Measuring Market Valuation of Amman Stock Exchange Industrial Sectors: Tobin's Q Ratio as Investors' Market Performance Indicator

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Abstract

This research investigation purported to present the market valuation of Amman Stock Exchange Industrial Sectors utilizing the Tobin's Q ratio to serve as performance indicator among Jordanian industrial firms. The most specific research objectives addressed in this research work were to evaluate the Amman Stock Exchange Industry market performance, present the trend in Q ratio valuation during the study period, and to recommend some guiding principles to enrich investors in making the right investment decisions.

The research paper is anchored on the concepts of Chung and Pruitt (1994) who have developed a simple approximation of Tobin's q. For the methodology, the researchers made use of the 49 sample companies from all industrial public traded company sectors listed in the Amman Stock Exchange (ASE) clustered based on the Amman Stock Exchange classification as published in their publications inclusive of 2008-2015. The sectors included the Pharmaceutical & Medical Industries, Chemical Industries, Paper & Cartoon Industries, Food & Beverage, Tobacco & Cigarettes, Mining & Extraction Industries, Engineering & Construction, Electrical Industries, Textile, and Leather & Clothing.

The researchers computed the market performance of the industrial sectors of the Amman Stock Exchange Investors through the Tobin's q, formula as shown. Tobin's q ratio was used to calculate the valuation of the industrial sectors of the various companies for eight (8) consecutive years applying the simple approximation, as follows:

$$Tobin's\ Q = \frac{market\ value}{replacement\ cost}$$

The approximate formula: q= (MVE+PS+DEBT)/ TA, was used. Tobin's q ratio has been calculated and trend analysis for q ratio has been done, through time-series for the eight years study period.

Results of the study showed that it was in *Mining and Extraction Industries* which yielded the highest Tobin's q ratio; which was interpreted to mean that these sectors have the highest market performance, while the lowest q ratio was on the *Electricity Industries*, which showed the lowest market performance; these should have been indicators for investors to realize the very good performance of these industries during the first 6 years of study and from the investors' perspective, would have led to optimal investment opportunities.

The recommendations made for this study, were for investors to have practical knowledge and experience about the stock market valuation and most importantly to coordinate with financial firms who have the appropriate knowledge, skills and expertise to review vital information about undervalued or overvalued business clusters. Moreover, investors must be properly guided to invest in stocks of companies with sound market value; they should consider the macro indicators for the stock market and be cognizant of policies on market stability and economic situations which may affect market capitalization.

Keywords: Tobin's Q, investment, Performance ratio, stock market

1. Introduction of the Study

The study intends to measure the Tobin's Q ratio of Industrial Sectors of the Amman Stock Exchange investors with an emphasis on industrial firms, in the frame of the Jordanian firms. The data for this study was based on those companies that are listed on Amman stock exchanges in   Jordan.

The present research aims   to analyze the Tobin's Q ratio for the Industrial sector of Jordan among listed companies in Amman stock Exchange. Therefore, an initiative has been taken to address performance evaluation of the companies to contribute some guidelines to the investors and using market-based criteria Q ratio as alternative to market evaluation.

Stock valuation has been one of the most challenging issues in finance, where pricing of common stocks issued by corporations, is one of the key issues in financial evaluation.

Many models were utilized for market valuation. All these models were tried to establish a reliable reference for stock valuation. Extensive studies were made in this area to develop a new theoretical model to improve the accuracy of the stock valuation models that were used for as market performance measurement.

These models are introduced by the academic professionals to be applied in the real-world of business to support investors in their investment decisions as decision tools to allow more acute predication to problems in stock valuation.

In this research investigation, Tobin's q has been chosen as an attractive measure because it is more accurate, more precise and, also, due to its relationship with the investment valuation indicating the performance of the investment; this has been proven to becoming increasingly suitable. The literature about Tobin's cited that it is the ratio of market value to replacement cost of tangible assets, and it is used to value investment opportunities, management's performance, and the mispricing of stocks.

As acknowledged by investment analysts, measuring Tobin's q is often not an easy task, because of data unavailability, and the calculation of Tobin's q is often not accessible, nor an easy access for the data, or no disclosure for public use, nor published for the use of the investors.

To deal with the issue of data unavailability, several researchers devised their own operational measures of Tobin's q to overcome the difficulty of getting the data. This applied to the present investigators who seek to use one of the more simplified methods of gathering data which may prove more reliable and accurate for investors to use as a guide in market valuation. The authors were more interested in using Chung and Pruitt (1994) due to the assumptions that book values are good estimates of their market values. This was also supported by another commonly used approximation of the true q which is the simple q, Switzer and Emery (1996) which assumed that book values are good estimates of their market values.

Tobin's q is a measure of market value to replacement cost, which provides an empirically fruitful framework for the analysis of individual firms; it is the ratio between the market value of the firm's assets and the replacement value of its assets.

The concept about q ratio was first introduced by Tobin (1969) as a predictor of a firm's future investments and has since been used to explain a wide variety of economic phenomena, including industry concentration, as cited by Montgomery and Wernerfelt, (1988). On the other hand, Lindenberg and Ross (LR) (1981), developed one of the most popular estimation techniques for Tobin's q with which they divide the firm's assets into three components namely, plant and equipment, inventories and other assets, and applied different methodology for each.

It might be noted that the findings of the Lindenberg and Ross (1981) procedure seemed to be too complex, thus, Hall (1990) and Hall et al. (1988) proposed a recurrent model. Unlike other measures of Tobin's q, Hall's measure does not include other asset components in the replacement costs. Hall's procedure is used in Hall (1993), Chung and Jo (1994), and Lewellen and Badrinath (1997).

The most appealing aspect of Tobin's q is that it accounts for both market and accounting data It responds to some of the criticisms directed at both accounting measures as well as stock returns as performance measurement tools.

In this study, we decided to use Chung and Pruitt's method (hereafter, C-P) to calculate q. The main advantage of this method is that it is considerably more conservative with respect to both data requirements and computational effort, than the traditional method of Lindenberg and Ross (1981).

Furthermore, in this research work, the simplified method applied showed data which can provide the investors a reliable market indicator for their future investments.

1.1. Research Objectives

The aim of this research investigation is to determine the market valuation of Amman Stock Exchange Industrial Sectors utilizing the Tobin's Q ratio to serve as performance indicator among Jordanian industrial firms.

Specifically, the research objectives addressed in this research work were as follows:

1. to evaluate the Amman Stock Exchange Industry market performance,
2. to present the trend in Q ratio valuation during the study period,
3. to propose guiding principles to enrich investors in making the right investment decisions.

1.2. Conceptual Framework of the Study

The research paper is anchored on the following concepts postulated by authors who researched on stock valuation formula for investors to assess their company performance.

Lang, Stulz and Walking (1989), in their investigation, found out that the largest gains are achieved when high q bidders acquire low q firms in successful tender offers. This finding is extended to mergers by Servaes (1991).

In the same note and purpose, the study of Nathalie Han Kin Sang, (1998) concluded that the simple q and the benchmark q are highly correlated, and results from tests for the equality of their coefficient estimates reveal no significant differences. In the investigation, the simple q which provides good estimates of the LR q 's is satisfactory given the simplicity of their calculations.

Chung and Pruitt (1994) likewise have developed a simple approximating of Tobin's q. In their study, they

proved the approximate q value with those obtained via Lindenberg and Ross (1981), who, more theoretically corrected the model and indicated that at least 96.6% of the variability of Tobin's q is explained by the approximate q.

As the researchers were interested to evaluate the stock market of Amman Stock Exchange and the performance of the industrial company, the concepts of Joseph Wolfe, Antonio Carlos and Aidar Sauaia (2003), was also used as a benchmark, from their study "The Tobin q as A Company Performance Indicator." In this paper, Tobin's q was used in a more-meaningful way, to judge the comparative performance of firms in business games. The results were inconclusive and indicated that further investigation would be useful because this paper investigated the use of Tobin's q as a more-meaningful way to judge the comparative performance of firms in business games.

In a similar note, the research paper of Md. Rostam, et al (2016), entitled "Analyzing Tobin's Q Ratio of Banking Industry of Bangladesh: A Comprehensive Guideline for Investors, analyzed the Tobin's Q of Banking Industry of Bangladesh from the investors' perspective, as well as evaluated the Banking Industry on the basis based on and its stated book value from the investors' point of view.

These research works were somehow related also with the studies of Behrooz Nabavand and Javad Rezaei (2015), they have conducted a study on "Review between Tobin's Q with performance Evaluation Scale Based Accounting and Marketing Information in Accepted Companies in Tehran Stock Exchange." The research investigated the relationship between Tobin's Q and performance evaluation criteria based on accounting and market information in companies listed on the Tehran Stock Exchange in a 5-year period. The results obtained from this study showed that there was a significant relationship between the Tobin's Q ratio and market performance measure during the 5-year period of their research period.

In the study conducted by Liang Fu Rajeev Singhal Mohinder Parkash (2016) their study provided evidence on the relationship between the *q* ratio and future operating performance for a sample of publicly traded US firms; their study further showed that firms with higher *q* ratios experience superior operating performance in the long run.

For this present research investigation, all the above conceptual ideas about the computations of Tobin's q as indicators to present the trend in Q ratio valuation during the study period, so that certain guiding principles can be proposed for investors to make the right investment decisions.

2. Methodology

In this research investigation, the researchers made use of the 49 sample companies from all industrial public traded company sectors listed in the Amman Stock Exchange (ASE). The clustering of these sectors was based on the Amman Stock Exchange classification as published in their annual publication inclusive of 2008-2015. The sectors included the Pharmaceutical & Medical Industries, Chemical Industries, Paper & Cartoon Industries, Food & Beverage, Tobacco & Cigarettes, Mining & Extraction Industries, Engineering & Construction, Electrical Industries, Textile, and Leather & Clothing.

The researchers made use of the published annual reports of the sample sectors for the years 2008 to 2015, with the year-end closing prices from the annual financial reports and the number of shares outstanding that were obtained from the price bulletin published by the authority of Amman Stock Exchange (ASE) Official Website (www.exchange.jo).

The market performance of the industrial sectors of the Amman Stock Exchange Investors was computed through the Tobin's q. The q ratio was used to measure the ratio of the market value of a company's assets to the replacement cost of the company's assets. The numerator of the ratio is the market value of its outstanding stock and debt and the dominator is the book value of the company assets.

The formula is shown below:

$$Tobin's\ Q = \frac{market\ value}{replacement\ cost}$$

Tobin's q ratio was used to calculate the valuation of the industrial sectors of the various companies for eight (8) consecutive years applying the simple approximation, as follows:

The approximate formula: q= (MVE+PS+DEBT)/ TA, was used, where MVE is the product of the a firm's share price and the number of outstanding common stock share; PS is the liquidating value of the firm's outstanding preferred stocks, *DEBT* is the value of the firm's short term liabilities net of its short term assets plus the book value of the firm's long term debt, and *TA* is the book value of the total assets of the firm. All the data which were subjected to the above- formula, the required inputs that were readily obtained from the basic financial and accounting data of the 49 companies in the industrial sectors.

Tobin's q ratio has been calculated and trend analysis for q ratio has been done, through time-series for the eight years study period.

3. Results

The Tobin's q ratio for market performance of industrial sectors of Amman stock exchange are reported in the tables that follow.

3.1. Research 1. The Amman Stock Exchange Industry market performance,

The table reflected the q ratio shown for the Pharmaceutical and Medical Industries, where it was shown that only in 2014 when the q ratio was over 1 (1.21).

Table 1.   The q ratio for the Pharmaceutical and Medical Industries

Study period	Q ratio
2008	0.55
2009	0.46
2010	0.56
2011	0.41
2012	0.61
2013	0.53
2014	1.21
2015	0.94

The data in the table may imply that the market value of this cluster of industries was overvalued during 2014, in comparison to the market valuation with the other years of operation. During the other years, the q ratio implied that the market valuation was undervalued.

Table 2.   The q ratio for the Chemical Industries

Study period	Q ratio
2008	0.93
2009	0.77
2010	0.62
2011	0.60
2012	0.55
2013	0.68
2014	0.71
2015	0.69

The q ratio for the Chemical Industries inclusive of the years of study showed that these q ratios were all lower than 1. These results would have been a very good indicator that in these industries, these would have been a very promising business opportunity for the investors.

Table 3. The q ratio for the Paper & Cardboard Industries

Study period	Q ratio
2008	0.63
2009	0.52
2010	0.57
2011	0.63
2012	0.53
2013	0.52
2014	0.73
2015	0.68

The q ratio for the Paper and Cardboard Industries inclusive of the years of study showed that these q ratios were all lower than 1. These results would have been a very good indicator that in these industries, these would likewise have been a very good chance for investors and would have been a very favorable investment opportunity but were not given notice as investment opportunity, were not invested in and utilized maximally.

Table 4.   The q ratio for the Food and Beverages Industries

Study period	Q ratio
2008	0.92
2009	0.79
2010	0.66
2011	0.71
2012	0.88
2013	0.78
2014	0.88
2015	1.31

The q ratio for the Food and beverages industries were undervalued until 2014, but as shown in the table, the q ratio was over 1 in 2015. This result indicated that it would have been an investment opportunity, but was lost, and was not anymore available in 2015.

Table 5. The q ratio for the Mining and Extraction Industries

Study period	Q ratio
2008	**1.27**
2009	**2.66**
2010	**2.20**
2011	**1.62**
2012	**1.73**
2013	**1.60**
2014	**1.18**
2015	**1.58**

As reflected in table 5, the q ratio for the Mining and Extraction Industries showed that these q ratios were all over 1 through the study period. These results were very consistent during all the eight years, as the q ratio would have been a very good indicator that these sectors have a high performance but would not have brought about very good investment opportunities for the investors. As further interpreted from the data on the table, the q ratio yielded by the mining and extraction industries showed the highest performance in comparison with other sectors,

Table 6   The q ratio for the Tobacco & Cigarettes Industries

Study period	Q ratio
2008	**0.80**
2009	**0.96**
2010	**1.00**
2011	**1.14**
2012	**1.88**
2013	**2.33**
2014	**2.01**
2015	**2.30**

The q ratio for the Tobacco & Cigarettes Industries inclusive of the years of study showed differences in the q ratios between two groups. The q ratios yielded for the first two years were less than 1, it showed an impressive gradual increase over 1 starting in 2010 then, from 2011 until 2015, it was continuously increasing, reaching a q ratio over 1 for the rest of the study period. These results implied that the market value for this sector was more than duplicated twice during the study period. This would have been a very good indicator performance for these industries, from the investors' prospective, as these results are indicators of being overvalued, which would have been not optimal after 2009 as investment opportunities.

Table 7 The q ratio for the Engineering & Construction Industries

Study period	Q ratio
2008	**0.87**
2009	**0.75**
2010	**0.76**
2011	**0.74**
2012	**1.36**
2013	**0.84**
2014	**0.72**
2015	**0.60**

The q ratio for the Engineering & Construction Industries inclusive of the years of study is shown in the table, the q ratios were all lower than 1. These results would have been a very good indicator that in these industries, the market valuation would have been a very good indicator of success for investors if they have involved and availed of these business opportunities.

Table 8. The q ratio for the Electrical Services

Study period	Q ratio
2008	0.45
2009	0.53
2010	0.42
2011	0.35
2012	0.61
2013	0.62
2014	0.59
2015	0.49

The q ratio for the Electrical Services N Industries inclusive of the years of study showed that these q ratios were all lower than 1 and much more lesser than 0.5 These results would have been a very good indicator that in these industries, and around 0.5. These results indicate that this sector has the lowest performance in the stock market.

Table 9. The q ratio for the Textiles, Leathers & Clothing

Study period	Q ratio
2008	0.72
2009	0.71
2010	0.84
2011	0.78
2012	0.72
2013	0.89
2014	1.35
2015	1.35

The q ratio for the Textiles, Leathers & Clothing inclusive of the years of study showed that there were differences in the q ratios from the first six years in comparison with the last two years. It showed somehow that these sectors have been over valued only during the last two years. These results would have been a very good indicator for investors during the first 6 years, as an investment opportunity.

3.2. Research Problem 2. The trend in Q ratio valuation during the study period
The results on the sample Tobin's q ratio value average for the industrial sector ratio companies showed the decreasing trend over the years 2008-2015 was from 1.6 to .9 below one for the last two years which fell dramatically. The result showed that the stock was overvalued on average as Tobin's q ratio over one for the years 2008 until 2012 than the Tobin's q ratio average value which were less than one for the years 2013 until 2015 the result can be seen in Figure 1.

Though the average stock value of the industrial sector is overvalued for the years 2008, 2009, 2010 2011, and 2012, the average stock value of the industrial sectors was undervalued during the years 2013, 2014,2015.

From the figure, the trend showed that the Stock is overvalued when Tobin's q greater than one Q>1 this value implied means that the market value is higher than company's stated book value. The stock is undervalued when Tobin's q less than one Q<1 the market value is lower than company's stated book value, and when Tobin's q equal 1 Q=1, this means that market value reflected unity through the recorded assets of company.
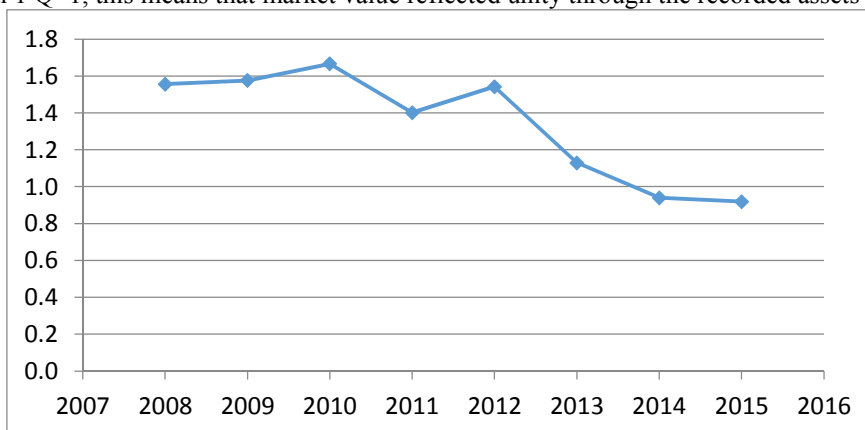

Figure 1. Graphical Chart of the q ratio trend over the study period.

In Table 10, this trend line is further illustrated as the data in the table provided an analysis of the number of

companies classified based on q ratio value.

The table showed that 69 %t of the sample companies has q ratio < 1 over the period 2008 -2015 which indicated that most of the listed companies have Q< 1 at this era of time. As further shown in the table, the average q ratios of the 2 companies per year were fairly valued at   Q=1 over the period of study.

Table 10. The q ratio Trend Analysis for the industrial sectors for the years 2008-2015

Years	Q>1	Q=1	Q<1
2008	10	2	37
2009	14	1	34
2010	13	3	33
2011	2	4	43
2012	17	3	29
2013	14	0	35
2014	16	4	29
2015	15	1	33

By analyzing the Tobin's q ratio value over the period of study, it may be interpreted from the data on Table 10, between 60%-90% of the sample companies in the pool of the sample companies, showed q ratios less than 1 inclusive of the years when the study was conducted, indicating that the majority of the companies in this market industry have good potential to be an investment opportunity.
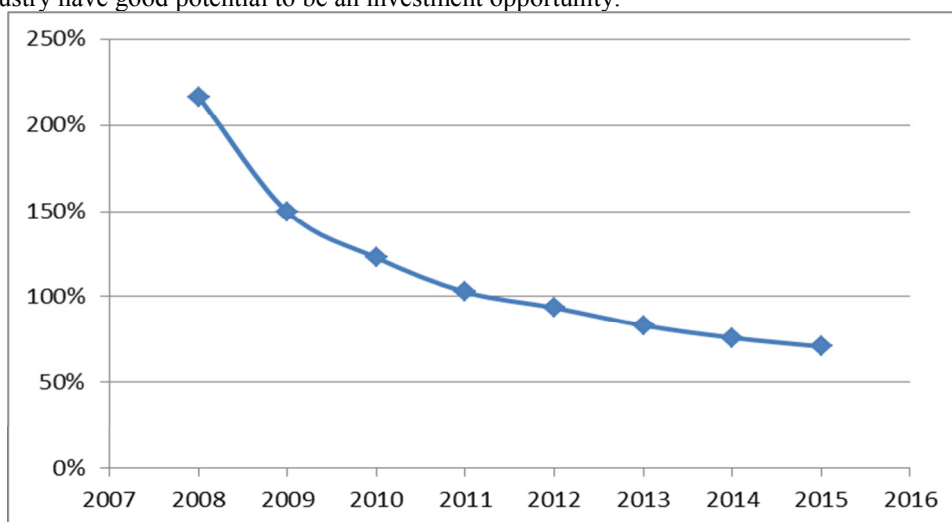

Figure 2. Graphical Chart of the q ratio of market capitalization / GDP

Figure 2 is a graphical chart of market capitalization, that reflected a relationship between market value to the economic gross domestic product (GDP). The chart further showed a gradual decrease since 2008, until 2015; it came down from 216.7% to 70.7%. These results somehow showed a dramatic falling within the study period, the decrease was almost 2/3 of the GDP.

For the investors, this market-based measure which was done through Tobin's q may help the investors to look for investments   with initial companies having a Q less than 1. Stock market valuations have never worked as a timing tool, because these valuations do not tell investors when to get into the market or get out of the market. Markets are driven by sentiment, trends and momentum more than fundamentals over the short-to-intermediate terms. In short term decisions, are speculations but valuations can help investors provide a better frame for their expectations for future market returns; this is an important factor indexing the market value as an investment indicator.

4. Conclusions and Recommendations

From the results of this research undertaking, it can be perceived that most investors did not recognize the market value measure signals. Tobin's q does not assume any pricing models in its computation, it gives market indicator for company performance and market valuation.

Thus, the investors would have taken the opportunity to invest in companies with the q ratio which were above the average, since the expected returns from investing will likely be poor but if the Tobin's q has lowered below the average expected return, these would have been an excellent opportunity to invest.

It is therefore recommended by the researchers that investors must have practical knowledge and experience about the stock market. Investors must likewise consult with financial firms who have the appropriate knowledge,

skills and expertise to review such very vital information about undervalued business within the clusters addressed in this research work; that the value a ratio of less than one, would have been attractive to corporate investors or potential purchasers of stocks; if their purpose is to purchase the firm instead of creating a similar business. Moreover, the undervalued companies with q values of less than 0ne, would likely result in increased interest in the business, as this would increase the potential of creating market value, and, presumably would in turn increase its Tobin's Q ratio.

Furthermore, since the results also showed the general ideas of other researchers, as shown from the conceptual framework taken from concepts of various authors, as reflected in this research endeavor; overvalued companies, those with a ratio higher than one, must be considered by interested investors as indicators, they must see increased competition, as a ratio higher than one indicates that a firm's market value rate higher than its replacement cost. This would cause individuals or other companies to form similar types of businesses to capture some of the market created value of business. In this aspect, this may lower the existing firm's market shares, and reduce its market value.

Most importantly, investors should invest in stocks of companies which have sound market value and should consider the macro indicators for the stock market, and other such policies on market stability and economic situations which may affect market capitalization.

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