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Measuring the Effect of Rural Housing Support on Agricultural Activity: A Panel-Data Analysis for Ain M'lila Province

Benzouai, Med Cherif ★

ABSTRACT

The goal of this study is to measure the effect of rural housing support policy on agricultural activity through a Dynamic Panel Data Model upon yearly data for the period 2004-2014. Results show that a co-integration relationship is detected between rural housing financial support amounts and agricultural activity in Ain M'lila province at the long run. The positive impact emphasizes the success of the rural housing support policy in Algeria.

Keywords: Agricultural activity, agricultural support, agricultural subsidies, panel-aata, Algeria.

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1. INTRODUCTION

Over the years, rentier countries are making a great effort trying to diversify their economics, and perhaps the majority of them realize that it will only be achieved if they succeed in stimulating the agricultural sector. In the last two decades, Algeria has achieved a great fiscal surplus as a result of high oil prices, which reached a high level exceeded 150 US$, see figure 1 in appendixes. And it has focused to direct a part of these resources to revitalize the agricultural sector and increase its contribution to the GDP through a variety of support and funding policies. There are many studies that dealt with the Algerian agricultural financial and support policies such as the study of Zbiri (2014); Djermouli (2006); Ayache (2011); and Ammarie (2014).

In the last years, particularly between 2000 and 2014, Algeria gave a big intention to the agricultural sector, the government has allocated to the agricultural sector a total of 53.4 billion dinars (about 486 million US$) out of 525 billion dinars within the 2001-2004 program, and 312

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billion dinars out of 4202.7 billion dinars within 2005-2009 program, and 1000 billion dinars out of 21,214 billion dinars within the 2010-2014 program, without taking into account the other rural projects related to irrigation and water resources programs. This interest is reflected in the evolution of the agricultural production volume, For example, the volume of wheat production moved from 1470 thousand tons in 1999 to 2602 thousand tons in 2004 with the end of the 2001-2004 program, the wheat production volume has reached about 3678 thousand tons in 2014.[1]

This paper focuses on one of the financial support policies in the agricultural sector used by the Algerian government, which is the rural housing policy, by running a panel-data regression for Ain M'lila province over the period 2004-2014,[2] where Ain M'lila province envelope three areas which are Ouled-Gacem, Ain M'lila-centre and Ouled-Hmla. Ain M'lila province is a commercial and industrial pole, and the Author expects that the results of this policy will be clear as the difficulty of pressure on commercial and industrial investors to expand into the agricultural sector. Therefore, the significant positive results of the impact of the size of rural housing financial support provided on the development of agricultural production can be generalized to the rest of Algeria regions.

This study aim to answer the following question: *Is there a significant impact of the financial rural housing support policy on agricultural activity?*

The study starts from three hypotheses; first, financial rural housing support policy has a positive impact on agricultural activity. The second hypotheses is there is no difference between the the studied areas (Ouled-Gacem, Ain M'lila- centre and Ouled-Hmla) in terms of effect size of financial rural housing support policy on agricultural activity. Finally, the presence of a positive impact of financial rural housing support policy on agricultural activity in Ain M'lila province can be generalized to other regions in Algeria. As Ain M'lila province is an industrial and commercial area at the first degree, meaning that most investors are used to invest in industrial and commercial sectors and they have no interest in agricultural sector, so, the success of the financial rural housing support policy to push investors towards agricultural sector in Ain M'lila province can be generalized to the rest of Algeria agricultural regions, where the beneficiaries from this housing program are farmers.

The goal of this study is to measure the impact of financial rural housing support policy on agriculture production through an empirical analysis using a panel-data model (Dynamic OLS panel-data model) upon yearly data for the period 2004-2014.

The paper is organized as follows. In section 2 we present a Literature Review on the agricultural funding and support policies; Section 3 presents the panel-data Model & Methodology, followed by Section 4 for results and discussion, and finally, Section 5 presents the main conclusion.

2. LITERATURE REVIEW

Agriculture is fundamental to civilization, and it is a primary goal for any government to achieve sustainable development. Many studies highlight the relationship between agriculture and development, (Ghatak and Ingersent, 1984; Timmer, 1992; GARON YEH and LI, 1999;

[1] For further details see OCDE statistics

[2] This period is depended on the rural housing program period, which launched in 2004 and stopped in 2014.

Helmsing, 2001; Godoy et al. 2010; Tonts and Siddique, 2011; Yusuf, 2014; Awokuse and Xie, 2015).

Economic theory and empirical studies strongly suggest that governments cannot directly and reliably command and control agricultural activity (McMahon and Cardwell, 2015). However, it remains an option; national governments can build and then defend agricultural policies. Furthermore, there are many agricultural support policies that can be pursued by national governments. Many studies suggest that there is a significant impact of agricultural policies on lifting of the labor force, food security, reduce poverty and increase the national output.

Ramesh and Linu (2001) find that The World Trade Organization agricultural policies package on domestic support and export subsidies provides for complex classification of support and subsidies for agriculture, some of which are totally exempt from reduction commitments. This classification favors' developed countries, which are able to maintain a high level of support for agriculture. Developing countries should press for combining all forms of support for agriculture and seek reduction in total support in order to attain a level playing field.

Jacob (2003) evaluates many agricultural support policies in South Africa such as Land redistribution, Rural restitution, Joint ventures; it was found that there is a positive impact on agriculture activity and his report emphasised the importance of post-transfer support to land redistribution reform beneficiaries.

The study of Okolo (2004) analyzes the agricultural support policies in Nigeria, he finds that agriculture contribution to GDP is quite significant, and he suggests that the government should support the small farmers who dominate the agricultural sector by guaranteeing some micro credit assistance, extension service support and adequate training which are necessary for successful farm operation. Zbiri (2004) presents in his study the different mechanisms and policies of agricultural support in Algeria, he pointed out that the abolition of agricultural support in Algeria raised the agricultural production inputs price and interest rates on agricultural loans, these negative impacts pushed the government to return to the agricultural support according to a new policy based on the support of producing farmers instead of all the farmers.

Anderson and Valenzuela (2008) offered a new and innovative global dataset compiled under the World Bank's agricultural distortions projects. Swinnen (2010) reviews the main explanations for the agricultural support policies which shift from taxing agriculture to subsidizing and supporting farming.

Meyer (2011) suggests that microfinance offers a partial solution for the agricultural sector and he recommend to avoid interest rate controls and to allocate subsidies for building institutions and financial infrastructures which will contribute to the success of microfinance.

Past literature is based on historical and analytical methodology while the results of this study are based on an empirical model. The author cannot find any research that link the rural housing programs with agricultural activity; thus, this study gives a primary vision on the impact of such type of agricultural support policies on agricultural activity.

3. DATA & METHODOLOGY

3.1. Panel Data

To test the study hypotheses and answer the problem, we select a sample of three areas situated in Ain M'lila province (Ain M'lila centre, Ouled-Gacem and Ouled-Hamla), during the time period 2004-2014 to run a balanced panel data regression. The data provided by *The sub-division of the Directorate of Agricultural Interests of Ain M'lila province,* and the only criterion for the

Data selection is the period of application of the financial rural housing support policy which launched in 2004 and stopped in 2014.

To build the study model, the agricultural activity (AGAC) is used as a dependent variable. The dependent variable is an Index of 17 types of agricultural goods with equal weights calculated as follows: Agriculture Activity (AGAC) = mean (Cereal production (5 goods), Animals production (3 goods), Seasonal production (4 goods), other goods production (5). Summary of descriptive statistics are showing in *table 1* in the appendix. In this study, there is one crucial independent variable which is the amount of financial support allocated to the rural housing.

3.2. Modeling

The model under Panel-Data regression is given by:

$$Y_{i,t} = a_i + \beta X_{i,t} + \varepsilon_{i,t} \quad (1)$$

where $Y_{i,t}$ is an index represent the agricultural activity of the area i in period t; and a_i represents the influence of each area by restricting the determinants of the agriculture activity that cannot be calculated through the explanatory variable, thus, it calculated the characteristics that we cannot seen across areas with the stability of time, and this effect either be subject to the model itself, fixed effects or random effects, by applying the "Hausman" test; β is the estimated coefficient of the explanatory variable (the amount of financial support allocated to the rural housing) for the model; and $X_{i,t}$ is the explanatory variable of the model for the area i in the period t. The last term $\varepsilon_{i,t}$ is a vector of random error of the area i in period t.

The model equation can be formulated in the light of the sample data as follows:

$$AGAC_{i,t} = a_i + \beta_1 X(\text{Housing}) + \varepsilon_{i,t} \quad (2)$$

3.3. Model estimation

3.3.1. Best Estimated model (Static Analysis)

The basic formula of the panel data regression was provided by Green (2012); There are three possible models depending on the different Individual Effect a_i per sectional units, and it is supposed that this impact is constant over time and Particular to each sectional unit. If the individual impact a_i is the same for all sectional units, the model is the Pooled OLS regression, and it estimated by the ordinary least squares method. In the case of individual impact a_i vary across the sectional units over time; the model can be one of two basic models:

- **Fixed Effect Model:** the individual Effect a_i is fixed and specific for each sectional unit (for each area in this study). There are several ways to estimate this model. In this study i will rely on the List Square dummy variables method, which consisted on adding dummy variables that take two values (1.0) as an independent variables in the model. This model can be formulated as:

$$Y_{i,t} = Da_i + \beta X_{i,t} + \varepsilon_{i,t} \quad (3)$$

where D is a matrix of dummy variables, $Y_{i,t}$ and $X_{i,t}$ the observations of each sectional unit i in period t. These terms can be written more detailed as follows:

$$\begin{bmatrix} Y_1 \\ Y_2 \\ \vdots \\ Y_n \end{bmatrix} = \begin{bmatrix} i & 0 & \dots & 0 \\ 0 & i & \dots & 0 \\ \vdots & & & \\ 0 & 0 & \dots & i \end{bmatrix} \begin{bmatrix} a_i \\ a_2 \\ \vdots \\ a_n \end{bmatrix} + \begin{bmatrix} X_1 \\ X_2 \\ \vdots \\ X_n \end{bmatrix} \beta + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \vdots \\ \varepsilon_n \end{bmatrix} \quad (4)$$

- **Random Effect Model**: in this model, the individual impact a_i considered as a part of the error component of the model. To estimate this model, we will rely on the Generalized List Square method. The formula of this model can be given as follows:

$$Y_{i,t} = a + \beta X_{i,t} + \varepsilon_{i,t} \quad (5)$$

where $\varepsilon_{i,t} = a + u_t + u_{i,t}$. The random error $\varepsilon_{i,t}$ includes three components, the individual impact a_i and the temporal properties u_t, and the third component represents the rest of the remaining neglected variables that change between sectional unit and over time.

3.3.2. Dynamic OLS Panel-Data Model

Dynamic panel data method will be able to estimate the possible relation between independent variables and lagged values of dependent variable. To develop a panel dynamic OLS model, Stationarity tests should be applied, then the cointegration test will indicate if the tow variables have a long run association ship, which can be formulation in a Dynamic OLS Panel-Data equation.

4. RESULTS AND DISCUSSION

According to the static analysis of panel-data, we built three models and the following table illustrated the panel-data regression results:

Table 1: Results of the Static Analysis of Panel-Data (where DV = AGAC)

The model	Pooled OLS	Fixed Effect Model	Random Effect Model
Constant	13628.74*****	14227.32*****	14165.78*****
Housing	10.54462*****	-1.427129	5.637088
D2	/	2372.343*****	/
D3	/	-237.7647	/
R^2	0.131473	0.835363	0.036714
R2 (Adjusted)	0.100454	0.719149	0.002311
F (statistic)	4.238499	7.188140	1.067187
	[0.048929]	[0.000160]	[0.310422]

Restricted F	55.58027	/	/
Hausman (statistic)	/	/	11.030686 [0.0009]
Observation	30	30	30

***stands for the statistically meaningful at a level of 5%. The values in the brackets show the probability values of test statistics.*

Source: *Those results obtained by EViews 8 based on the sample data provided by The sub-division of the Directorate of Agricultural Interests of Ain M'lila province.*

To choose between the pooled OLS model and the Fixed effect model, Restricted F test was applied; (F) statistics has been calculated according to the formula:

$$F(N-1, NT-N-K) = \frac{\left(R^2_{FEM} - R^2_{PM}\right)/N-1}{\left(1-R^2_{FEM}\right)/\left(NT-N-K\right)} \quad (6)$$

where, R^2_{FEM} is the R^2 of the fixed effect model, R^2_{PM} is the R^2 of the pooled OLS model and K is the number estimated parameters as it appears in *Table 1*.

The calculated (F) statistics reached 55.58 and it is greater than the tabulated value of (F) statistics amounted to 3.71, According to the restricted F test the best appropriate model for the study between the two models is the fixed effects model (the model variables and its coefficients are illustrated the third column of the *Table 1*).

The second step is to choose between the fixed effects model and random effects model. Hausman (1978) test was applied and Hausman test statistics (χ^2) is found as meaningful in level of 5% (as shown in *Table 1*). Thus fixed effects model is more appropriate for this study.

According to the assumption results of *the fixed effect model* in which the relationship between the amount of financial support allocated to the rural housing (Housing) and Agriculture Activity (AGAC) is tested, it is found that there is a negative and non meaningful relationship as statistically in level of 5% (the coefficient of the variable housing is -1.42, negative and t-test is non-meaningful at 5%). Accordingly, we cannot use *the fixed effect model* to test the study hypotheses. However, dynamic panel data method is the most suitable model to be applied, because the impact of the financial support allocated to the rural housing policy will only appear after a period of time, thus the dynamic panel data will be able to estimate the possible relation between independent variables and lagged values of dependent variable.

To develop a panel dynamic OLS model, Stationarity tests should be applied, augmented Dickey-Fuller (1979, 1981) and Philips and Perron (1988) tests can help to avoid false results through stationary test of times series**.** Our results drawn from stationary tests allow a rejection of the null hypothesis in first difference that signify no Stationarity in all our series, but enable an acceptation at a level, that signify integration of the variables at order 1. Stationarity tests at level and first difference shown in *Table 2* as follows:

Table 2: Stationarity Tests Results

Variables	**ADF**		**PP**	
	Level	**First difference**	**Level**	**First difference**
AGAC	1.55765 [0.9556]*	37.4557 [0.0000]	0.67771 [0.9950]	41.6475 [0.0000]
Housing	4.95415 [0.5497]	39.3385 [0.0000]	3.87240 [0.6939]	18.9623 [0.0042]

The values in the brackets show the probability values of test statistics.* **Source: *Those results obtained by EViews 8 based on the sample data provided by the sub-division of the Directorate of Agricultural Interests of Ain M'lila province.*

Engle and Granger (1981, 1987) in their paper, estimated cointegration of non-stationary time-series variables for demonstrating the existence of cointegration between two macroeconomic variables implies a true long-run economic relationship. Stationarity tests results permit to develop a panel co-integration model. I started with the cointegration test which shown in *table 3*. For this purpose, Pedroni test was applied and most probabilities corresponding calculated statistics are less than 5%, which mean that we can reject the null hypothesis that signify there is a cointegration among the study variables, and have the tow variables have a long run association ship.

Table 3: Cointegration Test

	Statistic	**Probability**
Alternative hypothesis: Common AR Coefficient (within-dimension)		
Panel PP-Statistic	-1.887324	0.0296
Panel ADF-Statistic	-1.977308	0.0240
Alternative hypothesis: Individual AR Coefficient (between-dimension)		
Group PP-Statistic	-2.552473	0.0053
Group ADF-Statistic	-2.222010	0.0131

Source: *Those results obtained by EViews 8 based on the sample data provided by the sub-division of the Directorate of Agricultural Interests of Ain M'lila province.*

Granger causality test of Clive Granger (1969) was used to determine whether the variable Housing (rural housing financial support) is useful in causing AGAC (Agricultural Activity) with lagged values of two variables included. Granger causality test reported in *Table 4* made it clear that one direction flow at 5% significance level for Housing program to Agricultural Activity.

This Unidirectional relationship can be clarified how Agricultural Activity in Ain M'lila province is depend on the rural housing financial support amounts change to the effect that investors in industrial and commercial sectors have an incentive represented in the rural housing

program subsidies, which make them expanding their activities to envelope the agricultural sector.

Table 4: Granger Causality

Pairwise Granger Causality Tests			
Lags: 5			
Null Hypothesis:	Obs	F-Statistic	Prob.
Housing does not Granger Cause **AGAC**	15	7.69094	0.0352
AGAC does not Granger Cause **Housing**		2.22246	0.2296

Source: *Those results obtained by EViews 8 based on the sample data provided by the sub-division of the Directorate of Agricultural Interests of Ain M'lila province.*

Our two variables are co-integrated, we can develop a panel dynamic OLS model, the cointegration regression results indicated that the coefficient of the independent variable (Housing) is significant at 5 % level; (***see equation (7)***).

$$AGAC = 139.2071\ \text{Housing}$$
$$t=10.37478$$
$$[0.0000]$$

These findings are supporting the study hypothesis and could be interpreted as economically that if the amount of financial support allocated to the rural housing goes up by one unit the index of agriculture activity goes up by 139.2071 unit at the long-run.

5. CONCLUSION

In this paper, the author investigates the impact of rural housing support on agricultural activity, results show that there is a co-integrated relationship in the long run between the amount spent on rural housing support and the evolution of agricultural activity in Ain M'lila province. The estimated Dynamic Panel-Data Model confirms that the increase in the rural housing subsidies amounts by one unit leads to raise the agricultural activity by 139.21 units. The results obtained can be generalized to the rest of Algerian provinces, as Ain M'lila is a commercial and industrial province, however, the adopted rural housing policy succeeded in attracting investors to the rural areas which reflected positively on the agricultural activity. This paper recommends the Algerian government to press ahead with this policy because of its positive impact on agricultural activity.

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APPENDIX

Figure 1: Brent Crude oil price in US dollars per barrel (2000-2015)

Source: **The chart is compiled using the daily price from 4 January 2000 to 12 January 2015. Data from:** http://www.eia.gov/**.**

Table 1: Summary of descriptive Statistics of the study sample

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness	Kurtosis
Housing	30,00	20,00	338,00	109,43	91,73	1,41	1,26
Durum Wheat	31,00	2647,00	68589,00	25021,61	19882,79	0,65	-0,94
Soft wheat	31,00	625,00	21484,00	7971,23	7143,48	0,66	-1,19
Barley	31,00	3064,00	30800,00	14230,48	8026,76	0,19	-0,95
Oat	31,00	350,00	2653,00	1143,61	599,11	0,69	-0,31
Dodder	31,00	14176,00	103600,00	38365,29	17766,19	1,93	5,24
Tobacco	30,00	0,00	3360,00	804,77	875,36	1,12	0,89
Gardening	31,00	2380,00	127174,00	76055,90	26239,49	-0,41	0,74
Potato	31,00	6950,00	84552,00	34977,10	16623,15	0,61	1,29
Onions	31,00	1230,00	19865,00	8372,03	5906,05	0,67	-0,66
Cattle	31,00	22,00	12144,00	1853,58	3042,20	2,43	5,14
Sheep	31,00	227,00	9803,00	4588,03	2737,16	0,48	-0,63
White mea	31,00	491,00	14317,00	4288,26	3221,59	1,56	2,18
Milk 10^3 liters	31,00	615,00	8642,00	3517,61	2188,56	0,84	-0,14
Eggs 10^3 units	31,00	123,00	56566,00	14322,29	17114,65	1,33	0,60
Honey (Qx)	31,00	0,00	34,00	5,87	7,49	2,12	5,55
Wool (Qx)	31,00	131,00	769,00	347,16	189,54	1,08	0,50
AGAC	31,00	10947,00	21921,00	14764,68	2624,63	0,78	0,30

Source: Data provided by The sub-division of the Directorate of Agricultural Interests of Ain M'lila province.

Value of Accounting Numbers and Analysts' Forecast Errors

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ABSTRACT

The occurrence of accounting manipulation and creative accounting practices have consequently reduced the value of accounting numbers in the form of decreased earnings quality. Analysts use these reported earnings to make appropriate predictions and as such the underlining principles of the financial statements under review influence the forecast accuracy or otherwise. Thus, in this present study, the effect of earnings quality was examined on EPS forecast errors. This was achieved in three stages, firstly, the EPS forecast were determined using Panel Vector Auto-regressive model of order 2 (AR (2)); secondly, the modified Dechow and Defond accrual quality model by Francis, LaFond, Olsson, and Schipper was used to obtain the earnings quality; and thirdly, the earnings quality derived was regressed against forecast errors along with other firms' characteristics as control variables. Data were gathered from 10 sampled firms selected at random for the 10 year period of 2005 to 2014. Pre-estimation and post estimation tests were conducted on the series and the final regression estimate reveal that firm's value measured by Tobin's q and earnings quality have negative effect on forecast errors. It was therefore concluded that, accrual quality a measure of earnings quality have a negative effect on EPS forecast errors. Implying that the higher the quality of earnings, the lesser the EPS forecast errors. It was recommended that financial analysts should strive towards understanding the quality of earnings reported before forecasting EPS.

Keywords: Forecast, Analysts, Quality, EPS, Accrual, Earnings

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1. INTRODUCTION

The historical evolution of accounting and numbers are intertwined, as there cannot be accounting without numbers. One of the most important products of accounting system is said to be financial reporting which provides information for users to make economic decisions on the evaluation of the reporting organization's performance. As observed by Bolo and Hassani (2007), financial reporting provides the basis for evaluating the past performance and to effectively assess and predict the possible future profitability. Financial reports are seen to be the germane accounting numbers used by both external and internal stakeholders especially the financial analysts. In line with Block (1999), financial analysts rely extensively on accounting information to make forecasts. They ultimately use the extracted financial indicators from these financial statements (which provides historical information) to predict (forecast) future financial position of organizations. As such, the accuracy or otherwise of their prediction is highly dependent on the underlining principles used in the preparation of the financial statements.

In essence, accounting numbers constitute all financial indicators reported in the financial statement. This present study focuses on earnings which Pawel (2014) considered a better aggregate indicator of firm periodic performance than other accounting numbers. Earnings have been observed to be the primary focus of the financial analysts in forecasting future performance and as observed by Rajakumar and Shanthi (2014), Earnings per Share (EPS) is the most important variable which is considered as the prime determinant of market share price and a classical model to measure the performance of business. Since investors take major investments decisions based on EPS, the accuracy of EPS prediction is said to be the major factor of market prediction. Brown (1993) opined that forecasting EPS are of great interest to market investors, top level managers, financial analysts and capital market researchers. Although, prior researchers have used various methods of EPS forecast such as model, Hidden Markov model (HMM) and fusion model comprising of Auto regression (AR) with Adaptive Neuro fuzzy Inference System (ANFIS), Auto regressive moving average (ARMA) with ANFIS, this work uses Auto Regressive (AR) model in forecasting EPS.

The value of accounting numbers in this study implies the quality of earnings reported measured through accrual quality. Accrual quality model developed by Dechow and Dichev (2002) as modified by Francis, LaFond, Olsson, and Schipper (2005) was used in this study. The measure is based on the knowledge that accruals quality is affected by the measurement error in accruals, as such, the residuals of the model represent the quality of earnings. Penman and Zhang (2002) described quality of earnings to refer to reported earnings before extraordinary items that are readily identified on the income statement. Earnings are of good quality if it is a good indicator of future earnings (sustainable earnings), consequently, when an accounting treatment produces unsustainable earnings, those unsustainable earnings deemed to be of poor quality.

Tariq and Rasha (2011) further observed that the quality of earnings figures is important to the financial markets and analysts make earnings forecasts and stock acquisition decisions based on earnings figures. This implies that the accuracy or errors in forecast of EPS is affected by the quality of earnings reported, although there is paucity of literature in this area. Thus, this study empirically examines the effect of financial reporting quality on EPS forecast errors. This objective was achieved in different stages discussed as follows. Firstly, the EPS was forecasted using AR(2) model and the absolute difference between the EPS forecast and EPS actual constituted Forecast Errors (FE); secondly, accrual quality measured by the residuals derived from the modified Dechow and Dichev (2002), model was obtained to determine the financial reporting quality; and lastly, the regression analysis was ran along with various diagnostic test.

The remainder of this paper is presented as follows: Section 2 depicts statement of problem that led to this study along with the paper objective; Section 3 shows a review of extant literature including empirical review of accounting numbers and analyst forecast, the theoretical consideration and hypothesis development; the methodology with description of measurement of study variables are presented in section 4; a detailed data analysis and discussion of the results are shown in Section 5; the conclusion and recommendation of the paper are presented in Section 6.

The occurrence of corporate fraud in the past has led to a loss of confidence in accounting numbers and the overall reliability of reported earnings is questionable. Specifically, fraud cases of Enron, sun beam Inc, Tyco, WorldCom and Nigerian banks show evidence of financial manipulation. Schipper (1989) explained that earnings management is a targeted intervention in financial reporting to achieve some personal interests. Scott (2009) observed that earnings management occurs when management exploits the opportunity to make accounting decisions that might change reported income while earnings quality enables investors to infer a firm's profitability or potential future performance. Maherani, Ranjbar and Fathi (2014) explained that management tries to manipulate price and earnings reporting given the importance of reported earnings for the users. Two main motives to manipulate earnings (earnings management) include encouraging investors to buy company's stocks and increasing the market value.

Creative accounting practices come in when the loop holes in the accounting rules are exploited for personal. An aspect of creative accounting practices is the accrual accounting which provides many options for determining earnings at different periods, as such accruals can be used to manipulate corporate earnings. Management practices in meeting target performance at all cost usually lead to a reduction of earnings quality. For instance, the case of StanbicIBTC of not showing full disclosure of what truly constituted the earnings reported for 2013 and 2014 accounting year. As observed by Tariq and Rasha (2011) poor quality of earnings provide distorted information to the financial markets that lead to inaccurate EPS forecast and defraud investors and other stakeholders. Thus, understanding the relationship between earnings quality through the nature of accounting transactions and EPS forecast errors is important.

The main objective of this paper study is to empirically review the consequent effect of earnings quality on EPS forecast errors. To achieve this, Auto regressive model was used to determine EPS forecasts, which were compared with the actual EPS, and earnings quality measures of accrual quality were derived.

3. LITERATURE REVIEW

The external reports also called financial statements of organizations are used by many groups of users for separate purposes. One of these groups is financial statements' analysts, which ultimately use these statements (which provides historical information) to predict (forecast) future financial position of organizations. As such, the accuracy or otherwise of their prediction is highly dependent on the quality of these financial statements (Mohammadi, 2014) explained that financial reporting quality includes the accuracy of reported information to better describe a firm's operations. IASB (2010) gave more comprehensive qualitative characteristics of financial reporting of the fundamental characteristics (i.e. relevance and faithful representation) and the enhancing qualitative characteristics (i.e. understandability, comparability, and timeliness).

3.1. Accounting Numbers and Earnings Quality

Prior researchers have sought to explain the meaning of earnings quality, financial analysts, in their assessment, must notice not only the quantity of earnings but also the quality of earnings. The quality of earnings is referred to as the potential background of earnings growth and the likelihood of future earnings realization. Roghayeh, Mohammadreza, and Ali (2013) opined that the value of a single share is not only dependent on the company's earnings per share of the current year, but also is dependent on the expectations of the company's future, the profitability strength of future (following) years and the reliability coefficient related to the future earnings. Earnings quality is a multidimensional concept that is seen as a critical Measurement for the financial health of any company.

Earnings quality which is an important accounting number has different definitions as well as different measures, Krishnan and Parsons (2008) defined it as the degree to which reported earnings capture economic reality, in order to appropriately assess a company's financial performance. Khajavi and Nazemi (2005) explained that earnings quality can be sought in earnings sustainability, accruals and profits reflecting economic transactions. Bodie, Kane and Marcus (2002) define earnings quality as the persistence of current level of reported earnings in future periods. According to Williams (2005), earning stability and management determine earnings quality. Hence, earnings quality is the degree at which the earnings reported show the true picture of the financial status of the company irrespective of the method of accounting in use.

The relationship between earnings quality and other firms' characteristics had been researched in the past, Safaeian and Sadeghi (2009) evaluated investment decisions and its relationship with sustainable earnings in eight industries. The results indicated a significant positive relationship between earnings quality and earnings sustainability in five industries. Haghighat and Homayun (2004) examined correlation between accruals and earnings; they found that the quality of accruals is only affected by firm size, earnings and sale. A significant positive relationship was found between accruals quality, sales, earnings persistence, firm size, operating cash flow and earnings. Furthermore, a significant correlation was found between quality of earnings and accruals. Khajavi and Nazemi (2005) examined the impact of accruals on earnings quality of TSE-listed companies. There was no significant difference between the average efficiency of companies, when accruals are reported at lowest and highest rates.

Furthermore, Tian (2007) evaluated the impact of earnings management on earning relevance in company valuation. The results indicated that earnings management affects company valuation, because it reduces the information content of earnings. Francis, et al. (2002) examined the relationship between earnings quality (eight indicators of earnings quality), specific cost of debt and specific cost of equity. The results indicated that companies with poor earnings quality have higher cost of debt and cost of common stocks compared with companies with high earnings quality.

3.2. Conservatism and Earnings Quality

Conservative accounting can be viewed as the case where reported net assets are expected to be lower than market value in the long run (Feltham and Ohlson, 1995). Wolk, Tearney, and Dodd (2001) observed that conservatism applies to measurement of assets and recognition of revenues and expenses: it tends to lead accountants to choose accounting methods in favor of slower recognition of income and lower valuation of net assets. Conservatism has been characterized as biased accounting which causes market value to exceed book value (Feltham and Ohlson 1995;

Zhang 2000) also as accounting choices that relatively lower the book value of net assets (Penman and Zhang 2002). Basu (1997) defines conservatism as accountant's tendency to require a higher degree of verification to recognize good news as gains than to recognize bad news as losses.

Wild, Bernstein, and Subramanyam (2001) state that the quality of conservatively determined earnings is perceived higher because they are less likely to overstate current and future performance expectations compared with those determined in an aggressive manner. Hawkins (1998) states that high-quality earnings result from a consistent conservative accounting policy that results in a prudent measurement of the company's financial condition and net income. White, Ashwinpaul, and Dov (1998) gave a list of fifteen indicators of high earnings quality and the entire list describes conservative accounting methods

Wu (2010) examines the extent to which conservative accounting affecting shareholder value. He finds that there is a positive association between conservatism and cumulative stock returns during the current financial crisis. The results provide supportive evidence to the positive accounting theory that conservatism is an efficient governance mechanism to mitigate information risk and control for agency problems, and shareholders benefit from it.

While Martin (2002) concluded that investors can predict future earnings and book values more accurately for firms using conservative accounting methods. Penman and Zhang (2002) show empirically that conservative accounting can yield lower quality earnings and that stock market does not appear to price the lower quality earnings appropriately. The findings revealed that conservative accounting with investment growth depresses earnings and accounting rates of return and creates hidden reserves. Additionally, slowing of investment releases hidden reserves and creates earnings and higher rates of return. Also, Tariq and Rasha (2011) concluded in their research that conditional conservatism negatively affects both earnings quality and stock prices of Egyptian firms.

Although, the exact consequence of conservatism on quality of earnings remains debatable, prior researchers have proxied conservatism as an indicator of earnings quality (for example, the work of Persakis and Iatridis, 2015)

3.3. Accounting Numbers and Analysts Forecast

Financial analysts are viewed as important information intermediaries within capital market since investment practitioners and advisors rely on analysts' earnings forecast for share valuation and other portfolio decision making (Beaver, 1998; Capstaff, Paudyal and Rees, 1995). However, these analysts rely extensively on financial statements; this means that any fundamental change in the underlining principles that affects earnings will automatically influence the process of forecasting future earnings of companies. According to Alexander (2003), there are two main factors affecting analysts forecast accuracy. These are: firms' characteristics (size of the firm) and analysts' characteristics.

Some works have been done in the quest of finding out the determinants of analysts forecast errors, Pawel (2014) examined the effect of analysts disclosure cash flow forecasts on earnings estimates when earnings quality is low and discovered that as earnings quality decreases, cash flow forecasts become increasingly inaccurate compared to earnings estimates. Also, Liang and Riedl (2014) examined how the reporting model for a firm's operating assets affects analyst forecast accuracy. The sample for the study was drawn from U.K. and U.S. investment property firms having real estate as their primary operating asset, exploiting that U.K. (U.S.) firms report these assets at fair value (historical cost). It was predicted and found that

higher Net Asset Value (NAV) forecast accuracy exists for U.K. relative to U.S. firms; this is consistent with the fair value reporting model revealing private information that is incorporated into analysts' balance sheet forecasts. It was further discovered that lower EPS forecast accuracy exists for U.K. firms when reporting under the full fair value model of IFRS, in which unrealized fair value gains and losses are included in net income. This is consistent with the full fair value model increasing the difficulty of forecasting net income through the inclusion of non-serially correlated elements such as these gains/losses. Overall it was concluded that the fair value reporting model enhances analysts' ability to forecast the balance sheet, but the full fair value model reduces their ability to forecast net income. However, Ionascu (2012) concluded that for Romanian listed companies, forecast errors for earnings per share reported under local GAAP are positively correlated with a conservative approach and negatively associated with fair value based accounting policies. This he done by exploring the effect of the use of fair value on analysts' forecasts accuracy for companies listed on Bucharest Stock Exchange (BSE). Based on a sample of 266 firm-month observations (predictions made in 2008 for 2009 and 2010).

Also, Hope (2003a and 2003b) showed that a high volume of disclosure leads to a decrease in analysts' forecast errors. Based on a sample of 1,553 firm-years from 22 countries, the CIFAR index of the level of annual report disclosure was used to analyze the impact of the quantity of information disclosed on analysts' forecasts accuracy, showing that increased disclosure leads to a decrease in forecasting errors.

Furthermore, various scholars have researched into the effect of adoption of International Financial Reporting Standards (IFRS) by various countries in the world on the analysts forecast accuracy; some of these scholars are discussed here. Cotter, Tarca and Wee (2009) studied 145 large listed Australian firms to explore the impact of IFRS adoption on the properties of analysts' forecasts and the role of firm disclosure about IFRS impact. It was discovered that analyst forecast accuracy improves and analysts have benefited from IFRS adoption. This is in line with Cheong, Kim and Zurbruegg (2010), which provided an investigation into whether financial analysts' forecast accuracy differs between the pre- and post-adoption of the international financial reporting standards (IFRS) in the Asia-Pacific region, namely, for the countries of Australia, Hong Kong and New Zealand. Panel data analysis was applied over a period from 2001 to 2008. It was found that intangibles capitalized under the new recognition and measurement rules of IFRS are negatively associated with analysts' earnings forecast errors. The results are robust to several model specifications across each of the countries, suggesting that the adoption of IFRS may indeed provide more value-relevant information in financial statements for the users of financial reports.

Hodgdon, Tondkar, Harless and Adhikari (2008) also investigated the relationship between analysts' earnings forecast errors and firm compliance with the disclosure requirements of International Financial Reporting Standards (IFRS). Using a comprehensive disclosure index of selected IFRS for which previous research has indicated significant noncompliance, an unweighted and an innovative weighted measure of IFRS disclosure compliance were developed. It was found that forecast error is negatively related to IFRS compliance, and that the magnitude of this effect is larger when controlling for analyst fixed effects. It was suggested that compliance with the disclosure requirements of IFRS reduces information asymmetry and enhances the ability of financial analysts to provide more accurate forecasts. This view is supported by Ernstberger, Krotler and Stadler (2008), and Ashbaugh and Pincus (2000). However, Daske and Gebhardt (2006) found a lower accuracy and higher dispersion for German firms applying international accounting standards (IAS).

From the above empirical review, it can be observed that there exists a paucity of literature relating earnings quality specifically to EPS forecast errors which is the crux of this paper.

3.4. Theoretical Consideration and Hypothesis Development

Agency theory and capital need theory provides the platform on which the hypothesis of this paper is developed. The separation of the role of managers from the owners resulted in the need for financial reporting. The agency theory has opined by Sheikh, Khan, Iqal, and Ahmed (2012) considers how conflict of interest may arise in firms when managers' personal interests override their obligations to comply with principal-agent contract of maximizing shareholders wealth. It examines the principal-agent dilemma. Due to the need to present a better result to the owners and potential owners of the firm, managers tend to engage in earnings management and subsequently reduce the overall quality of earnings reported. Also, the constant need for capital is one reason why managers present a better picture of the financial position of the company. According to Core (2001), capital needs theory holds that companies that have growth opportunities in the capital market seek external financing opportunities from the capital market. Thus, financial analysts make use of this financial statements tailored to attract more capital and to show a better picture to the owners of the company for forecast, this result to a reduction in forecasting accuracy. In essence, the paper makes the following testable hypothesis:

H_0: *Earnings quality has no significant effect on EPS forecast errors.*

4. DATA & METHODOLOGY

The *expost facto* research design was adopted in this study. As such, secondary data were obtained from the annual reports and accounts of ten (10) companies for a period of 10 years (2005-2014). Purposive sampling method was used to select the sampled firms from the total population of one hundred eighty-six (186) firms listed on the Nigerian Stock Exchange (NSE, 2014). To achieve the objective of this paper, three variables were identified and discussed in this section. These are: dependent variable which is represented by EPS forecast errors; Independent variable of earnings quality; and control variables of firms' characteristics. The measurement procedures of each of these variables are discussed below.

4.1. EPS Forecast Errors

Several methods have been used in prior research to determine EPS forecast, such as; Brown and Rozeff (1979) used the time series method to predict the quarterly EPS with a sample size of 23 firms. Also, Zhang and Schniederjans (2002) used cash flow information to predict EPS based on the research by Jegadeesh and Titman (1993). Kenneth and Willinger (1996) showed that logit-based financial statement analysis can predict abnormal returns on investments in equity securities. Qi (1999) used the neural network to predict the stock return. While, Mohammad and Mohammad (2007) forecasted EPS using genetic algorithm of artificial neural network; in this present paper panel vector Auto regressive model were used to forecast EPS.

An autoregressive model is a linear regression of the current value of the series against one or more prior values of the series. Panel Vector Auto Regression models have been used in the past to address various issues, while Canova and Ciccarelli (2012) employ them to examine the cross-sectional dynamics of Mediterranean business cycles; Wei, Cheng, and Wu (2011) observed that they can also be used to forecast out-of-sample. An AR model is a model that includes one or more past values of the dependent variable among its explanatory variables.

The simplest AR(1) is defined as:

$$y_{it} = \beta_1 y_{it-1} \quad (1)$$

When the random error and constant term are taken into account, the modified AR(1) model becomes:

$$y_{it} = \alpha_1 + \beta_1 y_{it-1} + \mu_1 \quad (2)$$

Where: $\beta_1 y_{it-1}$ is the first -order autoregression coefficient and μ_1 is the white noise viewed as a random error. In this present study, AR(2) model was used for the period between 2005 to 2014 and then EPS was forecasted for the same period, the model can be expressed as follows:

$$EPS_{it} = \alpha_1 + \beta_1 EPS_{it-1} + \beta_2 EPS_{it-2} + \mu_1 \quad (3)$$

The EPS forecast is thereafter compared with the actual EPS to determine the absolute values of forecast errors. Thus:

$$FE_{it} = /EPSACTUAL_{it} - EPSFORESCAST_{it} / \quad (4)$$

4.2. Earnings Quality

In calculating the earnings quality, the modified model of Dechow and DeFond (2002) by Francis, LaFond, Olsson, and Schipper (2005) was used. McNichols (2002) proposes this combined model, arguing that the change in sales revenue and PPE are important in forming expectations about current accruals, over and above the effects of operating cash flows.

This measure has been used in previous research such as Persakis and Iatridis (2015). The residual error in the model indicates that the estimated error in the current accruals is not associated with operating cash and it cannot be measured via determining the changes in income, machinery and equipment. Then, the value of the residual error multiplied by -1 represents the earnings quality.

All variables are scaled by average assets

$$TCA_{jt} = \alpha_0 + \beta_1 CFO_{j,t-1} + \beta_2 CFO_{j,t} + \beta_3 CFO_{j,t+1} + \beta_4 \Delta \mathrm{Re}v_{j,t} + \beta_5 PPE_{j,t} + \mu_1 \quad (5)$$

where:

$TCA_{j,t} = \Delta CA_{j,t} - \Delta CL_{j,t} - \Delta CASH_{j,t} + \Delta STDEBT_{j,t}$ = total current accruals in year *t*;

$CFO_{j,t} = NIBE_{j,t} - TA_{j,t}$ = firm *j*'s cash flow from operations in year *t*;

$NIBE_{j,t}$ = firm *j*'s net income before extraordinary items in year *t*;

$TA_{j,t} = (\Delta CA_{j,t} - \Delta CL_{j,t} - \Delta CASH_{j,t} + \Delta STDEBT_{j,t} - DEPN_{j,t})$ = firm *j*'s total accruals in year *t*;

$\Delta CA_{j,t}$ = firm *j*'s change in current assets between year *t-1* and year *t*;

$\Delta CL_{j,t}$ = firm *j*'s change in current liabilities between year *t-1* and year *t*;

$\Delta CASH_{j,t}$ = firm *j*'s change in cash between year *t-1* and year *t*;

$\Delta STDEBT_{j,t}$ = firm *j*'s change in debt in current liabilities between year *t-1* and year *t*;

$DEPN_{j,t}$ = firm *j*'s depreciation and amortization expense in year *t*;

$\Delta \mathrm{Re}v_{j,t}$ = firm *j*'s change in revenues between year *t-1* and year *t*; and

$PPE_{j,t}$ = firm *j*'s gross value of PPE in year *t*.

4.4. Firms Characteristics

Specific firms' characteristics have been said to influence EPS forecast errors. Thus, we controlled for firms' characteristics of actual EPS, firms size measured by natural logarithm of total asset (SIZE), and firms' value measured by Tobin's q. These have been used in prior studies of Harris and Wang (2003); Reza, Mahmood, and Hassan (2010); Pawel (2014).

4.5. Modeling

The main model in this work used in testing the hypothesis previously stated is shown as follows:

$$FE_{it} = \alpha_0 - \beta_1 EQ_{it} - \beta_2 EPS_{it} - \beta_3 SIZE_{it} - \beta_4 TOBINSQ_{it} + \mu_1 \qquad (6)$$

where:

FE_{it} = Forecast error of firm *i* in time t derived from model I and II above;

EQ_{it} = Earnings Quality of firm *i* in time *t* derived from the residuals of the cross sectional accrual model III;

EPS_{it} = EPS of firm *i* in time *t*;

$SIZE_{it}$ = Natural log of total assets of firm *i* in time *t*; and

$TOBINSQ_{it}$ = Tobin's q measuring the value of firm *i* in time *t*

We expected that earnings quality and firms' characteristics will have a negative effect on Forecast errors, hence, the sign of all the coefficients.

5. FINDINGS & DISCUSSION

A total number of 100 firm-year observations were used for the main model. Data obtained from forecast errors in equation 1 and residuals multiplied by -1 in equation 2 were discussed and analyzed in this section.

5.1 Descriptive Analysis

Table 1 shows the summary statistics of all the variables of Forecast Error (FE), Size, Tobin's q, Earnings quality and EPS of the sampled companies for the period under study. Specifically, the mean values stood at 51.128, 17.96, 3.19, 1.67, and 457.89 for FE, SIZE, TOBIN'S Q, EARNINGSQUALITY, and EPS respectively. Their respective minimum and maximum values show large variations of FE which indicates that the series ranges between 0.39 and 310.81; also, the TBINSQ and EPS show large variations by comparing their minimum and maximum values respectively. However, there is no much variations in the data set of size and earnings quality.

The standard Deviation shows the dispersion or spread in the data series. The higher the value, the higher the deviation of the series from its mean and the lower the value and the lower

the deviation of the series from the mean. The variable with a higher degree of dispersion from the mean is the EPS which further confirms the variations within the data set.

Table 1: Descriptive Statistics

	FE	SIZE	TOBIN'S Q	EARNINGSQUALITY	EPS
Mean	51.12873	17.96970	3.190667	1.67E-11	457.8878
Median	29.03090	18.01464	2.650000	0.001961	163.5000
Maximum	310.8080	19.67252	10.20000	0.049997	2808.000
Minimum	0.390100	16.30693	0.250000	-0.077252	-84.00000
Std. Dev.	65.76672	0.787082	2.546825	0.026660	690.3754
Observations	100	100	100	100	100

Source: Field Survey, 2016

5.2. Empirical Analysis

5.2.1. Diagnostic Test

Diagnostic tests were performed on the model to validate the correctness of model estimation. As such, the Hausman test was first used to determine whether fixed or random effect is suitable for the model. The probability of this test showed 0.76 which is higher than the acceptable 5%, thus, the null hypothesis of estimate random effect was accepted. However, running the Breusch and Pagan Lagrangian Multiplier test for random effects gave a p-value of 0.3091 indicating that the null hypothesis that the effects are not statistically significant was accepted. Thus, pooled OLS was estimated for this model, although the Breusch-pagan heteroskedasticty test showed a p-value of 0.000, implying that the null hypothesis of constant variance may not be accepted, thus the model was ran using the robust option on stata. The result is shown below:

Table 2: Regression Estimate

	THE MAIN MODEL			
Variable	**Coefficient**	**Std Error**	**t-Stat.**	**Prob.**
C	-131.267	160.4882	-0.82	0.417
Earnings Quality	-322.049	2555.997	-1.26	0.214
EPS	0.0534	0.0187	2.86	0.006
SIZE	9.5492	9.3886	1.02	0.314
TOBIN'S Q	-4.279	3.277	-1.31	0.197
R Square	0.3376			
Root MSE	55.44			
F-Statistic	3.03			
Prob.(F-Stat)	0.0251*			
Obs	100			
Ramsey's Reset test	1.21(0.3160)			

Auto-correlation	0.006(0.9412)

Dependent Variable: FE *significance at 5%
Source: Field Survey, 2016

The main Model proposed is:

$$FE_{it} = \alpha_0 - \beta_1 EQ_{it} - \beta_2 EPS_{it} - \beta_3 SIZE_{it} - \beta_4 TOBINSQ_{it} + \mu_1$$
$$FE_{it} = -131.2672 - 322.04 EQ_{it} + 0.053 EPS_{it} + 9.55 SIZE_{it} - 4.279 TOBINSQ_{it}$$

The Multiple regression estimate showed that earnings quality and firms value measured by Tobin's q have negative effect on forecast errors (FE); while EPS and firms Size have positive effect on Forecast Errors (FE). This is indicated by the sign of the coefficients, that is β_{1-4} = -322.04<0; 0.053>0; 9.55>0; 4.279<0. This result is inconsistent with a prior expectations. As we expected that earnings quality and firms characteristics should have negative effect on forecast errors.

5.2.2 Interpretation of Result and Discussion

Furthermore, the size of coefficients of the independent variables explained that a 1 unit increase in Earnings quality, ₦1 increase in EPS, 1% increase in Size and 1 unit increase in Tobin's q will cause a 322.04 decrease, 0.053 increase, 0.0955 increase, and 4.279 decrease respectively in Forecast errors (FE).

Although, the overall R-squared showed that about 33% variations in Forecast errors (FE) can be attributed to earnings quality and the control variables of firms characteristics, while the remaining 67% variations in FE are caused by other factors not included in this model. Showing a weak explanatory power of the model, the F-statistic p-value of 0.0251% shows that the panel regression result is statistically significant because this is less than 5%, the level of significance adopted for this study. Thus, the null hypothesis that Earnings quality has no significant effect on Forecast errors may not be accepted.

Several diagnostic tests were also performed on this model, the result of the Ramsey Reset test shows a p-value of 0.3160, implying that the null hypothesis that model has no omitted variables may be accepted. The Wooldrige test for autocorrelation shows a p-value of 0.9412, implying that the acceptance of the null hypothesis that no first order auto correlation. This indicates that the model is sufficient and adequate.

6. CONCLUSION

This study focused on the effect of earnings quality on EPS forecast errors. This was achieved in three stages; firstly, the EPS was forecasted and compared with actual EPS to obtain the absolute value of forecast errors using the AR(3) model; secondly, earnings quality measure was obtained by running a cross sectional regression analysis of the Dechow and Defond accrual quality model as modified by Francis, et al for the sampled firms, the residuals were multiplied by -1 to obtain the earnings quality measures; thirdly, the multiple regression estimate shows that earnings quality and firms value measured by Tobin's q have negative effect on forecast errors. Implying that an increase in quality of the earnings and the financial report as a whole will cause a decrease in analyst EPS forecast errors, this is line with the work of Pawel (2011). Also, Siegel, Lessard, and Karim (2011) concluded that Tobin's q does predict whether analysts forecast

accurately and their result also showed that firms' size measured by the Natural Logarithm of total assets has a positive effect on forecast errors, this is in line with our result. It was therefore concluded that, accrual quality a measure of earnings quality have a negative effect on EPS forecast errors. Implying that the higher the quality of earnings, the lesser the EPS forecast errors. Thus, it was recommended that financial analysts should strive towards understanding the quality of earnings reported before forecasting EPS and to be at alert when firms' size increases as empirical evidence has shown it positively affect Forecast errors.

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APPENDIX

```
. hausman fixed random

                ---- Coefficients ----
             |      (b)          (B)          (b-B)     sqrt(diag(V_b-V_B))
             |     fixed        random       Difference
S.E.
-------------+------------------------------------------------------------
   usedresid |   -340.5515    -322.0489       -18.50262
146.7142
         eps |    .0776804     .0534058        .0242746        .0479283
        size |   -12.57319     9.549166       -22.12235        25.16872
     tobinsq |    1.611507    -4.279204        5.890711
8.417186
------------------------------------------------------------------------------
                     b = consistent under Ho and Ha; obtained from xtreg
          B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                        =        1.87
              Prob>chi2 =
0.7600

 xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        fe[crossid,t] = Xb + u[crossid] + e[crossid,t]

        Estimated results:
                     |       Var     sd = sqrt(Var)
             ---------+-----------------------------
                  fe |   4325.262       65.76672
                   e |   3211.078       56.66638
                   u |         0              0

Test:   Var(u)= 0
chi2(1) =     1.03
Prob > chi2 =     0.3091

 reg  fe  usedresid eps size  tobinsq

Source |       SS       df       MS              Number of obs =      100
                                                   F =    7.01
      Model |  86145.5423     4  21536.3856          Prob > F      =  0.0001
```

```
   Residual |  169044.896    55  3073.54357          R-squared     =  0.3376
-------------+------------------------------          Adj R-squared =  0.2894
      Total |  255190.439    59  4325.26167          Root MSE      =   55.44


------------------------------------------------------------------------------
fe |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  usedresid |  -322.0489   275.9998    -1.17   0.248    -875.1649    231.0672
        eps |   .0534058   .0113648     4.70   0.000     .0306302    .0761814
       size |   9.549166   9.591333     1.00   0.324    -9.672294    28.77063
    tobinsq |  -4.279204   3.044918    -1.41   0.166    -10.38136    1.822948
      _cons |  -131.2672   170.8394    -0.77   0.446    -473.6371    211.1026
------------------------------------------------------------------------------

 estat ovtest

Ramsey RESET test using powers of the fitted values of fe
      Ho:  model has no omitted variables
                F(3, 52) =      1.21
                Prob > F =   0.3160


 estat hottest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
        Ho: Constant variance
        Variables: fitted values of fe

        chi2(1)      =    37.76
        Prob > chi2  =   0.0000

xtserial  fe  usedresid eps size  tobinsq

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
   F(  1,       9) =      0.006
          Prob > F =      0.9412

reg  fe  usedresid eps size  tobinsq, robust

Linear regression          Number of obs =      100
F =    3.03
Prob > F      0.0251
R-squared     =  0.3376
Root MSE      =   55.44

------------------------------------------------------------------------------
```

fe	Robust Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
usedresid	-322.0489	255.9969	-1.26	0.214	-835.0782	190.9805
eps	.0534058	.0187003	2.86	0.006	.0159294	.0908821
size	9.549166	9.388552	1.02	0.314	-9.265913	28.36425
tobinsq	-4.279204	3.27716	-1.31	0.197	-10.84678	2.288372
_cons	-131.2672	160.4882	-0.82	0.417	-452.8928	190.3583

Bio-Qualitative Estimation of Diffused Air Pollution of a City in North-Eastern Algeria by Using Epiphytic Lichens

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& Rachid Djamaï[4]

ABSTRACT

This research evaluates the overall air pollution in the Skikda region, the capital of petrochemicals in northeastern part of Algeria, we used a qualitative method based on the census and geographical distribution of the lichen flora corticolous according pink pollution in the study area combined with mapping. It is essential to know some biophysical factors, such as climate and the tree flora (lichen substrate or phorophyte) to better understand their influence on the distribution of lichens in different stations. Thus, 39 lichen species have been identified in 8 sites established as a zoning that takes into account their exposure to different sources of emanation. The census results of the lichen flora of the Skikda region and its periphery have shown that the number and rate of recovery is closely linked to the degree of pollution. This finding is remarkable in the field by reducing the number of species and their recovery rate when the overall pollution is diffuse is important.

Keywords: cartography, pollution, lichen, Skikda – Algeria.

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1.0 INTRODUCTION

For five decades, many methods for pollution studies have been developed. Some methods are qualitative approach to assess the extent of pollution from field observations. These qualitative approaches are exemplified by the works of Hawksworth (1970); Deruelle and al (1983);Van Haluwyn (1986). Quantitative methods had also been employed in pollution studies. These quantitative methods involve the use of mathematical modeling through the use of different parameters related to the lichen flora. Well known in quantitative approach to pollution studies may include the use of poleotolerance index (P.I) used by Trass (1973), atmospheric purity index (A.P.I) advocated by De Sloover (1964) which is the most used in the world. Maintaining air quality necessarily involves the detection and estimation of overall air pollution of this area of study Deruelle (1983b; 1984).

Establishing a mapping based on the areas of iso-pollutions and class sensitivity of lichen species in a pollution level of the area studied. As part of our research, we opted for mapping networks as a floristic approach based on the geographical distribution of lichen species. This floristic method or qualitative method is essentially based on the census of the lichen flora of the Skikda region in the northeastern part of Algeria. It provides information about different lichen species that live in this area and secondly to determine the lichen species most sensitive to pollution than is commonly called cash poleophobia, Posthumus (1983) and Lebrun (1990); Semadi (1997); Fadel (2011). It is important to note that these methods do not in any case to establish a direct correspondence with physical-chemical pollution measurements. They help assess the overall air pollution relative value of each area under study (Deruelle, 1984; Khallil *et al.*, 1998; and Joyeux *et al.* 1999).

The rationale for selecting epiphytic lichens as a bio-indicator of air pollution is linked to many issues. Firstly, the region of Skikda was devoid of pollution sensors. In addition, their installation costs quite expensive, these sensors require very stringent continuous readings. Secondly, lichens are generally plastic plant that is present everywhere. Each species has its own requirements and its distribution is influenced by the environment. In this paper, we highlight the special situation of Skikda that is conducive to the use of lichens. Thirdly, substratum climate and conditions are favorable for development of the lichen flora. The study region has favorable climate for the development of lichen vegetation. Some climatic factors, such as high relative humidity, a sizeable rainfall and favorable temperatures, are conducive to epiphyte flora. Phorophytes is abundant in this region producing a variety of vegetation conducive to lichens growth, i.e. *Fraxinus Angustifolia* (Vahl.), *Quercus suber* (L), *Olea europea* (L), and the Citrus genus.

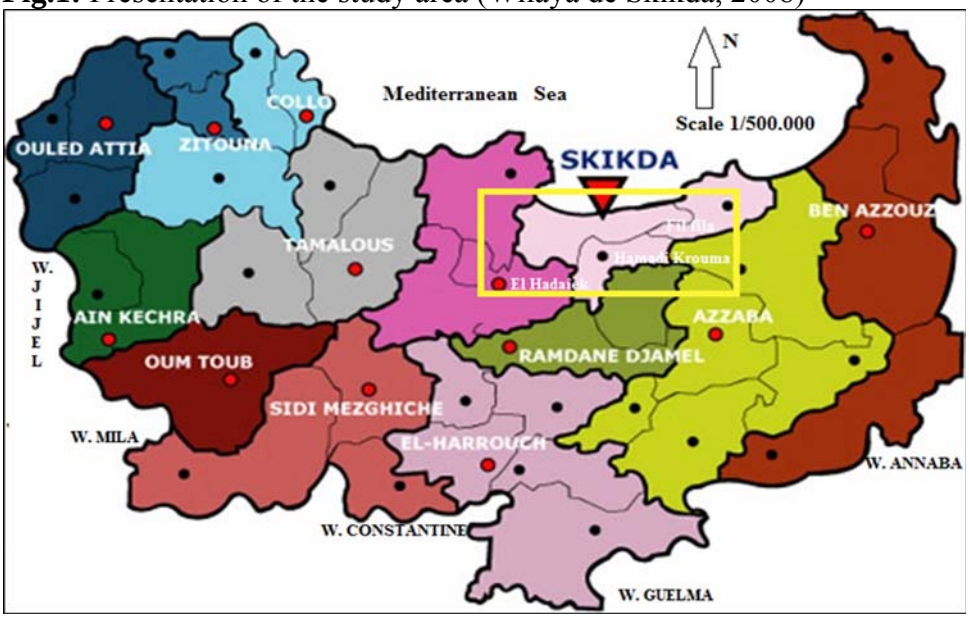
2.0 THE STUDY AREA

Our study area is within a quadrilateral including the town of Skikda wilaya capital with Stora and El Hadaiek outlying towns and Hamadi Krouma and spun yarn (Fig.1). It is located between latitudes 36 ° 5 'and 36 ° 30'N and longitudes 7 ° 15' and 7 ° 30 'E. The area is connected by a dense road network system. The study area is bounded by:

- To the north by the Mediterranean Sea.
- To the west by the massive mountains of Stora and the high coastal hills
- South and South -Is the valley of Oued Saf - Saf and coastal plains of Skikda at low altitudes.

Considering these boundaries with other wilayas, Skikda is located west of Annaba in the east of Jijel, in the northwest of Guelma and north - east of Constantine.

Fig.1: Presentation of the study area (Wilaya de Skikda, 2008)



3.0 DATA & METHODOLOGY

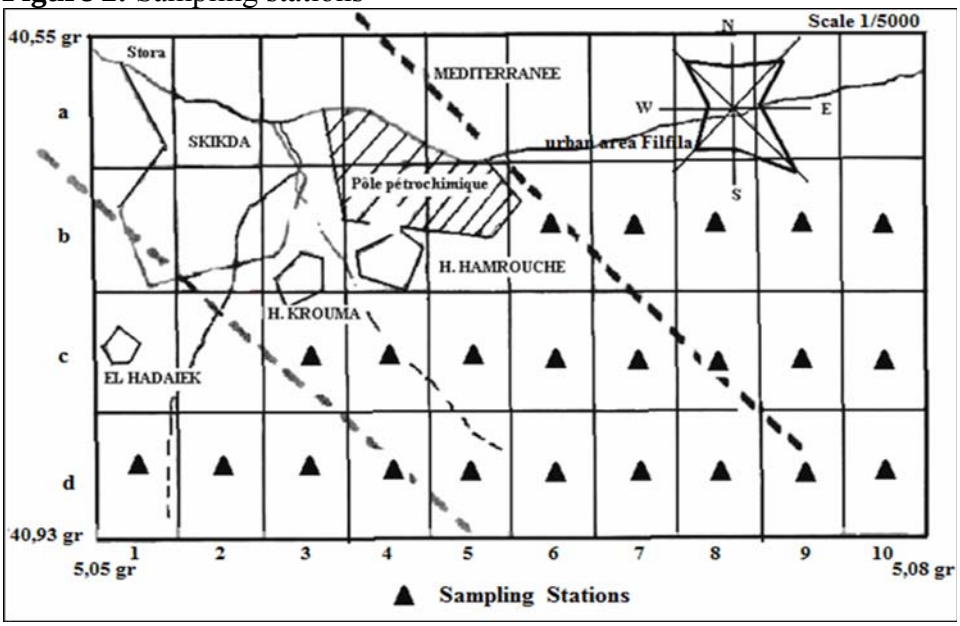
3.1. Floristic method

In this study, we opted for a mapping networks under floristic approach based on the geographical distribution of lichen species. This floristic method or qualitative method is based on the census of the lichen flora of the city of Skikda and peripheral municipalities. This floristic method allows us to identify the lichens that live in this area, and to determine the most sensitive species to pollution that is commonly known as poleophobia species Semadi (1983) Fadel (2014). Records of different species of lichens in the study area were already made by Metlaoui (2001) and completed by Hadjoudja (2012). The latter involves examining several trees of different ages and from different species. Four readings on each tree were taken. Two readings were performed on the side exposed to the pollution including one at the base and the other at a height from 01 to 1.5 m above the ground. Another two readings were performed on the opposite side. The determination technique of all species collected was performed in the laboratory using a binocular loupe and a microscope for cuts thallus. Some reagents such as potassium hydroxide in 10% Lugol, iodine and paraphenyl diamine were used for species identification.

3.2. Presentation of the meshing and the choice of sampling stations

For four decades the region Wilaya has been known induced pollution by industrial development and commercial activities related to many infrastructures (port, road and rail) that led to urban growth uncontrolled denaturing transition between urban, industrial, and agricultural areas. They were also the cause of many including that of air pollution, responsible for various pollutants from combustion emitted from diffused source that confuses different emission foci represented by urban cities (Skikda, Hadaiek, Hamrouche Hamoudi, Hamadi Krouma and Fil fila), mobile homes consist of traffic and petrochemical industrial zone (Inspection de l'environnement, 2004).These different sources of emissions are included in the study site located in a quadrilateral of 60 Km^2. It is divided into a grid of 40 meshes (1.5 x 1) Km or 0.003 gr 0.015 gr in longitude and latitude. The coordinates of each mesh are specified by a number in abscissa and by letter in ordered. The base maps used in our research are of Algeria maps at 1 / 25,000 (type 1960) Skikda N° 7 - 8 published by the National Geographic Institute (I.G.N) and the use of satellite images. We have established a zoning based on exposure to different emanations of various pollution sources and their locations in relation to urban and the industrial areas (Fig. 2).

Figure 2: Sampling stations



Most of the sites is about three quarters of the study area is characterized plains and hills. The rest of the area is located in the foot-hills. Each site includes several stitches. Each cell comprises at least one sampling station. In general, the choice of stations is determined by environmental factors (microclimate, abundance of phorophytes and homogeneity of vegetation) but also by topographical factors. In this research, we considered a coherent ecological system taking into account individual stations, represented both by roadside trees or isolated trees and secondarily by citrus orchards and trees of urban parks. Site 1 is the one that is most exposed to various pollutants emanating from industrial areas and urban cities of Skikda and Hamadi Krouma. Against the site by 8 the least exposed to pollution is removed by a straight line at about ten kilometers from sources of emanation. It should be noted that the surveyed sites are geographically distributed heterogeneously. They are distributed as follows:

- 50% of them are located in the coastal area populated by several porophytes *Fraxinus angustifolia* (Vahl.), *Pinus pinaster* (Ait.) and *Cupressus sempervirens* (L)

- 40% in the area inhabited by subcoastal phorophytes such as *Olea europea* (L), *Casuarina equistifolia* (L), *Cupressus sempervirens* (L) and fruit tree orchards of citrus Citrus genus;

- 10% in the mountainous area remains the main phorophyte represented by *Quercus suber* (L).

4.0 FINDINGS & DICUSSIONS

The inventory of lichens allowed us to know their distribution according altitudinal gradient, exposure, substrate and sites that are more or less exposed to pollution. At the study area, 39 species were identified. The nomenclature identification is adapted from Ozenda and Clauzade (1970), and Jahns (1989), Roux *et al.* (2006). Some species followed by "sp" mention with the number 1 and 2 are different but belong to the same genus which have not been identified. Given that our work focuses on the distribution of lichens according to the pollution gradient, we do not submit a complete list of lichens.

4.1. Global geographic distribution of lichen vegetation

Several authors, such as Semadi (1983), Lebrun (1990) and Fadel *et al.* (2011) found that the geographical distribution of lichens is influenced by three factors: type of substrate, climate and the degree of air pollution.

4.1.1 Site 1: Urban city of Skikda

This site is located southwest of the largest petrochemical pole. It includes three b_1 mesh; b_2; b_3. On this site we selected five sampling stations mainly composed by roadside trees represented by the species Fraxinus angustifolia (Vahl.). Note that we also explored some of the walls and roofs of houses.

Altitude: 05 -20 m
Exposure: South / West
Slope: 00-05%
Substrate: *Fraxinus angustifolia* (Vahl.)
Recovery: 00-05%
Number of species: 02

4.1.2 Site 2: Suburban area of Skikda

Site 2 is located in the suburban zone of Skikda more exactly to the southwest of the center. It also links with the urban area of Hamadi Krouma. It includes two mesh c_2; c_3 which are located 3 sampling stations also composed of roadside trees belonging to the genus *Fraxinus angustifolia* (Vahl.) and afforestation *Cupressus sempervirens* (L.)

Altitude: 05 -10 m
Exposure: South / Southwest
Slope: 00-5%
Substrate: *Fraxinus angustifolia* (Vahl.) and *Cupressus sempervirens* (L.)
Recovery: 05-10%
Number of species: 04

4.1.3 Site 3: Industrial area and the urban area of Hamadi Hamrouche

This site includes the petrochemical pole,the urban area of Hamadi Hamrouche and the small industrial park. It is formed by three meshes b_4; b_5; c_4 articulated around the main road (R.N n° 44, connecting Skikda towards Annaba). It includes four sampling stations.

Altitude: 05- 10 m
Orientation: North - East and South West / urban city of Skikda
Slope: 03-5%
Substrate: *Olea europea* (L) and *Fraxinus angustifolia* (Vahl.)
Recovery: 5 - 10%
Number of species: 02

4.1.4 Site 4: Coastal Plain Safsaf

This site is homogeneous in its composition. It is occupied mainly by citrus orchards. It is located in the coastal plain. It includes b_6 meshes; b_7; b_8 where three sampling stations are located. It includes b_6 meshes; b_7; b_8 where three sampling stations are located.

Altitude: 05 -10 m
Exposure: East / petrochemical industry
Slope: 00- 05%
Substrate: orangery and Citrus genus *Pinus pinaster* (Ait.)
Recovery: 30 - 40%
Number of species: 24

4.1.5 Site 5: Portion of the coastal plain of sub Safsaf

This site consists mainly of perennial crops represented by different species of the genus Citrus. The plant species Casuarina equistifolia (L.) is the boundary of the various groves. This site includes c_5 meshes; c_6; c_7; d_4; d_5; d_6; d_7 which are located five sampling stations.

Altitude: 05-15 m
Exposure: South - East / petrochemical pole of the city of Skikda
Slope: 05-10%
Substrate: Citrus genus and *Casuarina equistifolia* (L.)
Recovery: 15 - 20%
Number of species: 18

4.1.6 - Site 6: Urban city of Hadaiek

Site 6 covers four meshes represented by c_1; d_1; d_2; d_3 which are located four sampling stations.

Altitude: 10-15 m
Exposure: South-west / the petrochemical pole and the urban fabric of Skikda
Slope: 8-12%
Substrate: *Fraxinus angustifolia* (Vahl.) and *Cupressus sempervirens* (L.)
Recovery: 30 - 40%
Number of species: 16

4.1.7 - Site 7: Verger of locality "Pontous"

This site covers three d_8 meshes; d_9; d_{10} which are distributed three sampling stations.

Altitude: 25- 30 m
Exposure: Southeast / petrochemical pole and the city of Skikda
Slope: 03-05%
Substrate: Genus Malus and *Casuarina equistifolia* (L.).
Recovery: 10 - 20%
Number of species: 10

4.1.8 - Site 8: Locality "Sedaa Rassou" and the forests of Jebel Abu Fare

Site 8 is farthest from the petrochemical pole and urban Skikda of Hammoudi Hamrouche and Hamadi Krouma. This site includes eight b_9 meshes; b_{10}, c_8; c_9; c_{10} occupied by an oak forest more or less degraded. Given the homogeneity of this website only four sampling stations were selected.

Altitude: 40 to 50 m
Exposure: Northeast and Southeast / petrochemical industry
Slope: 05-10%
Substrate: *Quercus suber* (L.)
Recovery: 50 - 60%
Number of species: 19

The analysis of the representation of different species, gives a glimpse of the lichen landscape of our study area. It varied depending on its location but also depending on the substrate on which it lives. This landscape seems to dominate in the following species.

4.2. Spatial distribution networks based pollution rose

The diversity of lichen species, their recovery can be explained by the existence or absence of pollution; however, we must not omit the role of other factors (climatic, orographic and substratum) that have a role in the distribution of lichens, Semadi *et al.* (1993); Rahali (2002); Fadel *et al.* (2009). If we consider the relationship of lichen vegetation and pink pollution, we notice that the lichen species are distributed in a pollution gradient defined by reducing the number of species and decreasing recovery rate (Tab.1).

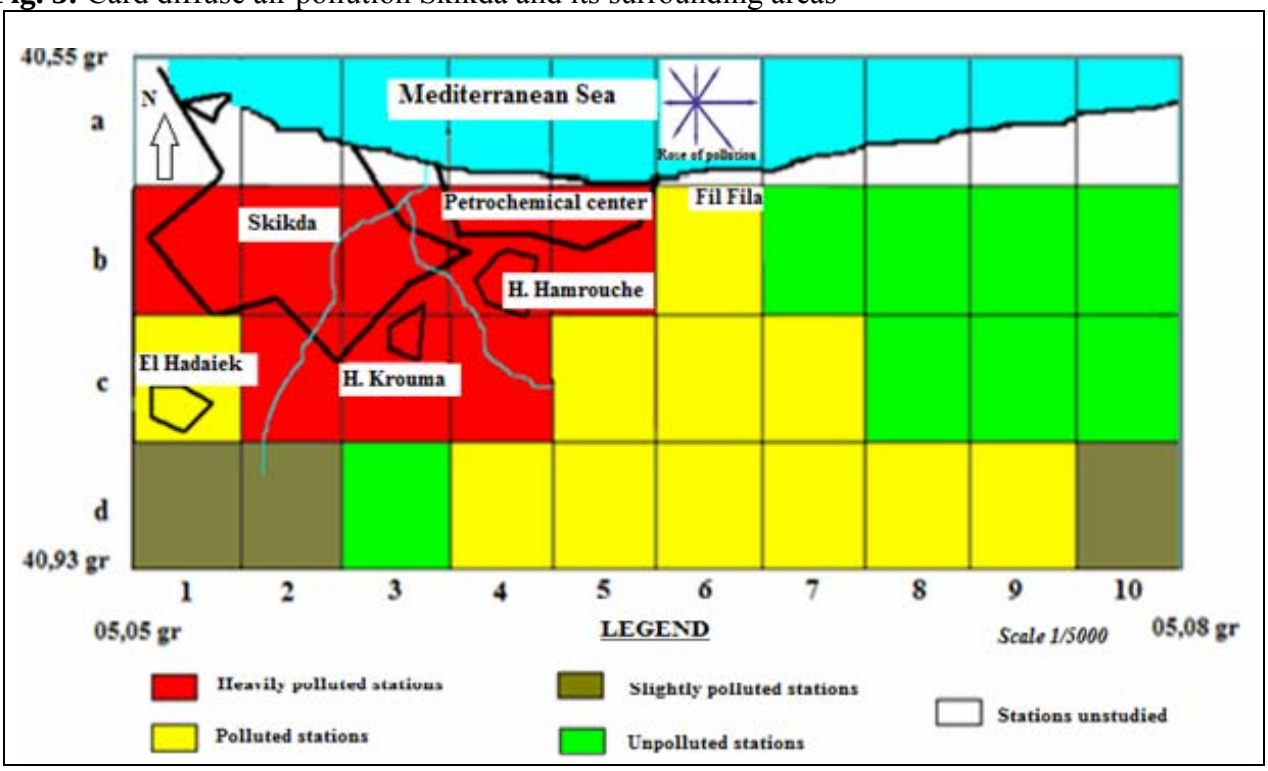
Table 1.0: Distribution of the lichen flora according to the gradient of the pollution

STUDY LOCATION	CORRESPONDING MESH	NUMBER OF SPECIES	RECOVERY RATE (%)
Site 1 Heavily polluted	b_1 ; b_2 ; b_3.	*02*	*00 – 05*
Sites 2 & 3 Polluted	c_2; c_3; c_4; b_4; b_5	*02 - 04*	*05 - 10*
Sites 5 & 7 Slightly polluted	c_5 ; c_6 ; c_7; d_4 ; d_5 ; d_6 ; d_7 ; d_8, d_9, d_{10}	*10 - 18*	*10 - 20*
Sites 4, 6 & 8 Unpolluted	b_6 ; b_7 ; b_8 ; b_9 ; b_{10}; c_1; c_8, c_9, c_{10}; d_1 ; d_2 ; d_3	*16 - 24*	*>30*

The table reveals that sites 1 and 2 and 3 contain few species (2 - 4). Their recovery rate is low from 0 to 10%. These sites are highly urbanized and industrialized are diffused sources of global atmospheric pollution of our study area. They are heavily polluted. Sites 5 and 7 located in the sub coastal area near the petrochemical zone and the urban area of Hamrouche Hamoudi are in the corridor of the pink pollution generated by prevailing winds from the northwest. Ecological conditions are favorable for development of lichen where we counted between 10 and 18 species. Their recovery rate is relatively low barely exceeding 20%, making them slightly polluted sites.

Sites 4, 6, and 8 to specific ecological conditions (climatic, orographic and substratum) are so far from sources of fumes away from all forms of pollution. The diversity of phorophytes are also the source of abundant lichen species of these sites, some 19 to 24 species were observed. The rate of recovery is above 30% to some of them up to 60%. These sites include several species susceptible to pollution such as *Diploïca canescens* (Dicks.) Massal. ; *Parmelia caperata* (L.) Ach. ; *Parmelia perlata* (Huds.) Vain. ; *Parmelia soredians* Nyl. ; *Parmelia tiliacea* (Hoffm.) Ach.

Fig. 3: Card diffuse air pollution Skikda and its surrounding areas



The polluted areas shown in the map (Fig. 3) include b_1 mesh; b_2; b_3; b_4; b_5; c_2; c_3; c_4 as moderately to highly polluted. They are located in the hallway of the pink pollution generated by prevailing winds from the northwest. These include the industrial area and transport the pollutants emitted by different units to deposit them in stations located in her direction. On the other hand, sites that are low or not polluted are located far from sources of emissions from industrial units and sources of urban emissions. They are located off the hallway through which the prevailing winds from the northwest. They are located in the southeast of the mesh, southwest and northeast. These findings are supported by previous studies on the bio-quantitative estimation using the methods of the atmospheric purity, poleotolerance index and analytical monitoring of air pollution total hydrocarbons (Fadel 2007 & 2014).

4.3. Poleophobia scale of the lichen flora of the study area

Lichens are distributed according to the level of the pollutions. This distribution allowed us to establish a scale of poleophobia as the principal species that is sensitive to pollution. These classifications are delineated below.

(a) ***Very resistant species, located in urban and industrial areas***

- *Caloplaca* sp_1
- *Pertusaria albescens* (Huds.) M.Choisy
- *Phlyctis agelaea* (Ach.) Flot.
- *Physcia biziana* (Massal.) Zahlbr.
- *Physconia grisea* (Lamk.) Poelt
- *Xanthoria parietina* (F) Fr Th

(b) ***Moderately resistant species, located in the little urbanized suburban areas***

- *Caloplaca* sp_1
- *Caloplaca* sp_2
- *Candelariela* sp
- *Collema nigrescens* (Huds.) DC.
- *Pertusaria hemisphaerica* (Flörke) Erischs
- *Pertusaria Hymenea* (Ach.) Schaer.
- *Phaeophyscia hursita* (Mereschk.) Moberg
- *Physconia pulverulacea* Moberg

(c) ***Poleophobia species located in rural areas away from sources of emissions***

- *Diploïca canescens* (Dicks.) Massal.
- *Parmelia caperata* (L.) Ach.
- *Parmelia perlata* (Huds.) Vain
- *Parmelia soredians* (Nyl.).
- *Parmelia tiliacea* (Hoffm.) Ach

5. CONCLUSION

Our study was directed on the qualitative bio-estimation of a global and diffuse atmospheric pollution of the city of Skikda and its periphery using lichen flora as bio-indicator. We identified all the arboreal lichen flora of all the stations studied. During this phase we also collected all the data needed to study the biophysical environment of our study area. It is imperative to identify some biophysical factors, such as climate and the tree flora (lichen substrate or phorophyte) to better understand their influence on the distribution of lichens in different stations. The census results of the lichen flora of the Skikda region showed that the number and rate of recovery is closely linked to the degree of pollution. Previous works by Gilbert *et al.* (1970), and Semadi *et al.* (1997) point in the same direction. They appreciate the degree of pollution directly from field observation. The same finding is remarkable to know when pollution is high, the number of species decreases and

their recovery rate. The quality card air obtained allowed to demonstrate that all sampling sites located within moderately to highly polluted sites are located in the corridor of pollution generated rose by prevailing winds North West. These pass through the industrial area and transport the pollutants emitted by different units to deposit them in stations located in that direction. Sites that are located in peripheral urban fabric sites are heavily polluted. The sites contained in the meshes which are near major roads are moderately or highly at polluted. Only sites that are poorly or not polluted are located away from sources of emissions from industrial units and sources of urban emissions.

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Analysis Economic of Development and Efficiency Intra-Trade in Arab Free Trade Area

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ABSTRACT

This research aims mainly study and analysis of the implications of regional developments on the foreign total intra- trade in the region during the period (2000 - 2013). This research employed descriptive methods to analyze indicators of efficiency of the foreign total intra-trade in the region. It was found that an increase in the value of the foreign total intra-trade in the region at an annual rate reached about 13.7%, and the average of the relative importance of the foreign total intra-trade of the foreign total trade in the region toward 11.41%. Jordan is more than the member States in the concentration of foreign trade with countries in the region, by about 37%, followed by the state of Yemen by about 25.9%. The average indicator of the degree of economic vulnerability in the region about 8%, as the general index of the degree of economic stability and the foreign total intra- trade about 8.26%, and the average per capita share of these trade toward 114.1 dollars, representing about 3.96% of the per capita share of the foreign total trade of the states of the region. The index reached the diversity of the region toward 0.686. There was high degree of concentration of exports in nine countries. Iraq where the value of the In-dex about 0.981, followed by Libya about 0.812, while Syria was less than the states in the concentration index about 0.137. Morocco about 0.157. The average value of the concentration index for the region about 0.374.

Keywords

International Trade, Arab foreign trade, the Arab economy, GAFTA.

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1.0 INTRODUCTION

An Arab states established many of the conventions aimed at the development of joint Arab economic action in general, the foreign total intra- trade development, in particular, the last of which was the convention on the Great Arab Free Trade Area, known as (GAFTA) in the year 1998, which entered into effect in 2005. As a model for the Arab integration, it introduced liberation of foreign trade as an interface between the Arab states and it intends to establish an Arab customs union in the future. It was hoped that the union will lead to the opening of Arab markets, and the removal of obstacles and hindrances tariff and non-tariff barriers and facilitate cross the transfer of goods (League of Arab States, 2003).

The implementation of the convention and an important step complete liberalization of trade between the Arab states. His liberalization was reflected the evolution of intra-trade Arab and growth, as intra-Arab trade essential tool, thus it was important for achieving the Arab economic integration. However, despite the efforts of the Arab countries for the liberation of the trade and development, there has been a modest volume of foreign total intra-trade of the foreign total trade in the regaion. The official figures did not exceed that ratio was about 11.66% during the period (2011 -2013), while reached about 12.14% in the period (2005 -2010), (Soliman, 2015; and Khateeb *et al.*, 2016).

The gain thus far has not been commensurate with the objectives of the establishment and implementation of the convention in the revitalization and development of trade between Arab states, where it was expected to be fully implemented and that full implementation would lead to a reduction in import prices and to facilitate the exchange of Arab commodities. The anticipated result was an increase the amount of exports from the Arab countries producing and exporting countries, and also helps to transfer part of the imports by the Arab States of foreign commodity.

There are challenges and difficulties and constraints prevented the investment that potential constituents, reflected in an annual growth rates of trade between the countries of the region, (Soliman, 2014).

The Arab region has witnessed many regional developments since the year 2011. The most important of which some political events in some Arab states which impact on foreign trade and overall interface between the Arab States that had taken place in these developments, and then also affected the foreign trade in most of the Arab countries, and the great Arab free trade area in general, while the relative importance of the foreign total intra-trade in the foreign total trade and the College of the region during the period (2011-2013) about 0.49% compared to the highlights during the period (2005-2010), *see* Khateeb *et al.*.

This research attempts to answer the question: What is the reality of the foreign trade of total intra-Arab free trade area, and what commensurate with this reality with the plans of the objectives of the establishment and implementation of the Convention?

This research aims to study foreign total intra-trade in the great Arab's free trade area. We intend to uncover indicators of efficiency, the effects of regional developments on the foreign total intra-trade in the region during the period (2000 -2013). The study aims to achieve these objectives: (i) to study the reality of the foreign total intra-trade in the great Arab free trade area, and (ii) to estimate the indicators for economic efficiency forforeign total intra-trade in the region.

2.0 DATA & METHODOLOGY

This research is based on the data published many sources. These sources include: public administration for economic affairs of the League of Arab States, the Arab Organization for Agricultural development, the Arab Monetary Fund, the secretariat of the Council of Arab Economic Unity, the Food and Agriculture Organization of the United Nations (FAO), the World Bank, the Ministry of Agriculture's Economic Affairs of Egypt, the Central Agency for Public Mobilization and Statistics, and the use of some of the data and statistics published by some of the international information network "Internet."

The present research adopts descriptive methods to study the development and efficiency of the foreign total intra-trade in the great Arab free trade Area. We had employed the following elements as our analytical tools:

i. *The equations of the trend to study the evolution of the foreign total intra-trade, intra-exports and intra-imports in the region, and stand on the annual growth rates of each;*

ii. *The measurement of economic efficiency indicators foreign trade total intra- Arab free trade zone: using the following indicators: (a) the relative importance of the foreign total intra-trade in the total foreign trade in the region, and (b) the relative importance of the foreign total intra-trade in the total foreign trade of member states in the region;*

iii. *The degree of economic openness of the foreign total intra-trade in the region, as well as the degree of economic openness between member states in the region;*

iv. *The correlation between intra- exports and intra- imports, and the rate of coverage of total intra- exports to total intra-imports of member states in the region;*

v. *The degree of economic participation and economic dependence on the foreign total intra-trade, and efficient functioning of the export operations to the member States in the region;*

vi. *Annual growth rates and the degree of economic stability of the foreign total intra-trade in the region, and the per capita share of the foreign total intra-trade in the region; and*

vii. *Concentration and commodity diversification of exports of Arab States in the region.*

This paper attempts to test the following hypotheses: (a) total Intra-Exports and imports total in the great Arab free trade Area not commensurate with the abolition of customs taxes after the start of the application of the Convention in the region; (b) removal of the customs duties and taxes itself may not lead automatically to the growth of the foreign total intra-trade in the region, there are obstacles to the customs duties to prevent the growth of the intra-trade; and (c) Arab countries exports not to diversity and concentration, which makes it a competitive production between Arab member states in the region, hinder the development of the total intra- exports in the region.

3.0 FINDINGS & DISCUSSIONS

3.1 Reality of the foreign total intra-trade in the greater Arab Free Trade Area

The average value of the foreign total intra-trade in the great Arab free trade area during the period (2000 -2013) has remained at about 121.77 billion dollars. It is ranged from a minimum value of about 32.55 billion dollars in the year 2000, with a relative number of about 35.6% compared to the base year (2000), and a maximum value of about 229.75 billion dollars in the year 2013, with a total increase of 250.9% compared to the basis year. The foreign total intra-trade in the region increased by about two and a half since the implementation of the Convention. The foreign total intra-trade in the region was development by annual statistical amounted to about 16.72 billion dollars, representing about 13.7% of the annual average of the foreign total intra-trade in the region, (Table 1) .

The average value of the total intra-exports in the great Arab free trade area during the period of study at about 62.23 billion dollars, and ranged between a minimum value of about 16.16 billion dollars in year 2000, with a relative number of about 34.6% compared to the base year, and a maximum value of about 115.83 billion dollars in the year 2013, with a relative number of about 346.9 % compared to the base year. The total intra- exports in the region development by annual

statistical amounted to about 8.4 billion dollars, representing about 13.6% of the annual average of the total intra-exports in the region, (Table 1) .

The average value of the total intra-imports in the region during the period of study at about 59.54 billion dollars, and ranged between a minimum value reached about 15.95 billion dollars in the year 2000, with a relative number reached about 36.6% compared to the base year, and a maximum value of about 113.93 billion dollars in the 2013, with a relative number reached about 261.7% compared to the base year. The total intra- imports in the region development by annual statistical amounted to about 16.72 billion dollars, representing about 13.9% of the annual average of the total intra-imports in the region, (Table 1).

Table 1. Development of the value of the foreign total intra-trade in the great Arab free trade area during the period (2000 -2013). Value: billion US dollars.

Statement Year	Total intra- trade		Total intra- exports		Total intra- imports	
	Value	Relative number	Value	Relative number	Value	Relative number
2000	32.55	35.55	16.60	34.55	15.95	36.64
2001	36.48	39.84	18. 34	38.18	18.14	41.67
2002	40.01	43.69	1642	41.88	19.89	45.69
2003	46.56	50.85	22.56	46.96	24.00	55.13
2004	6.328	69.11	34.35	71.50	28.93	66.46
2005	91.57	100.00	48.04	100.00	43.53	100.00
2006	111.13	121.36	58.25	121.25	52.88	121.48
2007	133.66	145.96	70.28	146.29	63.38	145.60
2008	182.21	198.98	94.88	197.5	87.33	200.62
2009	151.97	165.96	75.61	159.20	75.49	173.42
2010	157.72	172.24	77.21	160.72	80.51	184.95
2011	207.41	226.50	106.43	221.54	100.98	231.98
2012	220.09	240.35	111.54	232.18	108.56	249.39
2013	229.75	250.90	115.83	241.11	113.93	261.73
Average	**121.77**	**-**	**62.23**	**-**	**59.544**	**-**
Ann. %	**13.7**	**-**	**13.6**	**-**	**13.9**	**-**

The volumes in brackets are negative. Source: collected and calculated from: (i) The League of Arab States, the Arab Monetary Fund, the Unified Arab Economic Report , various issues; and (ii) The International Bank, data, World Development Indicators, various periods.

This results indicate to that the rates of annual changes in the foreign total intra- trade in the region is still low, despite the implementation of the Convention on the Arab free since the year 2005, and did not reach hoped the expected aspirations achieved. It also during recent years did not indicate concrete rates, amounting to about 4.4% of the foreign total intra- trade, and about 3.8% for the total intra- exports, and about 4.9% for the total intra- imports in the region in the period (2012 - 2013), (Table 2).

Table 2. Indicators of the annual change of the foreign total intra- trade in the great Arab free trade area for the period (2000-2013).

Statement	Average period 2000 -2013	2012	2013	Annual rate of change%	
				2000-2013	2012-2013
Total intra-trade by billion dollars	121.77	220.09	229.75	13.7	4.4
Total intra- exports by billion dollars	62.23	111.54	115.83	13.6	3.8

Total intra- Imports by billion dollars	59.54	108.56	113.93	13.9	4.9
Total intra- exports/ total exports (%)	9.81	9.3	8.8	0.06 %	(5.4)
Total intra imports/ total imports (%)	13.83	14.3	13.8	1.8 %	(3.5)
Total intra- trade /Total trade (%)	11.41	11.2	10.7	1.3 %	(4.5)
Total intra- trade / GDP (%)	8	8.197	8.192	3.35 %	(0.06)

The volumes in brackets are negative. *Source*: collected and calculated from: 1.The League of Arab States, the Arab Monetary Fund, the Unified Arab Economic Report , various issues. 2. The International Bank, data, World Development Indicators , various periods.

3.2 Indicators of economic efficiency of the foreign total intra-trade

3.2.1 Foreign total intra-trade in relations to total foreign trade in the region

The average of the Relative importance of the foreign total intra-trade in the foreign total trade in the region during the study period mounted at about 11.41%, reached about 11.22% in the year 2012, and about 10.71% in the year 2013. The average of the relative importance of the total intra-exports in total exports of the region toward about 9.81%, amounted to 9.26% in the 2012, and about 8.79% in the 2013. Also the average of the relative importance of the total intra-imports in the total imports of the region toward about 13.83%, reached about 14.32% in the 2012, and 13.75% in the 2013, (Table 3).

The results indicate to decline in the relative importance of the foreign total intra-trade in the foreign total trade in the great Arab free trade area , which means the existence of factors to prevent further such importance, and ways and means to overcome them.

3.2.2 Relative importance of the intra-trade among member states

3.2.2.1 Intra-trade in relations to foreign total trade

It is clear that the Arab states had differed of the extent of the importance of the foreign total total intra- trade with the rest of the Arab states in it's the foreign total trade, and found that the state of Jordan was more member states in the concentration of the foreign total trade with countries in the region, where the average of the relative importance of its the foreign total intra-trade in the foreign total trade amounted to about 37.03%, followed by the State of Yemen in by about 25.92%, while the countries of each of Bahrain, Syria, Oman, Sudan, Lebanon, Egypt, Iraq, Saudi Arabia, and Morocco in the centers from the third to XI (10% and more) by about 24.28%, 23.32%, 20.36%, 19.18%, 18%, 15.8%, 11.49%, 10.63%, 10.12%, respectively, while state of Algeria, and Palestine were less member states of concentration of the foreign total intra-trade with other countries in the region, to about 3.48%, 2.74% respectively, (Table 4).

Table 3. Evolution of the relative importance of the foreign total intra-trade in the foreign total trade in the great Arab free trade area during the period (2000 -2013).

Statement Year	**Total intra-trade / total trade %**	**Total intra-exports / total exports %**	**Total intra-imports / total imports %**	**Total intra-imports / The gross domestic product (GDP) %**
2000	10.22	9.46	11.15	4.79
2001	8.61	6.96	11.35	5.47
2002	9.81	8.44	11.75	5.91
2003	10.90	9.26	13.09	6.16

2004	12.18	11.05	13.88	7.08
2005	13.29	11.71	15.62	8.39
2006	12.17	10.29	15.23	8.60
2007	12.63	10.41	16.53	8.88
2008	14.09	12.09	17.16	9.60
2009	8.87	7.31	11.31	8.93
2010	11.77	10.55	13.23	8.01
2011	13.20	11.71	15.26	8.54
2012	11.22	9.26	14.32	8.20
2013	10.71	8.79	13.75	8.19
Ave.	**11.41**	**9.81**	**13.83**	**22.13**

Source: collected and calculated from: 1.The League of Arab States, the Arab Monetary Fund, the Unified Arab Economic Report , various issues. 2. The International Bank, data, World Development Indicators , various periods.

3.2.2.2 Total intra-exports in relations to total exports by member states in the region

The assessment of the relative importance of the total intra- exports in the total exports of member states in the region during the study period, it is clear that the state of Jordan was more member states in the focus of its overall exports with the other countries in the region, where the average of the relative importance of the intra- exports in the total exports toward 49.64%, followed by the state of Lebanon by about 42.44%, while the countries Syria, Egypt, Bahrain, Oman, Sudan, Yemen, Palestine, and Saudi Arabia in the centers of the third to tenth (10% and more) by about 36.14%, 23.4%, 16.05%, 13.67%, 13.52%, 11.62%, 11.51%,, 11.36%, respectively, while the heads of state of Libya, and Kuwait less than States in the focus of its overall exports with the other countries in the region, by about 3%, 2.56%, respectively, during the study period, (**Table 4**).

3.2.2.3 Intra-imports in relations to total imports of member states in the region

The assessment of the relative importance of the intra- imports of the total imports of member states in the region during the study period, it is clear that the State of Yemen was more member states in focus the total imports with the other countries in the region, where the average of the relative importance of the intra- imports in the total imports amounted to about 38.95%, followed by the state of Bahrain in the second worth, by about 34.69%, while the countries Jordan, Oman, Sudan, Iraq, Qatar, Kuwait, Syria, Lebanon, Morocco and Egypt in the centers from the third to the XII (10% and morwe) by about 32.82%, 32.21%, 24.2%, 22.79%, 16.31%, 15.74%, 13.86%, 13.33%, 13.11%, 11.96%, respectively, while the heads of State of Algeria, and Palestine less than States In the focus, by about 4.22%, 0.42%, respectively, (Table 4).

3.2.3 Degree of economic openness as indicated by total intra-trade in the region

Through estimated the relative importance of the foreign total intra- trade in the total GDP of the region, it can know the vulnerability of the economies of member states in the area of the foreign total trade between each of them, and whether there was a degree of openness of the Arab economie, consequently, the greater the degree of openness for the foreign total intra- trade in the region as a positive indication of where at least the adoption of these States to the outside world. Indicates a certain degree of interdependence among the countries of the region, assess the degree of economic openness in the region during the study period. It is clear that reached about 8%, and ranged between a minimum of about 4.8% in the year 2000, and a maximum of about 9.6% in the year 2008, also reached to about 8.197% in the 2012, and about 8,192% in the year 2013, these results indicate a low degree of economic openness between Arab member states in the region, the agenda, (Table 4).

3.3.4 Correlation between the total intra-exports and the total intra-imports

The correlations between total intra-exports and intra-imports of member states in the region are shown in Table 4. Table 4 allows us to measure the extent to which the correlation between intra-exports and intra-imports to know whether trade among member states in accordance with the comparative advantages and competitiveness and the actual needs of each state, or is it merely a reciprocal agreements, and the extent of the importance of the convention in the foreign total intra-trade in the region. We discovered syndromic relations between the total intra-exports and the total intra-imports of member states during the study period. To indicate the existence of a strong correlation more (0.7) between thr intra-exports and the total intra-imports in the states of each of Jordan, Yemen, Oman, Kuwait, Morocco, Egypt, Algeria, Tunisia, Saudi Arabia, Lebanon, Syria, and Sudan, where the value of correlation coefficient about 0.947, 0.989, 0.948, 0.937, 0.936, 0.934, 0.898, 0.894, 0.885, 0.884, 0.842, 0.814, respectively. This finding gives a great importance to the impact of the convention on the greater Arab Free Trade Area on intra- rade of member states. There was week correlation in Qatar, Iraq, and Libya, by about 0.674, 0.542, 0.325, respectively. The correlation measure was even weaker in the state of Palestine at about 0.116 during the study period. It was found that the average correlation coefficient between the total intra-exports and the total intra-imports of all the States in the region is high. It reached as high as 0.791 in the same period of study. This finding demonstrates that the Convention on the Arab Free Trade Area is important in the total intra-trade in the region.

When we examined the correlation between the total intra-exports and the total intra- imports member states in the region, it is was found that there were diversity of commercial exchange between member states, and their centralization in bilateral exchange had produced greater increase in total intra-trade. This increase was due to the economic gains for all states that required coordination between member states in the production of economic policies to bring about changes in production structures and to facilitate the movement of trade. In addition, an increase the competitiveness of the exchanged goods to replace goods traded between other Arab countries with the rest of the world countries also contributed to this positive development.

Table 4. Transactions simple link between intra-exports and intra-imports, and the relative importance of the foreign total intra-trade in the foreign total trade of member states in the region as the average for the period (2000 -2013).

Statement Country	**Correlation coefficient (T)**	**Relative importance of intra-trade college in total trade of member states**		
		Total intra-trade / total trade %	**Total intra-exports / total exports %**	**Total intra-imports / total imports %**
Jordan	0.947	37.03	49.64	32.82
United Arab Emirates	0.955	6.48	6.39	6.61
Bahrain	0.942	24.28	16.05	34.69
Tunisia	0.894	8.74	9.64	8.07
Algeria	0.898	3.48	3.05	4.22
Saudi Arabia	0.885	10.63	11.36	8.76
Sudan	0.814	19.18	13.67	24.20
Syria	0.842	23.32	36.14	13.86
Iraq	0.542	11.49	3.22	22.79
Amman	0.948	20.36	13.52	32.21
Qatar	0.674	8.15	5.63	16.31
Kuwait	0.937	5.66	2.56	15.74
Lebanon	0.884	18.	42.44	13.33
Libya	0.325	4.50	3.01	7.48
Egypt	0.934¤	15.80	23.40	11.96

Morocco	0.936	10.12	4.22	13.11
Yemen	0.989	25.92	11.62	38.95
Palestine	(0.116)	2.74	11.51	0.42

The volumes in brackets are negative. Source: collected and calculated from: 1.The League of Arab States, the Arab Monetary Fund, the Unified Arab Economic Report , various issues. 2. The International Bank, data, World Development Indicators , various periods.

3.3.5 Degree of economic openness between member states in the region

We examined the degree of economic openness to member states in the region in order to to state-to-state comparison. We found that seven countries had relatively high index values (10% and more). Jordan, for instance, had the highest value. The value of the degree of economic openness to the other member states of the region toward 33.11%, followed by the state of Bahrain, by about 28.69%, then comes Amman by about 19.72%, then comes the states of Yemen, Syria, Iraq, and Lebanon, by about 14.25%, 12.37%, 10.37%, 10%, respectively, while the degree of economic openness at mid level is relatively small, between (5%- less than 10%) in seven countries: United Arab Emirates, Saudi Arabia, Tunisia, Egypt, Qatar, Morocco, and Sudan, where the value of the degree of economic openness toward 9.23%, 7.92%, 7.56%, 6.55%, 6.13%, 5.93%, 5.68%, respectively. The remaining four countries showed relatively low levels (less than 5%) of the degree of economic openness, are Kuwait, Libya, Palestine, and Algeria, the value amounted to about 4.25%, 4.1%, 2.16%, 2.03%, respectively, (Table 5).

Low degree of economic openness means that here is a low the degree of integration between states. This is indicated by the decline in value of the foreign total intra-trade in the region. We must find the means to increase the openness of the Arab states on some of them economically, the low degree of dependence on the outside world and achieve economic growth of Member States, and reduce obstructions.

3.3.6 Coverage rate of the total intra-exports to the total intra-imports of member states

The coverage rate measures the value of export in excess of imports. This value indicates the extent of state control of imports, and their purchasing power. If exports exceeds imports, there is a trade surplus. Theoretically, the rate of coverage of the total intra-exports total equal the total intra-imports equal in the region, where the value of the total intra-imports total is the same value of the total intra-exports total plus freight and insurance costs, but in practice there may be some differences due to reasons related to register the data re-export within the exports of the non-deployment of some of the statements that exports of crude oil and gas and the differences in the timing of registration and the classification of exports and imports to (Soliman 2015).

We found that the rate of coverage of the total intra-exports in relations to the total intra-imports among member states, six countries achieved surplus in the balance of trade the interoperability of macroeconomic policy, Palestine, Saudi Arabia, Syria, United Arab Emirates, Algeria, and Qatar, where the rate of coverage about 728.48%, 328.89%, 192.28%, 127.93%, 124.7%, 111.56%, respectively. While nine states coverage rates between about (50% and more-less than 100%), are Egypt, Tunisia, Libya, Oman, Lebanon, Bahrain, Kuwait, Sudan, and Jordan, where the rate of coverage about to 98.75%, 88.22%, 80.46%, 72.8%, 64.22%, 58.53%, 53.05%, 51.48%, 50.55%, respectively. While the rate of coverage in the three states (less than 50%), are Yemen, Iraq, and Morocco, where the rate of coverage about by 27.17%, 18.15%, 16.33%, (Table 5).

Table 5. Indicators of the coverage rate and the degree of economic openness and the degree of economic participation and economic dependence of member states in the region as the average for the period (2000 -2013).

Statement The states	**Rate of Coverage**	**Degree of economic**	**Degree of economic**	**Economic dependency**	**Intra- trade/ national**

	%	openness%	participation %	%	income %
Jordan	50.55	33.11	32.85	21.99	33.85
United Arab Emirates	127.93	9.23	12.25	4.05	8.42
Bahrain	58.53	28.69	26.16	18.09	29.90
Tunisia	88.22	7.56	6.26	4.02	7.54
Algeria	124.70	2.03	10.99	0.90	2.23
Saudi Arabia	328.89	7.92	53.37	1.85	7.74
Sudan	51.48	5.68	32.03	3.75	17.7
Syria	192.28	12.37	31.57	4.23	13.79
Iraq	18.15	10.37	67.62	8.69	83.9
Amman	72.80	19.73	15.74	11.42	21.82
Qatar	111.56	6.55	5.47	3.10	7.20
Kuwait	53.05	4.25	30.	2.78	4.37
Lebanon	64.22	10.02	21.79	6.10	1023
Libya	80.46	4.07	10.83	2.25	3.78
Egypt	98.75	6.13	0.63	3.08	6.36
Morocco	16.33	5.93	71.93	5.10	6.07
Yemen	27.18	14.25	57.25	11.20	15.97
Palestine	728.48	2.16	75.86	0.26	1.94
Average	80.15	8.03	20.24	4.06	8.29

Source: collected and calculated from: 1.The League of Arab States, the Arab Monetary Fund, the Unified Arab Economic Report , various issues. 2.The International Bank, data, World Development Indicators , various periods.

3.3.7 Degree of economic participation of the foreign total intra-trade of member states in the region

The degree of economic participation may be indicated by the absolute difference between exports and imports of the state, or net the foreign total trade and attributed to the total value of the foreign trade, ranging between (0) when there is a perfect balance in the balance of trade, and higher than the equivalent of 100, when the state is net imported or exported, the extent of the contribution or the participation of foreign trade of the state in the international trade of other states (Soliman, 2015, and Fawaz and Soliman, 2015).

Egypt is the most balanced in the trade balance the interoperability of macroeconomic policy with the rest of the member states in the region, where a degree of economic participation of Egypt about 0.63%, followed by the group of countries that have achieved relatively balanced in their balance of trade the interoperability of macroeconomic policy with the rest of the member states, where a degree of economic participation toward (5% - less than 20%), include of Qatar, Tunisia, Libya, Algeria, United Arab Emirates, and Oman, where the economic participation of about 5.47%, 6.26%, 10.83%, 10.99%, 12.25%, 15.74%, respectively. Following are the group of states which had achieved an average balance in their balance of trade the interoperability of macroeconomic policy with the rest of the member states, with the participation of about (more than 20%- Less than 50%), these countries include of Lebanon, Bahrain, Kuwait, Syria, Sudan, and Jordan, where a degree of economic participation of about 21.79%, 26.16%, 67%, 31.57%, 32.03%, 32.85%, respectively, while the group of countries that achieved balance low in the balance of trade the interoperability of macroeconomic policy with the rest of the other States (more than 50%) include of Saudi Arabia, Yemen, Iraq, Morocco and Palestine, where a degree of economic participation of about 53.37%, 57.25%, 76.62%, 71.93%, 75.86%, respectively, (Table 5).

3.3.8 Economic dependence of member states in the region

The economic dependence of the state indicates to the extent of the dependence on imports, and calculated estimate the proportion of imports in the gross domestic product (GDP), ranging from (100) in the case of the adoption of the GDP of the state entirely on imports, and (0) in the case of the contrary (Soliman, 2015).

We examined the degree of economic dependency of member states in the region during the study period. Jordan relies on imports from Arab states, it has a degree of economic dependency of about 21.99%, followed by Bahrain by about 18.09%, then Amman by about 11.42%, also Yemen by about 11.2%, comes after the group of states which rely on imports of member states about (5%- Less than 10%) and include of Iraq, Lebanon, and Morocco, where a degree of economic dependency about 8.69%, 6.1%, 5.1%, respectively.

A group of states which rely on imports from the member states of the region by about (1%- Less than 5%) nine countries include of Syria, United Arab Emirates, Tunisia, Sudan, Egypt, Qatar, Kuwait, Libya, and Saudi Arabia, where a degree of economic dependency about 4.23%, 4.05%, 4.02%, 3.75%, 3.1%, 3.08%, 2.78%, 2.25%, 1.85%, respectively. There are two states adopted only on the striking of member states about (less than 1%), include of Algeria and Palestine, where a degree of economic dependency about 0.9%, 0.26%, respectively. (Table 5).

There is still a long economic integration among states. This is reflected in the low proportion of total imports to the total GDP of the region, where reached about 4.06% of the average during the study period, demonstrating the importance of the expansion of the trade exchange between member states, the increase of commercial exchange between these states would be at the expense of its imports from the outside world and contributes to the treatment of trade dependence abroad suffered by most of the Arab States.

3.3.9 Efficiency of the performance of the export operations to member states in the region

The proportion of the foreign total trade to the total national income indicates the efficiency of the export operations. Whenever the value of this indicator increases, export activities also increases. This is an indication of intra-regional trade activities.

Jordan benefited most from intra-regional export. The proportion of the total intra-trade interfaces with the member states in the area of the total national income of about 33.85, followed by Bahrain about 29.9%, then comes from Oman, Yemen, Syria, and Lebanon, where the proportion of trade with the member states of the region of the total national income of about 21.82%, 15.97%, 13.79%, 1023%, respectively, while the group of countries, the proportion of inter-trade with member states of the total national income toward (more than 5%- 10%)) of Iraq, United Arab Emirates, Saudi Arabia, Tunisia, Qatar, Sudan, Egypt, and Morocco, where the ratio amounted to 83.9%, 8.42%, 7.74%, 7.54%, 7.2%, 17.7%, 6.46%, 6.07%, respectively. The lesser group (less than 5%) include Kuwait, Libya, Algeria, and Palestine, where the ratio amounted to about 4.37%, 3.78%, 2.23%, 1.94%, respectively, (Table 5).

We found that here is a decline in the number of export institutions and low efficiency of the performance of the export operations between member states, thus decreasing the region as a whole, where the proportion of the total intra- trade in the total national income of the region toward 8.29% as an average during the period of study.

3.3.10 Annual growth rates of the foreign total intra- trade in the region

The annual growth rates of the foreign total intra-trade in the region ranged from a low of a decrease of 16.6% in the year 2009, and a maximum reached about 44.7% in the year 2005, with an annual average of reached about 13.7%. The annual growth rates of the total intra-exports in the region between a low of a decrease of about 19.39% in the year 2009, and a maximum of about 52.26% in the year 2004, with an average annual rate of about 13.6%, ranging from annual growth rates of the total intra-imports in the region between a low of a decrease of about 13.56% in the 2009, and a maximum of about 50.46% in the 2005, with an average annual rate of about 13.9% during the study period, (Table 6).

3.3.11 Degree of economic stability of the foreign total intra-trade in the region:

The assessment of economic instability by intra-trade in the region during the study period shows that it ranged between a minimum of 0.28% in the 2013 to a maximum of about 148.75 in the 2000. The index of the degree of economic stability and the intra-trade in the region is 8.26%. The values

for economic instability in intra-exports in the region ranges between 0.44% in the 2006, and a maximum of about 124.81 in the 2000. The general indicator of the degree of economic stability the total intra-exports region was 8.37%. The transactions ranged from economic instability of the total intra-imports in the region between the minimum reached about 0.46% in the 2007, and a maximum of about 179.81 in the 2000. The general indicator of the degree of economic stability the total intra- imports in the region toward 7.95% for the same period of study, (Table 6).

These results indicate that the total intra-imports was more stable of the total intra-exports in the region and. In general, intra-trade, the total intra-total exports and imports in the region of instability or relative stability during the study period.

Table 6. Development of annual growth rates and transactions instability of foreign trade internetwork college in the region during the period (2000 -2013).

Statement Year	Annual growth rates%			Transactions instability%		
	Total intra-trade	Total intra-exports	Total intra-imports	Total intra- trade	Total intra-exports	Total intra-imports
2000	14.14	17.98	10.39	148.75	124.81	179.81
2001	12.08	10.48	13.73	22.42	15.94	29.75
2002	9.68	9.71	9.65	13.98	17.04	10.65
2003	16.37	12.13	20.67	26.36	30.99	21.42
2004	35.91	52.26	20.54	20.85	16.47	25.48
2005	44.70	39.85	50.46	5.27	3.07	7.59
2006	21.36	21.25	21.48	1.98	0.44	4.53
2007	20.27	20.65	19.85	2.74	5.80	0.46
2008	36.32	35.00	37.79	24.11	26.74	21.37
2009	(16.60)	(19.39)	(13.56)	7.07	8.19	5.92
2010	3.78	0.95	6.65	12.50	15.83	9.05
2011	31.54	37.84	25.43	5.30	6.25	4.31
2012	6.12	4.80	7.50	3.00	2.70	3.30
2013	4.39	3.84	4.95	0.28	1.04	0.49
Average	13.7	13.6	13.9	8.26	8.37	7.95

The volumes in brackets are negative. Source: collected and calculated from: 1.The League of Arab States, the Arab Monetary Fund, the Unified Arab Economic Report , various issues. 2. The International Bank, data, World Development Indicators , various periods.

3.3.12. Per capita share of the foreign total intra-trade in the region

The average per capita share of the foreign total intra-trade in the region during the period of study at 114.97 dollars, representing about 3.96% of the per capita share of the total foreign total trade in the region. The per capita share of the foreign total intra- trade in the region between the minimum reached about 86.13 dollars in the 2001, the equivalent of about 3.53% of the per capita share of the foreign total trade in the region, and a maximum of about reached 140.89 dollars in the 2008, the equivalent of about 3.46% of the per capita share of the foreign total trade in the region, (Table 7). The low and declining per capita share of the foreign total intra-trade in the region.

3.3.13. Concentration and diversification commodity of exports

The degrees of diversity commodity concentration of member states in the region in the 2013 shows that the Arab states differed in indicators of concentration. It is still characterized by a low in the degree of diversity in their exports, for achieving medium levels of diversity (0.5), with the exception of Tunisia, Egypt, and United Arab Emirates which record index diversity in the exports

of about 0.531, 0.536, 0.554, respectively. The average value of diversity index for the region reached about 0.686, (Table 8).

The concentration index shows a high degree of concentration of exports in nine countries. Ranking from high to low: Iraq has0.981, followed by Libya about 0.811, then comes the states of Saudi Arabia, Kuwait, Oman, Yemen, Algeria, Sudan, and Qatar about 0.761, 0.746, 0.62, 0.592, 0.54, 0.534, 0.519, respectively, while Syria was less than the states in the concentration index about 0.137. Morocco has about 0.157, then comes of Lebanon, Tunisia, Egypt, and Jordan about 0.159, 0.16, 0.161, 0.164, respectively. The average value of the concentration index for the region reached about 0.374, (Table 8).

Table 7. Evolution of per capita from the dollar foreign trade of total intra-Arab free trade zone during the period (2000-2013)

Statement Year	**Per capita by dollar**		
	The foreign total trade (1)	**The foreign total intra-trade (2)**	**(1)/ (2) %**
2000	1196.81	102.17	8.54
2001	1558.34	86.13	53.5
2002	1468.36	98.14	6.68
2003	1504.94	109.04	7.25
2004	1790.13	121.83	6.81
2005	2320.63	132.94	5.73
2006	3006.71	121.67	4.05
2007	3403.82	126.25	3.71
2008	4066.33	140.89	3.46
2009	5237.71	88.68	1.69
2010	4008.47	117.71	2.94
2011	4597.63	132.05	2.87
2012	5622.10	112.17	2
2013	6010.96	107.07	1.78
Average	3270.93	114.97	3.96

Source: collected and calculated from: 1.The League of Arab States, the Arab Monetary Fund, the Unified Arab Economic Report , various issues. 2. The International Bank, data, World Development Indicators , various periods.

Table 8. Indicators of concentration and commodity diversification of exports of the States members of the Arab free trade zone in 2013.

Statement Country	**Number of Goods**	**Concentration Index**	**Diversity Index**
Jordan	234	0.164	0.624
United Arab Emirates	259	0.434	0.554
Bahrain	235	0.356	0.702
Tunisia	226	0.160	0.531
Algeria	98	0.540	0.728
Saudi Arabia	254	0.761	0.752
Sudan	84	0.534	0.793
Syria	221	0.137	0.603
Iraq	137	0.981	0.881
Amman	234	0.620	0.672
Qatar	232	0.519	0.771
Kuwait	233	0.746	0.783

Lebanon	223	0.159	0.642
Libya	141	0.811	0.786
Egypt	239	0.161	0.536
Morocco	245	0.157	0.682
Yemen	190	0.592	0.737
Average	196	0.374	0.686

*Sudan data for the year 2012 the last statement available.
Source : collected from:1. UNCTAD, as the classification of SITC 3 digit (the classification of the third level). 2. The League of Arab States, the Arab Monetary Fund, the Unified Arab Economic Report, various periods..

4.0 CONCLUSION

The Arab states implemented many measures and agreements aimed at the development of the intra-Arab trade. The Convention on the Great Arab Free Trade Area in the year 1998, which entered into effect implementation in the 2005, has the aim of opening Arab markets, and the removal of obstacles and hindrances tariff and non-tariff barriers and facilitate cross the transfer of goods. There have been modest gains in intra-trade compared to foreign trade in the region. According to the findings of this research, we offer the following recommendations:

(1) Coordination between the member states of the region in production and economic policies, specialization in the production of certain products in the state or of several Arab countries in accordance with the comparative advantage in the production, as well as the division of labor between the Arab countries reduce competition in the Arab markets.

(2) Facilitate the movement of trade between Arab states to overcome the problem of the concentration of trade in some states, first and foremost, means of transport, communications, especially transport between the east and the west.

(3) Work on the development of rules of origin to increase the proportion of the component of the joint Arab about 50% in the case of the participation of two Arab countries in its production, so as to increase the ratio to 75% if the number of partners in production to three Arab countries or more help to Edit Arab trade in diversity and mutual respect.

(4) Proposing the list of goods exempted from customs tax and tariffs on the remaining commodities, where the absence of agreement on rules of origin have negative repercussions on the liberalization of intra-Arab trade, and increases the exceptions.

(5) Provuide information and transparency on dealing or trade exchange between member states, in respect of all administrative procedures and policies of the various economic, which constitute an essential element in the process of implementation of the region.

(6) Establish an emergency committee to deal with the regional developments and to overcome the emergency problems to the economies of member States, and the coordination between these States in the formulation of plans to face the economic challenges that arise as a result of recent developments or other disasters and their reflections on the movement of intra-Arab trade, to limit their negative effects.

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Credit Risk Assessment for Commercial Loans

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ABSTRACT

The purpose of this research is to provide practical tool for credit evaluation of firms by using cash flow statements as the basis. A predictive function for firm credit score is introduced using the expected cash flow adjusted for internal and external state effects. The data used in this research came from 10 publicly traded companies in SP500 for in-sample testing. Out-of-sample test was accomplished by an additional 10 companies from NASDAQ. We assert that the Cash Flow Base (CFB) distribution method as a tool for commercial loan assessment is inadequate. This research introduces the use of the distribution of the Altman Z-score as a means for commercial risk assessment. The use of failure rate *H(t)* in this paper allows lenders to specified the level of default risk tolerance and decide whether to grant the loan. We verified our method in out-of-sample testing. Our Comparative Altman Z-Score forecasting method was able to identify risky firms with 0.95 confidence. The contribution of this research lies in its practical and interdisciplinary applications in risk management for banking and finance.

Keywords:
Altman Z-score, bankruptcy, cash flow analysis, credit evaluation, risk assessment

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1.0 INTRODUCTION

Credit risk assessment is a practical issue in commercial loan application evaluation. There are many tools used in credit risk assessment (Brown & Moles, 2014), for example, Data Envelopment Analysis and econometric modeling had been employed. Data Envelopment Analysis (DEA) had also been used in credit risk evaluation as in Troutt *et al*. (1996); Simak (1999), Cielen and Vanhoof (1999) and more recently by Emel *et al*. (2003), Paradi *et al*. (2004) and Cielen *et al*. (2004). Econometric method had been employed by Zavgren (1985), Keasey and Watson (1987), and Becchetti and Sierra (2003) to predict company failures. This research examines company cash flows as the indicator for credit risk for commercial loan evaluation. The research question presented by this paper is *whether cash flow distribution analysis is an effective tool for company evaluation in commercial loan?*

The assessment of credit worthiness may involve several scenarios. One scenario may involve newly established company with no track record of past financial performance. In this case, it is nearly impossible to assess the company's financial performance on the basis of past operations. Another scenario involves the loan applicant experiencing financial distress. For companies with track records of financial performance, cash flow analysis may be used for credit worthiness evaluation. In this paper, we use cash flow statements for credit risk evaluation. We evaluated the Cash Flow Distribution approach and the Altman Z score method as possible tools for corporate risk assessment. The Altman Z is used as a default test to verify whether the company experiences financial distress.

The objective of this paper is to provide a practical tool for pre-qualifying loan application through the use of cash flow analysis. The intended contribution of this research lies in the utility of the proposed credit assessment tool for stakeholders: $\Phi(Z_i)$.

2.0 LITERATURE REVIEW

2.1 Cash Flow Distribution as a Tool for Credit Evaluation

One line of literature for credit risk assessment is the use of the distribution cash flow statements. In a study of construction companies in the US, Huang *et al*. (2013, p. 612) proposed a cash flow based structural model (CFB) as:

$$C_{it} = E(C_{it}) + \sum_{j=1}^{k} \alpha_{ij} F_{jt} + \xi_{it} \qquad (1)$$

where C_{it} = the i^{th} firm's free cash flow; α_{it} = sensitivities of the i^{th} firm's C_{it} to the j^{th} state factor; F_{jt} = unobservable state factors; ξ_{it} = idiosyncratic factor of i^{th} firm that causes variation in the firm's C_{it}; and h_{it} = variance explained by systematic factor. The distribution of the error is defined as $\xi_{it} \rightarrow N(0, \sqrt{1-h_{it}})$. Huang *et al.* predicts the firm's cash flow as an expected cash flow adjusted for the level of the firm's cash flow sensitivity to external shock.

The model in (1) claims that the firm's free cash flow tends to be mean reverting. The model assumes that there are *k* factors and the factor loading is α_{it}, the mean reverting effect of the model renders the distribution to be a *Gaussian* process (Appendix 1) where the state factor is given by:

$$dF_{jt} = \alpha_{F_j} \left[b_{F_j} - F_{j,t-1} \right] dt + \sigma_{F_j} dz_j \qquad (2)$$

where F_{jt} stands for the j^{th} state value at time t; α_{F_j} is the velocity of the mean reverting process of F_{jt}; the last period's state factor is $F_{j,t-1}$. The state factor may also change over time, the variation of F_{jt} is given by σ_{F_j}. The last term dz_j is the Wiener process.

The CFB model proposed by Huang *et al.* finally asserts that the firm's present value is given by;

$$V_{it} = \left[\sum_{\tau=t+1}^{T} \frac{C_{i\tau}}{(1-\gamma_A)^{\tau-t}} \right] + \frac{C_{iT}(1+\mathrm{g})}{(1+\gamma_A)^{T-t}(\gamma_A - g)} \tag{3}$$

where V_{it} = present value of the cash flow at time t; $C_{i\tau}$ = firm's remedial cash flow at time t; T = beginning time of constant growth; C_{iT} = firm's remedial cash flow at time T; γ_A = constant growth rate after time T.

The rationale for determining the present value of the cash flow is to obtain the current monetary value. With known present value of the firm's cash flow, the next step is to determine the threshold for the firm's default on the loan. Huang *et al.* provides the probability of default as: (i) if $0 < \ell V_{t-1} < \hat{D}_t$, the default probability is given by:

$$f(x) = \begin{cases} \dfrac{2}{\ell V_{t-1}\left(\hat{D}_t\right)} x, & \text{if } \ 0 < V_t < \ell V_{t-1} \\ \dfrac{2}{\hat{D}_t\left(\hat{D}_t - \ell V_{t-1}\right)} [\hat{D}_t - x], & \text{if } \ 0 < V_t < \hat{D}_t \\ 0 & \text{if } \ V_t > \hat{D}_t \end{cases} \tag{4}$$

and (ii) if $\ell V_{t-1} > \hat{D}_t$, the default probability is given by:

$$f(x) = \begin{cases} \dfrac{2}{\left(\hat{D}_t\right)^2} x, & \text{if } \ 0 < V_t < \hat{D}_t \\ 0 & \text{if } \ V_t > \hat{D}_t \end{cases} \tag{5}$$

The decision rule is governed by the Credit Quality Score (CQS). If CQS is closer to 0, it is considered credit worthy; if CQS is closer to 1, the firm is classified as having poor credit. The CQS decision rule for $0 < \ell V_{t-1} < \hat{D}_t$ is summarized as:

$$CQS_t = PD_t = \Pr(D_t > V_t) = \begin{cases} 1 - \dfrac{V_t^2}{\hat{D}_t\left(\ell V_{t-1}\right)} & \text{if} \quad 0 < V_t < \ell V_{t-1} \\ \dfrac{\left(\hat{D}_t - V_t\right)^2}{\hat{D}_t\left(\hat{D}_t - \ell V_{t-1}\right)} & \text{if} \quad \ell V_{-1} < V_t < \hat{D}_t \\ 0 & \text{if} \quad V_t > \hat{D} \end{cases} \tag{6}$$

Huang *et. al*. summarized the decision CQS when $\ell V_{t-1} > \hat{D}_t$ as:

$$CQS_t = PD_t = \Pr(D_t > V_t) = \begin{cases} 1 - \left(\dfrac{V_t}{\hat{D}_t}\right)^2 & \text{if} \quad 0 < V_t < \hat{D}_t \\ 0 & \text{if} \quad V_t > \hat{D} \end{cases} \tag{7}$$

In this literature review, we contest that $C_{it} = E(C_{it}) + \sum_{j=1}^{k} \alpha_{ij} F_{jt} + \xi_{it}$ presented by Huang *et al.* and its predecessors (Liao et al., 2009, and Duffie & Lando, 2001) is not accurate for two reasons: (i) the method for calculating the expected value of the cash flow $E[C_{it}]$ was not given, and (ii) the second term in the equation $\sum_{j=1}^{k} \alpha_{ij} F_{jt}$ is not correct because this second term must be multiplied by the first term as $E[\mathrm{C}_{it}]\left(\sum_{j=1}^{k} \alpha_{ij} F_{jt} + \xi_{it}\right)$ and depending on the direction of the shock, the adjustment may be plus or minus as shown below:

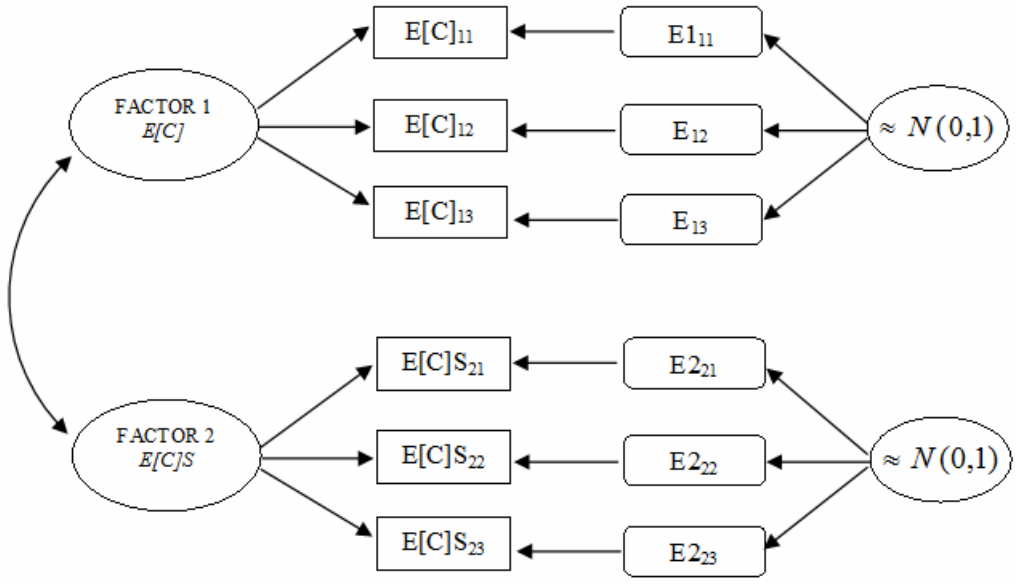
$$C_{it} = E[C_{it}] \pm E[\mathrm{C}_{it}]\left(\sum_{j=1}^{k} \alpha_{ij} F_{jt} + \xi_{it}\right) \tag{8}$$

A third flaw is found in the state factor argument. The state factor in (2) is assumed to behave as a Gaussian process. This assumption is untenable. A state factor may be represented as extreme or non-extreme. The shock from the external environment, as a state factor, may be short-lived or permanent. In case where the shock is short-lived, the distribution may be mean reverting. The Gaussian assumption may be valid in this case. However, if the effect of the shock is permanent, the assumption of mean reverting is invalid. The formula used to predict the firm's present value (3) is usable only if the data is normally distributed and there is no effect of external shock. The assumption of normality had been criticized for being not reflective of real life situation. (Doganoglu *et al.*, 2007). It was shown that asset returns are non-elliptical (Chicheportiche & Bouchaud, 2012). Admittedly normal distribution is not always found in practical context (Geary, 1947). The assumption of normality contradicts the concept of "state factor" if state factor represent real life situation and real life situation does not confirm to normal distribution. In this paper, we

found that the in-sample CDF falls outside of one standard unit of the standard normal curve and the out-of-sample set falls within the normal curve. Thus, the assumption that the data should be $N(\mu,\sigma^2)$ in the CFB model is not supportable. We offer a better method called *Comparative CDF of Altman Z-Score.*

The credit assessment in the CFB model consists of three steps: (i) Estimate the firm's cash flow, (ii) calculate the expected cash flow; and (iii) determine the firm's default probability. The conceptual framework for CFB is illustrated in Figure 1. We offered corrections to the three defects mentioned above in the methodology section.

Figure 1. Conceptual Framework of Cash Flow Distribution Method



2.1 Altman's Z-score Model

A second line of literature deals with financial distress assessment by using fnancial ratios. Under the Altman approach, financial distress studies may be called "bankruptcy prediction studies." This approach employed parametric model using the firm's financial ratios.

Altman (1968) applied the model to a sample of manufacturing companies in the US. Subsequent studies reaffirmed the applicability of the Z-Score model to privately held companies (Deakin, 1972; Ohlson, 1980), non-manufacturing firms (Grice and Ingram, 2001; Altman, 2000), banks (Sinkey, 1975; Chotalia, 2014), insurance companies (Trieschmann and Pinches, 1973; Pinches and Trieschmann, 1977).

Altman's research identified five key ratios to predict failure and the model expresses these ratios in the form of a relationship with other ratios in the model with assigned a relative weighting. The bankruptcy score sorts firms into bankrupt and non-bankrupt groups according to their Z score (Aziz *et al.*, 2006). In 1968, the Altman Z-score model was parametized as:

$$Z = 0.012X_1 + 0.014X_2 + 0.033X_3 + 0.006X_4 + 0.999X_5 \qquad (9)$$

where X_1 = working capital/asset; X_2 = retained earnings/asset; X_3 = EBIT/total assets; X_4 = market value of equity/total assets; X_5 = sales/total assets; Z = overall index (Altman, 1962 & 2000).

The model was later modified (Altman, 1983, p. 122) to cover private firms as:

$$Z' = 0.717X_1 + 0.840X_2 + 3.107X_3 + 0.420X_4 + 0.998X_5 \qquad (10)$$

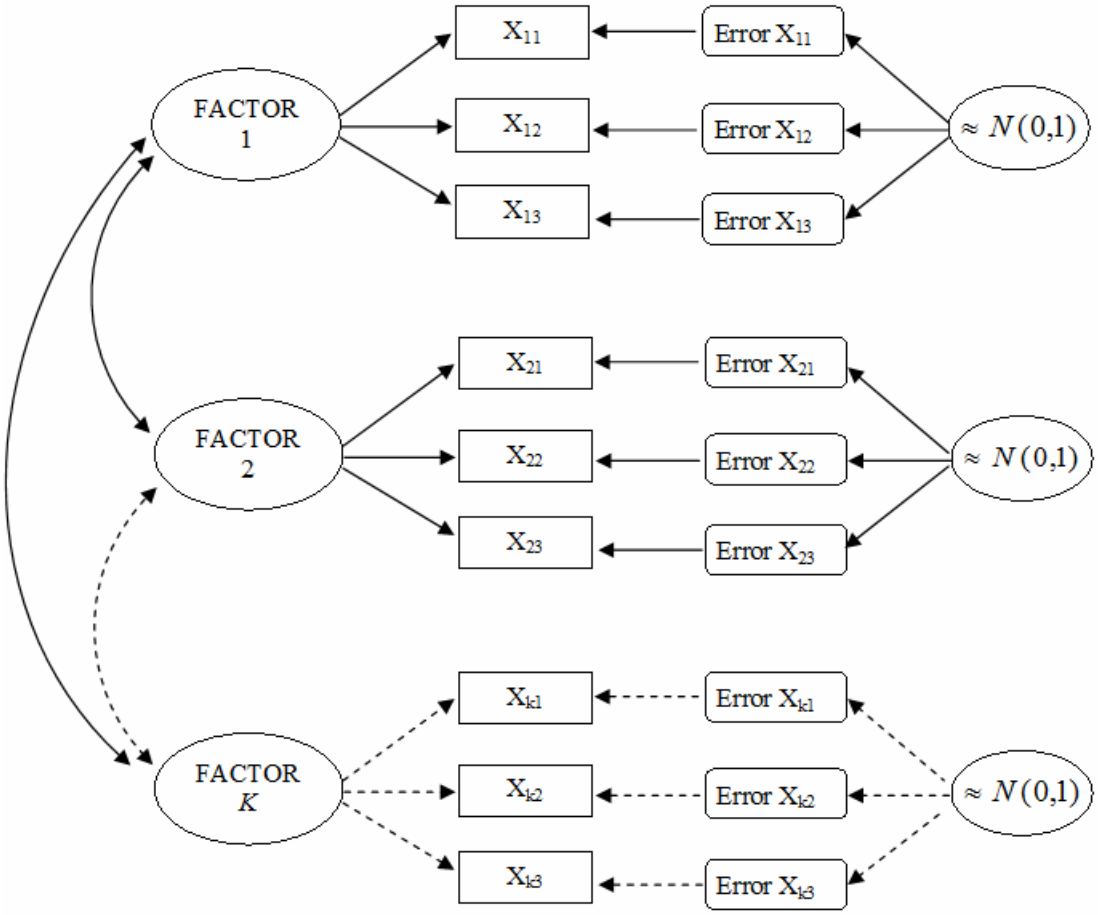
The decision rule is governed by: $Z' > 2.60$ means "safe;" $1.10 < Z < 2.60$ means "gray area" and $Z < 1.11$ means that the firm is in financial distress.

In 1982, another version of the Altman Z-score was introduced to cover non-manufacturing companies (Altman, 1982, p. 124). The third version of the Altman Z score is given by:

$$Z = 3.25 + 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4 \qquad (11)$$

For non-manufacturing firms, the safe zone is defined as $Z > 2.60$; the gray area is $1.10 < Z < 2.60$ and financial distress is defined as $Z < 1.10$. The model had an average accuracy of more than 85% in bankruptcy prediction (Aziz *et al.*, 2006) and is still the most popular technique in business failure identification.

Figure 2. Conceptual Framework of Structural Equation for Altman Z-Score Method



3. DATA

Secondary data was used for this study. There are two sets of data used in this research. The first set of data was used as an in-sample testing. This set of data consists of 10 companies selected from across industries listed in SP500. The second data set consist of 10 companies selected from the NASDAQ. This second set was used for out-of-sample testing. The rationale for using different data set for the our-of-sample test is to verufy the general applicability of the proposed model.

The financial statements used consist of 8 periods of reporting. The rationale for this short span of time for the study comes from the nature of risk assessment for commercial loan. Longer period, i.e. larger sample size, would provide inaccurate assessment of risk due to change in circumstances (IAS 39 and IFRS 7).

Ten companies from SP500 were used for in-sample testing. These companies were selected on the basis of their data availability and being cross-industries representation.

Table 1. Net Cash Flow for Eight Consecutive Quarters in In-Sample Set

SP500	Fiscal Year 2014				Fiscal Year 2015			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
MMM	1,954.00	2,125.00	1,929.00	1,897.00	1,791.00	2,983.00	1,605.00	1,954.00
GOOGL	16,639.00	19,620.00	15,605.00	18,347.00	16,976.00	18,453.00	18,068.00	16,639.00
ACP	0.24	0.29	0.46	0.44	0.51	0.52	0.49	0.47
AXP	20,740.0	18,430.0	21,264.0	22,288.0	23,572.0	21,071.0	19,938.0	20,740.0
T	3,611.00	11,305.00	2,458.00	8,603.00	4,444.00	20,956.00	6,202.00	3,611.00
ADSK	1,609.60	1,323.10	1,345.00	1,853.00	1,182.70	1,473.10	1,337.50	1,609.60
BAX	2,049.00	1,866.00	2,078.00	2,925.00	2,530.00	6,680.00	1,970.00	2,049.00
MLM	35.80	34.32	73.59	108.65	56.36	44.16	436.42	35.80
PXD	257.0	445.0	550.0	1,025.0	383.0	219.0	581.0	257.0
SBUX	1190.3	1019.4	1708.4	1857.0	1750.4	2080.5	1530.1	2263.5

In order to test the reliability of the proposed model, an out-of-sample test was employed. The out-of-sample data consist of eight consecutive quarters of net cash flows from 10 companies listed in the NASDAQ. The original 10 companies from SP500 (Table 1) were not used for out-of-sample test because we attempt to verify the generalizability of the model by applying it to true out-of-sample testing by not repeating the test of data from the same source, i.e. SP500. The 10 companies selected for the out-of-sample test is listed in Table 3.

Table 3. Net Cash Flow for Eight Consecutive Quarters in Out-of-Sample Set

NASDAQ	Fiscal Year 2014				Fiscal Year 2015			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
ABMD	34.74	17.48	19.47	22.40	40.43	54.42	53.22	34.74
APC	5,924.00	5,365.00	8,335.00	7,369.00	2,308.00	2,173.00	2,072.00	2,697.00
BJRI	34.86	25.89	24.39	30.68	25.96	25.45	26.57	34.86
CNL	18,157.00	23,237.00	11,210.00	44,423.00	64,836.00	22,429.00	17,329.00	18,157.00
HCOM	36,738.00	28,228.00	31,693.00	39,885.00	26,940.00	35,599.00	28,845.00	36,738.00
MHFI	1,531.00	1,617.00	1,918.00	2,497.00	1,176.00	1,720.00	1,441.00	1,531.00
RAVN	63.40	62.16	66.35	51.94	47.45	47.30	32.28	63.40
SMID	2.88*	2.85	4.24	3.57	2.27	1.94	0.99	2.88
TTWO	822.00	754.41	897.45	911.12	815.78	711.71	835.24	822.00
VEEV	188.88	140.11	132.13	129.25	107.56	119.77	16.26	188.88

*Billion dollars

4. METHODOLOGY

4.1 Sample Size Determination

Minimum sample size determination was accomplished under the Weibull method in Gou *et al.* 2013. It was explained that Weibull minimum sample calculation is accomplished three steps (Gou *et al.* 2013). The minimum sample size for Weibull's distribution function may be obtained by:

$$1 - CI = R^n \tag{12}$$

where CI = confidence interval; R = Weibull reliability; and n = sample size. The confidence used for sample size determination is 99%. Since $1 - CI = \alpha$, equation (15) may be written as:

$$\alpha = R^n \tag{13}$$

The mean of the Weibull reliability for the study period is $R + SD = 0.51$. Using 0.99 as the confidence interval, the value for alpha is $\alpha = 0.01$. The sample size is $n = 7$. The sample size used in this research is comprised of 8 operating quarters.

The sample size under Gou is verified by the DeMoivre-Laplace Central Limit Theorem equation:

$$\lim_{n\to\infty} \Pr\left[\frac{X_n - n^* p}{\sqrt{npq}}\right] \tag{14}$$

where X_n = number of incidence of increase in net cash flows in the sample period; n = 8 operating quarters; $p = (s+1)/(n+2)$; and $q = 1 - p$. Solve for n*, thus:

$$n^* = \frac{\left(Z\sqrt{npq}\right) + X_n}{p} \tag{15}$$

For in-sample group, $n^* = 13.16$ and for the out-of-sample group, $n^* = 13.50$. This number represents two fiscal years of sample. By dividing the result by 2 to obtain the one year minimum sample size, the final sample sizes are $n^* = 6.58$ for in-sample and $n^* = 6.75$ for out-of-sample set. These values are consistent with the Gou method where $n = 7$.

4.2 Company Cash Flow Distribution

The cash flow distribution is tested by comparing the observed CDF against the standard CDF under one unit of standard deviation. Within one standard unit, the CDF is 0.68 for the null hypothesis. The decision rule states that $H_0 : CDF \le 0.68$ is not statistically significant; this means that the distribution is within the expected region. The alternative hypothesis is $H_A : CDF > 0.68$ or that the distribution lies outside of the normal range of expectation. The CDF formula is given by:

$$CDF = \frac{1}{2}\left[1 + erf\left(\frac{X - \mu}{\sigma\sqrt{2}}\right)\right] \tag{16}$$

which is approximately:

$$\langle CDF \rangle = \Phi\left(\frac{X - \mu}{\sigma}\right) \tag{17}$$

For the null hypothesis, $\langle CDF \rangle = CDF^* = 0.68$. The observed value for the CDF is obtained by:

$$CDF = \Phi\left(\frac{\overline{X} - \mu}{S}\right) \tag{18}$$

where $\overline{X}$ = sample mean for the 8 periods in the sample; μ = estimated mean; and S = sample standard deviation.

In addition to the individual data set's distribution, the cash flow distribution method requires the use of market performance distribution. This second requirement is not feasible. The cash flow is a quarterly data. However, market performance is tracked daily. Using a three month's

average would require the market to be stable so as to capture the mean reverting characteristic of the market. For this reason, we urge that the CFB method as a means to assess credit worthiness is not practicable.

4.3 Altman Z Score as Alternative Tool for Credit Worthiness Testing

The Altman Z-score is used as an alternative to Huang *et al.*'s CFB approach. The relevant version of the Altman Z-score is given as:

$$Z = 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4$$

where X_1 = working capital/asset; X_2 = retained earnings/asset; X_3 = EBIT/total assets; X_4 = market value of equity/total assets; and Z = overall index. The decision rule is $Z > 2.60$ means "safe;" $1.10 < Z < 2.60$ means "gray area" and $Z < 1.10$ means that the firm is in financial distress (Altman *et al.*, 2014).

5. FINDINGS

The testing for normality was first accomplished in order to verify the claim of the CFB method. The CFB method assumes that the cash flow is normally distributed. It is a common practice to use the Anderson-Darling (AD) test to verify normality. The AD test is given in two parts: (i) AD observed value, and (ii) AD* or the theoretical value. The data is considered normally distributed if $AD \le AD^*$ and not normally distributed if $AD > AD^*$. The AD observed is obtained by;

$$AD = -n - S^* \tag{19.1}$$

$$S^* = \sum\left(\frac{2k-1}{n}\right)\ln F(X) + \ln(1 - \mathrm{F(X)}) \tag{19.2}$$

The theoretical value AD* is given by:

$$AD^* = AD\left(1 + \frac{0.75}{n} + \frac{2.25}{n^2}\right) \tag{20}$$

This approach to normal distribution test is problematic because the equation (AD*) is biased in favor of finding $AD \le AD^*$. Therefore, we approach normality by comparing the CDF of the data to the CDF* of the assumed normality.

The empirical cumulative distribution function (CDF) was obtained through the Weibull CDF:

$$CDF = 1 - \exp\left(-\left(\frac{X}{\mu}\right)^{1/\beta}\right) \tag{21}$$

The observed CDF is compared to the assumed normal distribution CDF:

$$CDF = \frac{1}{2}\left[1 + erf\left(\frac{X-\mu}{\sigma\sqrt{2}}\right)\right] = \Phi\left(\frac{X-\mu}{\sigma}\right)$$ where erf is the error function, *see* (17).

The first set of calculation involves the modeling of the predictive function of the cash flow for each stock in order to verify the direction of the trend of the cash flow movement. The trend

direction is indicated by the value of *beta*. The decision is governed by the following logic: if $\beta < 1$, the trend is decreasing with respect to time; if $\beta > 1$, the trend is increasing with respect to time, and if $\beta = 1$ there is no trend direction (Weibull, 1951). From ten companies in the in-sample test, two companies showed decreasing trend and eight companies showed increasing trend. The significance of this finding is the ability of this trend analysis method under Weibull can allow us to predict the direction of movement of the company's cash flow.

Table 1. In-Sample Empirical Evidence of Cash Flow Distribution

SP500 Ticker	Linear Model	Cash Flow CDF	System Reliability	Expected CF Beta (β)
MMM	Y = 8.75 + 0.09X	0.64	0.36	11.07
GOOGL	Y = 9.77 + 0.002X	0.63	0.37	458.80
CNP	Y = -0.76 + 0.23X	0.62	0.38	4.38
AXP	Y = 9.96 + 0.014X	0.63	0.37	73.48
T	Y = 8.69 + 0.035X	0.64	0.36	28.54
ADSK	Y = 7.28 -0.009X	0.63	0.37	-116.58
BAX	Y = 7.88 + 0.103X	0.63	0.37	9.72
MLM	Y = 4.35 + 0.291X	0.66	0.34	3.44
PXD	Y = 6.01 - 0.01X	0.63	0.37	-104.92
SBUX	Y = 7.49 + 0.19X	0.63	0.37	5.15

In Table 1, the mean time to failure or the cumulative distribution (CDF) of the system is between 0.62 and 0.84 as compared to the CDF of the normal distribution within one standard deviation is $CDF^* = 0.68$. In order to verify whether the data falls within the range of normal expectation in comparison to normal distribution curve, the Fisher transformation is used where:

$$Z_F = 0.50 \ln\left(\frac{1+k}{1-k}\right) \tag{22}$$

where *k* is the observed value. In this case, *k* is the individual CDF. The value of Z_F is used to determine the upper or lower range of the CDF* by:

$$Z_{obs} = Z_F \pm Z_\theta \sqrt{\frac{1}{n-3}} \tag{24}$$

The result of the calculation is shown in Table 2. The difference between the observed CDF and that of the theoretical CDF* (assumed normal distribution) is not statistically significant for in-sample set.

Table 2. In-Sample ΔCDF as a Tool for Normality Verification

SP500 Ticker	Observed *CDF*	Theoretical *CDF**	Diff. ΔCDF	Transform Z_F	ΔCDF Z_{obs}	Significant Range > 1.65
MMM	0.64	0.68	0.04	0.04	0.78	Not sig.
GOOGL	0.63	0.68	0.05	0.05	0.79	Not sig.
CNP	0.62	0.68	0.06	0.06	0.80	Not sig.
AXP	0.63	0.68	0.05	0.05	0.79	Not sig.
T	0.64	0.68	0.04	0.04	0.78	Not sig.
ADSK	0.63	0.68	0.05	0.05	0.79	Not sig.
BAX	0.63	0.68	0.05	0.05	0.79	Not sig.

MLM	0.66	0.68	0.02	0.02	0.76	Not sig.
PXD	0.63	0.68	0.05	0.05	0.79	Not sig.
SBUX	0.63	0.68	0.05	0.05	0.79	Not sig.

In the our of sample group, we were able to discover 7 out of 10 companies with decreasing trend in cash flow movement. As a tool for discovering risk companies, this approach is more effective than the cash flow structural modeling discussed in Huang *et al*. under CFB method. This result is reported in table 3. Similar calculation as described in table 2 was also carried out. The mean value of the in-sample set is $\overline{CDF} \cong 0.80$ which is more than 0.68. Therefore, the distribution of the cash flow is outside of the normal range of one standard unit of the normal distribution curve. However, in the out-of-sample set, $\overline{CDF} \cong 0.62$ which falls within the range of one standard unit of the normal distribution curve. These conflicting results further undermines the assumption made in the CFB method.

Table 3. Out-of-Sample Empirical Evidence of Cash Flow Distribution

NASDAQ Ticker	Linear Model	Cash Flow CDF	System Reliability	Expected CF Beta (β)
ABMD	Y = 3.57 + 0.18X	0.63	0.37	5.42
APC	Y = 8.08 - 0.38X	0.58	0.42	-2.65
BJRI	Y = 3.34 - 0.014X	0.63	0.37	-73.58
CNL	Y = 10.10 + 0.5X	0.63	0.37	19.26
HCOM	Y = 10.40 – 0.005X	0.63	0.37	-220.75
MHFI	Y = 7.39 - 0.043X	0.63	0.37	-23.51
RAVN	Y = 3.91 - 0.112X	0.63	0.37	-8.92
SMID	Y = 0.82 - 0.184X	0.62	0.38	-5.42
TTWO	Y = 6.71 - 0.004X	0.63	0.37	-228.06
VEEV	Y = 92.64 – 0.29X	0.60	0.40	3.45

The next test involves series of calculation for system analysis. The expected value (η) of the cash flow is calculated under Weibull's QQ plot approach. This result may be compared with the actual mean of the observed series. As part of the system analysis, we examined the mean time to failure rate or system failure rate or $H(t)$. The value of $H(t)$ for cash flow indicates the probability of company's financial failure. In the in-sample test we discovered two companies that has the probability of instantaneous failure of $H(t) = 1.0$. In the context of commercial loan evaluation, these companies represent cash flow risk.

Table 4. In-Sample Cash Flow Expected Value and System Failure Analysis

SP500 Ticker	Expected Value Eta (η)	Predictor Mean ($\overline{X}_{obs}$)	System Failure $H(t)$	System Survival $S(t)$
MMM	6,339.96	7,648.75	0.012	0.988
GOOGL	17,521.08	17,543.38	0.047	0.953
CNP	0.47	0.43	1.000	0.00
AXP	21,104.05	21,005.38	0.002	0.998
T	5,917.56	7,523.75	1.000	0.00
ADSK	1,446.98	1,466.70	0.016	0.984
BAX	2,648.39	2,768.38	0.005	0.995
MLM	77.22	103.14	0.090	0.910
PXD	408.57	464.63	0.00	1.000
SBUX	1,795.3	1,674.95	0.002	0.998

In the out-of-sample testing, despite the findings of 7 out of 10 companies showing decreasing trend in cash flow. Two companies (BJRI and SMID) shows immediate risk *H(t)* exceeding 50%. This means that in the out-of-sample data set, two companies manifest probable default in commercial loans according to their cash flow patterns form the last 8 operating quarters (Table 5).

Table 5. Out-of-Sample Cash Flow Expected Value and System Failure Analysis

NASDAQ Ticker	Expected Value Eta (η)	Predictor Mean ($\overline{X}_{obs}$)	System Failure $H(t)$	System Survival $S(t)$
ABMD	35.43	34.95	0.144	0.856
APC	3,221.50	4,530.38	0.00	1.000
BJRI	28.12	28.58	0.773	0.227
CNL	24,235.38	27,472.25	0.008	0.992
HCOM	32,701.10	33,083.25	0.001	0.999
MHFI	1,619.49	1,691.38	0.005	0.995
RAVN	50.04	54.29	0.080	0.920
SMID	2.28	2.70	0.798	0.202
TTWO	817	821.21	0.086	0.914
VEEV	92.64	127.86	0.009	0.991

The results in tables 1 – 5 explain the distribution of the cash flows and risk assessment on the basis of cash flow trends and system analysis. Table 6 (in-sample) and 7 (out-of-sample), examine the Altman Z-score for each company. According to the calculation of the Altman Z-score under $Z = 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4$ there is one company in the group (Ticker: CNP) that falls in the "gray zone". No company falls in the "distress zone."

Table 6. In-Sample Altman Z-Score Bankruptcy Model[3] for 8 Quarters*

SP500 Ticker	Z_1	Z_2	Z_3	Z_4	Z_5	Z_6	Z_8	Z_8
MMM	11.51	11.56	11.98	12.61	12.76	13.02	13.28	6.90
GOOGL	12.28	13.12	12.02	12.56	13.25	12.99	13.00	12.34
CNP	1.92	1.92	1.97	1.95	2.03	1.98	1.53	1.56
AXP	2.58	2.62	2.64	2.62	2.72	2.71	2.71	1.25
T	3.97	3.92	4.01	3.63	3.50	3.39	3.49	2.90
ADSK	5.22	5.15	4.92	4.60	4.71	3.21	2.69	2.26
BAX	7.59	7.61	7.72	8.19	8.50	7.68	7.20	6.93
MLM	6.34	6.73	6.60	6.43	6.27	6.34	6.36	5.84
PXD	5.92	5.69	6.50	6.56	6.30	5.97	7.75	4.94
SBUX	8.09	8.16	8.36	8.50	8.22	8.40	8.07	6.08

*Quarter 1 = Z_1, Quarter 2 = Z_0, …

[3] The model used for the calculation follows this formula: $Z = 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4$. The decision rule is given by: $Z > 2.60$ is classified as "safe;" $1.10 < Z < 2.60$ is classified as "gray"; and $Z < 1.10$ is classified as "distress." The parameters are * X_1 = (Current Assets – Current Liabilities) / Total Assets; X_2 = Retained earnings / Total Assets; X_3 = Earnings Before Interest and Tax / Total Assets; and X_4 = Book Value of Equity / Total Liabilities.

The same test is used to re-test ten different companies in the out-of-sample test (Table 7). It was found that one company (MHFI) shows irregular Altman Z-score. This was later confirmed by Z-score forecasting that MHFI is a financially distressed firm. Nine firms in the out-of-sample group (except MHFI) are found in the safe zone.

Table 7. Out-of-Sample Altman Z-Score Bankruptcy Model for 8 Quarters

NASDAQ Ticker	Z_1	Z_2	Z_3	Z_4	Z_5	Z_6	Z_8	Z_8
ABMD	9.88	8.16	7.28	6.88	7.21	6.92	6.98	33.61
APC	5.71	5.48	5.66	5.18	4.76	4.95	4.27	3.29
BJRI	20.00	19.66	18.70	41.39	41.19	31.56	36.19	3.62
CNL	11.71	12.23	12.76	12.24	11.44	12.08	13.28	15.06
HCOM	15.59	15.86	15.26	14.58	15.23	15.95	15.83	15.65
MHFI	1.39	-1.72	7.39	8.34	4.26	3.73	3.49	1.17
RAVN	9.30	9.76	9.94	9.34	15.39	9.96	9.60	8.17
SMID	8.35	9.29	9.60	8.03	7.96	9.71	9.23	7.30
TTWO	5.13	5.14	5.14	4.93	4.95	4.98	4.91	3.86
VEEV	5.64	5.58	5.87	5.61	5.68	5.71	5.91	4.23

While tables 1 and 3 show the direction of the trend of the cash flow, tables 8 and 9 shows that direction of the trend and the scale of the expected value for the Altman Z-score. These two measurements used the Altman Z-score observed in previous 8 operating quarters as the bases for forecasting the trend and magnitude of future Altman Z-score. These measurements are useful and practical tools for corporate credit assessment. The expected level of the Altman Z-score is read from η, the direction of the trend is read from β, the risk of possible default may be read from $H(t)$, and the certainty is read from $S(t)$.

The findings presented in tables 8 & 9 go beyond cash flow analysis. These calculations shows the use of the cash flow as the basis to assess the company's financial distress, and the proposed forecast method allows the lender to assess corporate credit worthiness by using $H(t)$ as a risk indicator. With known risk tolerance level, the lender could use this forecast method to grant or deny credit. This method represents a practical tool that holds utility in banking operations and financial analysis.

Table 8. In-Sample Altman Z-Score Forecast from 8 Quarters

SP500 Ticker	$Y_{(i)} = a + bX$	η	β	*CDF*	*R*	$H(t)$	$S(t)$
MMM*	$Y_Z = 2.41 - 0.06X$	11.15	-16.68	0.07	0.94	0.07	0.93
GOOGL*	$Y_Z = 2.54 - 0.01X$	12.74	124.36	0.01	0.99	0.03	0.97
CNP**	$Y_Z = 0.58 - 0.06X$	1.79	-16.94	0.06	0.94	0.34	0.66
AXP**	$Y_Z = 0.82 - 0.12X$	2.28	-8.69	0.13	0.87	0.34	0.66
T*	$Y_Z = 1.23 - 0.02X$	3.43	-57.68	0.02	0.98	0.25	0.75
ADSK*	$Y_Z = 1.23 - 0.26X$	3.44	-3.89	0.36	0.64	0.22	0.78
BAX*	$Y_Z = 2.02 + 0.01X$	7.57	73.51	0.01	0.99	0.04	0.96
MLM*	$Y_Z = 1.84 - 0.02X$	6.28	-43.88	0.02	0.98	0.09	0.91
PXD*	$Y_Z = 1.84 + 0.00X$	6.17	310.18	0.00	1.00	0.29	0.71
SBUX*	$Y_Z = 2.05 - 0.05X$	7.75	-20.67	0.05	0.95	0.08	0.92

Use the η as the indicator for prospective Altman Z-Score:*Safe: $Z > 2.60$, **Gray: $1.10 < Z < 2.60$, and ***Distress: $Z < 1.10$.

There are two companies (MHFI and RAVN) that shows high *H(t)* which may pose a potential risk of default. Depending on the lender's risk tolerance level, *H(t)* of the Altman Z-score series may be used as an indicator for possible default.

Table 9. Out-of-Sample Altman Z-Score Forecast from 8 Quarters

NASDAQ Ticker	$Y_{Z(o)} = a + bX$	η	β	*CDF*	*R*	$H(t)$	$S(t)$
ABMD*	$Y_Z = 2.30 + 0.17X$	9.93	5.95	0.17	0.83	0.06	0.94
APC*	$Y_Z = 1.51 - 0.14X$	4.51	-7.12	0.17	0.84	0.14	0.86
BJRI*	$Y_Z = 2.99 + 0.37X$	19.86	2.67	0.37	0.63	0.01	0.99
CNL*	$Y_Z = 2.56 + 0.06X$	12.99	17.83	0.05	0.95	0.03	0.97
HCOM*	$Y_Z = 2.74 + 0.0X$	15.51	374.91	0.00	1.00	0.02	0.98
MHFI***	$Y_Z = 0.85 + 0.68X$	2.34	1.47	0.66	0.34	0.37	0.63
RAVN*	$Y_Z = 2.30 + 0.0X$	10.00	-316.54	0.00	1.00	0.58	0.42
SMID*	$Y_Z = 2.15 + 0.02X$	8.55	-47.90	0.02	0.98	0.09	0.91
TTWO*	$Y_Z = 1.55 + 0.06X$	4.72	-17.40	0.06	0.94	0.12	0.88
VEEV*	$Y_Z = 1.68 - 0.04X$	5.38	-23.18	0.05	0.96	0.12	0.88

Use η as the indicator for prospective Altman Z-Score: *Safe: $Z > 2.60$, **Gray: $1.10 < Z < 2.60$, and ***Distress: $Z < 1.10$.

6. DISCUSSION

The challenge of assessing credit worthiness in commercial loans is to find practical tools for the credit assessment. The CFB method reviewed in this paper proved to be ineffective. As presented in (1) – (7), CFB method looks good as an academic treatise, but lacks practical utility. By using the Altman Z-score, we present as alternative approach to cash flow analysis for purposes of financial distress. This method is not a new contribution. However, the use of series of Altman Z-score over a span of operating periods to run an Altman Z-score distribution and use that distribution as the basis for predicting cash flow risk---is a novel approach in cash flow analysis.

The combination of the Altman Z-score distribution and Weibull's system analysis provides a powerful tool for corporate credit evaluation. By reading the Weibull statistics, there is no need to create complicated "credit score." The reading of various Weibull statistics of the Altman Z-score series could provide a multi-aspect to credit evaluation of a firm's financial strength. The value of η provides the expected value of the Altman Z-score. As a point-wise forecast, η provides an empirical basis of the expected value. Secondly, the value of $H(t)$ provides a more accurate tool in probability reading for the current risk of failure in the Altman Z-score. This combined approach to risk assessment has practical utility in the banking business and financial analysis.

7. CONCLUSION

From the in-sample and out-of-sample testing, we learned that cash flow-based structural equation as credit risk assessment tool for commercial loan is not effective. The Altman Z-score is a better alternative. As a tool for assessing potential financial distress, the Altman Z-score could better serve as a tool to assess the firm's credit worthiness. This paper has extended the Altman Z-score by tracking the Altman Z-score over 8 consecutive quarters to obtain an Altman Z-score distribution. This extension of the Altman Z-score analysis is a contribution to the literature. The argument that the current cash flow of the firm is a function of series of past series and the current market condition is rejected for *non sequitor* argument. The effect of the current market condition has already been incorporated into the process to produce the current cash flow; therefore, by restating it in the argument does not add anything to the proposition. The use of the QQ plot of the past

Altman Z-score, or numerical measurement of the firm's financial health, is a better empirical tool for assessing the firm's credit worthiness.

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APPENDIX 1

Weibull QQ Plot Procedures

Firstly, the time function $F(t)$ is obtained by:

$$F(t) = \frac{i - 0.30}{n + 0.40} \tag{A.1}$$

From $F(t)$, the quantitative X and Y are obtained. The X_Q array is obtained by:

$$X_Q = \ln\left(\ln\left(\frac{1}{1 - F(t)}\right)\right) \tag{A.2}$$

The Y_Q array for the Altman Z-score is obtained by:

$$Y_Q = \ln(X_{obs}) \tag{A.3}$$

With known X_Q and Y_Q, the linear regression function is obtained by:

$$I = N\sum XY - \sum X \sum Y \tag{A4.1}$$

$$II = N\sum X^2 - \left(\sum X\right)^2 \tag{A4.2}$$

$$III = N\sum Y^2 - \left(\sum Y\right)^2 \tag{A4.3}$$

The slope of the line is simply $b = I / II$ and the intercept is given by $a = \overline{Y} - b\overline{X}$.

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