the relationship between financial constraints and technical efficiency, they revealed that the regulatory constraints had a positive impact on technical efficiency in Italian producer cooperatives. **Michael Machokoto & Geoffry Areneke [32]** used panel data analysis revealing that the financial constraints affected negatively the investment cash flow, however the credit constraint has a significant effect on changes in capital market. **Annick Pamen Nyola et al [33]** investigated the impact of regulation on European banks by dividing the sample into three categories: high income, middle income and low income. The findings indicate that the regulations have a positive, significant relationship with the high income level. However in the middle and low income categories, the activities decrease and entry

requirements are affected. **Aviner Augusto S. Manoel et al [34]** investigated the relationship between the financial constraints on market value of Brazilian firms. The findings indicate that the financial constraint significantly affects market value but non constraints have little effect on the cash flow held by companies. **Ofoeda, I. et al [35]** conducted a study to test the impact of the regulatory constraints, financial inclusion with growth of economic in (52) African countries. They found that the financial inclusion and regulation have a strong and significant effect on economic growth using a regression model. **Georgios Efthvoulou & Prit Vahter [36]** used a Univariate Probit model to analyze the associated financial constraints on innovations performance. They indicate that a significant positive impact of the financial constraints with performance of innovation. **Daniel Paravisini [37]** tested the financial constraints on firms' access to external resources using novel data analysis of local bank in France. This paper conducted that when the lending expands the profitability of bank portfolio in terms of lending does not decline, and total deposit increases. **Pablo G. G. Alez & Lars-F. Andersson [38]** applied the fire insurance in Spain to test the regulatory constraints on capitalization and capacity. The findings indicate that foreign reinsurers increasing capacity, and financial leverage has a positively significant relationship with reinsurance when loss ratio is significant with reinsurance but weakly correlated. **Fernando R. Chaddad & Jeffrey J. Reuer [39]** analyzed the associated the financial constraints on initial public offerings in US firms by dividing the study period into three periods and using econometric methodology. The findings indicate that in the first period there is no change in investment and cash flow; in the second there was a negative effect of financial constraints on cash flow and investment; and in third period, there was a decline in cash flow and investment. **Priya Nagarai & Chuanqian Zhang [40]** assessed the relationship between regulatory quality on cost of capital and equity by using multilevel mixed models. The conclusion indicates a negative relationship between the regulatory quality with cost of capital when applied in (55) countries over (13) years. **Timothy J. Riddiough & Zhonghua Wu [41]** investigated the associated investment and liquidity management with the cash constraint firms. They revealed that there is a smooth variation in cash flow with investment and financial constraints pushing the firms more sensitive towards cash constraints in firms listed in NYSE and NSADAQ. **Pateris Zilgalvis [42]** tested the regulatory effect on the financial innovation principle to determine prioritizing regulatory. The article revealed the most important result is regulatory protecting the investors from the fraud loss and risk and providing investors with information. **Weixi Liu & Ian Tonks [43]** analyzed the relationship between pension funding constraints and firms costs using GMM system. The findings suggest a negative association of pension funding constraints with firm dividends, the associated funding requirements with

investment are sensitive in UK pension funding. **Pargati Priya & Chandan Sharma [44]** applied in (74) developing countries to investigate the relationship between the financial constraints and corruption and innovation capacity. The conclusions indicate that the financial constraints have an adverse effect on innovations capacity, and the relationship between financial constraints is positive with corruptions in developing countries. **Nina Budina et al [45]** tested liquidity constraints on investment performance using accelerators model in Bulgaria firms. The findings indicate that there is no association between the cash flow and investment, and liquidity constraints have a positive relationship with firm size but a negative relationship with debt. **Ali Gungoraydinoglu & Özde Öztekin [46]** examined the financial crises and banking regulations on corporate financing. The study findings show that there is a significant impact of financial crises on financial decision-making. Financial crises pushed the corporate corporations to depend on leverage, and the firms have difficulty issuing securities during the financial crises. This study used a multivariate regression model.

3. Methodology, Variable Definitions and Data Resources

Salah Eladly [47] used the structural equation model to test the multivariable relationships in risk performance on working capital management. The conceptual framework was investigated using AMOS23 and the Multivariate Detection model, which was also used by **Ali Gungoraydinoglu & Özde Öztekin [46]**, to analyze the relationship between multiple variables. For this study, data was collected from Egyptian Financial Supervisory Authority reports of financial position (balance sheet and income statements) for insurance firms under the financial authority form 1999 to 2019. **Dependent variables** were selected from the annual reports, as shown during the sample period: (Y_1) Return on equity (ROE), which was measured by dividing net operating profit by equity; (Y_2) Return on assets (ROA), measured by dividing net operating profit by total assets; and (Y_3) Liquidity, which was measured by **Minhua Yang [8]** using ROE and ROA, and by **Nader Alber & Hatem Ramadan [5]** to measure banking performance. The **Control variable** was calculated based on total asset algorithm, which is a natural algorithm of total assets. The **Independent variables** were selected according to Law NO. 10. As noted by **Annalisa Ferrando & Alessandro Ruggieri [28]**, which used investment constraints. This study used most of investment variables treated in Law 10 as mentioned before. **Ulf Von Kalekreuth [29]** measured financial constraints by investment restrictions and the firm size as control variable, consistent with this paper. The cash ratio to paid capital was 50%, and the ratio of bonds to paid capital was 10%. In terms of government securities and secure certificates ratio to paid capital was 10%, and the last variable in regulatory

constraints was other approved investments by the regulator ratio to paid capital, which was 10%. This study concurs with **Pablo G. G. & Lars-F. Andersson [38]** in the applied filed of insurance to test the effect of regulatory constraints. Furthermore, this study was consistent with **Nina Budina et al [45]** to test liquidity constraints on investment, where the current study used liquidity as a proxy of financial performance as dependent variable. **Ansgar Walther [13]** studied the relationship among banks regulations and liquidity in this research.

Based on the previous literature review this paper has selected the following independent variables:

- (1) Investment to paid capital (X_1), this ratio has been selected to express the percentage in the same ratio (10%). The second reason for selecting the investment ratio is that it expresses the proportion of bonds and shares. Cash to paid capital (X_2).
- (2) Government securities and secure certificate (X_3).
- (3) Algorithm of total assets (X_4).

4. Hypotheses and Objectives

- (1) Regulatory constraints are positively associated with return on equity in Egyptian insurance firms.
- (2) Regulatory constraints are positively associated with return on asset in Egyptian insurance firms.
- (3) Regulatory constraints are positively associated with liquidity in Egyptian insurance firms.

Objectives:

- (1) To investigate the impact of the regulatory constraints on financial performance of insurance companies in Egypt.

- (2) To mitigate the effect of the regulatory constraints on investment channels and instruments for high level of profitability (if there).
- (3) Possibility to modify the ratios of investment instruments.

5. Empirical Results and Discussion

A. Summary of descriptive analysis

The following table 1 reports the basic descriptive analysis of the financial performance variables liquidity, ROE and ROA with regulatory constraints variables investment, cash and government securities, and secure certificate as independent variables. This paper used a sample of (23) firms for (21) years for (399) observations which have supervision under Financial Authority in Egypt. Table 1 reports the descriptive analysis where row-1 mean, row-2 median, row- 3 max, row-4 min. row-5 standard division, row-6 skewness row-7 Jarque- Bera and probability.

Table 1 shows the size and liquidity have been represented statically with a significant impact on financial performance. This study is consistent with **Salah Eladly [47]** and **Jing Ai Vickie Bajtelsmit Tianyang Wang [48]** both of whom showed a statistically significant relationship between the firm size with financial performance. But the negative relationship has been noticed in literature review, for example **X. Chang et al [17]** used a sample of (420) Australian firms to investigate the financial constraints on Australia's firms' performance, they captured the results that the financial constraints minimize the sensitivity of investment to internal resources and beside increase cash in hand to internally gains funds by using a regression model.

Table 1. Descriptive statistics for regulatory constraints with financial performance during the period study

tests	Investment	Cash	Shares	Lnx4	ROE	ROA	Liquidity
Mean	0.017060	0.089519	0.043259	13.17006	0.138785	0.030481	0.844375
Median	0.015340	0.071977	0.038488	13.09981	0.139345	0.028420	0.851430
Maximum	0.044395	0.239380	0.114690	16.62014	0.474458	0.096811	0.997488
Minimum	0.000261	0.001307	0.000654	9.472166	-0.220321	-0.034591	0.595981
Std. Dev.	0.011564	0.059884	0.029442	1.507681	0.141172	0.024850	0.086929
Skewness	0.383055	0.313761	0.389552	0.240858	0.082026	0.208380	-0.440053
Kurtosis	2.236610	2.429707	2.229707	2.658386	2.899317	2.836910	2.877177
Jarque-Bera	19.44605	17.95589	19.95589	5.797972	0.615960	3.329772	13.12830
Probability	0.001***	0.001***	0.001***	0.055079	0.734930	0.189212	0.001410**
Observations	399	399	399	399	399	399	399

*** α Less than (0.001). ** α residual less than (0.01).

B. Univariate detection

Shan Ge [7] used Univariate analysis to test the relationship between financial constraints and product prices in life insurance; also **Salah Eladly [47]** used Univariate detection to analyze the relationship between risk performance and working capital management in insurance firms. However, both of them used this test to identify the presence of some outliers and extremes for each variable separately, omitted those outliers by using Box-and-Whisker Plots test for computing the values of both the lower quartile Q_1 and the upper quartile Q_3 , then calculating the interquartile range $IQR = Q_3 - Q_1$, and finally excluding the values less than $(Q_1 - 1.5IQR)$ and those higher than $(Q_3 + 1.5IQR)$ to replace missing values by using linear interpolation and complete these missing values by using the transform command.

C. Multivariate detection

This paper used multivariate analyses, which include two variables and more. For instance Ali **Gungoraydinoglu & Özde Öztekin [46]** used a multivariate model to test multidimensional variables, so this paper requires a means to objectively measure the multidimensional position of each observation relative to some common point. This version is addressed by the Mahalanobis D^2 measure, a multivariate evaluation of each observation across a multivariable. This approach measures each observation's distance in multidimensional space from the mean center of all observations, to provide a single value for each observation irrespective of the number of variables considered, and can remove

observations in this multidimensional when higher D^2 values represent observations farther removed from the general distribution.

The findings shown in the above Table 1, can be concluded that the normality distribution of this study proxies in terms of algorithm of total assets ($\ln x_4$), return on equity (Y_1), and return on assets (Y_2) the Jarque-Bera used to test at a significant level $\geq (0.05)$. On the other side, this paper variables investment X_1 , cash X_2 , government securities and secure certificate X_3 , and liquidity Y_3 have not normally distributed, since the significance of Jarque-Bera statistic is $\leq (0.05)$. But when the coefficient of the Pearson skewness is less than or equal (1) or greater than or equal to (-1), as shown on the above table 1, the data are not significantly skewed based on the review of literature findings, which refer to a positive relationship between regularity constraints and financial performance as for **Nader Alber & Hatem Ramadan [5]**, **Lukas Ahnert et al [6]** and **Swamy V. [9]** in contrast to this study's finding that the negative relationship between regulatory constraints and financial performance is consistent with **Mathew L. Higgins & Paul Thistle [2]**.

D. Testing of Group unit root

In this section, a set of tests were used as shown in the following table 2 to assure that variance and mean are invariant: the unit root test to investigate over the period 1999 to 2019, the stationary time series of the study period, the covariance is computed of the ROE, ROA and liquidity, with regulatory constraints issued by Law 10 for the year 1981, used the following statistical techniques:

Table 2. Group unit root test for regulatory constraints and financial performance during the period study

Tests	Statistic	Obs	Cross-sections	Prob.**
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-13.8434	2777	7	0.001***
ADF - Fisher Chi-square	220.536	2777	7	0.001***
PP - Fisher Chi-square	211.054	2786	7	0.001***
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-6.69540	2777	7	0.001***

*** $\alpha < (0.001)$.

As shown in the above table, the result shows that the stationary of the time series of the ROE (Y_1), ROA (Y_2), liquidity ratio (Y_3), investment X_1 , cash X_2 , government securities and secure certificate (X_3), and algorithm of total assets ($\ln x_4$), at level 1 $\sim (0)$ based on the constant level, through to the following criteria; LLC, IPSW, PP, and ADF, at a $\rho \geq (0.001)$, in consistence with **Mathew L. Higgins & Paul Thistle [2]**.

E. The model of Co-integrating equation

The purpose of this test is to measure the existence of long-term equilibrium relationship with non-stationary time series proxies ROE (Y₁), ROA (Y₂), liquidity (Y₃), investment (X₁), cash X₂ government securities and secure certificate X₃, and algorithm of total assets lnX₄; this paper used Engle–Granger Co-integration tests in the following Table 3:

Table 3. The model of Co-integrating for financial performance with regulatory constraints

Variables	tau-statistic	Prob.*	z-statistic	Prob.*
ROE (Y ₁)	-15.92248	0.001***	-317.8018	0.001***
ROA (Y ₂)	-7.545909	0.001***	-101.1017	0.001***
L (Y ₃)	-8.353389	0.001***	-120.0785	0.001***
Investment (X ₁)	-8.795828	0.001***	-130.7136	0.001***
Cash (X ₂)	-7.869344	0.001***	-108.2697	0.001***
GOV. (X ₃)	-13.79549	0.001***	-263.3513	0.001***
LN _{X4}	-8.654998	0.001***	-110.0235	0.001***

*** $\alpha < (0.001)$.

As shown in above Table 3, where panel A is dependent and independent variables, panel B Tau test panel C Prob. Panel D Z test shows that a long-run equilibrium associated among the (ROE Y₁, ROA Y₂, Liquidity Y₃), and independent variables (X₁, X₂, X₃, lnX₄) from 1999 to 2019, based on the Tau-statistic, and z-statistic, at a significant level less than (0.001).

F. The Pearson correlation matrix tests

Table 4. Pearson correlation matrix to measure a significant linear relationship between the constructs of both regulatory constraints and financial performance variables

Constructs	ROE	ROA	Liquidity	Investment	Cash	Gov. Securities	Algorithm of total assets
ROE	1						
ROA	0.398***	1					
L	0.441***	0.439***	1				
Investment	-0.456***	-0.444***	-0.455***	1			
Cash	-0.491***	-0.493***	-0.384***	0.488***	1		
Gov. securities	-0.513***	-0.460***	-0.360***	0.484***	0.469***	1	
Algorithm of total assets	0.524***	0.522***	0.436***	-0.541***	-0.591***	-0.587***	1

*** $\alpha < (0.001)$.

Table 4 shows negative and significant linear correlations with the construct dependent variables ROE Y₁, ROA (Y₂), and liquidity (Y₃) and the construct of the variables investment (X₁), cash (X₂), and government securities and secure certificate (X₃), at a $\rho \geq (0.001)$. Also, there are positive and significant linear associated with the construct dependent variables in ROE (Y₁), ROA (Y₂), and liquidity (Y₃) with the construct of algorithm of total assets (lnX₄) at a $P \geq (0.001)$.

G. The model of SEM:

Salah Eladly [47] used structural equation model to investigate the multivariate functional data and conceptual framework using AMOS23. And **Kuang Y Lee & Lexin**

Li [49] also used the structural equation model for estimating multivariate data. So, this paper has selected SEM because this technique provides the most efficient estimation techniques consisting of a series of separate multiple regression equations estimated simultaneously where constructs could be represented by a summated scale. Also SEM clearly distinguishes between unobserved theoretical constructs and imperfect empirical measures, and it is covariance-based rather than variance-based.

The following figure 1 shows SEM for investigating the construct of the independent proxies in terms of investment, cash, government securities and lnX₄ on the construct of the dependent variables in terms of Return On Equity Y₁, Return On Assets Y₂, and Liquidity Y₃.

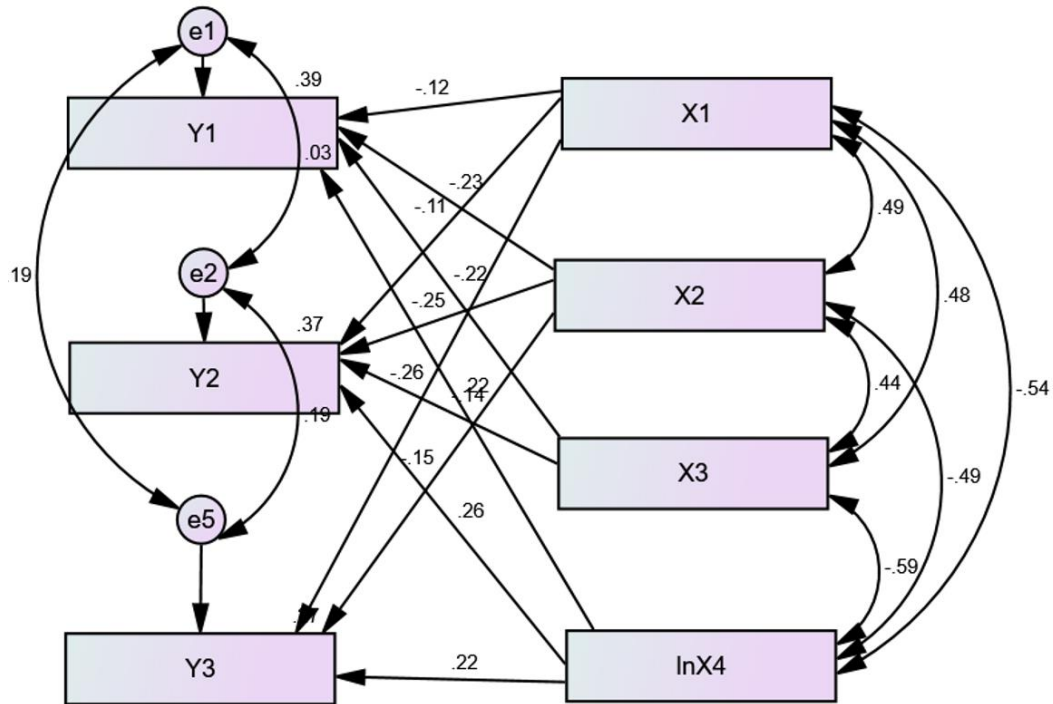


Figure 1. Structural Equation Model

Table 5. Regression weights for testing the effect of the construct of investment, cash, government securities and lnX4 on the construct of ROE, ROA, and liquidity for estimating Maximum Likelihood

	Path	Standardized estimate	Unstandardized estimate	S.E.	C.R.	SIG.
Y3	<--- X1	-.264	-.184	.031	-5.876	0.001***
Y1	<--- X2	-.230	-.221	.038	-5.755	0.001***
Y1	<--- X3	-.223	-.208	.039	-5.360	0.001***
Y2	<--- X3	-.139	-.137	.042	-3.290	0.001***
Y2	<--- lnX4	.257	.234	.041	5.669	0.001***
Y3	<--- lnX4	.222	.142	.029	4.928	0.001***
Y2	<--- X2	-.253	-.256	.041	-6.218	0.001***
Y1	<--- lnX4	.216	.186	.038	4.846	0.001***
Y3	<--- X2	-.147	-.105	.031	-3.384	0.001***
Y2	<--- X1	-.110	-.109	.042	-2.593	0.001***
Y1	<--- X1	-.120	-.113	.039	-2.876	0.004**

Normed Chi-Square=1.888 probability level=0.169 GFI=0.999 AGFI=0.973 NFI=0.999 IFI=0.999 TLI=0.987 CFI=0.999
RMSEA=0.040RFI=0.973, RMR= 0.006

*** $\alpha < (0.001)$, ** $\alpha < (0.01)$.

The results show for testing as following.

The model fit is evaluated in terms of ten indices as following as the table includes:

- Where the value was 1.88, indexed value of Chi-Square with cut-off values $\geq (5)$
- The value of Normed Fit Index (NFI) Value .999
- The value of Goodness-of-fit index (GFI) value .999
- The value of Tucker-Lewis Index .987
- The value of -Adjusted Goodness of Fit Index .973
- Relative Fit Index (RFI) value .973
- The value Incremental Fit Index .999
- The value Comparative Fit Index .999
- The value of Root Mean Square Residual Approximation .040
- The value of Root Mean Square Residual .006, if CFI > 0.95 then a model is satisfactory, GFI > 0.90, RMR < 0.08 and RMSEA < 0.08

The above table 5 shows the rejection of the first hypothesis.

The result of first hypotheses shows that testing of the

relationship between the financial constraint and ROE shows a significant negative impact of the construct of investment (X_1), cash (X_2), and government securities and secure certificate (X_3) as independent proxies on the construct of the dependent proxy in terms of return on equity (Y_1), at a significant level less than (0.01), but the later the proxy of the algorithm of total assets (lnx_4) has a positive impact on the proxy ROE (Y). This validates the first research hypothesis; the independent variables investment (X_1), cash (X_2), government securities and secure certificate (X_3) and the algorithm of total assets (lnx_4) have a significant impact on the ROE (Y_1), with the regression model as the follows:

$$y_1 = -0.120x_1 - 0.230x_2 - 0.223x_3 + 0.216lnx_4$$

The exogenous proxies were accepted, investment (X_1) cash, (X_2) government securities and secure certificate (X_3) and algorithm of total assets lnx_4 , in structural equation model explain (39.4%) from total variation of the variable; ROE (Y_1), the rest percent comes from either the random error in the regression model or other Independent proxies excluded from regression model. This study is consistent with **Aviner Augusto S. Manoel et al [34]** and **Minhua Yang [8]** on the effect of the financial constraints on cash holding or ability to reinvest their profit on contrast of this paper as for **Shan Ge [7]** revealed that the financial constraints affected directly product prices, also this result is consistent with **Siddarth Roche et al [22]** that the firm size is a significant positive with regulatory constraints. On the other hand **Martin F. Grace & Richard D. Phillips [1]** and **Minhua Yang [8]** presented evidence of insurance domestic firms have high level of profitability.

Regarding to the second hypothesis, the results show that they are rejected. The result shows a negative and significant impact of the construct of the independent variables investment (X_1), cash X_2 , and government securities on the construct of the dependent variables return on assets, at a $P \geq (0.01)$, but the later independent variable of the algorithm of total assets (lnx_4) has a positive effect on the dependent variable of return on assets. This validates the second research hypothesis: the relationship between (investment X_1 , cash X_2 , government securities and secure certificate X_3 and algorithm of total assets* lnx_4) as the independent variables are a significant impact on return on assets as dependent variable in a regression model as follows:

$$y_2 = -0.110x_1 - 0.253x_2 - 0.139x_3 + 0.257lnx_4$$

The exogenous proxies were accepted, investment (X_1), cash X_2 , government securities and secure certificate (X_3) and algorithm of total assets (lnx_4), in structural equation model explain (37.1%) from total variation of dependent variable ROA (Y_2), the rest percent comes from other the random error in the regression model and independent variables excluded from regression model, as for **Clifford**

A Ball & Hans R Stoll [12] using operator training simulator model to evaluate the capital regulations requirements, documented the regulatory constraints requirements distort the investment decision and it is adversely affected in incentive investment in us banks but the difference in scope of applying on contrast with this study. For **Georgios Efthymoulou & Prit Vahter [36]** whose finding refers to the positive relationship, contrast that study with **Swamy V. [9]**, where the relationship between the financial regulations is positive with turn on equity.

The third hypothesis result shows that there is a significant negative impact of the construct of the independent proxies investment X_1 , and cash X_2 on the construct of the dependent variables in terms of liquidity (Y_3), at a $\rho \geq (0.001)$, but the later independent variable of algorithm of total assets lnx_4 is a significant and positive impact on the dependent proxy of liquidity (Y_3). This validates the third research hypothesis; regulatory constraints variables of investment (X_1), cash (X_2), and the algorithm of total assets (lnx_4) have a significant effect on liquidity (Y_3), with the regression model as follows:

$$Y_3 = -0.264X_1 - 0.147X_2 + 0.222lnX_4$$

The exogenous variables were accepted, investment X_1 , cash X_2 , and the algorithm of total assets (lnx_4) in SEM explain (27.3%) of the total variation of dependent variable; liquidity (Y_3); the rest of percent comes from either the random error in the regression model or other independent variables excluded from the regression model.

The test of the Root Mean Square Residual Approximation (RMSEA) and Root Mean Square Residual (RMR) less than (0.08), which refers a close fit of the theoretical model to the actual model. Results consistent with **Weixi Liu & Ian Tonks [43]** concluded the negative relationship between the financial constraints with corruption, and the positive relationship with investment, and **X. Chang et al [17]** however, the government securities and secure certificate have insignificant relationship X_3 with liquidity Y_3 .

6. Conclusions

This study used a sample structural equation model of regulatory constraints issued by Egyptian Financial Supervisory Authority under Law 10 for the year 1981 to examine the financial performance of Egyptian insurance firms measured by return on equity, return on assets and liquidity:

- (1) The first hypothesis result shows that the relationship between regulatory constraints and return on equity is such that there is a significant negative effect of the construct the independent variables in terms of investment, cash, and government securities and secure certificates (X_3), on the dependent proxy,

return on equity, at a significant level less than (0.01). However, the later independent proxy of the algorithm of total assets ($\ln x_4$) has a positive impact on the dependent proxy in terms of return on equity. This validates the first research hypothesis, as the independent variables investment, cash, government, secure certificate, and algorithm of total assets have a significant effect on the dependent variable return on equity (Y_1), which is consistent with **Minhua Yang and Siddarth Roche et al [8, 22]** in controlling for the variable size of the firm. This result contrast with **Martin F. Grace & Richard D. Phillips [1]**, is also consistent with **X. Chang et al [17]**. This article presented evidence of insurance demotic firms which have a great level of regulations and achieved a high level of profitability, but some of the small domestic insurance firms have less profitability than the others.

- (2) The Second hypothesis result shows a significant negative impact of the independent proxies investment, and cash on the dependent variables return on assets, at a significant level less than (0.001). However, the later independent variable of the algorithm of total assets ($\ln x_4$) has a positive effect on the dependent variable of return on assets. This validates the second research hypothesis, as the independent variables investment, cash, and algorithm of total assets ($\ln x_4$) have a significant effect on the dependent variable return on assets. On other hand, for **Nader Alber & Hatem Ramadan [5]** in banking sector, the result was positive in terms of liquidity constraints in banking performance.
- (3) The third hypotheses finding indicates that a significant negative effect of the independent variables investment X_1 , and cash X_2 on the dependent variable liquidity, at a significant level less than (0.001). However, the later independent variable of ($\ln x_4$) has a positive effect on the dependent variable liquidity. This validates the third research hypothesis, as the independent variables investment, cash, and algorithm of total assets have a significant effect on the dependent variable liquidity, but an insignificant relationship with government securities. This result was contrast with **L. Nguyen & A. C. Worthington [3]**. The result showed the regulations and size affected the efficiency of Australian private insurer.

Recommendations

- (1) The paper results conducted to investigate the negative relationship between the regulatory constraints and financial performance so the Egyptian financial authority should mitigate the Regulatory constraints in terms of investment channel and the investment ratio.
- (2) Future studies should test the suggestion ratio on financial performance.

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