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Corruption and Banking System Performance in Algeria
الفساد وأداء النظام البنكي في الجزائر

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Abstract

In this paper we have explored and analyzed the relationship between corruption and banking system performance in Algeria measured by multiple key indicators, and using statistical analysis of time series. Causality tests have excluded some indicators of banking performance from the study for being independent from corruption. Statistical analysis have shown that banking profitability measured by return on equity and return on assets slightly influence corruption in the same direction, which means the higher profitability of banks is the higher is corruption. Also, corruption influences banking performance in a negative way, the higher corruption is the lower is the performance, mainly real interest rate of banks and liquid assets to deposits.

Keywords: Performance of Banks, Corruption, Economic Development

الملخص

في هذه الورقة البحثية قمنا من تحليل واختبار العلاقة بين الفساد وفعالية النظام البنكي في الجزائر، التي تم تقييمها بالاعتماد على مجموعة من المؤشرات، كما تم استعمال التحليل الاحصائي للسلاسل الزمنية من أجل الحصول على النتائج. اختبارات السببية أدت إلى إلغاء مجموعة من مؤشرات فعالية البنوك لكونها مستقلة عن الفساد وعدم وجود علاقة سببية بينها. في حين أفرز التحليل الإحصائي عن مجموعة من النتائج أهمها أن بعض مؤشرات الربحية للبنوك ونخص بالذكر العائد على الأسهم والعائد على الأصول لها تأثير على الفساد في نفس الاتجاه، أي أن زيادة ربحية البنوك تؤدي إلى زيادة الفساد في الجزائر، إلا أن هذا الأثر ضعيف. من جهة أخرى يؤثر الفساد سلبا على مجموعة من مؤشرات الفعالية للبنوك ونخص بالذكر سعر الفائدة الحقيقي وسيولة البنك، بعبارة أخرى فإن ارتفاع الفساد يؤدي إلى انخفاض فعالية البنوك.

الكلمات المفتاحية: فعالية البنوك، الفساد، انمو الاقتصادي.

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1. INTRODUCTION

Banking system is the corner stone of any strong economy, by providing financial resources needed for investments and keeping them running, which will theoretically on the long term improve and develop the economy. So, it is easy to see why low performance of the banking system could slow down economic development. In Algeria statistics show that financial sector is underperforming, at the image of the stock exchange market which is almost inexistent, and banking system which is mainly composed of public banks which are not a very efficient tool for financing profitable investment. In this context we can point at many factors as the causes for this low performance, one of them being corruption, from which Algerian economy is suffering for many years, and the financial sector might be one of the most affected sectors by the situation. In this paper we discuss the extent of damage caused by corruption on banking system's performance in Algeria, but also we are going to explore the relationship in the other way and see if banking system's performance has anything to do with corruption level. The study is going to rely on statistical analysis.

2. Statement of the Problem

The aim of this paper is to explain the relationship between the banking system and corruption, by analyzing causality and effect of corruption and banking performance indicators, and also see how banking performance influences corruption in Algeria. Furthermore, the main problem we are trying to address is the poor performance of the banking system, which we aim to explain using corruption, and explore whether or not banking performance is causing more corruption, the main question we aim to answer is: what is the nature of relationship between banking performance and corruption? Based on this context two main hypotheses have been formulated:

- There is a negative correlation between corruption and banking system performance that is statistically significant.
- Banking performance is also causing more corruption.

3. Corruption

Corruption is an intentional miss use of power and position by an official or a governmental figure, in order to achieve personal interest or the interest of another person at the expense of the public (Iyanda, 2012, p. 38). Also, according to transparency international corruption is an unlawful and inappropriate way for officials in public or private sector to enrich themselves or those close to them using the public power (OECD, 2007, p. 20). The United Nations (UN, 2016, p. 20), have underlined the idea that corruption is one of the biggest challenges facing economic development in Africa, and that it is indirectly involved in rising poverty by making investment environment instable and harming the overall economic performance of African countries. According to the UN, the effect of corruption on the economy could be summarized in: high prices and thus low purchasing power; low tax revenues; poor and fragile public infrastructures; uncertain and instable economic environment; lack of trust from the people towards governmental institutions (UN, 2016, p. 30).

4. Corruption in Algeria

According to transparency international, Algeria is one of the most corrupted countries in the world and corruption is deep into Algerian institutions, the following table shows the evolution of corruption perception index (CPI) provided by the organization, in Algeria from 2003 to 2017:

Table1. Corruption perception index in Algeria

Years	CPI	Ranking
2003	**26**	**88/133**
2004	**27**	**97/145**
2005	**28**	**97/158**
2006	**31**	**84/163**
2007	**30**	**99/179**
2008	**32**	**92/180**
2009	**28**	**111/180**
2010	**29**	**105/178**
2011	**29**	**112/182**
2012	**34**	**105/174**
2013	**36**	**94/175**

2014	**36**	**100/174**
2015	**36**	**88/167**
2016	**34**	**108/176**
2017	**33**	**112/180**

Source: Transparency International database, available at: https://www.transparency.org/, consulted on 25/08/2019.

CPI is the corruption perception index provided by transparency international organization; it measures corruption from a scale of 1 to 100, the higher the score the less corruption there is, which means that a score of 100 is equivalent of 0 corruption level in the country. As shown n the table above, CPI in Algeria is low, with an average of 31 in the period from 2003 to 2017. Also, Algeria is way down in the ranking list, meaning that it has higher corruption level than most countries.

5. Banking System Performance

Banking system performance can be measured using multiple indicators, total assets, total equity, deposits, net loans and net income, are all good and easy to use indicators found directly on balance sheets and income statements. Therefore, these indicators are ready to use with no calculations needed (Satish, 2016, p. 434). Furthermore, in order to measure profitability of a bank which is one of the most common performance indicators, some calculations have to be made (Sackitey, 2016, p. 3)(Satish, 2016, p. 431). The most important of these indicators are:

Return on assets (ROA) = net profit/total assets, this indicator measures how profitable the bank is relative to its assets, otherwise said: how efficient is the bank in turning its assets into incomes.

Return on equity (ROE) = net profit/total equity, this indicator measures the bank efficiency at making profit from each unit of shareholder' equity (Abugamea, 2018, p. 8).

Cost to income ratio (C/I) = total cost / total income, this indicators takes in consideration non-interest costs and excludes bad and doubtful debt expense (Tripe, p. 5).

Besides, there are many other calculated indicators which measures banking performance on different levels like: overhead cost, total credits to deposits

and liquid assets to deposits. These indicators can be divided into distinguished categories; some researchers like Bikker (Bikker, 2010, pp. 141-159) in his assessment of banking performance measurement, highlighted two different categories of measures direct and indirect indicators, and pointed five levels of measurements: competition, efficiency, costs, profits and market structure. Other researchers have opted for a different categorization, according to Joseph P. Hughes & al, (Hughes & Mester, 2013, p. 5), performance indicators of banks can be put into two different categories: non- structural and structural indicators.

6. Algerian Banking System Performance

Before analyzing the relationship between corruptions and banking system performance, first we are going to showcase a number of key indicators of Algerian banking system's performance in the following table:

Table2. Key indicators of Algerian banking performance

Years	ROA	ROE	C/I	Real interest rate	Credit to deposit	Liquid assets to deposits	Overhead cost
1996	0.1	2.95	28.45	-4.05	22.83	24.47	0.81
1997	0.05	1.69	41	8.14	20.24	20.81	0.66
1998	0.22	5.56	74.1	15.1	16.12	34.76	0.78
1999	0.24	5.57	47.55		17.39	28.8	0.86
2000	0.23	5.4	46.65	-10.32	20.86	14.44	0.87
2001	0.17	3.24	51.77	10.03	20.9	27.29	1.74
2002	0.56	10.22	35.11	7.18	23.57	34.47	1.47
2003	0.28	4.93	32.62		25.72	29.13	0.83
2004	0.38	6.8	35.85	-3.78	25.34	45.78	1.37
2005	0.26	5.18	36.25	-6.99	28.72	55.41	1.07
2006	1.16	24.29	33.42	-2.32	30.39	57.59	1.2
2007	1.01	20.13	49.41	1.48	28.68	57.78	1.25
2008	1.42	24.7	31.2	-6.38	28.27	68.17	0.97
2009	1.9	24.85	39.16	21.61	30.89	58.47	1.33
2010	1.97	21.09	36.94	-6.96	33.58	60.45	1.1
2011	2.08	21.09	37.74	-8.66	32.73	54.94	1.21
2012	1.93	18.88	38.21	0.48	32.86	55.51	1.26

2013	**1.67**	**15.76**	**36.44**	**8.07**	**36.02**	**48.82**	**1.25**
2014	**1.54**	**15.06**	**32.6**	**8.31**	**37.49**	**43.9**	**1.04**
2015	**1.57**	**15.49**	**/**	**15.52**	**40.17**	**39.4**	**1.76**
2016	**1.76**	**15.96**	**/**	**6.39**	**46.19**	**26.76**	**1.56**
2017	**/**	**/**	**/**	**3.42**	**/**	**/**	**/**
Global Ranking	**62/180 (2016)**	**70/180 (2016)**	**171/178 (2014)**	**70/121 (2017)**	**148/159 (2016)**	**105/182 (2016)**	**139/180 (2016)**

Source: https://www.theglobaleconomy.com/Algeria/, consulted on 25/08/2019.

As shown on the table, overall performance of Algerian banking system is below average to average comparing to other countries. Return on assets average is 0.98% in the period between 1996 and 2016, with a maximum value of 2.08% recorded in 2011 and a rank of 62 from 180 countriesin 2016, which is above average. Return on equity is 12.8% on average in the same period, with a maximum value of 24.85% recorded in 2009 and a minimum 1.69% in 1997; global ranking was 70 from 180 countries, which is also above average. Next we have cost to income ratio: the average is 40.42% in the period from 1996 to 2014, and Algeria ranked 171 from 178 countries in 2014, this ratio is negatively correlated with efficiency, which means that Algerian banks according to this indicator have high profitability, because costs are low comparing to income. Then, we have shown real interest of banks which is a measure that takes in consideration inflation levels, Algeria scored 3.42% in 2017 and was ranked 70 from 121 countries, the average of real interest is -2.18 in the period from 1980 to 2017, also as shown in the table many years have negative real interest rate values, the lowest value is -29.77 recorded in 1991, which means that banks are losing money and their purchasing power is diminishing. Furthermore, we have credit to deposit ratio, the average is 28.52% with a high point of 166.43 in 1975 and a minimum 16.12 recorded in 1998. It is clear from the numbers that credit to deposit ratio in Algeria is dropping over the years, and in 2016 Algeria had a rank of 148 from 159 countries, which shows a poor performance of banking system at this level. Liquid assets to deposits of Algerian banking system have an average of 42.25% in the period between 1996 and 2016, with a rank of 105 from 182 countries, which below average. Finally, we showcased

overhead cost for Algerian banking system, which is 1.16% on average in the period between 1996 and 2016, Algeria's rank in 2016 was 139 from 180 countries which way below average and means that there is poor performance at this level.

7. Empirical Study

7.1. Methodology

Based on the hypotheses stated above, a statistical approach has been opted in order to test and have answers for the issue discussed in this paper. A time series data analysis using EViews 9 have been performed in order to test and determine the nature of the relationship between banking system performance and corruption. Banking system performance is measured using the indicators highlighted in table2, and corruption has been measured using the corruption perception index (CPI) provided by the transparency international organization, demonstrated in table1. It is worth noting in order to avoid confusion that CPI is inversely measuring corruption, which means the highest CPI is the better and less corruption there is in the country. Data analysis has been performed following several steps: checking for stationarity of time series using augmented Dickey-Fuller test, and making them stationary if necessary; determining lag length for the models; checking for cointegration between variables using Johansen test; performing Granger causality tests between variables; determining the statistical model type based on the previous tests and estimating coefficients for the model, and finally we are going to forecast and use scenario method to explain the relationship between dependant and independent variables.

7.2. Stationarity Tests

The following table summarizes the results for stationarity tests of the time series data, using augmented Dickey-Fuller, while trying to make the series stationary if necessary using first difference or second difference. In these tests, the null hypothesis is that the variable is not stationary, and could be rejected if the probability is less than 0.05:

Table3. Stationarity tests using augmented Dickey-Fuller

	level	1st difference	2nd difference	results
CPI	**0.7549**	**0.000**	**/**	**Stationary at 1st difference**
ROE	**0.5227**	**0.000**	**/**	**Stationary at 1st difference**
ROA	**0.8012**	**0.0001**	**/**	**Stationary at 1st difference**
C/I	**0.0149**	**/**	**/**	**stationary**
Bank credit to deposit	**0.9950**	**0.0558**	**0.000**	**Stationary at 2nd difference**
Liquid assets to deposits	**0.0061**	**/**	**/**	**stationary**
Real interest rate	**0.0005**	**/**	**/**	**stationary**
Overhead cost	**0.1561**	**0.000**	**/**	**Stationary at 1st difference**

Source: Generated using EViews 9 output

The previous table has been generated based on EViews 9 output, and as shown in the table three series are stationary: total cost to total income, the liquid assets to deposits and real interest rate time series. CPI, ROE, ROA and overhead cost are stationary at first difference and finally the bank credit to deposit ratio time series is stationary at 2nd difference.

7.3. Causality Tests

In this step we are going to use Granger causality test to test causality between corruption (CPI) and banking performance indicators, the null hypothesis for this test is that variable X does not Granger cause variable Y, and this could be rejected if probability is less than 0.05. Results of causality tests are shown in the following table:

Table4. Granger Causality Tests

Causality test	Prob.
ROA does not Granger cause CPI	**0.0206**
CPI does not Granger cause ROA	**0.6241**
ROE does not Granger cause CPI	**0.0058**
CPI does not Granger cause ROE	**0.3040**
C/I does not Granger cause CPI	**0.3353**
CPI does not Granger cause C/I	**0.4786**
Liquid assets to deposits does not Granger cause CPI	**0.1301**
CPI does not Granger cause Liquid assets to deposits	**0.0269**
Bank credit to deposits does not Granger cause CPI	**0.1932**
CPI does not Granger cause bank credit to deposits	**0.5480**
Real interest rate does not Granger cause CPI	**0.7110**
CPI does not Granger cause real interest rate	**0.0311**
Overhead cost does not Granger cause CPI	**0.6118**
CPI does not Granger cause overhead cost	**0.4425**

Source: Generated using EViews 9 output

As shown on the table, some banking system variables are unrelated to corruption because there is no causality relationship either way, these variables are: total cost to total income ratio, overhead cost and bank credit to deposit ratio, these performance indicators can't be explained by corruption and therefore they are excluded from the study. On the other hand we can see that some performance measures of banking system can be explained by corruption because there is a statistically significant causality relationship between them, we can also see that some variables cause corruption and others are caused by corruption. Return on equity and return on assets which are both profitability measures are influencing corruption, and it is a one way relationship. While corruption affects real interest rate and liquid assets to deposits and it's also a one way relationship.

7.4. Estimating models:

After performing the necessary tests we opted for Vector AutoRegression (VAR) model in order to explain the relationship between variables of the study and perform forecasting, the estimated model are shown in the next table:

Table5. Estimated Models

	Model 1	Model 2	Model 3	Model 4
Models	**CPI = -0.000527841913764*ROE(-1) + 0.00155350712001*ROE(-2) + 0.619342341113*CPI (-1) + 0.0169710976839*CPI (-2) + 0.100503475226**	**CPI = 0.447963495114*CPI (-1) + 0.0196606451392*CPI (-2) - 0.0142406048515*ROA(-1) + 0.0332373152436*ROA(-2) + 0.149292851053**	**REAL_INTEREST_RATE = -0.297583828735*REAL_INTEREST_RATE (-1) - 0.239994319705*REAL_INTEREST_RATE (-2) + 13.7642573915*CPI (-1) + 187.995823671*CPI (-2) - 58.1768193292**	**LA_TO_D = -135.744478305*CPI (-1) - 45.8954799882*CPI (-2) + 0.507963153711*LA_TO_D(-1) + 0.309383549577*LA_TO_D(-2) + 64.8996092061**
R square	**58.54%**	**66.59%**	**43%**	**77.2%**

Source: Generated using EViews 9 output

Model 1 explains corruption, CPI (dependant variable) using return on equity, ROE (independent variable).

Model 2: explains corruption CPI (dependant variable) using return on assets ROA (independent variable).

Model 3: explains real interest rate (dependant variable) using corruption CPI (independent variable.

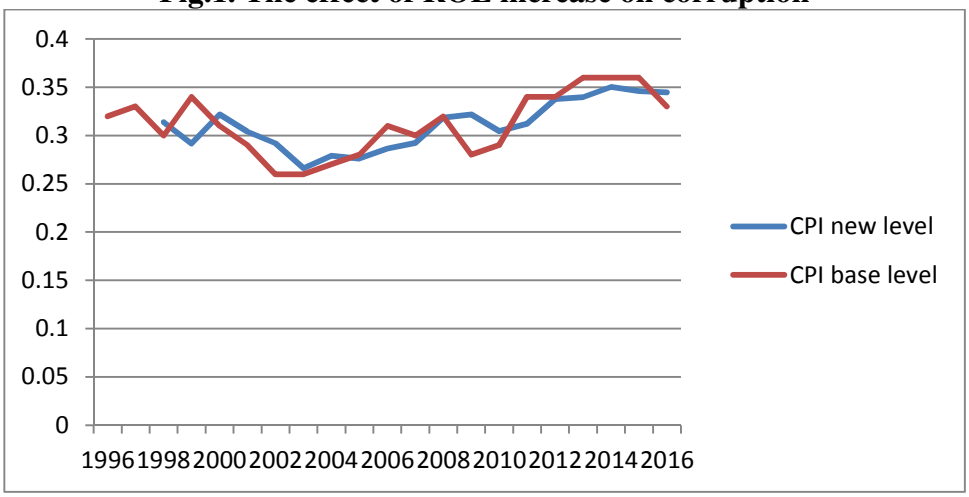
Model 4: explains liquid assets to deposits LA to D (dependant variable) using corruption, CPI as independent variable.

8. RESULTS AND DISCUSSION

In order to understand the relationship between variables, we are going to explore different scenarios in which we make a change in the independent variable and how it affects the dependant variable using the estimated models in table5. Note that all figure shown in this segment are generated using EViews 9 outputs.

First we are going to see how an increase of profitability in banks would influence corruption, by increasing ROE and ROA 25% and measure the ne values of CPI and then compare them to the base values.

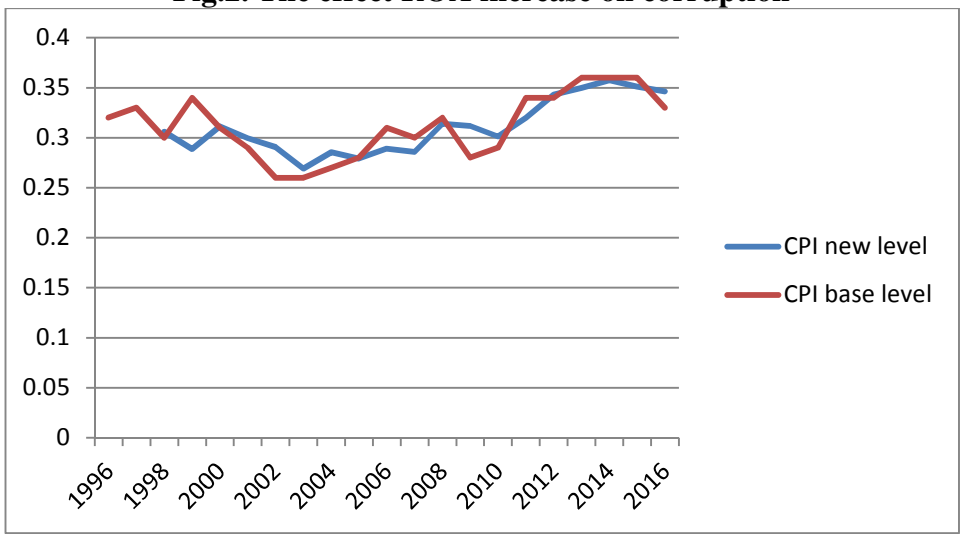
Fig.1. The effect of ROE increase on corruption



Source: Generated using EViews 9 output

After increasing return on equity by 25% corruption has slightly increased, the average CPI in the period of study has dropped only by 1 point, which means that there is a positive correlation between the two variables, but it is also worth noting that corruption isn't very sensitive to ROE changes. Keep in mind that the lower CPI is the higher is the corruption level in the country. The following figure shows the effect of a 25% increase in ROA on corruption level:

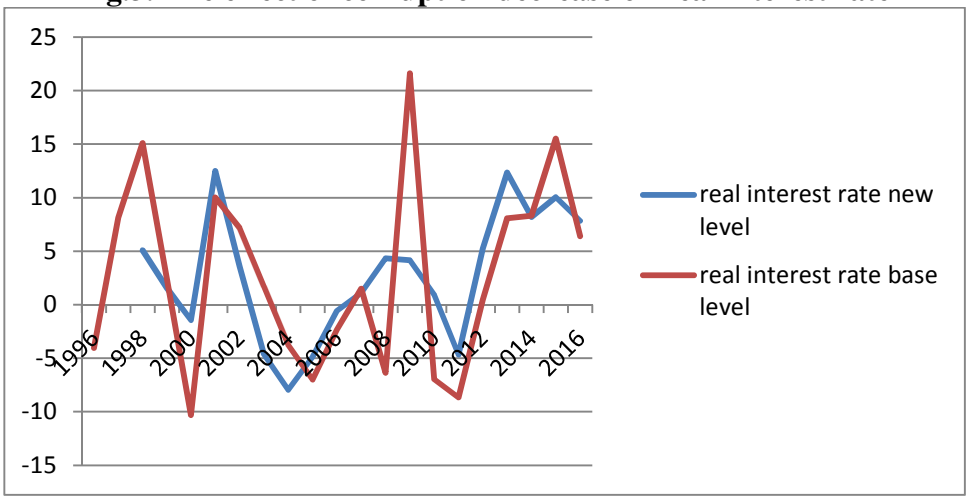
Fig.2. The effect ROA increase on corruption



Source: Generated using EViews 9 output

As shown in the previous figure, the increase of ROA results in slightly more corruption. Thus this effect is barely noticeable and could be neglected.
Next we are going to show the effect of a decrease of corruption by 25% on real interest rate of banks:

Fig.3. The effect of corruption decrease on real interest rate

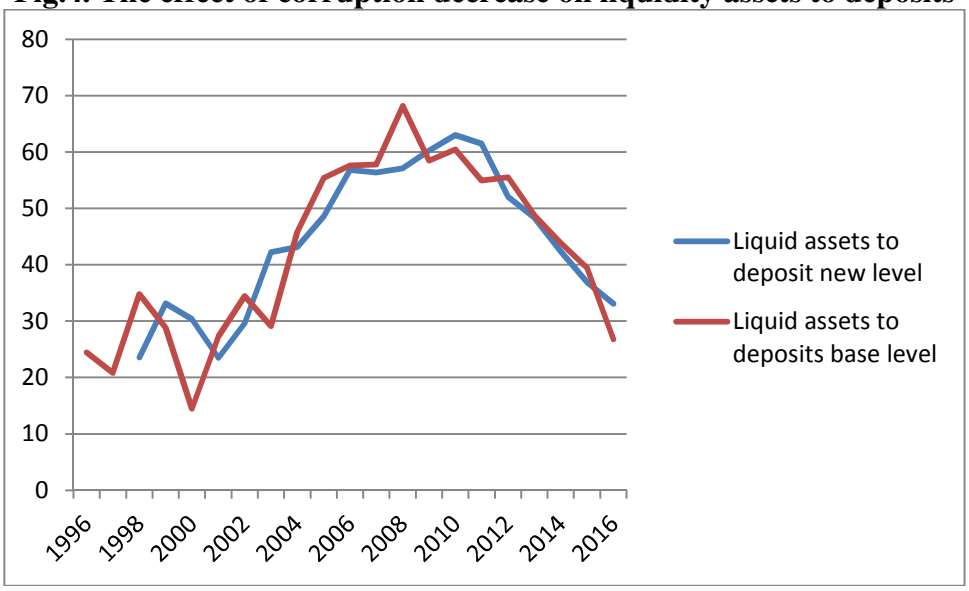


Source: Generated using EViews 9 output

Decrease in corruption will result in an overall increase of real interest rate of banks in Algeria. This means that there is a negative correlation between corruption and real interest of banks and the higher the corruption the lower real interest of banks.

Finally the result of decreasing corruption by 25% on liquid assets to deposits is shown in the next figure:

Fig.4. The effect of corruption decrease on liquidity assets to deposits



Source: Generated using EViews 9 output

Reducing corruption by 25% will result in an increase of liquid assets to deposits of banks, and the average will be 2% higher in the period of study. This means that the correlation between the two variables is negative and the higher corruption is the lower is the liquidity of banks.

9. CONCLUSION

Statistical analysis has revealed several findings, most importantly: there is a causality relationship between some of banking system performance indicators and corruption, some indicators are caused by corruption while other indicators cause corruption in a one way direction relationship, these relationships are statistically significant at a significance levelα less than 5%. We couldn't find any relationships that go both ways; also some performance indicators are independent from corruption and can't be explained using the corruption index.

After determining the causality relationships and estimating models, the effect of independent variables on dependant ones have been shown using scenarios, by changing values of the independents and analyzing the impact on values for the dependants. We found that profitability of banks represented in return on assets and return on equity, has a negative correlation with corruption, meaning that higher profitability results in higher corruption level. Though, corruption is not very sensitive to profitability changes. On the other hand corruption has a negative relationship with real interest rate of banks and their liquid assets, meaning that high corruption level results in low real interest rate and low liquidity.

10. RECOMMENDATIONS

Based the study results, and after measuring the effect between the variables, we can highlight one main recommendation, which is the necessity to reduce overall corruption and increase governance in banks. This would increase performance of banking system in Algeria at some levels, mainly real interest rate of banks and their liquidity assets to deposits ratio.

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