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# Measuring Egyptian Banks Efficiency using Co-Plot

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## Abstract

Measuring the efficiency of the banking industry has been a significant challenge, especially in the developing countries. This research aims at measuring the efficiency of the Egyptian banks through the period of 2010-2013, in which the 25<sup>th</sup> of January revolution took place. The research applied an intermediation approach using the Co-Plot technique on 27 Egyptian licensed banks. Data were collected from Bank scope and banks' annual reports. It is found that, the political unrest has no significant impact on the banking efficiency and that the state owned banks are more efficient than the privately owned ones. Moreover, the majority of the banks showed a less efficient performance pre and post the 25<sup>th</sup> of January revolution.

**Keywords:** Co-Plot; Efficiency; Egyptian Banking; Intermediation Approach.

**JEL Classification:** G21, G28, G29

## 1. Introduction

The efficiency and reliability of the financial sector has been a subject area of study in the last decades. Within the broad scope of the financial sector, a stable and well-functioning banking system has become in the center of many researches throughout the world. Because of globalizations, competitions and unexpected financial crisis, the modern financial system appears to be complicated in structures and sophisticated in array of functions. Many methods and techniques are used to measure the efficiency of the banking industry. However, the majority of the studies on bank efficiency have been carried out in the US and European countries.

In the last two decades, there has been a fast development of empirical research in developing economies, where market-oriented banking reform has been either completed or underway. The main objective of any reform is to improve the efficiency of resource allocation and to strengthen the financial foundation of the economy. Strategies for reform vary across countries, yet, it generally includes privatization, lowering entry barrier, enhancing the regulatory framework, liberalizing interest rates, and more efficient resources allocation. As a result, studies focus on efficiency measurements attempt to capture the effect of de-regulation, financial liberalization,

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ownership, and efficient resource allocation. Privatization has been a key strategy to enhance bank performance by establishing good governance and management structure.

Most of the efficiency methods are built on comparing the banks outputs with its inputs, however, the measurements of banks' outputs and inputs remain a contentious challenge among researchers. In the banking literature, four main approaches used to measure efficiency by using input–output definition, 1) *production approach* (Benston, 1965; Thanassoulis, 1999), 2) *intermediation approach* (Sealey and Lindley, 1977; Brockett et al., 1997; Seiford and Zhu, 1999), 3) *operating approach* (Leightner and Lovell, 1998) and 4) *revenue approach* (Drake et al., 2006). The first two approaches apply the traditional microeconomic theory of the firm to banking and differ only in the specification of banking activities. The last two approaches go a step further by incorporating some specific activities of banking into the classical theory and thereby modify it. Under the *intermediation approach*, financial institutions are viewed as intermediate funds between depositors and borrowers. Banking business has to satisfy both users and suppliers of bank funds. The *intermediation approach* is also known as the asset approach (Sufian and Habibullah, 2010; Sufian, 2011). According to this approach, the bank uses total loans and securities as outputs, whereas deposits along with labour and physical capital are defined as inputs (Sealey and Lindley, 1977). Along with efficiency approaches, some methods have been used such as translog cost function as in (Murray & White, 1983), Multi-cost production as in (Hunter et al., 1990), Data Envelopment Analysis (DEA) as in (Rosman et al., 2014; Ioannis and Giokas, 2012; Seiford and Zhu, 1999; Oral and Yolalan, 1990).

Recently, the conditioning plot or Co-Plot technique is used to measure efficiency in different fields of study, especially in banking sector. The main concept of this technique is to design a two-dimensional graphic display for multi-criteria analysis. Its main feature is the simultaneous analysis of actions (e.g. banks) and criteria (e.g. efficiency variables) in a simple way. The method produces three results: (1) similarity among actions by the composite of all criteria involved, (2) the structure of correlations among the criteria and (3) the mutual relationships between the actions and the criteria.

Stone et al. (2012) implemented the Co-Plot to provide a conceptual discussion of equity culture and its development mechanism in the Central and Eastern European Countries. Nath, et al. (2012) applied the Co-Plot method to explore the linkage between strategic grouping and performance of the Indian banking sector. Yang and Lee (2013) used Co-Plot technique to identify the strategic groups of Taiwan's 14 financial holding companies (FHCs), which allow the financial holding industry to understand the industry configuration and competition from other companies. The main objective of this study is to classify Egyptian banks according to their efficiency level based on intermediation approach using Co-Plot technique.

The paper is organized as follows. Section 2 introduces an overview of the Egyptian banking sector. Section 3 introduces the methodology and the mathematical

model of Co-Plot technique. Section 4 describes data and its properties. Section 5 explains results obtained in the study. Section 6 discusses conclusions and their implications.

## 2. An Overview of the Egyptian Banking Sector

The Egyptian banking sector is dominated by the Central Bank of Egypt (CBE), which is an autonomous regulatory body, assuming the authorities and powers over the banking sector, assigned by Law No. 88 for 2003, and the Presidential Decree No. 65 for 2004. It is the only authority responsible for controlling the monetary policy and banking system in Egypt. It is managed by a board of directors under the chairmanship of the Governor, who is appointed by decree of the President of the Republic, upon his/her nomination by the Prime Minister and the ministry council.

The banking sector consists of the registered banks, which consist of three types of banks: (a) commercial banks that accept deposits and provide finance for a wide variety of transactions; (b) business and investment banks that perform medium-and-long-term (lending) business and finance operations (these banks can also accept deposits and finance foreign-trade operations); and (c) specialized banks which offer specific types of economic activities and accept demand deposits. According to the 2013/2014 Economic review published by (CBE), in 2013/2014, banks' aggregate financial position increased by LE 120.5 billion or 7.7 percent (compared with an increase of LE 75.0 billion or 5.5 percent a year earlier) to post LE 1684.3 billion at end of Dec. 2013. Table (1) shows the aggregate balance sheets for the entire banking sector.

<b>Banks : Aggregate Balance Sheet</b>					
(LEmn)					
End of June	2009	2010	2011	2012	2013
<b>Assets</b>					
Cash	11128	12448	14830	14534	29227
Securities&investments in TBs of which*:	332597	405895	474176	555326	653889
Treasury bills	193122	174512	248478	284503	355028
Other gov securities	82758	137061	159991	210101	234672
CBE notes	-	-	-	-	-
Balances with banks in Egypt; of which	173482	200719	117010	104269	131326
Lending and discount balances	775	729	885	978	953
Balances with banks abroad	77120	57371	96080	75905	77012
Lending and discount balances	1869	2004	1398	2714	1800
Loans and discounts	429957	465990	474139	506736	549120
Other assets	67709	78232	93455	109390	123275
<b>Assets =Liabilities</b>	<b>1091993</b>	<b>1220655</b>	<b>1269690</b>	<b>1366160</b>	<b>1563849</b>
<b>Liabilities</b>					
Capital	41550	46598	59049	67345	72061
Reserves	21371	28486	22056	25539	35838
Provisions	69748	70418	55105	54127	61264
Long term loans&Bonds	22045	21697	26180	27840	30312
Obligations to banks in Egypt	31004	53881	28171	19009	25608
Obligations to banks abroad	18195	20305	15168	14792	15222
Total deposits	809694	892492	957037	1023517	1186985
Other liabilities	78386	86778	106924	133991	136559
Payable cheques	3576	4764	5143	4848	4850

Table (1)  
Banks Aggregate Balance sheet  
Source: Central Bank of Egypt

In numbers, the sector is dominated by private banks, which represent 87.5% or 35 banks; however, the state owned banks have almost 45% of all the sector assets, within, the National Bank of Egypt alone controls 30%. Historically, till the 1960s the sector consisted of governmental owned banks only. In the 1970s, the sector witnessed the beginning of a new era of liberalization, where the banking sector activities were open to private capital, both foreign and local. This move towards the liberalization of the financial system, and increasing its degree of competitiveness, was framed by the launching of Economic Reform and Structural Adjustment Program (ERSAP) in 1991, which focused on financial liberalization (Nasr & Mohy ElDin, 2004).

According to El-Mikawy (2002), the Egyptian banking system is considered as a product of several transformations that took place during the last decades. This has been reflected in the transition from a banking system dominated by foreign banks, towards a system that is predominantly Egyptian, and dominated by publicly owned banks. Egypt financial sector was introduced to another reform program (2004-2008), this program aims to improve financial-sector soundness aiming to foster the environment for an efficient, increasingly private-led, financial system that serves Egypt's development and growth objectives. The latest reform resulted in more consolidated banks with a large economics of scale through merger and acquisition. The number of operating banks decreased from 52 to 40 as shown in table 2. Moreover, the success achieved by the first reform plan, set the corner stone and paved the way for building the second reform program. It focused on several pillars out as the implementation of Corporate Governance regulations in the banking sector and the Central Bank of Egypt, which in turn provides a comprehensive set of corporate governance provisions to strengthen: board practices and composition, board of directors committees, internal control functions (Risk, Audit, and Compliance) and disclosure and transparency.

In the 25<sup>th</sup> of January 2011, Egypt embarked a process of political transition; doubtless, this transition had significant effects on all aspects of the Egyptian economy, especially banking sector. In the Fiscal Year (FY) 2014, the Egyptian economy witnessed an economic growth of 2.5% that is expected to increase to 3.3% in FY15, and the budget deficit is projected at 10% for FY15, lower than the deficit of 12% in FY14. Egypt has been benefiting from the large-scale exceptional financing from the Gulf. Saudi Arabia, UAE, and Kuwait have committed around US\$20 billion to Egypt through a mix of central bank deposits, cash grants, in-kind grants, and project aid, of which about US\$15-16 billion was received as of end-June 2014<sup>2</sup>. Furthermore, the

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<sup>2</sup> World Bank, Egypt Overview, <http://www.worldbank.org/en/country/egypt/overview#1> extracted Dec, 2014,

International Monetary Fund (IMF) had a positive view to the Egyptian banking sector, as it was resilient in the face of economic stagnation in recent years. The IMF recognizes the Central Bank of Egypt (CBE) appropriate effort, which reinforced the supervisory framework by strengthening regulations, further developing on-site and off-site supervision, and advancing implementation of Basel II and III<sup>3</sup>. In 2012, CBE concluded a project of implementing to enforce Basel II regulations across all banks<sup>4</sup>.

Nasr (2012) indicated that, the sector showed resiliency to two large, unexpected shocks—the global financial crisis and more recently the 25<sup>th</sup> of January revolution, in terms of both solvency and liquidity. Despite the fact that Egypt is one of the largest markets in the region, a few empirical studies about the bank efficiency were conducted. Most of the literature analyzes the regulatory and policy dimensions of the sector (Alshazly, 2001; Nasr & Mohy Eldin, 2006). Omran (2007) examined financial and operating performance of a sample of 12 Egyptian banks from 1996 to 1999; he found a directly proportional relationship between private ownership and better performance. Poshkwale and Binsheng (2009) examined the competitiveness and efficiency of the banking sector in Egypt from 1992 to 2007; their results suggest that, financial sector reforms had a positive and significant effect on improving competitiveness and production efficiency of the Egyptian banking sector and the average X-Efficiency of Egyptian banks is comparable to other African countries. Amer et al. (2011) examined the operating efficiency for twenty four commercial banks covering the period 2001-2008, they found that in the highly competitive banks, the operating efficiency is positively and significantly affected by the asset quality, capital adequacy, credit risk and liquidity of banks. Farrag and Lang (2012) analyzed the cost efficiency of Egyptian banks using the full set of Egyptian commercial banks from 2000 to 2006. They found that banks suffer significantly from internal X-inefficiency, and that Egyptian banks did not benefit from technological change, but instead faced a negative dynamics of the cost frontier. This study aims to fill the gap in the literature by measuring the Egyptian banks efficiency during (2010-2013).

Year	Banks	Branches
2005	52	2841
2006	43	2944
2007	41	3056
2008	40	3297
2009	39	3443
2010	39	3502
2011	39	3573
2012	40	3610
2013	40	3651

<sup>3</sup> IMF Staff Article IV Mission to Egypt, Press Release No. 14/538 <http://www.imf.org/external/np/sec/pr/2014/pr14538.htm> extracted Nov, 2014,

<sup>4</sup> <http://www.cbe.org.eg/NR/rdonlyres/A142CEC2-786D-478E-8CCD-19F549AFEC38/1367/meda1english.pdf>

Table (2) Structure of Egyptian Banking System

Source: Central Bank of Egypt

### 3. Methodology

The traditional multivariate statistical methods like principal component analysis, multi-dimensional scaling or cluster analysis analyze only the attributes (Financial variables) on which analysis is made or the observations (the units under consideration) separately. The Multi-Criteria Decision Making (MCDM) method of Co-Plot considers all the attributes as well as the observations simultaneously to obtain a two-dimensional plot, which gives the location of each unit corresponding to its measuring variables. Here, two graphs are superimposed sequentially; the first one maps the closely located units and the second one maps the similar variables represented with arrows.

Thus, Co-plot is an exploratory tool, which graphically represents:

- (1) Correlation among the attributes using which the groupings are made
- (2) Correlation among the units under observation
- (3) Mutual relationship among the units and their measuring attributes

The Co-Plot methodology is a relatively new methodology called. Co-Plot is a graphical display method to visualize data matrices of the form  $X_{n \times k}$  where,  $n$  represents the observations exhibited in the plot by  $n$  points and  $k$  represents the variables exhibited by  $K$  arrows relative to the same axes and origin located in a two dimensional plot. It is a bi-plot diagram with two graphs superimposed sequentially, where the first graph maps the  $n$  observations and the second graph portrays the  $k$  variables and hence the name. It has four stages:

Stage 1: In order to treat the variables equally,  $X_{n \times k}$  is normalized into  $Z_{n \times k}$ . The elements of  $Z_{n \times k}$  are deviations from column means ( $\bar{x} \cdot j$ ) divided by their standard deviations ( $S_j$ ), as follows:

$$Z_{ij} = (x_{ij} - \bar{x} \cdot j) / S_j$$

Stage 2: a measure of dissimilarity  $D_{il} \geq 0$  is chosen between each pair of observations (rows of  $Z_{n \times k}$ ). A symmetric  $n \times n$  matrix ( $D_{il}$ ) is produced from the  $\binom{n}{2}$  different pairs of observations. The city-block distance, i.e. the sum of the absolute deviations, is used as a measure of dissimilarity:

$$D_{il} = \sum_{j=1}^k |Z_{ij} - Z_{lj}| \geq 0, \quad (1 \leq i, l \leq n)$$

Stage 3: The matrix ( $D_{il}$ ) is mapped by means of a multidimensional scaling (MDS) method. Thus, observations are represented as  $n$  points,  $P_i$ ,  $i=1, \dots, n$  in an Euclidean space of  $m = 2$  dimensions. Guttman's smallest space analysis (SSA) provides a graphic presentation of pairwise interrelationships of a set of objects (Guttman, 1968). SSA uses the coefficient of alienation  $\theta$  as a measure of goodness-of-fit. In summary, for a two-dimensional space, this stage yields  $2n$  coordinates  $(X_{1i}, X_{2i})$ ,  $i = 1, \dots, n$ , where

each row  $Z = (Z_{1i}, \dots, Z_{ik})$  is mapped into a point in the two-dimensional space  $(X_{1i}, X_{2i})$ .

Stage 4:  $k$  arrows  $(\tilde{X}_j, j = 1, \dots, k)$  are drawn on the Euclidean space obtained in Stage 3. Each variable  $j$  is represented by an arrow  $j$  emerging from the center of gravity of the points  $P_i$ . Each arrow  $\tilde{X}_j$  is chosen so that the correlation between the actual values of variable  $j$  and their projections on the arrow is maximal. Therefore, arrows associated with highly correlated criteria point in about the same direction. As a result, the cosines of angles between these arrows are approximately proportional to the correlations between their associated criteria.

The goodness-of-fit of Co-Plot is assessed by two types of measures, one for Stage 3 and another for Stage 4. In Stage 3, a single coefficient of goodness-of-fit for the configuration of  $n$  observations is obtained from the SSA method, known as the coefficient of alienation  $\theta$  (For more details about  $\theta$ , see (Raveh, 1986)). In stage 4,  $k$  individual goodness-of-fit measures are obtained for each of the  $k$  variables separately. These are the magnitudes of the  $k$  maximal correlations,  $r_j^*$ ,  $j = 1, \dots, k$ , that measure the goodness-of-fit of the  $k$  regressions. The correlations,  $r_j^*$ , can be helpful in deciding whether to eliminate (or add) criteria. Criteria that do not fit the graphical display, namely those that have low  $r_j^*$ , should be eliminated. The higher the correlation  $r_j^*$  the better  $\tilde{X}_j$  represents the common direction and order of the projections of the  $n$  points along the rotated axis  $\tilde{X}_j$  (arrow  $j$ ).

Co-Plot will define each DMU (Banks in current study) as a dot in two-dimensional space. The position of each dot is decided by all given variables or indicators (Efficiency variables in our work), while the variable is expressed by the ray from the center of the gravity. From the result of Co-Plot, some statements can be concluded as following. The position of similar DMUs is close to each other on the plan, which indicates that DMUs from the same group possess similar features or behaviors. The relationship between variables can be obtained through the positions of rays: being opposite in direction illustrates negative correlation, while being basically the same in direction illustrates positive correlation.

#### 4. Data

A total of 27 Egyptian banks selected out of total 40 licensed banks in Egypt<sup>5</sup>. Data was extracted from “Bank scope” database and the annual reports published by the designated banks from 2010 to 2013. The selected sample of banks is the only banks with accurate published data during the period of study. The data for the remaining 13 banks are missing due to merger and acquisition or unavailability. Banks sample distributed as shown in figure 1 into different categories: 5 are stated owned

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<sup>5</sup> <http://www.cbe.org.eg/NR/rdonlyres/2E863212-7A1D-40D3-B8D1-CE6ED3C21A15/2682/citiaddress4122014.pdf>



representing 19% of the sample, 22 are privately owned representing 76%, 2 Islamic banks representing 7% of the sample.

This study applies the intermediation approach by comparing banks outputs with its main inputs. However, different approaches use different variables. The variables used as outputs by the intermediation approach are *Total Equity*, *Total Customer Deposit* and *Total personal Expenses*. This approach assumes that capital and deposit are inputs funds and employee salaries are mandatory expenses to effectively manage those funds. The intermediation approach, then, apply, *Total Loans* and *Other Earnings Assets* as outputs variables, as they represent the final product to generate revenues. The selected variables per bank are demonstrated in table 3 for FY 2010.

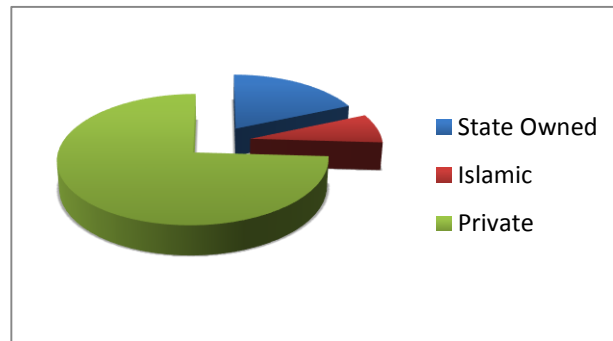


Fig (1): Banks Types Source: Author calculation

Year 2010						
		Inputs		Outputs		
DMU No.	Bank Name (DMU)	Total Equity USD	Total Customer Deposits USD	Personnel Expenses USD	Net Loans USD	Others Earning Assets USD
1	National Bank of Egypt	2000035	43080659	376855	14362737	32796575
2	Commercial International Bank, S.A.E.	1487052	10938818	107206	6050599	5483721
3	Banque Misr, SAE	1209270	25433925	23596	7295175	19798282
4	Arab International Bank	720900	2606200	38800	1503600	2329900
5	Arab African International Bank	696600	6195800	43700	4166900	3515100
6	Bank of Alexandria	635034	4767082	90357	3122242	2756983
7	HSBC Bank Egypt, S A E	622622	6862980	53586	2917947	3966975
8	Banque du Caire, SAE	466872	7044108	59334	2332286	3326330
9	African Export-Import Bank - Afreximbank	456700	93400	11200	1661200	100400
10	Credit Agricole Egypt	384145	3639212	47785	1862307	1989970
11	Faisal Islamic Bank of Egypt	374754	4973276	18679	518731	4233090
12	Housing and Development Bank	348755	1295636	23596	1133032	797068
13	Barclays Bank – Egypt, S.A.E.	340538	2488779	26137	994148	1832890
14	Suez Canal Bank	334202	2170545	36236	941598	1540120
15	The National Bank of Kuwait - Egypt SAE-NBK	310828	2229275	23392	1236578	1309567
16	Export Development Bank of Egypt	266499	1500026	23596	1190469	736600
17	MISR Iran Development Bank	257881	1263301	8200	649656	811588
18	Bank Audi, SAE	241209	2367727	22639	1227536	1171883
19	Société Arabe Internationale de Banque-SAIB	217500	1523600	23800	719900	1038400
20	Egyptian Gulf Bank	179712	845441	13189	593740	352105
21	Ahli United Bank (Egypt), SAE	175724	1407019	11791	939457	655146
22	BLOM Bank Egypt SAE	165953	1027949	11912	468356	670045
23	Arab Banking Corporation - Egypt	145789	624953	13793	255067	471377
24	Piraeus Bank Egypt, SAE	144667	1770621	24618	689500	1044833
25	Al Baraka Bank Egypt, SAE	141992	2063564	14242	909850	1142562
26	Union National Bank – Egypt, SAE	134344	564358	10393	297656	395573
27	Arab Investment Bank-Federal Arab Bank for Development and Investment	113024	553154	13880	337534	220903

Table (3) Inputs and Outputs Variables per Banks (2010)<sup>6</sup>

## 5. Results and Discussions

The twenty-seven banks operating in the country were subjected to Co-Plot analysis with five financial variables (*total equity, total customer deposit, personnel expenses, net loans and other earning assets*). The summary statistics for selected variables from 2010-2014 is shown in table (4). All the outputs are presented in Euclidian space graph with rays (arrows) represent the five variables and the dots (circles) represent banks. As shown in table (5), the coefficient of alienation was quite satisfactory (ranged from 0.43 to 0.05) with the correlation among the variables (ranged from 0.949 to 0.953). Thus, the goodness of fit was satisfied for both the observations (banks) and the attributes (financial variables).

	2010			2011			2012			2013		
	M	Median	SD	M	Median	SD	M	Median	SD	M	Median	SD
<b>Total Equity</b> (Var 1)	466	334	447	462	301	454	529	295	537	567	304	617
<b>Total Customer Deposit</b> (Var 2)	5160	2171	9088	5224	2050	9287	5495	2057	9740	5591	2238	9529
<b>Personnel expenses</b> (Var 3)	43	24	71	53	26	82	56	29	88	57	29	89
<b>Net loans</b> (Var 4)	2162	1133	2983	2211	1080	3016	2292	1084	3220	2223	961	3106
<b>Other Earning Assets</b> (Var 5)	3500	1172	6952	3210	1192	6390	3639	1421	6500	3817	1458	6685

Table (4) summary statistics per year, (\$mn)

Years	Coefficient of Alienation	Coefficient of correlation
2010	0.044	0.953
2011	0.05	0.949
2012	0.047	0.951
2013	0.043	0.953

Table (5) Coefficient of Alienation and Coefficient of correlation

<sup>6</sup> Tables for FY11,12 and 13 are in appendix

The five financial variables were represented using five arrows according to their degree of correlation among them, the higher the value, the more is the closeness. The cosines of the angles between these arrows were proportional to the correlations between the five financial variables. An arrow representing a certain variable tends to rise toward the higher-than- average values. All the banks located towards the direction of the arrow have values, which are higher than the average. The main concept of Co-Plot shows that, the super- efficient banks are located on an outer circle and the efficient units on a slightly inner circle surrounding the main cluster of inefficient banks concentrated in the center. Figures (2) to (5) give the composite picture of the twenty-seven banks using selected five financial indicators during 2010 to 2013. The banks are partially ordered from left to right according to their increased performance. Using the Co-Plot method, this grouping technique provides four groups of banks among the four years of analysis as shown in table (6).

<b>Groups</b>	<b>Bank(s)</b>
One	1
Two	2 and 3
Three	5,6,7 and 8
Four	4, 9-27

Table (6): Co-Plot output per group

According to the Co-Plot technique, the analysis indicates that group (1) is the most efficient through all the periods then group (2). Group (3) and (4) are less efficient with group (3) has slightly better efficiency. Although, the group's efficiency rank is the same across all years, however, the variables position changes as follows:

#### **Efficiency analysis (Year 2010)**

In 2010, Group (1) is the most efficient group and it consists of one bank, the National Bank of Egypt (NBE). NBE is a state owned bank and dominates 30% of the entire banking system total assets. NBE is more efficient in relation to total deposit and personnel expenses as inputs and other earning assets as outputs. This indicates the bank policy to maintain efficiency prior to the 25<sup>th</sup> of January revolution from the efficient use of customer deposits as compared to Bank capital, also, indicates an efficient human resource policy given the level of output. Moreover, NBE will contribute revenues more from other earning assets than issuing loans. Group (2) is the second in the efficiency level and it consists of 2 banks; Commercial International Bank (CIB) and Bank Misr (BM). This group is more efficient in accordance to total deposits and net loans as inputs. (CIB), which is a private commercial bank, shows less efficiency than (BM) which is another state owned bank. It worth mentioning here that, despite the consecutive reforms programme in the Egyptian banking sector, the state owned banks, mainly (NBE) and (BM), still more efficient than other private banks in the Egyptian Banking sector.

On the contrary, group (3) and (4) are less efficient in general with a slightly better efficiency for group (3), which in turn consists of: Arab African International Bank (AIIB), Bank of Alexandria (BA), HSBC Bank Egypt (HSBS, EG) and Banque du Caire (BC). Interestingly, two banks, (BA) and (BC), are again a state owned, which supports the argument of the superior efficiency associated with state owned bank as opposed to private banks. Group (3) is close to the total deposits variable only and this indicates a reliance on customer deposits to drive the overall banks efficiency. Group (4) lies behind all the variables, this indicates a critical level of low efficiency. One exception is Faisal Islamic Bank (FIS), which is number 11 in the sample. FIS lies exactly on the gravity center of the graph, which means it is just on average regarding the five variables.

### **Efficiency analysis (Year 2011)**

In 2011, Group (1) continues to be more efficient, as indicated in Figure (3). NBE stills the most efficient bank against all variables. Group (2) and (3) remain in their position as in 2010, however, there is a slight increase in CIB and BC level of efficiency as compared to 2010. Here, FIS joined Group 4 and it worth mention that the political unrest started in January 2011.

### **Efficiency analysis (Year 2012)**

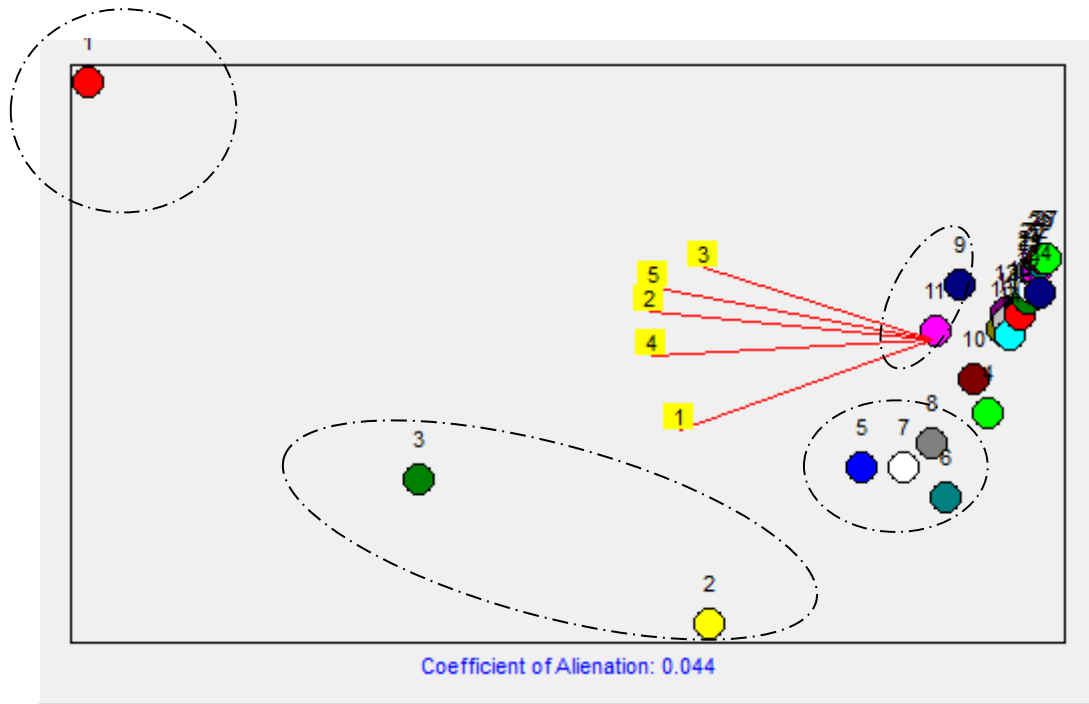
In the 2012, this year is of a much importance for the analysis as it indicated the immediate effect of the 2011 political unrest. Firstly, as shown in Figure (4) the *total equity* variable is not clear as it is totally correlated with the *other earning assets* variable. This correlation indicates policy changes as banks tend to increase equity to opposite any deposits withdrawals and depend more on other earning assets to generate revenues. Although all groups maintain their efficiency rank, however, NBE efficiency is derived from personal expenses and bank capital as well as other earning assets. CIB is less efficient as compared to 2011, and it is close only to total deposits variable. Here, FIS bank approached the center of the graph again showing increased in efficiency level.

### **Efficiency analysis (Year 2013)**

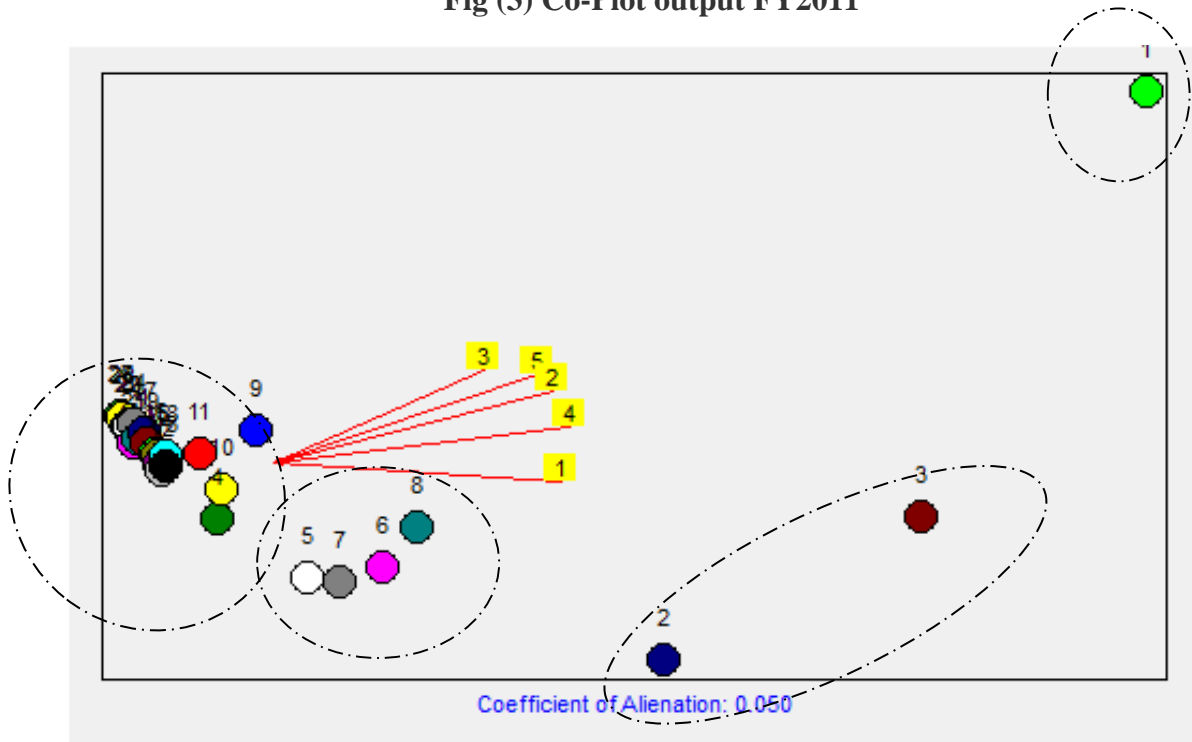
In 2013, the output is almost as in 2012 in regards to group efficiency ranking as well as variables directions. Almost no change from the previous year.

In a nutshell, the banking efficiency level is almost the same before and after the 25<sup>th</sup> of January revolution which indicates, that the Egyptian government and CBE implemented successful policies and remedies to co-op with this unexpected political unrest. However, the analysis shows that the vast majority of the banks (19 out of 27) are less efficient in using their resources.

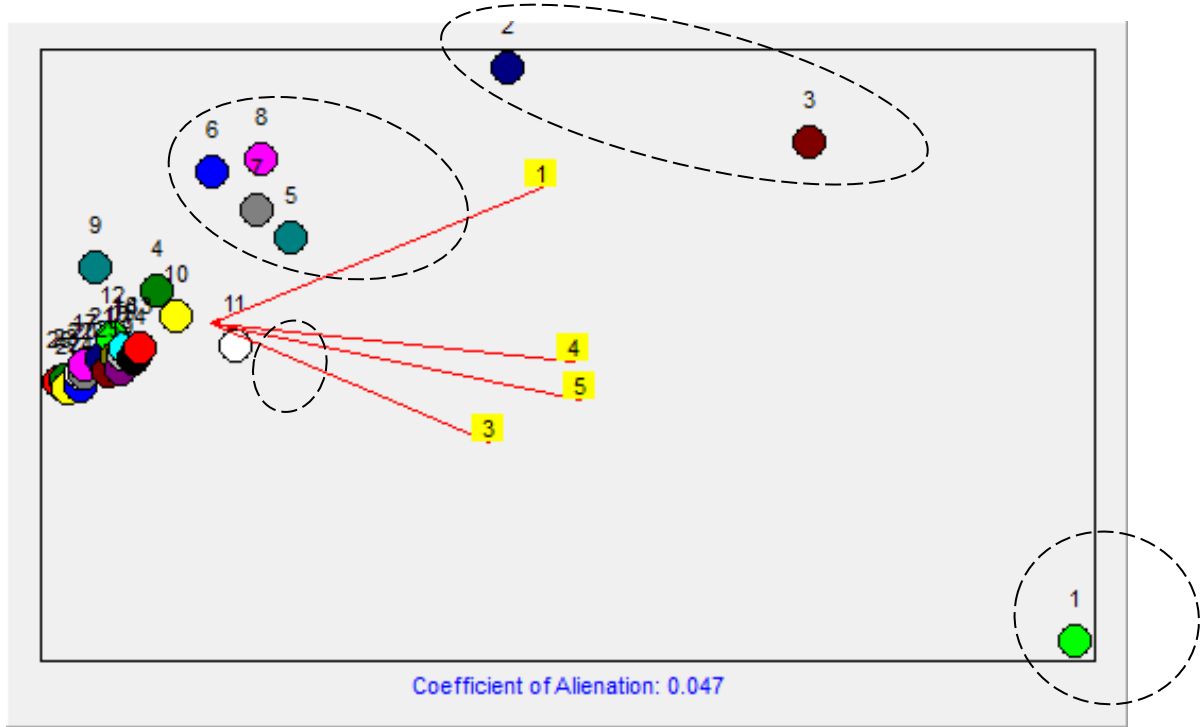
**Fig (2) Co-Plot output FY2010**



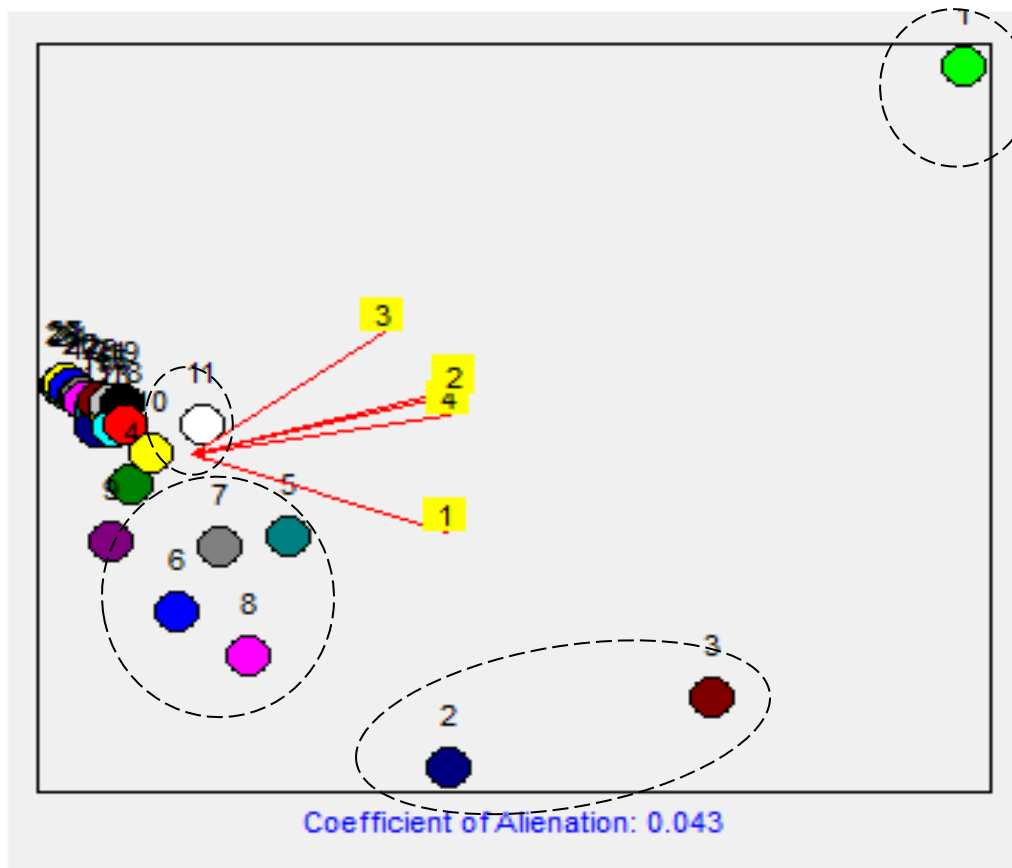
**Fig (3) Co-Plot output FY2011**



**Fig (4) Co-Plot output FY2012**



**Fig (5) Co-Plot output FY2013**



## Conclusions

This study aims to measure the efficiency level among Egyptian bank sector during 2010-2013 to test the effect of 25<sup>th</sup> of January revolution on the banking sector. It applies the Co-Plot method to classify and group banks on a two dimensional scale. The political unrest has almost no effect on the bank efficiency level due to CBE and Egyptian government policies and immediate interfering in the sector. However, the majority of the banks are showing less efficient level across the periods of the study. The results indicated a better efficiency in the state owned banks than the privately owned banks.



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**Appendix:** Tables 7 to 9 show variable values for FY11, 12 and 13.

Year 2011						
		Inputs			Outputs	
DMU No.	Bank Name (DMU)	Total Equity USD	Total Customer Deposits USD	Personnel Expenses USD	Net Loans USD	Others Earning Assets USD
1	National Bank of Egypt	2031751	43837923	420296	14261359	30507791
2	Commercial International Bank (Egypt) S.A.E.	1460287	11877860	123835	6593063	6469228
3	Banque Misr SAE	1195759	25936868	26442	7614762	17325935
4	Arab International Bank	713200	2386600	40100	1363400	1956000
5	Arab African International Bank	770800	5495000	36100	3476600	3440500
6	Bank of Alexandria	616447	5115774	120660	3221177	3100517
7	HSBC Bank Egypt S A E	700261	7012897	65283	3230900	3846415
8	Banque du Caire SAE	398627	7246007	143978	2894015	2750037
9	African Export-Import Bank - Afreximbank	512100	157800	11800	2345400	310300
10	Credit Agricole Egypt	332862	3374445	54497	1906580	1931360
11	Faisal Islamic Bank of Egypt	338879	5340075	31428	556632	525204
12	Housing and Development Bank	341405	1256129	43544	1104622	1061078
13	Barclays Bank - Egypt S.A.E.	328973	2365903	34686	935099	1514667
14	Suez Canal Bank	301418	1879888	38309	900846	1353770
15	The National Bank of Kuwait - Egypt SAE-NBK	269142	2049793	26442	1183167	1210341
16	Export Development Bank of Egypt	286762	1629504	26442	1079536	764247
17	MISR Iran Development Bank	245625	1025029	8759	637454	890575
18	Bank Audi SAE	249696	2608825	24919	1310077	1395026
19	Société Arabe Internationale de Banque-SAIB	220000	1608000	26200	658500	1192300
20	Egyptian Gulf Bank	173611	909505	15041	536422	437152
21	Ahli United Bank (Egypt) SAE	182220	1786734	12216	962672	961093
22	BLOM Bank Egypt SAE	164886	1096462	13894	446941	755572
23	Arab Banking Corporation - Egypt	141186	645781	14293	229454	557729
24	Piraeus Bank Egypt SAE	98822	1208413	23933	557447	604597
25	Al Baraka Bank Egypt SAE	150077	2104240	19046	990743	1160365
26	Union National Bank - Egypt SAE	130948	551596	11252	335339	331350
27	Arab Investment Bank-Federal Arab Bank for Development and Investment	108594	537553	17634	364340	322974

Table (7): Variables value FY11

Year 2012						
		Inputs			Outputs	
DMU No.	Bank Name (DMU)	Total Equity USD	Total Customer Deposits USD	Personnel Expenses USD	Net Loans USD	Others Earning Assets USD
1	National Bank of Egypt	1936267	46118072	455099	15757522	30209595
2	Commercial International Bank (Egypt) S.A.E.	1714639	12485387	130549	6454208	7051732
3	Banque Misr SAE	2034522	26883401	28700	7188702	19237814
4	Arab International Bank	742500	1650800	40700	1462400	1431400
5	Arab African International Bank	891200	5970800	39100	3412000	4440900
6	Bank of Alexandria	680464	5307373	130929	3079785	2885754
7	HSBC Bank Egypt S A E	697766	7491270	65718	3107157	4612954
8	Banque du Caire SAE	577287	7772714	144330	3372108	4520053
9	African Export-Import Bank - Afreximbank	612300	322800	14600	3101000	500000
10	Credit Agricole Egypt	368873	3605881	54459	2049828	2076534
11	Faisal Islamic Bank of Egypt	418923	5912508	36649	509920	5316618
12	Housing and Development Bank	331066	1289865	50843	913475	958308
13	Barclays Bank - Egypt S.A.E.	377611	2303583	32003	972898	1522083
14	Suez Canal Bank	294051	2036094	38378	798500	1577573
15	The National Bank of Kuwait - Egypt SAE-NBK	289056	2116038	26452	1148405	1421001
16	Export Development Bank of Egypt	279977	1735125	28700	984402	999338
17	MISR Iran Development Bank	254896	981636	9912	601519	816801
18	Bank Audi SAE	295000	2571906	23614	1489937	1255399
19	Société Arabe Internationale de Banque-SAIB	231500	2028900	28700	656100	1757600
20	Egyptian Gulf Bank	194538	1123158	16477	509476	696322
21	Ahli United Bank (Egypt) SAE	246000	2057377	13242	1174715	1069176
22	BLOM Bank Egypt SAE	175587	1327973	14130	417939	947730
23	Arab Banking Corporation - Egypt	144346	749782	13638	337805	510158
24	Piraeus Bank Egypt SAE	101781	1059296	24343	524208	493807
25	Al Baraka Bank Egypt SAE	161267	2284505	21203	1084463	1282491
26	Union National Bank - Egypt SAE	130358	622849	10752	416258	340264
27	Arab Investment Bank-Federal Arab Bank for Development and Investment	106079	557527	23122	361816	323865

Table (8): Variables value FY12

Year 2013						
		Inputs			Outputs	
DMU No.	Bank Name (DMU)	Total Equity USD	Total Customer Deposits USD	Personnel Expenses USD	Net Loans USD	Others Earning Assets USD
1	National Bank of Egypt	2559877	44597625	459077	15229253	30849711
2	Commercial International Bank (Egypt) S.A.E.	1729382	13948682	133372	6010846	9069451
3	Banque Misr SAE	2064348	26930474	28725	6950099	19824740
4	Arab International Bank	751800	1637700	43800	1352500	1541000
5	Arab African International Bank	1007400	7047200	39300	3508900	4947700
6	Bank of Alexandria	653925	4886130	131427	2823203	2566513
7	HSBC Bank Egypt S A E	711609	7103198	56906	2726833	3767507
8	Banque du Caire SAE	664641	8311551	158721	3500576	4909621
9	African Export-Import Bank - Afreximbank	706600	216400	17200	3432300	779900
10	Credit Agricole Egypt	398920	3520467	51520	1731442	1989745
11	Faisal Islamic Bank of Egypt	466513	5862423	37808	584430	5291071
12	Housing and Development Bank	304436	1277431	45902	867507	1058130
13	Barclays Bank - Egypt S.A.E.	409736	1993000	30578	800058	1380772
14	Suez Canal Bank	279764	2008152	36915	727150	1623059
15	The National Bank of Kuwait - Egypt SAE-NBK	272505	2513942	25493	961400	1458116
16	Export Development Bank of Egypt	243942	1780716	17271	914260	1095395
17	MISR Iran Development Bank	255509	1242402	9765	572375	876682
18	Bank Audi SAE	316011	2847836	25370	1553264	1469153
19	Société Arabe Internationale de Banque-SAIB	262100	2725200	28400	734100	2529700
20	Egyptian Gulf Bank	207245	1181953	16117	503140	737577
21	Ahli United Bank (Egypt) SAE	267982	2454587	12732	1344361	1246421
22	BLOM Bank Egypt SAE	191805	1401138	14633	466743	1033948
23	Arab Banking Corporation - Egypt	101714	733242	29051	386922	414461
24	Piraeus Bank Egypt SAE	84286	977474	25220	523088	433847
25	Al Baraka Bank Egypt SAE	167781	2238269	20985	1008253	1270402
26	Union National Bank - Egypt SAE	122440	778194	11249	429598	477575
27	Arab Investment Bank-Federal Arab Bank for Development and Investment	101714	733242	29051	386922	414461

Table (9): Variables value FY13