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Determination of Camels model on bank's performance

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Abstract

Banks need a way to evaluate performance and consider some important financial ratios and find the strengths and weaknesses. "CAMELS" model is a way to calculate and evaluate banks and financial institutions' performance. Capital adequacy, Asset quality, Management soundness, Earnings and profitability, and Liquidity and Sensitivity are the focus points of this rating.

In this study the effects of each category of CAMELS are studied on performance. Q-Tobin's ratio is put as performance indicator. And also, data which is used in this study is gathered from annual financial reports of an Iranian bank and at the end, the model is extracted from analyses. With CAMELS studies, banks can focus on risk and some important ratios and try to manage and control some possible crisis.

Keywords: CAMELS model, Bank's Performance, Ratios

1. Introduction

The banking sector occupies a very important position in the country's economy, acting as an intermediary to all industries, ranging from agriculture, construction, textile, manufacturing, and so on. The banking industry thus contributes directly to national income and its overall growth (Dash & Das, 2009) and although the banking sector is the backbone of any economy and this gains more importance for a country (Chandani *et al.*, 2014). As the banking sector has a major impact on the economy as a whole, evaluation, analysis, and monitoring of its performance is very important (Dash & Das, 2009). Overall, financial markets are defined as a system which brings economic actors together that need funds and have overmuch sources. In this structure, it is necessary for the third parties called as financial intermediates to reduce the risks and to provide effective fund transfer (Dincer *et al.*, 2011)

Bank is very old institution that is contributing toward the development of any economy and it's treated as an important service industry in modern world. Nowadays the function of bank is not limited to within the same geographical limit of any country. It is an important source of financing for most businesses. The common assumption, which underpins much of the financial performance research and discussions, is that increasing financial performance will lead to improved functions and activities of the organizations (Nimalathasan, 2008)

Simply stated much of the current bank performance literature describes the objective of financial organizations as that of earning acceptable returns and minimizing the risks taken to earn this return (Hempel *et al.*, 1996).

Generally, the financial performance of banks and other financial institutions has been measured using a combination of financial ratios analysis, benchmarking, measuring performance against budget or a mix of these methodologies (Avkiran, 1995).

Bank performance is one of the vital issues for the healthy functioning of economy. Although the measures evaluating bank performance are ample in amounts (Ozturul, 2011). In order to ensure a healthy, solid and stable banking sector, the banks must be analyzed and evaluated in a way that will allow the smooth correction and removal of the potential vulnerabilities (Roman & Sargu, 2013) because bank play crucial role in the economic life of the nation (Dincer *et al.*, 2011) and bank have a prominent role in the financial and business environment (Doupoumis & Zopounidis, 2010). Even if banks seem to create no new wealth, the transactions such as borrowing and lending actually expedite the process of production, distribution, exchange and consumption of wealth (Dincer *et al.*, 2011).

2. CAMELS' framework

In recent years one of the most used models for the estimation of a bank performances and soundness is represented by the CAMELS framework (Roman & Sargu, 2013). Actually, the analytical framework is based on the CAMELS rating system, a device created by federal banking regulators to assess the overall performance of banks (Rose & Hudgins, 2010).

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In order to evaluate banks' overall financial condition, CAMELS supervisory rating system is built and introduced first in USA for on-site monitoring. Now, it is used both on-site and off-site monitoring purposes (Kaya, 2001).

The central banks that are responsible for supervising the banks in each country use rating system to assess the soundness of the banks (Doumpos & Zopounidis, 2010). Due to lack of sufficient historical data about bank defaults, bank rating system are usually based on empirical assessment techniques (Sahajwala & Van den bergh, 2000). Credit agencies, auditors and bank regulators have traditionally relied on the CAMELS model (Pasiouras *et al.*, 2006)

Actually the most effective way to enforce financial rules and regulations in the financial supervisory system is to conduct financial examinations (Kao & Liu, 2004). The most popular approach is based on the CAMELS framework, which involves the consideration of six major factors (Doumpos & Zopounidis, 2010). The CAMEL acronym stands for Capital adequacy, Asset quality, Management, Earning and Liquidity. Regulators created an additional measure, Sensitivity, to evaluate market risk associated with changing interest rates and other factors (H. Hays *et al.*, 2009), especially in the financial crisis (Kandrac, 2014).

CAMELS rating are calculated in order to show financial performance of the banks in different respects (Ozturul, 2011). This system is a natural object of analysis, as it is not only a widespread supervisory tool, but also one of the few generally accepted quantifiers of the otherwise soft notion of bank safety (Derviz & Podpiera, 2008). CAMELS ratio model is very suitable and accurate to be used as a performance evaluator banking industries and to predict the failure rate (Salhuteru & Wattimena, 2015).

This system relies on various financial ratios obtained from periodic reports of the entities under their jurisdiction. The ratios are also aggregated into performance indices based on various weighting or scoring schemes. The aggregation of the ratios can be a complicated process involving subjective judgment. The changing economic conditions have made such aggregations even more difficult, increasing the need for a more reliable way to express a bank's financial condition (Kao & Liu, 2004).

By concentrating on the top line and bottom line, banks across the board have improved their profit while reducing their operational costs and more number of banks has improved their financial performance by using the concept of mergers and acquisitions. CAMEL rating is used by most banks across the world as a performance evaluation technique (Raiyani, 2010)

Elizabeth and Elliot (2004) indicated that all financial performance measure as interest margin, return on assets, and capital adequacy are positively correlated with customer service quality. To assess the performance of the bank is necessary to report the financial reports usually consists of a balance sheet, income statement, cash flow statement, statement of changes in equity and notes to the financial statement (Salhuteru & Wattimena, 2015). Some data from financial ratios are often compared to CAMELS in correctly identifying or predicting crisis events but sometimes, the relevant factors behind future failures or rating downgrades are satisfactorily captured by judiciously constructed risk-sensitive summary statistics of conventional balance sheet data (Derviz & Podpiera, 2008).

3. Some important indicators in prior studies of CAMELS model

Table 1: Some important indicators

Author	Title of study	Year	Capital	Asset quality	Management quality	Earnings	Liquidity	Risk
Dincer, H., Gencer, G., Orhan, N., & Sahinbas, K.	A Performance Evaluation of the Turkish Banking Sector after the Global Crisis via CAMELS Ratios	2011	Equity to (Loan + Market + Principle Amount Subject to Operational Risk) / Equity to Total Assets/ Equity to (Deposit + Non-deposit Sources)	Financial Assets to Assets/ Loans and Receivables to Assets /Permanent Assets to Assets	Interest expenses to total expenses/interest incomes to total incomes/total incomes to total expenses	Net Profit to Total Assets/Net Profit to Equity	liquid assets to Assets/liquid assets to short term liabilities/liquid assets to deposit and non-deposit sources	Total Assets to Sector Assets/ (Loans and Receivables) to (Sector Loans and Receivables)/ Deposits to Sector Deposits
Roman, A., & Şargu, A. C.	Analysing the Financial Soundness of the Commercial Banks in Romania: An Approach Based on the Camels Framework	2013	CAR/equity to total asset	Impaired loans to gross loans /loan loss provision to net interest revenue /total loans to asset	Operating expenses to asset/interest expenses to Deposits	ROA/ROE/cost to income ratio	liquid assets to (deposit and short term funding)/Net loans to (deposit and short term funding)	The ratio of its assets to the assets
Chandani, A., Mehta, M., & Chandrasekaran, K. B.	A Working Paper on the Impact of Gender of Leader on the Financial Performance of the Bank: A Case of ICICI Bank (india)	2014	CAR/ proportion of debt to capital/Debt to assets/bond investments to assets	Noncurrent receivables gross to debt/ Noncurrent debt to debt/Loans to assets/Noncurrent net debt to loans	Debt to deposits/ Returns per employee	Operating profit to average capital turnover rate/ margin or net profit to assets/ interest income to income	Securities to assets/Assets to deposits	-
Rodica-Oana, I.	The evolution of Romania's financial and banking system	2014	Solvability ratio/ Equity ratio	Risk ratio/Interbank loans and investments to assets/Loans to Assets/Net overdue and doubtful loans to Loans/Net overdue and doubtful claims to Assets/Net overdue and doubtful claims to Attracted and borrowed funds/ NPL/Total amounts due and overdue/Debtors and overdue debtors number/ Number of loans	State banks and with state major ownership / Private banks and with private ownership/Banks legal persons/Branches of foreign banks	Total provision Loss category	Effective liquidity to Required liquidity	Loans granted and commitments assumed by bank in some currency
Kao, C., & Liu, S. T.	Predicting bank performance with "financial forecasts:A case of Taiwan commercial banks	2004		Deposits/ Interest expenses to Noninterest expenses/Loans /Interest income to non-interest income				
Kandrac, J.	Modelling the causes and manifestation of bank stress:an example from the financial crisis	2014		Stress indices bank				
Derviz, A., & Podpiera, J.	Predicting bank CAMELS and S&P ratings: the case of the Czech Republic			CAR/ assets/ Loans to Assets				
Salhuteru, F., & Wattimena, F. (Bank Performance with CAMELS Ratios towards earnings management practices In State Banks and	2015		CAR/ Profit before tax to assets/ ROA/ Net profit margin/ Loan to Deposit				

Private Banks								
Hays, F. H., De Lurgio, S. A., & Gilbert, A. H.	Efficiency Ratios and Community Bank Performance	2009	Capital to assets	-	Salaries and benefits to average assets	ROA	Liquidity ratio	The relationship between interest rate sensitive assets and liabilities sensitive to interest rate/ GDP
Soni, R.	Applicability of CAMELS Rating for Supervisory Regulation of the Indian Banking	2012	CAR/ Debt to capital/ Debt to assets/ Investment securities to assets	Non-current receivables to total receivables/Noncurrent debt to assets/Investments to assets/percent changes in non-current receivables	Total debt to total deposits/Per capita profit per employee/ROE/ Earnings per employee	Operating profit to average working capital/ margin to total assets/Net profit to assets/Interest income to total income/Non-interest income to total income	Liquid assets to total deposits/Securities to assets	-
Gunsel, N.	Financial ratios and the probabilistic prediction of bank failure in North Cyprus	2007	Total capital to assets/Loans to assets	Loan to assets	Operating costs to assets/Interest expense to total deposits	Net income to total assets/Interest income to assets	Liquid assets to total deposits/ Deposits to total loans	Assets to assets of the banking system
Iqbal, M. J.	Banking sector's performance in Bangladesh-An application of selected CAMELS ratio	2012	CAR	NPL	-			
Rozzani, N., & Rahman, R. A.	Camels and performance evaluation of banks in Malaysia: conventional versus Islamic	2013	Earning to assets	NPL	Staff costs to assets	ROA/ROE	Net loans to (deposits and short-term financing)/Short-term liquid assets to deposits and financing	Risk sharia
Dash, M., & Das, A.	A CAMELS Analysis of the Indian Banking Industry	2009	CAR	(Gross noncurrent receivables, net of non-current receivables, net of noncurrent receivables) to loans	Investment to assets/ Loans to deposits/Per capita revenue /per capita income	Operating profit to average working capital/ Net profit to assets/ROE	Securities to investment/Securities to assets	EBTA
Venkatesh, D., & Suresh, C.	Comparative Performance Evaluation of Selected Commercial Banks in Kingdom of Bahrain Using CAMELS Method.Chithra	2014	CAR/Equity to assets/ Net capital to facilities/Capital to short-term funding/ Capital to debt	Loan loss reserve to gross loans/ Loan loss provisions to net interest revenue/ loan loss reserve to impaired loans /Net charge offs to average gross loans/ impaired loans to equity	Noncurrent loans to equity/Non operational items to net income/Equity to asset/Operating profit to total risk weighted asset	Rate margin/ cost of assets minus interest income divided by average assets/ other operating income to assets/ ROA/Equity ratio of operating expenses to operating income/ Noninterest expenses to assets	Receivables from other banks divided by debt to other banks/ Assets to loans/ Net loans to short-term deposits/ Net loans to total deposits/ Cash to short-term deposits/ Cash to deposits	The risk of interest rate/ exchange rate risk/ risk stocks

3. Research methodology

3.1. Research type

The type of this study is applied in terms of aim to find the relation between bank's performance and any cluster of CAMELS ratios. It is Cross-correlation to define relative indicators of CAMELS for bank.

3.2. Research Variables

3.2.1. Dependent variable

Performance can be shown with some ratios and tools. Banks need to find a system to evaluate performance. One of ratio that can be useful and practical to evaluate and decide is Tobin's Q ratio (Vafeas & Theodorou, 1998 and Rostami, 2015). In this study, performance of bank is dependent variable which is presented with Tobin's Q ratio. This ratio is calculated by the sum of market value and book value debts to book value assets. This ratio is devised by James Tobin of Yale University (Mehrani *et al.*, 2013 and Sadeghi *et al.*, 2009)

3.2.2. Independent variable

In this study, six categories of ratios according to CAMELS categories are applied and summarized to define CAMELS model in each group of ratios. Those categories as Gungel, N., (2005) & Nimalathan, B., (2008) & Peterson, (2006) and Sarker (2005) pointed, are:

- **Capital (C)** The first variable group is the indicators of capital and relevant indicators those present capital, the ratio of capital to assets and show organization strengths.
- **Asset Quality (A)** Asset quality ratios are one of the main risks that banks face. As loans have the highest default risk, an increasing number of non-performing loans shows a deterioration of asset quality.
- **Management Quality (M)** As management is a qualitative issue, such as the ability for risk taking, it is usually difficult to measure the quality of management. The management quality of a bank can be measured by some important ratios those are used in CAMELS model.
- **Earning Ability (E)** Earning is the most important performance measurement of banks. The ratios of earning and relative financial ratios are calculated in this study.
- **Liquidity (L)** Liquidity risk measures an institution's ability to meet unanticipated funds that are claimed by depositors. Liquidity ratios are expected to be both positively and negatively related to the likelihood of failure those are set in model.
- **Sensitivity (S)** Sensitivity ratios those are related to risk and covering power of organization that are defined and calculated to finalize bank's performance model because risk indicators is very important and highlighted in CAMELS model.

In figure 1, CAMELS model is shown to clarify six categories.

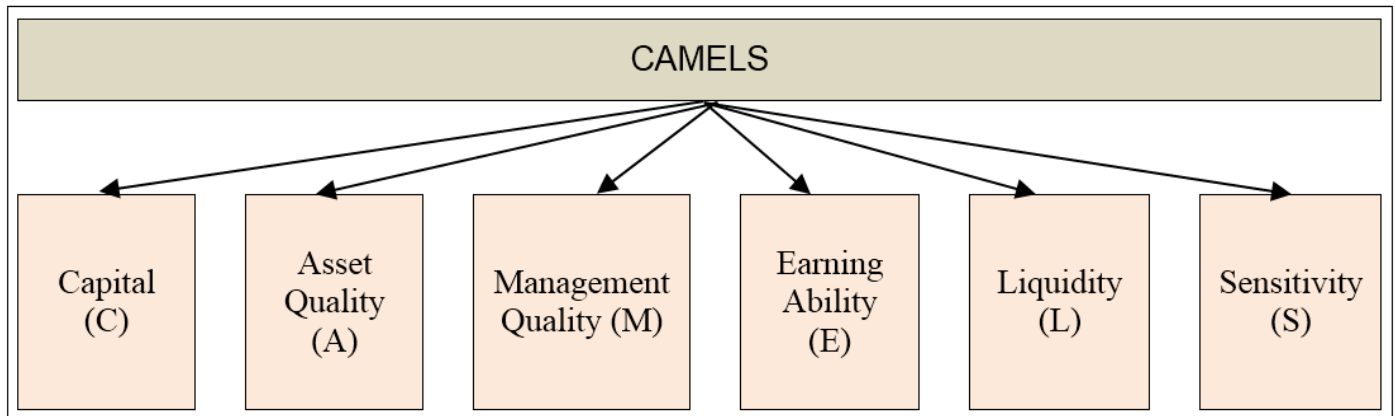


Fig 1: CAMELS model

In each category, 5 indicators are chosen and analyzed in CAMELS model to find best model for forecasting future trend and destination. All ratios those are used in bank's

performance model based on CAMELS framework as independent variables are defined as follow in table 2.

Table 2: Research indicators

Ratios	Indicators	Definition
Capital	TIER1	Total shareholders' equity/Total risk-weighted assets
	TIER2	Total complementary capital/Total risk-weighted assets
	CAR	Total capital base/ Total complementary capital
	TLTE	Liabilities/ Equity
	TDTE	Deposits/Equity
Assets quality	EATA	Rate base assets /Total assets
	TBPA	Bank shares of income/Total assets
	DA	Deposits/Total assets
	TAEA	Fix assets/Equity
	FIX	Fix assets/Total assets
Management quality	TPTB	Net profit/Number of branches
	TATB	Total assets/Number of branches
	TLTB	Total liabilities/Number of branches
	TDTB	Total deposits/Number of branches

	TFTB	Total loans/Number of branches
Earnings	FTI	Fees and commissions/Total Income
	PF	Loan income/Loans
	PD	Deposit cost/Deposit
	PP	Loan income/Deposit cost
	OI	Cost/Income
Liquidity	INTA	(Investment/Total assets)
	VTC	Current liquidity/Deposits
	OTA	Security/Total assets
	VD	Current liquidity/(Demand deposits)
	LI	Liquidity/Assets
Sensitivity and risk	NPL	Doubtful debts/Loans
	PROV	Provisions of loan/Loans
	NPL2	(Bad debts + Overdue)/Loans
	OPER	Long term deposits/Deposits
	DD	Demand deposits/Deposit

3.3. Data collection

Data which is used in this study is gathered from annual financial reports of an Iranian bank.

3.4. Research analysis

The data are analyzed with Eviews and Microsoft Excel software.

3.5. Results and discussion

3.5.1. Performance figure

The direction of "Bank Performance" is shown by figure 2.

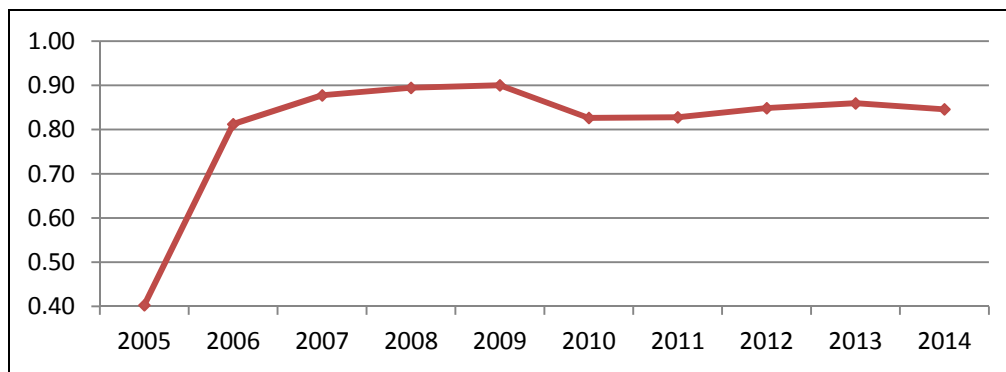


Fig 2: Q-Tobin direction

3.5.2. Estimation of model

According to extracted results, the model of "Bank Performance" based on Q-Tobin indicator as it is noticed, is estimated. In the model as dependent variable equal to some coefficient multiple independent variables plus a fix amount. This model is finalized at bank based on information in 2005 - 2014. This model can predict the relationship between CAMELS's categories and Tobin's Q ratio in bank. This is clear that Prob (F-statistic) is less than 0.05, so, this model is accepted and there is a logical relationship between dependent and independent variables and also, all coefficients are significant. According to results, R-squared amount is shown that estimation can explain variables well and the changes of independent variable were presented with independent variables completely. If the model considers degree of freedom, Adjusted R-squared is close to one and is logical. Amount of these R-squared and Adjusted R-squared show that the specified model makes the certainty properly for deciding and other analyses. Durbin-Watson statistic is suitable to distinguish autocorrelation disturbance components in regression model.

3.5.3. Normality test

According to normality test result, Jarque-Bera test and probability more than 0.05, it is concluded that the normality

of distribution of residual sentences and also the skewness and kurtosis of model are probed final model of "Bank Performance".

3.5.4. Autocorrelation test

Autocorrelation test (Breusch-Godfrey Serial Correlation LM Test) is shown the Prob (F-statistic) is more than 0.05 and this point is reviewed there is not autocorrelation from higher than one in the finalized model of "Bank Performance".

3.5.5. Heteroskedasticity Test

One of important hypothesis test is Heteroskedasticity Test for finding homogeneity of variance. If there is not the same variance in terms of disruption will be accrued the anisotropy of variance in model. In this model the results of Heteroskedasticity Test based on Breusch-Pagan-Godfrey are shown that the Prob (F-statistic) is more than 0.05 and this point probe that the model does not have problem with variance.

The estimation of model, Normality test, Autocorrelation test and Heteroskedasticity test of each category are calculated as follows:

a. Capital ratios

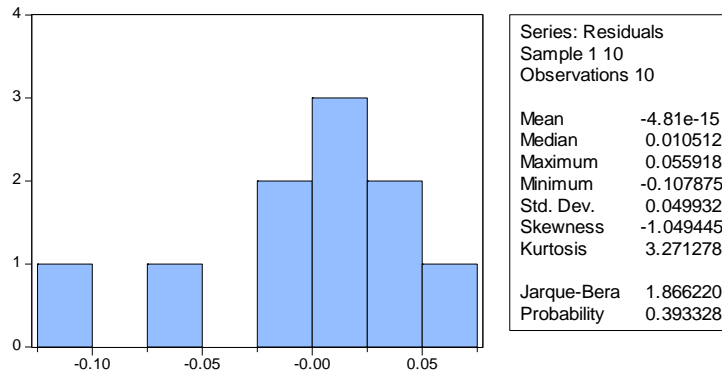
a. 1. Estimation of model

R-squared	0.884336	Mean dependent var	0.810000
Adjusted R-squared	0.739755	S.D. dependent var	0.146818
S.E. of regression	0.074898	Akaike info criterion	-2.061669
Sum squared resid	0.022439	Schwarz criterion	-1.880118
Log likelihood	16.30834	Hannan-Quinn criter.	-2.260830
F-statistic	6.116569	Durbin-Watson stat	1.455022
Prob(F-statistic)	0.051909		

a. 2. Research model (Substituted Coefficients)

$$Q = 0.27920 + 1.75178 \cdot \text{TIER1} + 1.82387 \cdot \text{TIER2} - 1.74595 \cdot \text{CAR} - 0.0330261725468 \cdot \text{TLTE} + 0.10054 \cdot \text{TDTE}$$

a. 3. Normality test



a. 4. Autocorrelation (Breusch-Godfrey Serial Correlation LM Test)

F-statistic	6.889154	Prob. F(2,2)	0.1268
Obs*R-squared	8.732437	Prob. Chi-Square(2)	0.0127
R-squared	0.873244	Mean dependent var	-4.81E-15
Adjusted R-squared	0.429597	S.D. dependent var	0.049932
S.E. of regression	0.037711	Akaike info criterion	-3.727157
Sum squared resid	0.002844	Schwarz criterion	-3.485089
Log likelihood	26.63579	Hannan-Quinn criter.	-3.992706
F-statistic	1.968330	Durbin-Watson stat	2.736558
Prob(F-statistic)	0.377737		

a. 5. Heteroskedasticity (Breusch-Pagan-Godfrey)

F-statistic	0.306062	Prob. F(5,4)	0.8869
Obs*R-squared	2.767134	Prob. Chi-Square(5)	0.7358
Scaled explained SS	0.502794	Prob. Chi-Square(5)	0.9920
R-squared	0.276713	Mean dependent var	0.002244
Adjusted R-squared	-0.627395	S.D. dependent var	0.003565
S.E. of regression	0.004547	Akaike info criterion	-7.664821
Sum squared resid	8.27E-05	Schwarz criterion	-7.483270
Log likelihood	44.32411	Hannan-Quinn criter.	-7.863982
F-statistic	0.306062	Durbin-Watson stat	1.949254
Prob(F-statistic)	0.886889		

b. Asset quality management ratios

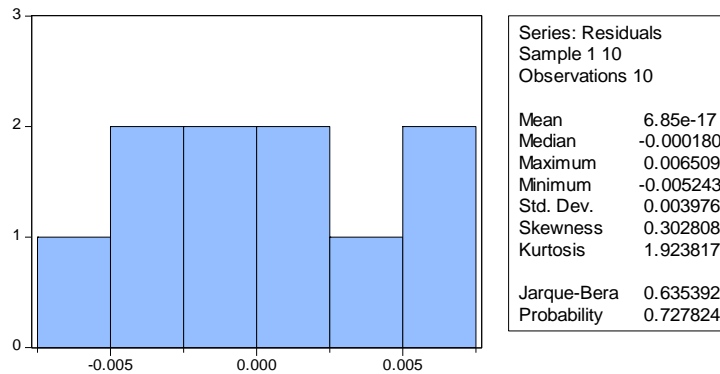
b. 1. Estimation of model

R-squared	0.999266	Mean dependent var	0.810000
Adjusted R-squared	0.998349	S.D. dependent var	0.146818
S.E. of regression	0.005965	Akaike info criterion	-7.122205
Sum squared resid	0.000142	Schwarz criterion	-6.940654
Log likelihood	41.61102	Hannan-Quinn criter.	-7.321366
F-statistic	1089.770	Durbin-Watson stat	2.903328
Prob(F-statistic)	0.000002		

b. 2. Research model (Substituted Coefficients)

$$Q = 0.27438 - 0.00036 * EATA - 0.00337 * TBPA + 0.0074 * DA + 0.06119 * TAEA + 0.01225 * FIX$$

b. 3. Normality test



b. 4. Autocorrelation (Breusch-Godfrey Serial Correlation LM Test)

F-statistic	4.894830	Prob. F(2,2)	0.1696
Obs*R-squared	8.303598	Prob. Chi-Square(2)	0.0157
R-squared	0.830360	Mean dependent var	6.85E-17
Adjusted R-squared	0.236619	S.D. dependent var	0.003976
S.E. of regression	0.003474	Akaike info criterion	-8.496280
Sum squared resid	2.41E-05	Schwarz criterion	-8.254212
Log likelihood	50.48140	Hannan-Quinn criter.	-8.761828
F-statistic	1.398523	Durbin-Watson stat	2.100185
Prob(F-statistic)	0.478286		

b. 5. Heteroskedasticity (Breusch-Pagan-Godfrey)

F-statistic	0.757971	Prob. F(5,4)	0.6230
Obs*R-squared	4.865118	Prob. Chi-Square(5)	0.4326
Scaled explained SS	0.359558	Prob. Chi-Square(5)	0.9964
R-squared	0.486512	Mean dependent var	1.42E-05
Adjusted R-squared	-0.155349	S.D. dependent var	1.44E-05
S.E. of regression	1.55E-05	Akaike info criterion	-19.02806
Sum squared resid	9.61E-10	Schwarz criterion	-18.84650
Log likelihood	101.1403	Hannan-Quinn criter.	-19.22722
F-statistic	0.757971	Durbin-Watson stat	2.985282
Prob(F-statistic)	0.622970		

c. Management quality ratios

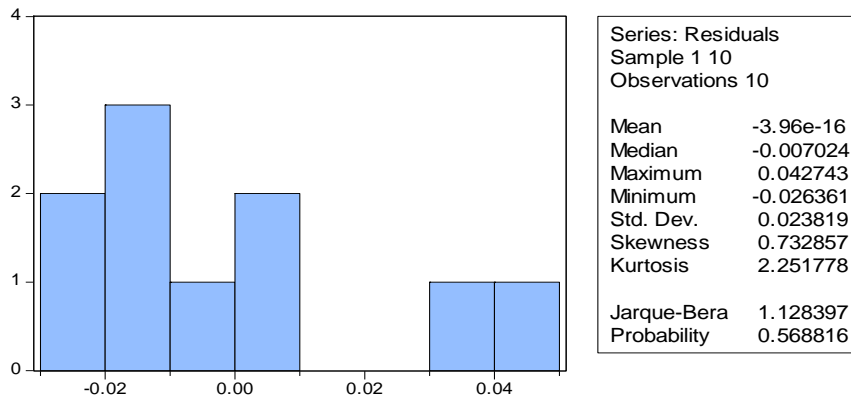
c. 1. Estimation of model

R-squared	0.973681	Mean dependent var	0.810000
Adjusted R-squared	0.940781	S.D. dependent var	0.146818
S.E. of regression	0.035728	Akaike info criterion	-3.542052
Sum squared resid	0.005106	Schwarz criterion	-3.360501
Log likelihood	23.71026	Hannan-Quinn criter.	-3.741213
F-statistic	29.59578	Durbin-Watson stat	2.314662
Prob(F-statistic)	0.002951		

c. 2. Research model (Substituted Coefficients)

$$Q = 0.82324 + 2.986634 * TPTB - 3.21095 * TATB + 2.71155 * TLTB + 2.14742 * TDTB + 1.08386 * TFTB$$

c. 3. Normality test



c. 4. Autocorrelation (Breusch-Godfrey Serial Correlation LM Test)

F-statistic	1.176343	Prob. F(2,2)	0.4595
Obs*R-squared	5.405137	Prob. Chi-Square(2)	0.0670
R-squared	0.540514	Mean dependent var	-3.96E-16
Adjusted R-squared	-1.067688	S.D. dependent var	0.023819
S.E. of regression	0.034250	Akaike info criterion	-3.919698
Sum squared resid	0.002346	Schwarz criterion	-3.677630
Log likelihood	27.59849	Hannan-Quinn criter.	-4.185247
F-statistic	0.336098	Durbin-Watson stat	2.352481
Prob(F-statistic)	0.883902		

c. 5. Heteroskedasticity (Breusch-Pagan-Godfrey)

F-statistic	0.379299	Prob. F(5,4)	0.8418
Obs*R-squared	3.216307	Prob. Chi-Square(5)	0.6667
Scaled explained SS	0.322088	Prob. Chi-Square(5)	0.9972
R-squared	0.321631	Mean dependent var	0.000511
Adjusted R-squared	-0.526331	S.D. dependent var	0.000602
S.E. of regression	0.000744	Akaike info criterion	-11.28548
Sum squared resid	2.21E-06	Schwarz criterion	-11.10393
Log likelihood	62.42740	Hannan-Quinn criter.	-11.48464
F-statistic	0.379299	Durbin-Watson stat	3.113264
Prob(F-statistic)	0.841838		

d. Earnings ratios

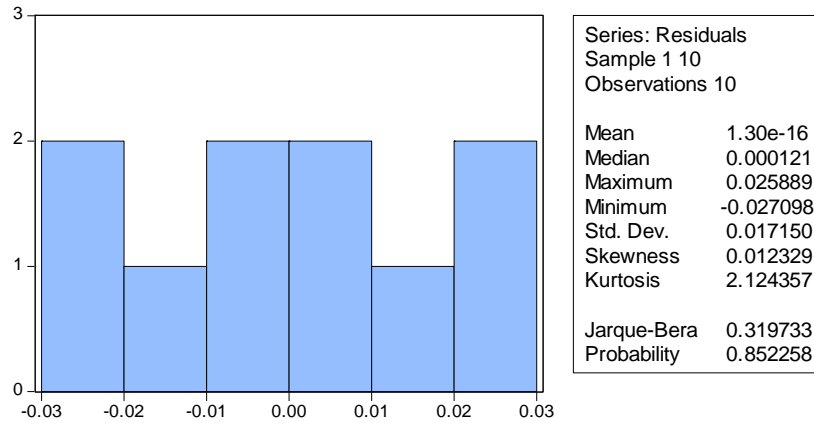
d. 1. Estimation of model

R-squared	0.986354	Mean dependent var	0.810000
Adjusted R-squared	0.969297	S.D. dependent var	0.146818
S.E. of regression	0.025726	Akaike info criterion	-4.198940
Sum squared resid	0.002647	Schwarz criterion	-4.017389
Log likelihood	26.99470	Hannan-Quinn criter.	-4.398101
F-statistic	57.82674	Durbin-Watson stat	2.794836
Prob(F-statistic)	0.000804		

d. 2. Research model (Substituted Coefficients)

$$Q = 0.27869 - 0.007836*FTI + 0.05364*PF - 0.01829*PD + 0.00300*PP - 0.00210*OI$$

d. 3. Normality test



d. 4. Autocorrelation (Breusch-Godfrey Serial Correlation LM Test)

F-statistic	14.73936	Prob. F(2,2)	0.0635
Obs*R-squared	9.364650	Prob. Chi-Square(2)	0.0093
R-squared	0.936465	Mean dependent var	1.30E-16
Adjusted R-squared	0.714092	S.D. dependent var	0.017150
S.E. of regression	0.009170	Akaike info criterion	-6.555104
Sum squared resid	0.000168	Schwarz criterion	-6.313036
Log likelihood	40.77552	Hannan-Quinn criter.	-6.820652
F-statistic	4.211244	Durbin-Watson stat	2.881341
Prob(F-statistic)	0.205269		

d. 5. Heteroskedasticity (Breusch-Pagan-Godfrey)

F-statistic	1.296775	Prob. F(5,4)	0.4123
Obs*R-squared	6.184618	Prob. Chi-Square(5)	0.2887
Scaled explained SS	0.556297	Prob. Chi-Square(5)	0.9899
R-squared	0.618462	Mean dependent var	0.000265
Adjusted R-squared	0.141539	S.D. dependent var	0.000296
S.E. of regression	0.000274	Akaike info criterion	-13.28209
Sum squared resid	3.01E-07	Schwarz criterion	-13.10054
Log likelihood	72.41045	Hannan-Quinn criter.	-13.48125
F-statistic	1.296775	Durbin-Watson stat	2.644404
Prob(F-statistic)	0.412277		

d. Liquidity ratios

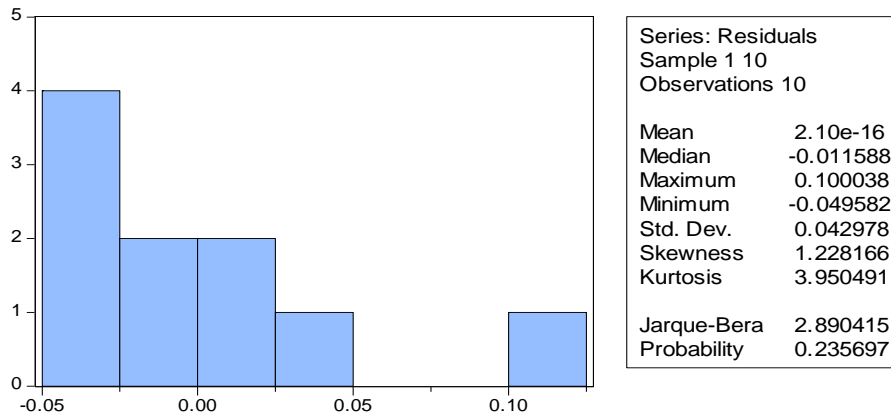
e. 1. Estimation of model

R-squared	0.914309	Mean dependent var	0.810000
Adjusted R-squared	0.807196	S.D. dependent var	0.146818
S.E. of regression	0.064467	Akaike info criterion	-2.361618
Sum squared resid	0.016624	Schwarz criterion	-2.180067
Log likelihood	17.80809	Hannan-Quinn criter.	-2.560779
F-statistic	8.535919	Durbin-Watson stat	2.433555
Prob(F-statistic)	0.029417		

e. 2. Research model (Substituted Coefficients)

$$Q = 1.00681 - 0.01414*INTA - 0.00428*VTC - 0.00418*OTA + 0.00018*VD - 0.00387*LI$$

e. 3. Normality test



e. 4. Autocorrelation (Breusch-Godfrey Serial Correlation LM Test)

F-statistic	1.460105	Prob. F(2,2)	0.4065
Obs*R-squared	5.935133	Prob. Chi-Square(2)	0.0514
R-squared	0.593513	Mean dependent var	2.10E-16
Adjusted R-squared	-0.829190	S.D. dependent var	0.042978
S.E. of regression	0.058127	Akaike info criterion	-2.861822
Sum squared resid	0.006757	Schwarz criterion	-2.619754
Log likelihood	22.30911	Hannan-Quinn criter.	-3.127370
F-statistic	0.417173	Durbin-Watson stat	2.305035
Prob(F-statistic)	0.838933		

e. 5. Heteroskedasticity (Breusch-Pagan-Godfrey)

F-statistic	0.369927	Prob. F(5,4)	0.8477
Obs*R-squared	3.161965	Prob. Chi-Square(5)	0.6750
Scaled explained SS	0.746348	Prob. Chi-Square(5)	0.9803
R-squared	0.316197	Mean dependent var	0.001662
Adjusted R-squared	-0.538558	S.D. dependent var	0.003010
S.E. of regression	0.003734	Akaike info criterion	-8.059226
Sum squared resid	5.58E-05	Schwarz criterion	-7.877675
Log likelihood	46.29613	Hannan-Quinn criter.	-8.258387
F-statistic	0.369927	Durbin-Watson stat	2.987897
Prob(F-statistic)	0.847671		

f. Risk ratios

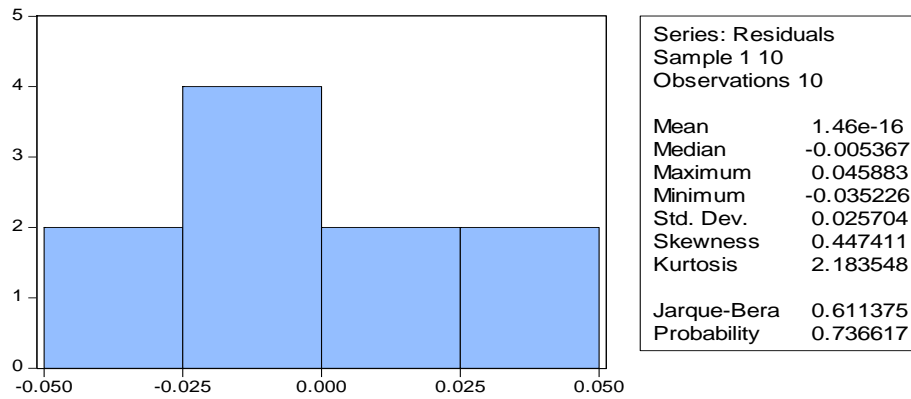
f. 1. Estimation of model

R-squared	0.969350	Mean dependent var	0.810000
Adjusted R-squared	0.931037	S.D. dependent var	0.146818
S.E. of regression	0.038556	Akaike info criterion	-3.389720
Sum squared resid	0.005946	Schwarz criterion	-3.208169
Log likelihood	22.94860	Hannan-Quinn criter.	-3.588881
F-statistic	25.30094	Durbin-Watson stat	3.076973
Prob(F-statistic)	0.003985		

f. 2. Research model (Substituted Coefficients)

$$Q = 1.20859 + 0.00315*NPL - 0.06968*PROV + 0.01488*NPL2 - 0.00145*OPER - 0.01744*DD$$

f. 3. Normality test



f. 4. Autocorrelation (Breusch-Godfrey Serial Correlation LM Test)

F-statistic	4.058780	Prob. F(2,2)	0.1977
Obs*R-squared	8.023239	Prob. Chi-Square(2)	0.0181
R-squared	0.802324	Mean dependent var	1.46E-16
Adjusted R-squared	0.110457	S.D. dependent var	0.025704
S.E. of regression	0.024243	Akaike info criterion	-4.610845
Sum squared resid	0.001175	Schwarz criterion	-4.368777
Log likelihood	31.05423	Hannan-Quinn criter.	-4.876393
F-statistic	1.159651	Durbin-Watson stat	2.364843
Prob(F-statistic)	0.537380		

f. 5. Heteroskedasticity (Breusch-Pagan-Godfrey)

F-statistic	0.734401	Prob. F(5,4)	0.6349
Obs*R-squared	4.786238	Prob. Chi-Square(5)	0.4425
Scaled explained SS	0.453179	Prob. Chi-Square(5)	0.9937
R-squared	0.478624	Mean dependent var	0.000595
Adjusted R-squared	-0.173096	S.D. dependent var	0.000682
S.E. of regression	0.000739	Akaike info criterion	-11.30008
Sum squared resid	2.18E-06	Schwarz criterion	-11.11853
Log likelihood	62.50042	Hannan-Quinn criter.	-11.49924
F-statistic	0.734401	Durbin-Watson stat	3.229892
Prob(F-statistic)	0.634941		

4. Conclusion

"CAMELS" rating is a common phenomenon for all banking system all over the world. It is mainly used to measure a ranking position of a bank on the basis of few criteria (Datta, 2012). Bank's performance or rather solvency or insolvency has been given much attention both at the local and international level. Financial ratios are often used to measure the overall financial soundness of a bank and the quality of its management (Wirnkar & Tanko, 2008).

Traditional method of applying financial ratios to evaluate bank's state of performance has been long practiced, with practitioners using CAMELS rating to measure their banks' performance. CAMELS bank rating is used by bank's management to evaluate financial health and performance (Rozanni & A. Rahman, 2013).

In this study the effect of each category of CAMELS model on performance are analyzed and interpreted. Actually there are significant relation between each category and Q-Tobin's ratio as bank's performance ratio. The important factor to

analyze this model is to find and concentrate on effective indicators and elements in each category. In fact, choosing indicators can be different in each industry, so, it can be challengeable and interpreting.

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