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**Classifying Companies by M- Score and  
F-Score: Do Financial Ratios and Indices Differ?  
A Sectional Analysis of the Saudi Arabian Stock Market**

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**1. Introduction**

The period of the nineties and early 2000's witnessed several corporate scandals. Gore, Pope, & Singh (2007) believes that such scandals undermined public confidence in financial reporting and hence in financial markets (p. 123). Suspicions that reported earnings numbers cannot be relied upon, and that they are managed, are widespread. Earnings manipulation has been the focus of a lot of studies; Beneish, (1999) conducted a study in which he developed a score (M-Score) to identify the companies that might be manipulating their earnings. On the other hand, there has been a lot of research to identify value stocks. Piotroski, (2000) created a nine ratio based score (F-score) to identify value stocks. Investors could use F-score as a screener to screen value stocks. It is expected that non-manipulator's stock would be a value stock, and the manipulators would end up by non-value stock. This expectation is supported by Beneish, Lee, & Nichols (2013) as their findings shows that companies with a higher probability of manipulation

(based on M-score) earn lower returns (p. 57). It is also not clear whether there are certain financial ratios that could be relied upon to determine the companies that fall in each classification manipulators/non-manipulators and value stock/non-value stock. Identifying such ratios would simplify identifying those companies for many financial statements users as many of them (including investors, auditors, etc.) rely on financial ratios to get a basic understanding of the company's performance. In addition to that, plotting such ratios could also help in understanding some of the characteristics of those companies. The aim of this research is to find out the following:

- Whether the companies that are classified as non-manipulators by M-score, would also be classified as value stock by F-score and vice-versa and whether this would differ from one sector to the other.
- Whether there is a significant difference between the means of financial ratios and indices of suspected manipulators and non-manipulators companies on one hand and companies with value stock and non-value stock on the other hand.
- Whether there are financial ratios and indices that are common across the two groups.
- Whether such financial ratios and indices differ depending on the nature of the sector in which the company operates.

Accordingly, this research aims to answer the following questions:

- Do companies that are classified as non-manipulators by M-score, are also classified as value stock by F-score, and are companies that are classified as manipulators by M-score, are also classified as non-value stock by F-score?
- Do means of financial ratios differ significantly between suspected manipulators and non-manipulators working in the same sector as classified by M-score?
- Do those financial ratios - which their means differ significantly between suspected manipulators and non-manipulators - differ from one sector to the other in the same market?
- Do means of M-score's indices differ significantly between the suspected manipulators and non-manipulators working in the same sector as classified by M-score?
- Do means of M-score's indices differ significantly between the suspected manipulators and non-manipulators in one sector to the other in the same market?
- Do means of financial ratios differ significantly between a value stock and non-value stock companies working in the same sector as classified by F-score?

- Do those financial ratios - which their means differ significantly between a value stock and non-value stock companies) – are different from one sector to the other in the same market?
- Do means of M-score's indices differ significantly between suspected value stock and non-value stock companies working in the same sector as classified by F-score?
- Do means of M-score's indices differ significantly between the value stock and non-value stock companies from one sector to the other in the same market?

It is worth mentioning that this paper assumes that M-Score classifies companies into suspected manipulators and non-manipulators and that F-score classifies companies' stock into value stock and non-value stock.

## **2. Literature Review**

### **2.1 M-score:**

M-Score is a model developed by Messod D. Beneish (1999). The model's variables are designed to capture either the financial statement distortions that can result from manipulation or preconditions that might prompt companies to engage in such activity. M-score can be calculated using eight financial variables (indexes) as follows:

$$\text{Days' Sales in Receivables Index (DSRI)} = \frac{\text{Receivables}_t / \text{Sales}_t}{\text{Receivables}_{t-1} / \text{Sales}_{t-1}}$$

It measures the ratio of the days that sales are in accounts receivable and benchmarks this ratio against the prior year. This variable gauges whether receivables and revenues are in or out of balance in two consecutive years. A significant increase in days' sales in receivables could be the result of a change in credit policy to spur sales in the face of increased competition, but disproportionate increases in receivables relative to sales could also suggest revenue inflation.

$$\text{Gross Margin Index (GMI)} = \frac{(\text{Sales}_{t-1} - \text{Cost of Good Sold}_{t-1}) / \text{Sales}_{t-1}}{(\text{Sales}_t - \text{Cost of Good Sold}_t) / \text{Sales}_t}$$

This index measures the ratio between the prior years' gross margin to the current year's gross margin.

If the GMI is greater than "1.0", gross margins have deteriorated.

$$\text{Asset Quality Index (AQI)} = \frac{1 - (\text{Current Assets}_t + \text{PP\&E}_t) / \text{Total Sales}_t}{1 - (\text{Current Assets}_{t-1} + \text{PP\&E}_{t-1}) / \text{Total Sales}_{t-1}}$$

This index measures the ratio of non-current assets, other than plant, property and equipment to total assets. It indicates the amount of total assets that are less certain to be ultimately realized, identified as asset quality. An AQI greater than "1.0" indicates that the company has potentially increased its involvement in cost deferral. An increase in assets realization risk indicates

an increased propensity to capitalize, and thus defer costs. (Beneish, 1999, p.27)

$$\text{Sales Growth Index (SGI)} = \frac{\text{Sales}_t}{\text{Sales}_{t-1}}$$

This index measures the ratio between the current year's sales to the prior year's sales. A ratio greater than "1.0" indicates that there is a growth in sales, and less than "1.0" indicates that there is a decline.

Sales growth itself is not indicative of earnings manipulation. However, growth companies are more likely to commit earnings manipulation (Warshavsky, 2012, p.17), because their financial positions and capital needs put pressure on managers to achieve earnings targets. (National Commission on Fraudulent Financial Reporting, 1987).

$$\text{Depreciation Index (DEPI)} = \frac{\text{Depreciation}_{t-1} / (\text{Depreciation}_{t-1} + \text{PP\&E}_{t-1})}{\text{Depreciation}_t / (\text{Depreciation}_t + \text{PP\&E}_t)}$$

This ratio measures the rate of the prior year's depreciation expense to total property plant and equipment of the prior year to the current year. A DEPI greater than "1.0" indicates that the rate at which assets are being depreciated has slowed – raising the possibility that the company has revised upward the estimates of assets' useful lives or adopted a new method that is income increasing. (Beneish, 1999, p.28)



**Sales, General and Administrative Expenses Index (SGAI) =**

$$\frac{\text{Sales, General \& Administrative Expense}_t / \text{Sales}_t}{\text{Sales, General \& Administrative Expense}_{t-1} / \text{Sales}_{t-1}}$$

SGAI measures growth or decline in the percentage of sales and administrative expenses to sales of the current period in relation to the prior's period. A disproportionate increase in sales, as compared to SGAI, would serve as a negative indication concerning a company's future prospects. (Warshavsky, 2012, p.17)

$$\text{Leverage Index (LVGI)} = \frac{(\text{Long Term Debt}_t + \text{Current Liabilities}_t) / \text{Total Assets}_t}{(\text{Long Term Debt}_{t-1} + \text{Current Liabilities}_{t-1}) / \text{Total Assets}_{t-1}}$$

LVGI measures the ratio of a company's total debt to total assets. When the LVGI is greater than "1.0", it indicates an increased leverage and, therefore, a company more prone to financial statement manipulation. (Warshavsky, 2012, p.18)

**Total Accruals to Total Assets Index (TATA) =**

$$\frac{\Delta \text{Current Assets}_t - \Delta \text{Cash}_t - \text{Current Liabilities}_t - \Delta \text{Current maturities of LTD}_t - \Delta \text{Income Tax Payable}_t - \text{Depreciation \& Amortization}_t}{\text{Total Assets}_t}$$

TATA shows the estimates of the short-term forecasted inflow and outflow activities of a company. Excluding any significant changes within the company, these accruals should be fairly consistent within some acceptable

measure of statistical variation. However, accruals have consistently provided a conventional opportunity to perpetrate a fraud. As a result, higher positive accruals are associated with the potential for earnings manipulation. (Warshavsky, 2012, p.17).

Beneish (1999) found DSRI, GMI, AQI, SGI, and TATA to be significant in detecting earnings manipulation through improper revenue recognition (p.30). Beneish has applied his study of financial statements of companies in developed markets. It would be useful to test whether these indices still stand at developing markets. This paper will examine whether the means of those indices are significantly different in those companies that are identified as manipulators (per M-score) and if they are standing from one sector to the other as well.

There are different studies that tested the significant difference between means of financial ratios of suspected manipulators and non-manipulators such as Nia, (2015), Omar, Koya, Sanusi, & Shafie, (2014). The results of such tests differed from one stock market to the other. On the other hand, there is no evidence whether the significant difference between the means of financial ratios between suspected manipulators and non-manipulators, value stock and non-value stock would still stands among companies working in different sectors.

Nia (2015) conducted a study on companies traded on Tehran Stock Exchange, and the results revealed a significant difference between the means of the current assets to total assets ratio, inventory to total assets ratio and revenue to total assets ratios between fraudulent and non-fraudulent firms. The study proposed examining this research in different industries, which is done through this paper.

Several researchers such as Pounder (2013), Warshavsky (2012), and Roxas (2011) recognized Beneish's model (M-score) as an approach to measuring accounting quality and detecting manipulators. Omar (2014) used Beneish's model together with ratio analysis as a tool to help auditors detect fraud in financial statements.

## 2.2 F-score:

F-Score is a measure of financial strength developed by Piotroski (2000) and is a composite of nine financial items. A stock is assigned a binary score for each item, and the nine scores are then summed to give the F-score for the stock, ranging between zero and nine (C. E. Hyde, 2014, p.25). Piotroski (2000) used four variables to measure performance related factors, three variables to measure leverage, liquidity and source of funds, and two variables to measure operating efficiency (p.7-8).

The following shows how the nine scores are calculated. (Hrvatska, 2014, p.128)

1. **Net Income:** Score "1" if last year's net income is positive.
2. **Return on Assets:** Score "1" if last year's ROA exceeds prior-year ROA.
3. **Gross Margin:** A measure of improving competitive position. Score "1" if full year's GM exceeds the prior year's GM.
4. **Asset Turnover:** Measures productivity. Score "1" if the percentage increase in sales exceeds the percentage increase in total assets.
5. **Current Ratio:** Measures increasing working capital. Score "1" if Current ratio has increased from the prior year.
6. **Operating Cash Flow:** A better earnings gauge. Score "1" if last year's cash flow is positive.
7. **Quality of Earnings:** Score "1" if last year's operating cash flow exceeds net income.
8. **Long-Term Debt vs. Assets:** Score "1" if the ratio of long-term debt to assets is down from the prior year's value. If Long-Term Debt is zero but assets are increasing, score "1".
9. **Additional Equity Investment:** Score "1" if the firm did not issue new shares/equity in the preceding year.

There are different research that focused on F-score. The finding by Mohr (2012), showed that buying high F-Score and shorting low F-Score growth stocks seems to yield a positive return (p. 20). A study by C. E. Hyde, (2014) found that stocks with a high F-score earn a significant return premium over stocks with a low F-score. Consistent with evidence from both developed and emerging market country studies. (p.29). This positive premium is robust across both countries and time. In a study on the Croatian car market, Hrvatska, (2014) found that Piotroski analysis and scoring system have proved to be useful primarily in assessing the financial stability of large systems quoted on stock exchanges, they are also a good tool for preliminary financial assessments of individual companies in any chosen sector (p.139). Bhatt (2014) finds that F-score gives a holistic view of the performance and position of the company. F-score proved successful in interpreting the strengths and weaknesses a company possesses and the opportunities available for the company to develop upon and the threats it faces in doing so (p.60). Mohanram, (2004) found that F-score is effective when applied to high Book-to-Market stocks (p.165).

### **3. Research Propositions**

Based on the above literature review, and to answer the research questions, the following propositions are developed:

**Proposition 1: Companies that are classified as non-manipulators by M-score are also classified as value stock by F-score in each sector.**

**Proposition 2: Companies that are classified as manipulators by M-score are also classified as non-value stock by F-score in each sector.**

**Proposition 3: Means of financial ratios differ significantly between suspected manipulators and non-manipulators working in the same sector.**

**Proposition 4: Means of M-score indices differ significantly between suspected manipulators and non-manipulators companies working in the same sector.**

**Proposition 5: Means of financial ratios differ significantly between value stock companies and non-value stock companies working in the same sector.**

**Proposition 6: Means of M-score indices differ significantly between value stock and non-value stock companies in the same sector.**

#### **4. Research Methodology**

##### **4.1 Sample Selection:**

**All of the companies working in both the Cement and Industrial sectors in Saudi Arabia stock market that were operating in the period between 2011 till 2014 are included in this study. The cement sector (12 companies) is chosen**

as it is not affected by the economic fluctuations as there is a high demand for constructions in Saudi Arabia and its products are highly demanded, so there is a lot of homogeneity between its companies. The industrial sector (14 companies) is chosen due to the diversified nature of its companies that gives another perspective and opposing nature of the Cement sector.

#### 4.2 Preparation of data:

The Financial statements of all companies in the two sectors for the years 2011 to 2014 are studied, and their data are used to calculate the different financial ratios. Eleven financial ratios are calculated to reflect the companies' liquidity, solvency, efficiency of using assets and profitability. These ratios are Current Ratio (CR), Quick Ratio (QR), Inventory Turnover (IT), Fixed Assets Turnover (FAT), Total Assets Turnover (TAT), Debt Ratio (DR), Return on Sales (RS), Return on Assets (RA), Return on Equity (RE), Accounts Receivable Turnover (ART), and Earnings Per Share (EPS). In addition, the ratios that Nia, (2015) tested are also considered for comparative purposes.

M-score and F-score for all companies working in both the Cement and Industrial sectors are calculated. M-score is calculated based upon the above-mentioned indices. The indices for each company are later used to validate propositions four and six. Companies that their M-score is more than "-2.22"

(as indicated by Beneish) in at least one year or more are considered non-manipulators and the rest of the companies that did not fulfill such a condition are considered as manipulators. Table (1) summarizes the results of applying the M-score measure in both sectors.

**Table (1): Classifying companies into non-manipulators/ manipulators for both sectors using M-score:**

<b>Sector</b>	<b>Non-Manipulators</b>	<b>Manipulators</b>	<b>Total</b>
<b>Cement</b>	<b>C1,C2,C3,C5,C8,C9 &amp; C12</b>	<b>C4,C6,C7,C10 &amp; C11</b>	<b>12 companies</b>
<b>Industrial</b>	<b>I1,I4,I5,I7,I8,I9, &amp; I12</b>	<b>I2,I3,I6,I10,I11,13 &amp; I14</b>	<b>14 companies</b>

On the other hand, companies are classified based on the F-score into value stock and non-value stock where companies with an F-score above "5" in all of the years of the study are regarded as a value stock otherwise they are considered to be a non-value stock.



**Table (2) Classifying companies into value stock/non-value stock for both sectors using F-score:**

Sector	Value stock	Non-value stock	Total
Cement	C1,C4,C5,C6,C7,C9 & C12	C2,C3,C8,C10 & C11	12 Companies
Industrial	I2,I3,I4,I8,I10,I11,I13 & I14	I1,I5,I6,I7, & I12	14 Companies

The research propositions are then tested using the appropriate statistical method as indicated below.

#### 4.3 Propositions Validation

**Proposition 1: Companies that are classified as non-manipulators by M-score are also classified as value stock by F-score in each sector.**

To validate such proposition, companies that are classified as non-manipulators are compared with those that are classified as value stock for each of the two sectors under study. The following table (3) summarizes the findings of such comparison.

**Table (3): Comparing non-manipulators to value stock companies in each sector:**

<b>Sector</b>	<b>Non-Manipulators</b>	<b>Value stock</b>
<b>Cement</b>	<b>C1,C2,C3,C5,C8,C9 &amp; C12</b>	<b>C1,C4,C5,C6,C7,C9 &amp; C12</b>
<b>Industrial</b>	<b>I1,I4,I5,I7,I8,I9, &amp; I12</b>	<b>I2,I3,I4,I8,I10,I11,I13 &amp; I14</b>

Based on the above findings in the Cement sector, it could be concluded that there are four companies (C1,C5,C9 & C12) that are common in both classifications while the rest are different. In the Industrial sector, only two companies (I4 & I8) are in common between the two classifications, while the remainder of the companies are different. This implies that the majority of the companies are not supporting Proposition 1. This indicates that the assumption that the companies that are regarded as non-manipulators are classified as value stock by F-score is not supported. The need to develop a score that can identify both non-manipulators and value stock would be useful.

**Proposition 2:** Companies that are classified as manipulators by M-score are also classified as non-value stock by F-score in each sector.

To validate such proposition, companies that are classified as manipulators are compared with those that are classified as non-value stock for each of the two sectors under study. The following table (4) summarizes the findings of such comparison.

**Table (4): Comparing manipulators to non-value stock companies in each sector:**

Sector	Suspected Manipulators	Non-value stock	Total
Cement	C4,C6,C7,C10 & C11	C2,C3,C8,C10 & C11	12 Companies
Industrial	I2,I3,I6,I10,I11,13 & I14	I1,I5,I6,I7, & I12	14 Companies

Based on the above findings in the Cement sector, it could be concluded that there are two companies (C10 & 11) that are common in both classifications while all the remaining companies are different. In the Industrial sector, only one company (I6) is common between the two classifications, while the rest of the companies are different. This implies that the majority of the companies are not supporting Proposition 2. This indicates that the assumption that the companies that are regarded as manipulators by M-score are classified as non-value stock by F-score is not supported. The need to develop a score that can identify both manipulators and the non-value stock would be useful especially in emerging markets.

**Proposition 3: Means of financial ratios differ significantly between suspected manipulators and non-manipulators working in the same sector.**

**By conducting a t-test for independent samples to compare the means of the financial ratios of both companies identified as suspected manipulators and non-manipulators in both the Cement and Industrial sector, it could be concluded that there is no significant difference between most of the financial ratios (at a confidence level of 95%) between the two groups, as the significance of the t-test is greater than  $p (.05)$  for all ratios except the following in the Cement sector:**

**Earnings Per Share based on net income (EPS\_C) for non-manipulators (M= 2.7081, SD = 2.60386) and suspected manipulators (M= 4.8160, SD= 2.08264) conditions;  $t = -2.595$ ,  $p = 0.014$ .**

**Debt Ratio (DR\_C) for non-manipulators (M= 0.2586, SD = 0.12112) and suspected manipulators (M= 0.1460, SD= 0.09296) conditions;  $t = 3.016$ ,  $p = 0.005$ .**

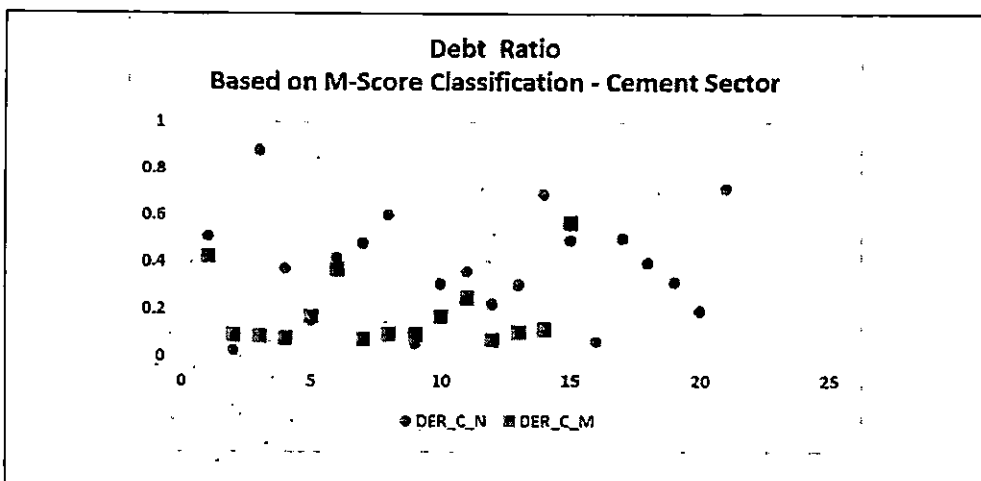
**On the other hand, in the industrial sector, there is a significant difference in the means of the following ratios:**

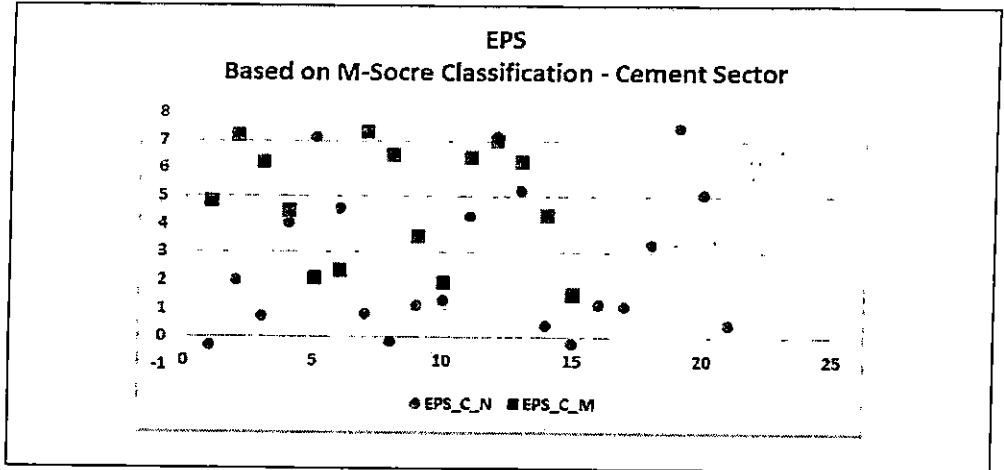
Fixed Assets Turnover (FAT\_I) for non-manipulators ( $M=1.9043$ ,  $SD = 1.0575$ ) and suspected manipulators ( $M=3.6586$ ,  $SD= 3.43088$ ) conditions;  $t = -2.239$ ,  $p=0.035$ .

Return on Sales (RS\_I) for non-manipulators ( $M=0.0867$ ,  $SD = 0.06143$ ) and suspected manipulators ( $M=0.1967$ ,  $SD= 0.13958$ ) conditions;  $t = -3.305$ ,  $p=0.003$ .

The results of studying the observations of the two ratios show that their means differed significantly between the two groups in the Cement sectors as presented in Fig. (1) as follows:

Fig (1): Comparing observations of DR and EPS for manipulators and non-manipulators in the Cement Sector:



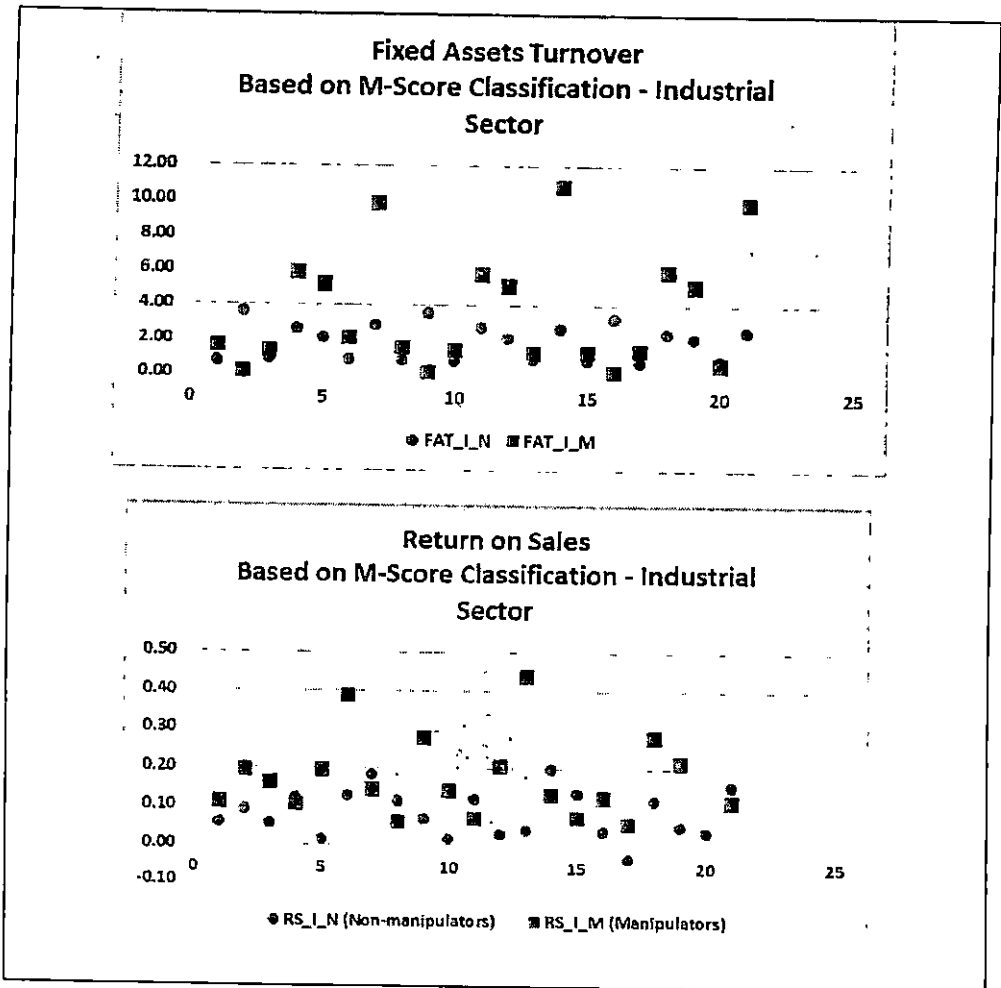


By studying DR's observations, it is clear that the debt ratio for suspected manipulators is mostly (except for three observations) below 20% while those which are classified as non-manipulators their DR's observations (except for five observations are above 20%). The cause of such a fact could be due to different reasons such as that the manipulators are manipulating to show a lower debt ratio to be able to raise more debt.

As for the EPS, it could be concluded that more than 86% of the suspected manipulators have EPS of 2.0 SR (Saudi Riyal) and above while more than 52% of the non-manipulators have EPS less than Saudi Riyal 2.0. This could be the result of the manipulation, to make such stock appealing to investors.

The results of studying the observations of the two ratios show that their means differed significantly between the two groups in the Industrial sector are presented in fig (2) as follow:

Fig. (2) Comparing observations of FAT and RS for manipulators and non-manipulators Industrial sector:



Based on the observations shown in Fig(2), it could be concluded that FAT for the non-manipulator companies in the Industrial sector is less than "4.0" while, for suspected manipulators, around 42% is above 4.0. This could be the result of the manipulation to make the company's financials more appealing. On the other hand, RS for non-manipulators is ranging from "-0.03" to almost "0.2", while for suspected manipulators the range is from "0.06" to "0.61" which is significantly higher than the non-manipulators. However, there are some companies in both groups that share the same range of RS.

The findings do not support the proposition regarding all financial ratios except those, which their means varied significantly between the two groups in both the Cement and Industrial sector.

It is also evident that the financial ratios that their means differed significantly in the Cement sector between the suspected manipulators and non-manipulators are different from those that differed significantly between the two categories in the industrial sector. This could be related to the nature of the sector in which such companies operate. These findings raise the need to develop a model or score that is sector-specific. It also raises questions about the ability of both M-score and F-score to effectively classify companies into manipulators/non-manipulators and value stock/non-value stock in emerging markets respectively.



**Proposition 4: Means of M-score indices differ significantly between suspected manipulators and non-manipulators companies working in the same sector.**

**By conducting, a t-test of independent samples to compare the means of M-score indices of both companies classified as suspected manipulators and non-manipulators in the Cement sector. It could be concluded that there is no significant difference between most of the indices (at a confidence level of 95%) between the two groups, as the significance of the t-test is greater than  $p (.05)$  for all indices except for the following index:**

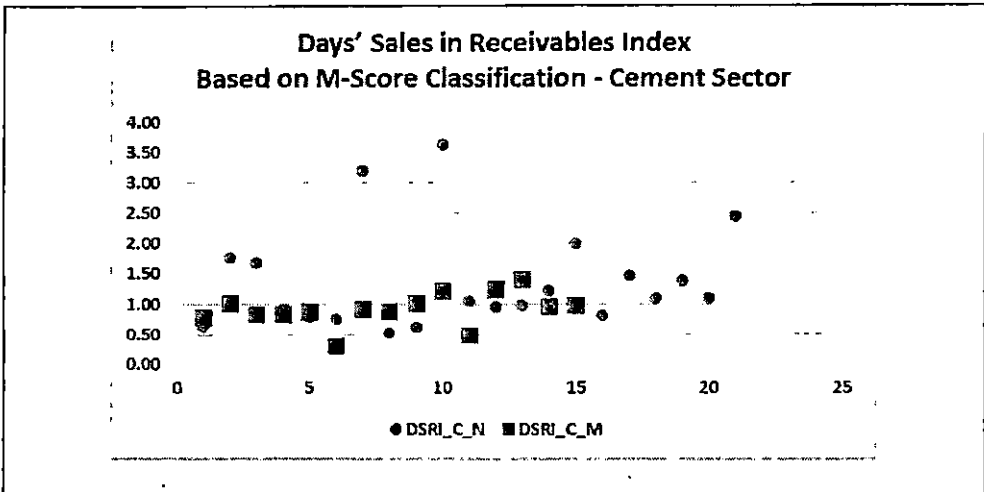
**Days' Sales in Receivables Index (DRSI\_C) for non-manipulators ( $M=1.3802$ ,  $SD = 0.83160$ ) and suspected manipulators ( $M=0.9200$ ,  $SD= 0.27355$ ) conditions;  $t = 2.360$ ,  $p=0.026$ .**

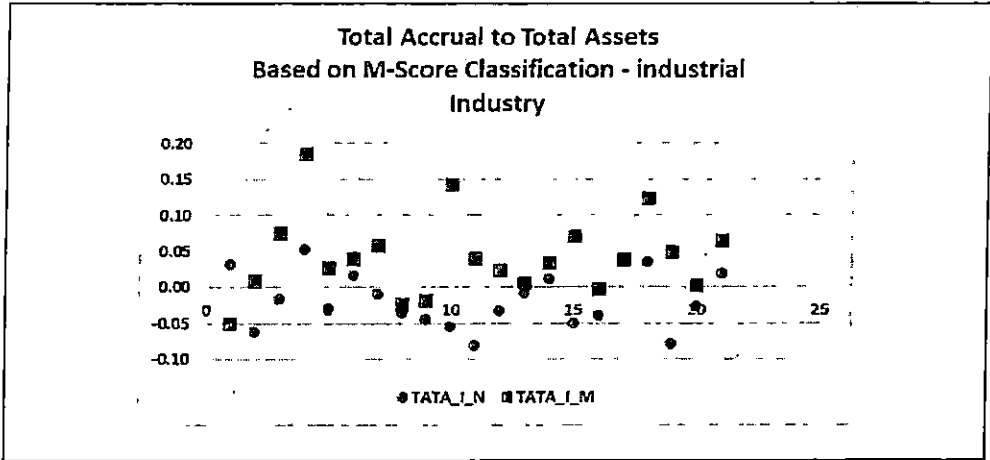
**By conducting, a t-test to compare means of M-score indices of both companies classified as suspected manipulators and non-manipulators for the Industrial sector. It could be concluded that there is no significant difference between all of the indices (at a confidence level of 95%) between the two groups, as the significance of the t-test is greater than  $p (.05)$  for all indices except for the following index:**

**Total Accruals to Total Assets Index (TATA\_I) for non-manipulators ( $M=-0.181$ ,  $SD = 0.03919$ ) and suspected manipulators ( $M=0.0429$ ,  $SD= 0.05614$ ) conditions;  $t = -4.080$ ,  $p=0.000$ .**

The following graph fig (3) compares the observations of each of the two sectors regarding those indices.

**Fig (3): Comparing observations of manipulators and non-manipulators for DSRI (Cement sector) and TATA (Industrial sector):**





Based on Fig. (3), it is clear that in the Cement sector the concentration of DSRI index is below 2.00 for both manipulators and non-manipulators. DSRI for four observations was 2.00 and above, which indicates that the companies involved had changed their credit policy by increasing the sales on credit, it could also mean revenue inflation. It is to be noticed that four observations are related to companies that fall in within the non-manipulators group. This raises a question of the reliability of one score to determine whether the company is trying to manipulate its reports.

On the other hand, TATA is significantly different in the Industrial sector. It is clear that all of the observations of non-manipulators are below 0.05 while around 33% of the observations of the suspected manipulators are above 0.05.

This confirms Warshavsky (2012) opinion that higher positive accruals are associated with the potential for earnings manipulation.

The findings does not support Proposition four except for M-score index that its mean varied significantly between the two groups in each sector.

It is also obvious that M-score index that its mean differed significantly, between the suspected manipulators and non-manipulators in the Cement sector (DSRI\_C) is different from (TATA\_I) in the Industrial sector.

Such results also differ from Beneish's (1999) findings, as only DRSI and TATA varied significantly, and they are not even common for both sectors while Beneish found that DSRI, GMI, AQI, SGI, and TATA are significant between the two groups. This needs further investigation to know whether the market or the market and sector have an effect on the significance of those indices.

Proposition 5: Means of financial ratios differ significantly between value stock companies and non-value stock companies working in the same sector.

By conducting t-test of independent samples on the means of financial ratios of the companies in the Cement sector which are classified as value stock and as non-value stock using F-score, it was found that there is no significant

difference between the means of the ratios except for (IT\_C) which differed significantly as follows:

Inventory Turnover (IT\_C) for value stock companies (M= 2.3107, SD = 1.40789) and suspected manipulators (M=1.4143, SD= 0.87568) conditions;  $t = 2.178$ ,  $p=0.036$ .

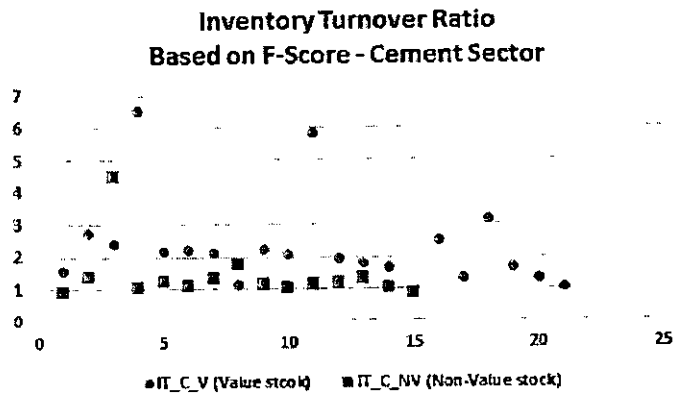
By conducting t-test of independent samples on the means of financial ratios of the companies in the Industrial sector that are identified as value stock and as non-value stock using F-score, the following ratios showed significant difference:

Current Ratio (CRI\_I) for value stock companies (M=1.957, SD = 1.2679) and non-value stock (M=0.8013, SD= 0.2994) conditions;  $t = 4.514$ ,  $p=0.000$ . Quick Ratio (QR\_I) for value stock companies (M=1.1585, SD = 1.08754) and non-value stock (M=0.1407, SD= 0.47749) conditions;  $t = 4.190$ ,  $p=0.000$ . Inventory Turnover (IT\_I) for value stock companies (M=3.2759, SD = 1.1205) and non-value stock (M=2.1500, SD= 0.84116) conditions;  $t = 3.679$ ,  $p=0.001$ . Total Assets Turnover (TAT\_I) for value stock companies (M=0.5604, SD = 0.31450) and non-value stock (M=0.7560, SD= 0.25823) conditions;  $t = -2.052$ ,  $p=0.047$ . Debt Ratio (DR\_I) for value stock companies (M=0.3396, SD = 0.2094) and non-value stock (M=0.5240, SD= 0.05096) conditions;  $t = 4.349$ ,  $p=0.000$ . Accounts Receivables Turnover (ART\_I) for value stock companies

( $M=5.1237$ ,  $SD = 2.28776$ ) and non-value stock ( $M=3.1840$ ,  $SD= 1.1187$ ) conditions;  $t = 3.690$ ,  $p=0.001$ .

The results of studying the observations of the  $IT\_C$  ratio that differed significantly between the two groups in the Cement sectors are presented in Fig. (4) as follows:

Fig (4): Comparing observations of IT between value stock and non-value stock for the Cement sector:

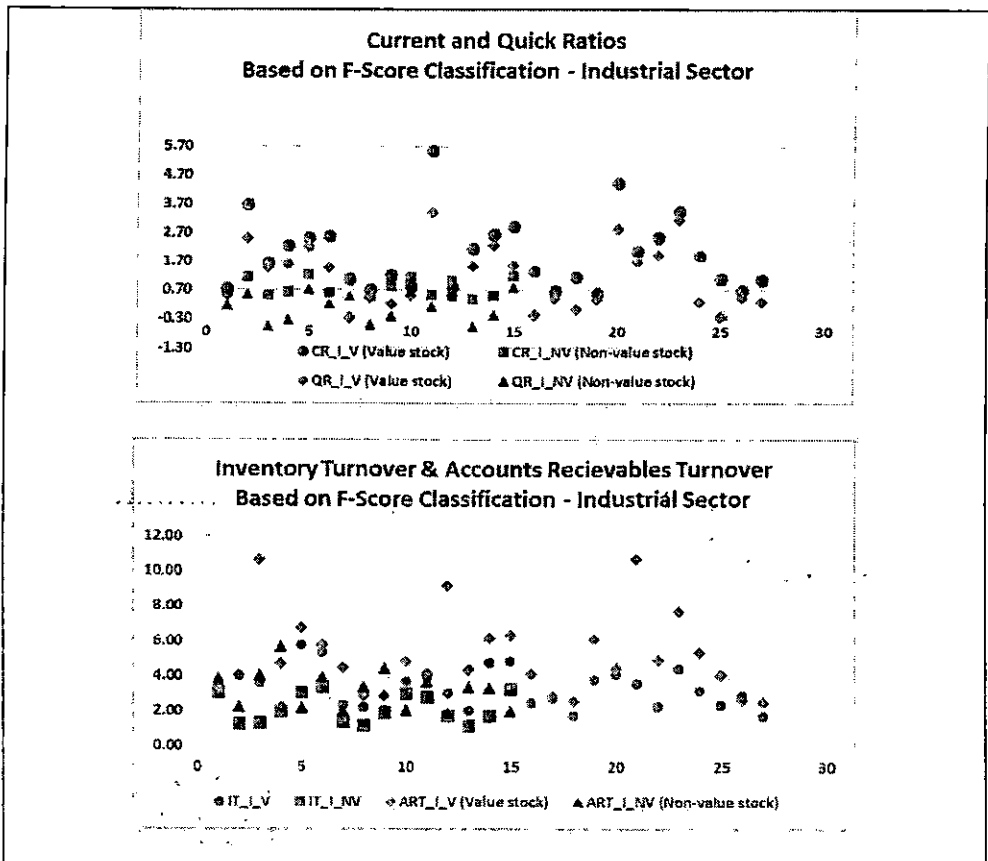


From the above graph, it could be concluded that all of the non-value stock company (except only one company) had inventory turnover ratio below “2.0” while most of the value stock companies had their inventory turnover ratio above “2.0” and greater than the ratio of the non-value stock companies. This

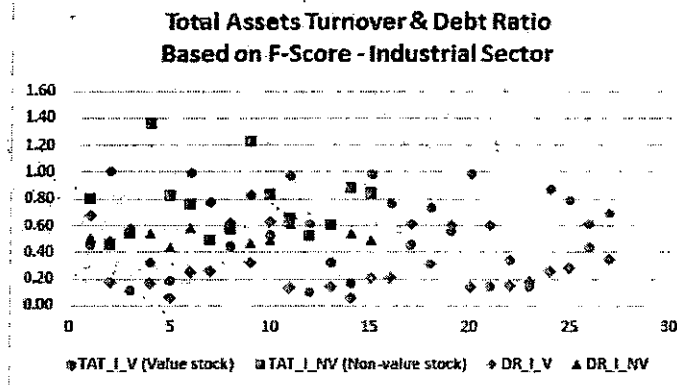
goes in line with the rational that value stock companies would have volatile inventory.

On the other hand, the results studying the observations in the industrial sector is presented in the following graphs on fig. (5) and fig. (6).

Fig. (5): Comparing observations of CR, QR, IT, & ART between value stock and non-value stock for Industrial sector.



**Fig. (6) Comparing observations of TAT and DR for value stock and non-value stock for the Industrial sector.**



Based on the above figures, the following could be concluded that the majority (74%) of the value stock companies have scored a current ratio of “1.0” or above while only 40% of the non-value stock companies scored “1.0” or above. In regards to the quick ratio, almost half (48%) of value stock companies have scored a quick ratio of “1.0” or above, while none of the non-value stock companies scored “1.0” or above. Although maintaining a quick ratio above “1.0” might not be a good sign of utilizing the company’s assets efficiently. However, having such trend in the value stock companies for both the current ratio and quick ratio shed the light on the importance of the liquidity measures to value stock companies.



In regards to the inventory turnover ratio, more than 93% of the value stock companies scored an inventory turnover ratio of “2.0” or above, while only 40% of the non-value stock companies scored such value. Such findings confirm the same finding in the Cement sector. This indicates the importance of such a ratio in identifying the value stock companies.

In regards to account receivables turnover ratio, most of the value stock companies (74%) had a ratio of “4.0” and above, while only 20% of the non-value stock companies had such value for such a ratio. This indicates that high accounts receivables turnover ratio is a characteristic of value stock companies in such a sector.

In regards to total assets turnover, most of the value stock companies (52%) has a ratio of less than 55%, while only 27% of non-value stock companies have a ratio of less than 55%. Although a higher ratio would be better, it seems that in such a sector, non-value stock companies are inflating such a ratio to make the stock more appealing to investors. Additional investigations are needed to explain such findings.

In regards to the debt ratio, around 33% of the value stock companies have a ratio of 40%, while all of the non-value stock companies have a ratio above 40%. Such result could show the importance of the solvency ratios in such a sector, as the higher this ratio, the higher the risk to investors.

Based on the above findings, it is clear that there are significant differences between the means of the financial ratios for both value stock and non-value stock companies in both the Cement and Industrial sectors. However, the means of several ratios in the Industrial sectors differed significantly between the two groups, which support proposition five. While in the Cement sector, most of the findings (except for IT) do not support proposition five. This emphasizes the importance of using different scores and ratios for various sectors, since the nature of the sector affects the relative importance of the ratios.

**Proposition 6: Means of M-score indices differ significantly between the value stock and non-value stock companies in the same sector.**

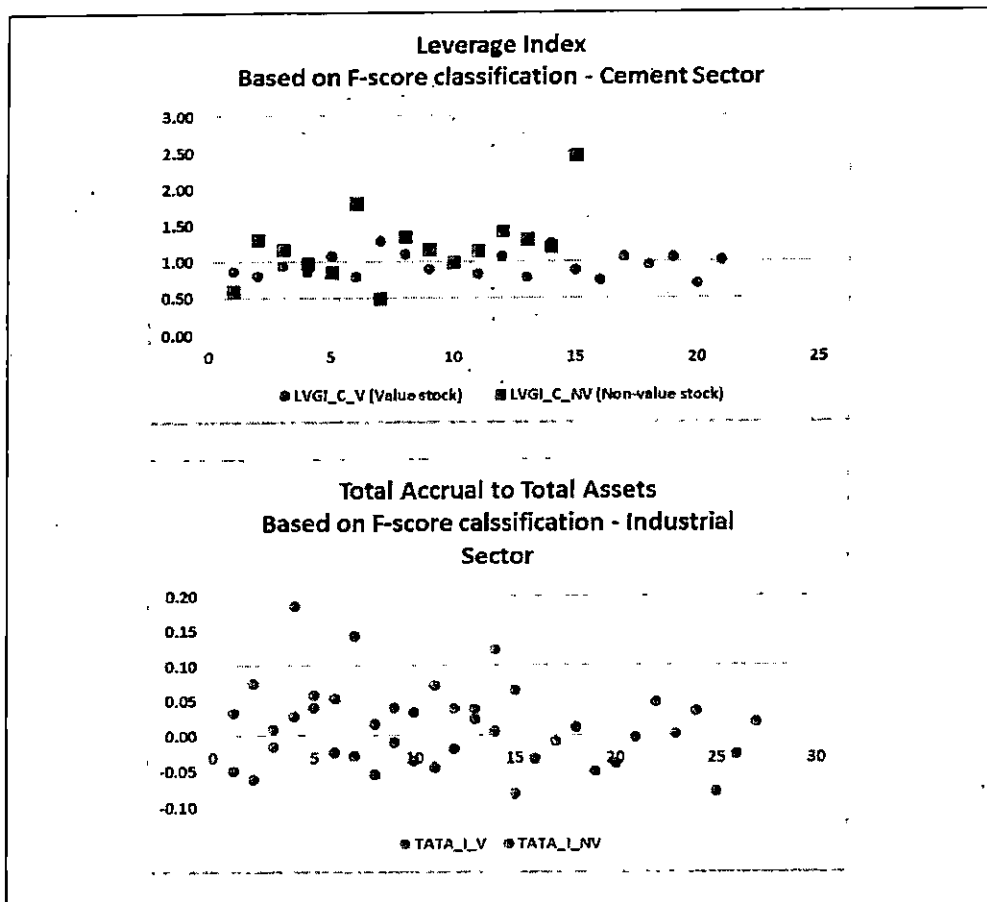
By conducting, a t-test of independent samples to compare means of M-score indices of companies classified as a value stock and those identified as non-value stock companies working in the Cement sector. It could be concluded that there is no significant difference between all of the indices (at a confidence level of 95%) between the two groups, as the significance of the t-test is greater than  $p (.05)$  for all ratios except LVGI\_C as its mean significantly differed between the value stock and non-value stock companies as follows:

Leverage Index (LVGI\_I) for value stock ( $M=0.9524$ ,  $SD = 0.15773$ ) and non-value stock ( $M=1.2207$ ,  $SD= 0.47293$ ) conditions;  $t = -2.115$ ,  $p=0.050$ .

By conducting a t-test of independent samples to compare the means of M-score indices companies classified as a value stock and those identified as non-value stock companies working in the Industrial sector. It could be concluded that there is no significant difference between most of the indices (at a confidence level of 95%) between the two groups, as the significance of the t-test is greater than  $p (.05)$  for all ratios except for the following index:

Total Accruals to Total Assets Index (TATA\_I) for value stock ( $M=-0.0070$ ,  $SD = 0.03781$ ) and non-value stock ( $M=0.0480$ ,  $SD= 0.06899$ ) conditions;  $t = -3.355$ ,  $p=0.002$ . The following graph in fig. (7) compares the observations of each of the two sectors regarding LVGI\_C and TATA\_I.

Fig. (7): Comparing observations of LVGI (Cement Sector) & TATA (Industrial Sector) between value stock and non-value stock:



Based on Fig. (7), it is clear that in the Cement sector, the concentration of this index is below “1.25” for value stock companies while around 40% of the observations of the non-value stock companies is above “1.25” based on F-score classification. This confirms Warshavsky (2012) results that companies with LVGI greater than “1.0” indicate an increased leverage and, therefore, a company more prone to financial statement manipulation. It is worth

mentioning that LVGI was not significantly different in the Cement sectors' companies.

On the other hand, TATA is significantly different in the Industrial sector. It is evident in fig. (9), that all of the observation of the value stock are either "0.06" or lower, while around 60% of the observations of the non-value stock are above "0.06". So, even by classifying the companies by the F-score indicates that TATA is one of the indices that is common under both classifications in the Industrial sector. However, TATA does not show any significant difference in the Cement sector in either classification (manipulators - non-manipulators and value stock – non-value stock). This could be attributed to the fact that in the Cement industry and due to the high demand of the product in Saudi Arabia, it sells either in cash or on short-term credit terms. Such findings suggest that there is a need to identify the significant M-score indices per sector or even per industry.

Such findings do not support Proposition six except for (LVGI\_C) in the Cement sector and for (TATA\_I) in the Industrial sector as their mean varied significantly between the two groups in each of the two sectors.

Finally, Nia's, (2015) findings are tested to the data of the companies under study to find whether they still stand at different sectors. The results shows that the means of inventory to total assets does not differ significantly between

the non-manipulators/manipulators group in both sectors. The means of current assets to total assets differ significantly (at a confidence level of 95%) between the two groups of companies in the Cement sector as for non-manipulators ( $M= 0.1318$ ,  $SD = 0.02416$ ) and suspected manipulators ( $M= 0.2563$ ,  $SD= 0.03289$ ) conditions;  $t= -3.125$ ,  $p=0.004$ . However, such a ratio did not show significant differences in the Industrial sector. The revenue to total assets ratio differed significantly (at a confidence level of 95%) between the two groups of companies in the Industrial sector as for non-manipulators ( $M= 0.7392$ ,  $SD = 0.19641$ ) and suspected manipulators ( $M= 0.5169$ ,  $SD= 0.34778$ ) conditions;  $t= 2.550$ ,  $p=0.016$ . The findings show that Nia's findings do not stand at different sectors. They did not even stand in a different market, as inventory to total assets did not differ significantly between the two groups. Such findings confirm the need for more research on developing a model or a score that is sector or industry based to be able to distinguish between manipulators/non-manipulators and value stock/non-value stock.

## **5. Discussions and Conclusions:**

Based on the above study, table (5) summarizes the different results findings that are achieved:

Table (5): Summary of the achieved results:

Comparison	Cement	Industrial
Significant difference in financial ratios based on categorizing the companies using M-score	EPS_C and DR_C	FAT_I and RS_I
Significant difference in financial ratios based on categorizing the companies using F-score	IT_C	CRI_I, QR_I, IT_I, DR_I, TAT_I, and ART_I.
Significant difference in M-score indices based on categorizing the companies using M-score	DRSI_C	TATA_I
Significant difference in M-score indices based on categorizing the companies using F-score	LVGI_C	TATA_I

By comparing the financial ratios and indices that their means differ significantly between the classifications, the following could be concluded:

- Total Accruals to Total Assets Index (TATA) in the industrial sector is significantly different between the two groups of companies (whether by using M-score or F-score). By studying the observations of the two classifications in the Cement sector, it is clear the most of the companies that are classified as non-manipulators by M-score and those which are

classified as value stock by F-score, have got TATA index below 0.05. However, such index did not show any significant difference in the highly harmonized Cement sector. This could propose the importance of the sector's nature and that the index that classifies the companies into either manipulators/non-manipulators and value stock/non-value stock should be different.

- Inventory Turnover ratio (IT) is significantly different between the two groups of companies (value stock/non-value stock classified based on F-score) in both the Cement and Industrial sectors. By studying the observations of each sector regarding this ratio, it could be concluded that the IT ratio is higher for the companies, which are both classified as non-manipulators by M-score and as value stock by F-score. It is worth mentioning, that although none of the F-score formulas are calculated directly based on inventory, the inventory turnover happens to be significantly different between the classifications that are based on F-score. Such findings indicate the importance of such a ratio in screening the companies.
- There are different ratios and indices that their means differed significantly between the various classifications and between the two sectors. This implies the importance of developing a customized score for



each sector when classifying the companies into manipulators/non-manipulators and value stock/non-value stock.

- The indices that differed significantly by using the M-score classification are affected by the market. The findings showed less number of indices (only DRSI and TATA) when applied to an emerging market such as Saudi Arabia Stock Exchange, in comparison to the findings by Beneish (1999) where five indices were significantly different (DSRI, AQI, SGI, and TATA).

Further research is needed to develop a model that is able to identify suspected non-manipulators/manipulators and value stock/non-value stock for each sector or industry instead of using one general model for all industries as the above findings show different results for various sectors. Additionally, such model should be tested on several markets, as several variables could affect such a model from one market to the other.

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