Singapore Management University
Institutional Knowledge at Singapore Management University

Research Collection School Of Accountancy

School of Accountancy

4-2016

Financial Health and Corporate Performance of Listed Manufacturing Companies in South Korea and Taiwan: A Comparative Study of the Two Asian Tigers

See Liang FOO

Shaakalya PATHAK

Follow this and additional works at: https://ink.library.smu.edu.sg/soa_research

Part of the Accounting Commons, Asian Studies Commons, and the Corporate Finance Commons

Citation

Financial Health & Corporate Performance of Listed Manufacturing Companies in South Korea & Taiwan: A Comparative Study of the Two Asian Tigers

Foo See Liang[1*] and Shaakalya Pathak[2]

[1] Practice Associate Professor of Accounting
School of Accountancy, Singapore Management University, Singapore 178900

[2] Research Assistant (Graduate Alumnus)
School of Accountancy, Singapore Management University, Singapore 178900

[*]*Corresponding author's email: slfoo [AT] smu.edu.sg*

ABSTRACT— *South Korea and Taiwan are two leading economies in Asia Pacific. This study examines the relationship between the financial health, as measured by the Altman Z-Score, and corporate performance, as measured by the Return on Equity (ROE), of listed manufacturing companies in these two markets. A linear regression was conducted between these variables to determine the magnitude and direction of their relationships. The trends of Z-Scores over a fourteen-year period are also analyzed. The analysis covers the period from 2000 to 2013(inclusive) and yielded a statistically positive correlation between ROE and the Z-Score for both markets. South Korea and Taiwan both registered moderate-to-strong mean and median Z-Scores. However, Taiwan is comparatively healthier. These findings further support the economic stature of these two markets as Asian tigers.*

Keywords— Financial Health, Corporate Performance, Manufacturing, Altman Z-Score, Return on Equity

1. INTRODUCTION

The Asia Pacific region has experienced dramatic economic growth in recent years (Cohen, 2006). While growth is essential, the sustainability of organizations is also dependent on its financial health. The two notable important economies that are riding on these economic growth trends in the Asia Pacific region are South Korea and Taiwan [1]. These two economies are important business hubs in the Asia Pacific economic ecosystem. The two economies are competing for international investment and business opportunities.

The purpose of this paper is to examine the relationship between corporate financial health, as measured by the Altman Z-Score (Altman, 1968), and corporate performance as measured by the Return on Equity (ROE), of listed manufacturing companies on The Korea Exchange Limited (KRX) in South Korea and The Taiwan Stock Exchange Corporation (TWSE) in Taiwan. More specifically, we seek to determine whether financial health is a determinant of corporate performance.

2. BRIEF LITERATURE REVIEW

Corporate financial health has been widely studied in countries in the Asia Pacific. These studies include Hong Kong and Singapore (Foo, 2015), China (Wang and Campbell, 2010A and 2010B), India (Pradhan, 2014), Sri Lanka (Gunathilaka, 2014), and Malaysia (Thai, Goh, Teh, Wong and Ong, 2014). The Altman Z-Score (Altman, 1968) was the preferred measure of financial health in all these studies.

Unlike the prior model by Beaver (Beaver, 1966) which examined financial ratios separately, Edward I. Altman, created the Altman Z-Score (Altman, 1968) which combined a variety of financial ratios into a single score reflecting the likelihood of a firm going into bankruptcy using multiple discriminant analysis (MDA).

---

[1] The Asian Tigers is the term used to describe the four Asian economies with exceptionally high growth rates. These countries are South Korea, Taiwan, Hong Kong and Singapore.

The model showed high predictive power on companies facing financial distress, as measured by the Z-Score. The literature on statistical models for bankruptcy prediction is wide-ranging and continues to expand. For example, E. I. Altman, in his lecture (Altman, 2007) quotes 12 new variants of his models. Other studies on financial health that followed the Z-Score Model include Blum (1974), Deakin (1977), Beynon and Peel (2001), Neophytou et al. (2001) and Chung et al. (2008). Some researchers also used logit regression techniques (Ohlson, 1980), recursive partitioning analysis (Frydman et al., 1985) and artificial neural network models (Trippi and Turban, 1996). Nevertheless, Perez (2006) highlighted that MDA is still one of the most popular approaches used for bankruptcy prediction (Agarwal and Taffler, 2007).

Furthermore, Aziz and Dar (2006) appraised 89 studies on prediction of bankruptcy between 1968 and 2003 and found that the multi-variable models, such as the Z-Score model, were the most widely accepted. Additionally, a significant body of research (e.g. Altman and McGough, 1974; Altman, 1982; Levitan and Knoblett, 1985; Koh and Killough, 1990) supports the reliability of the Z-Score for the prediction of financial distress. Recently, Sherbo and Smith's (2013) concluded that the Z-Score model has stood the test of time and is still highly applicable in today's business environment. In view of the above merits, this study adopts the Altman Z-Score as our measure of financial health. The formula for the model is discussed in the Methodology and Data section of this paper.

There have been numerous measures of corporate performance and profitability. However, the Return on Equity (ROE) has proven to be a consistently robust and popular measure of corporate performance (Chen (1997), Chen (2005), Damodaran (2007), Hagel et al. (2010), and Zhao (2013)). ROE is defined as the income earned on equity capital and is calculated by dividing net income by the book value of shareholder's equity (Damodaran, 2007). It is a widely used accounting measure of companies' financial performance in making investment decisions (Stowe, Robinson, Pinto & McLeavey, 2002). In view of this body of literature, we adopt ROE as our measure of corporate performance in this study.

A key comparative study completed among Asia Pacific countries was by Meric, Lentz, Li and Meric (2014). This study examined the financial characteristics (liquidity, turnover ratios, financial leverage, profitability and growth) of manufacturing firms using multivariate analysis. Although it provided useful insights into these markets, this study did not explore the relationship between corporate performance with their financial health.

3. MOTIVATION & CONTRIBUTION

Corporate performance is important but sound financial health is also needed to ensure sustainability. The motivation of this study is to determine whether well performing companies are financially healthy in these two markets. This study extends the work by Meric, Lents, Li and Meric (2014) on the Asia Pacific markets by providing further understanding into the financial health, as measured by the Z-Score, and corporate performance, as measured by ROE.

An important contribution is to provide empirical insights about these two markets in relation to their firms' Z-Score and ROE over a period of fourteen years, i.e. 2000 to 2013 (inclusive). This study also provides a comparison and examination of the similarities and differences between these two leading economies. We believe this comparative study would contribute to further understanding of these two markets by key stakeholders, such as investors.

Unlike studies by Sherbo and Smith's (2013), Zhao (2013), Pradhan, (2014), and Thai, Goh, Teh, Wong and Ong (2014) which applied the Z-Score on individual market or jurisdiction, this study explores the comparative relationship between financial performance and corporate health between two leading markets in the Asia Pacific region, namely South Korea and Taiwan.

By observing over fourteen year from 2000 to 2013, the subprime crisis period around 2008 is also captured in our analysis and allows us to examine its effect on South Korea and Taiwan. With Asia's growing economic importance, the study hopes to serve as catalyst for similar research on other Asian economies.

Additionally, a further motivation has been to extend the authors' previous study on the Singapore and Hong Kong markets, and also to combine the four tigers' insights as a value-add (Foo, 2015).

4. RESEARCH QUESTION & HYPOTHESIS

The research question for study is: do higher performing listed manufacturing companies (as measured by the ROE – dependent variable) in South Korea and Taiwan also exhibit higher financial health (as measured by the Altman Z-Score the independent variable)? The Null Hypothesis is that there is no significant statistical relationship between firm performance and financial health. Whereas, the Alternative Hypothesis is that there is a significant statistical relationship between firm performance and financial health.

5.   METHODOLOGY & DATA

This study adopts the widely used Altman (1968) Z-Score model (Wang and Campbell, 2010A and 2010B; Pradhan, 2014; Gunathilaka, 2014; Thai, Goh, Teh, Wong and Ong, 2014) to determine financial health. The Z-Score formula is provided in Figure 1.

<div style="border:1px solid black; padding:1em;">

Equation for Altman's Z-Score Model (1968):

$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1X_5$

X_1 = Working Capital / Total Assets

X_2 = Retained Earnings / Total Assets

X_3 = Earnings Before Interest & Tax (EBIT) / Total Assets

X_4 = Market Capitalisation / Total Liabilities

X_5 = Sales / Total Assets

</div>

Figure 1: Equation for Altman's Z-Score Model (1968)

A linear regression was assessed using the relevant data with this formula:

$Y = \beta_1 Z_1 + C$

Where Y is the dependent variable, which is the Return on Equity (ROE); β_1 is the regression coefficient, which provides an indication of the direction and magnitude of the relationship; Z_1 is the independent variable which is the Altman Z-Score and C is the constant variable.

The scope of the regression covers the period from 2000 to 2013. The financial statement data used was extracted from the Thomson Reuters DataStream database. Records of all firms listed on the two exchanges that had available error-free information were utilized in the regression analysis. Furthermore, the top and bottom 1% of the outliers were removed for the regression analysis.

6.   DESCRIPTIVE ANALYSIS

Table 1: Mean and Median Z-Scores – South Korea (KRX) and Taiwan (TWSE)

Korea (KRX)				Taiwan (TWSE)			
Year	**Median**	**Mean**	**Std. Dev.**	**Year**	**Median**	**Mean**	**Std. Dev.**
2000	1.63	1.67	1.23	**2000**	2.01	2.65	2.30
2001	1.62	1.98	1.50	**2001**	1.96	2.82	3.10
2002	1.92	2.11	1.39	**2002**	2.24	2.84	2.49
2003	2.09	2.19	1.31	**2003**	2.29	2.95	2.45
2004	2.10	2.31	1.28	**2004**	2.41	2.87	2.19
2005	2.46	2.75	1.45	**2005**	2.41	3.08	2.65
2006	2.38	2.70	1.54	**2006**	2.96	3.79	3.44
2007	2.56	2.92	1.66	**2007**	3.01	4.09	3.76
2008	2.08	2.32	1.55	**2008**	2.26	2.72	2.12
2009	2.29	2.56	1.55	**2009**	3.00	3.95	3.54
2010	2.38	2.77	1.59	**2010**	3.37	4.00	3.05
2011	2.36	2.60	1.55	**2011**	2.63	3.07	2.25
2012	2.43	2.70	1.66	**2012**	2.76	3.29	2.54
2013	2.52	2.76	1.83	**2013**	2.98	3.76	3.17
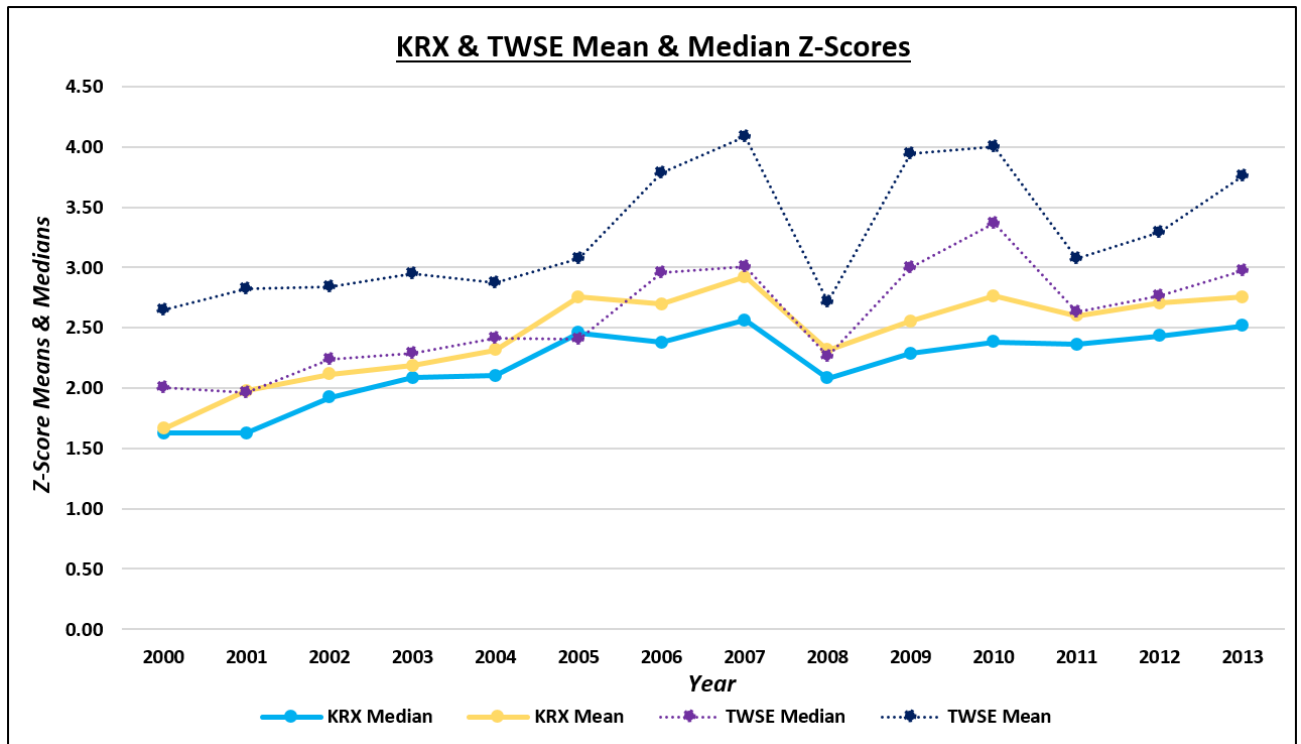
Figure 2: Mean and Median Z-Score Trends for South Korea (KRX) and Taiwan (TWSE)

Table 1 presents the mean and median Z-Scores for KRX and TWSE and Figure 2 presents the trends for the fourteen-year period from 2000 to 2013. As per Altman (1968), a Z-Score that is greater than 2.99 indicates strong financial health. Whereas, a Z-Score that is lower than 1.81 indicates poor financial health.

For both markets, the overall Z-Scores for their means and medians are in the moderate-to-healthy range. This indicates that they are financially healthy markets, which is also aligned with their economic standings in the Asia Pacific region. Taiwan's mean and median Z-Scores tend to be higher than South Korea's. This might be attributable to the fact that the Taiwan's market is relatively more concentrated with lesser firms that are large as opposed to the more fragmented Korean market which has more than double its listings.

The median Z-Scores are considerably lower in magnitude than their mean Z-Scores for all markets. This could be similarly explained by the large variations in the size and number of firms. For both countries, the median as well as mean Z-Scores fell in tandem to their lowest point since around 2004 during the subprime crisis in 2008. They rebounded in 2009, rising to a new peak in 2010 and again fell in the period from 2010 to 2011. Subsequently, the increases from 2012 to 2013 were less profound than the increases immediately after the subprime crisis, i.e. 2008 to 2010.

 South Korea's mean Z-Scores ranged from 1.67 to 2.92 and the median scores ranged from 1.62 to 2.56. This presents a medium financial health outlook. In thirteen out of fourteen years, the mean Z-Scores exceeded the 1.81 lower benchmark but never exceeded the higher 2.99 benchmark.

Additionally, Taiwan's mean Z-Scores have remained within the range of 2.65 to 4.09 and the median scores ranged from 1.96 to 3.37. This presents a significantly stronger financial health outlook. In all of the fourteen years, the mean Z-Scores exceeded the 1.81 lower benchmark and they exceeded the higher 2.99 benchmark in eight years.

Although the corporate health for both markets has recovered from subprime crisis, they have fallen short of their previous maximum peak which was recorded in 2007. Perhaps, this reflects a longer recovery period arising from the severe subprime crisis. In summary, Taiwan seems to have fared better than South Korea in relation to the median and mean Z-Scores for the period.

7. RESULTS & INTERPRETATION

7.1 South Korea

Table 2: Statistical Regression Outputs - South Korea (KRX)

roew	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
zscorew	5.411391	.180331	30.01	0.000	5.057846	5.764936
_cons	-10.42446	.5548177	-18.79	0.000	-11.5122	-9.336721

A total of 4,168 observations were used for the regression of firms in South Korea (see Table 2). Based on these observations, South Korea has a regression coefficient of 5.411. The standard error is close to zero, at 0.180, whilst the t-statistic is significant and positive at 30.01 and the p-value is equal to zero, supporting the reliability of the regression output. This result confirms the Alternative Hypothesis by posting a positive (direction) and significant (magnitude) relationship between ROE, the dependent variable (representing corporate performance), and Z-Score, the independent variable (representing financial health).

7.2 Taiwan

Table 3: Statistical Regression Outputs - Taiwan (TWSE)

roew	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
zscorew	2.086401	.0522535	39.93	0.000	1.983967	2.188836
_cons	-.6736934	.2718033	-2.48	0.013	-1.206518	-.1408685

For the Taiwan market, a total of 6,444 observations were used for the regression analysis (see Table 3). A regression coefficient of 2.086 has been obtained. The standard error deviation is also close to zero, at 0.052, whilst the t-statistic is significant and positive at 39.93 and the p-value is equal to zero, supporting the reliability of the regression output. This result also confirms the Alternative Hypothesis by posting a positive (direction) and significant (magnitude) relationship between ROE, the dependent variable (representing corporate performance), and Z-Score, the independent variable (representing financial health).

On the whole, this results show that there is indeed a statistically significant positive relationship between firm performance and financial health in both stock exchanges. South Korea's regression coefficient is far greater, and more than double that of Taiwan's. These strong positive and significant relationships between corporate performance and financial health may be construed as a positive signal for business stakeholders such as investors in these markets.

This variation in coefficients could be attributable to a variety of differences in business environment (macro) and business practices (micro) between the two economies. Firstly, the inherent nature of most key businesses in South Korea is that of large family-owned conglomerates known as the chaebol as opposed to the smaller Taiwanese SME firms[2]. Furthermore, both economies are export-oriented, however Korea's exports are mainly machinery, vehicles and transport equipment[3] while Taiwan's exports are predominantly agricultural commodities and electronic goods, which are less asset-heavy[4]. Additionally, the market capitalization of Korea's KRX is USD 1,251bn with about 1,815 firms listed on the exchange, whereas Taiwan's TWSE has a lower market capitalization of USD 861bn and has about 758 firms listed, which is less than half of Korea's[5]. As a result, it might be reasonable to expect Korean businesses to be better able to derive corporate performance from their financial health and vice versa.

8. LIMITATIONS

A limitation of this study is that it focuses on listed manufacturing corporations in South Korea and Taiwan, and not on other industries. This is because we would like to align our approach with the original Altman (1968) Z-Score Model. The focus of this paper is to explore the relationships of financial health and corporate performance in the specific contexts of South Korea and Taiwan.

---

[2] Karl, J. "Fields, Enterprise and the State in Korea and Taiwan." (1995)
[3] South Korea Exports, Trading Economics
[4] Taiwan Exports, Trading Economics
[5] Monthly reports, World Federation of Exchanges

9. FUTURE RESEARCH

For future research, the proposed methodology can be applied to analyze the relationship between financial health and corporate performance in other markets across Asia and beyond. Other industries can be included to enhance the breadth and depth of the study. Furthermore, other variables can also be examined, and their relationships can be analyzed.

10. CONCLUSION

We set out to explore and analyze the relationship between financial health, as measured by the Altman (1968) Z-Score, and firm performance, as measured by Return on Equity (ROE) ratios, of manufacturing companies listed on KRX and TWSE. We found that there was a statistically significant and positive relationship between Return on Equity (ROE) and Altman Z-Scores in both markets. These relationships may be construed as a positive assurance for stakeholders such as investors in these markets. Comparatively, KRX had a much higher regression coefficient than TWSE. This could be inferred as an indicator of the varying and distinct natures of the companies listed on these stock exchanges. Furthermore, in our descriptive analysis, we observed moderate-to-strong mean and median Z-Scores in both markets and they exhibited similar Z-Scores trends over the period.

11. REFERENCES

[1] Agarwal, V., & Taffler, R. J. "Twenty-five years of the Taffler Z-Score model: Does it really have predictive ability?", Accounting and Business Research, vol. 37, no. 4, pp285-300, 2007.

[2] Altman, E. I., "Financial Ratios, Discriminant Analysis and The Prediction of Corporate Bankruptcy", The Journal of Finance, vol. 23, no. 4, pp589-609, 1968.

[3] Altman, E. I., "Accounting implications of failure prediction models", The Journal of Accountancy, vol. 6, no. 1, pp4-19, 1982.

[4] Altman, E. I., "Revisiting credit scoring models in a Basel 2 environment", Lecture at National Taiwan University. 2007. Available: www.fin.ntu.edu.tw/~hwangdar/94emba19.ppt,

[5] Altman, E. I., & McGough, "T. P. Evaluation of a company as a going-concern", The Journal of Accountancy, vol. 143, pp50-57, 1974.

[6] Aziz, M. A., & Dar, H. A. "Predicting corporate bankruptcy: where we stand?", Corporate Governance, vol. 6, no. 1, pp18-33, 2006.

[7] Beaver, W. H., "Financial ratios as predictors of failure", Journal of Accounting Research, vol. 4, pp71 - 111, 1966.

[8] Beynon, M. J., & Peel, M. J., "Variable precision rough set theory and data discretisation: An application to corporate failure prediction", Omega, vol. 29, pp561-576, 2001.

[9] Blum, M. P., "Failing company discriminant analysis", Journal of Accounting Research, vol. 12, no. 1, pp1-25, 1974.

[10] Calandro Jr, J., "Considering the utility of Altman's Z-Score as a strategic assessment and performance management tool", Strategy & Leadership, vol. 35, no. 5, pp37-43, 2007.

[11] Chen, M. C., Cheng, S. J., & Hwang, Y. "An empirical investigation of the relationship between intellectual capital and firms' market value and financial performance", Journal of Intellectual Capital, vol. 6, no. 2, pp159-176, 2005.

[12] Chen, S., & Dodd, J. L., "Economic Value Added (EVA): An Empirical Examination of a New Corporate Performance Measure", Journal of Managerial Issues, vol. 9, no. 3, pp318-333, 1997.

[13] Chung, K. C., Tan, S. S., & Holdsworth, D. K., "Insolvency prediction model using multivariate discriminant analysis and artificial neural network for the finance industry in New Zealand", International Journal of Business and Management, vol. 3, no. 1, pp19-29, 2008.

[14] Cohen, B., "Urbanization in developing countries: Current trends, future projections, and key challenges for sustainability", Technology in Society, vol. 28, pp69, 2006.

[15] Damodaran, A., "Return on Capital (ROC), Return on Invested Capital (ROIC) and Return on Equity (ROE): Measurement and Implications", Stern School of Business. Available: http://people.stern.nyu.edu/adamodar/pdfiles/papers/returnmeasures.pdf, pp11, 2007.

[16] Deakin, E. B., "Business failure prediction: An empirical analysis", In E. Altman, & A. Sametz (Eds.), "Financial crises: Institutions and markets in a fragile environment", New York: John Wiley, pp28, 1977.

[17] Frydman, H. E., Altman, E. I., & Kao, D. G., "Introducing Recursive Partitioning for Financial Classification: The Case of Financial Distress", Journal of Finance, vol. 40, no. 1, pp269-291, 1985.

[18] Gunathilaka, C., "Financial Distress Prediction: A Comparative Study of Solvency Test and Z-Score Models with Reference to Sri Lanka", The IUP Journal of Financial Risk Management, vol. 11, no. 3, pp39-51, 2014.

[19] Hagel, J., & D, J., "The Best Way to Measure Company Performance – HBR", Available: https://hbr.org/2010/03/the-best-way-to-measure-compan.html, 2010.

[20] Koh, H. C., & Killough, L. N., "The use of multiple discriminant analysis in the assessment of the going concern status of an audit client", Journal of Business Finance & Accounting, vol. 17, no. 2, pp179-192, 1990.

[21] Levitan, A. S., & Knoblett, J. A., "Indicators of exceptions to the going concern assumption", Auditing: A Journal of Practice and Theory (Fall), pp26-39, 1985.

[22] Meric, I., Lentz, C., Li, S., & Meric, G., "A Comparison of the Financial Characteristics of Hong Kong and Singapore Manufacturing Firms", Global Journal of Business Research, vol. 8, no. 3, pp31-37, 2014.

[23] Neophytou, E., Charitou, A., & Charalambous, C., "Predicting corporate failure: Empirical evidence for the UK", Discussion Paper No. 01-173, March, School of Management, University of Southampton, Southampton, 2001.

[24] Ohlson, J., "Financial Ratios and the Probabilistic Prediction of Bankruptcy", Journal of Accounting Research, vol. 18, no. 1, pp109-131, 1980.

[25] Perez, M., "Artificial neural networks and bankruptcy forecasting: a state of the art", Neural Computer & Application, vol. 15, pp154-163, 2006.

[26] Pradhan, R., "Z Score Estimation for Indian Banking Sector", International Journal of Trade, Economics and Finance, vol. 5, no. 6, pp516-520, 2014.

[27] Sherbo, A., & Smith, A., "The Altman Z-Score Bankruptcy Model at Age 45: Standing the Test of Time?", ABI Journal, vol. 32, no. 11, pp40-42, 2013.

[28] Stowe, J. D., Robinson, T. R., Pinto, J. E., & McLeavey, D. W., "Analysis of Equity Investments: Valuation", Baltimore, MD: Association for Investment Management and Research (AIMR), 2002.

[29] Thai, S., Goh, H., Teh, B., Wong, J., & Ong, T., "A Revisited of Altman Z- Score Model for Companies Listed in Bursa Malaysia", International Journal of Business and Social Science, vol. 5, no. 12, pp197-207, 2014.

[30] Trippi, R. R., & Turban, E., "Neural networks in finance and investing: using artificial intelligence to improve real-world performance", (pp. 367-394). London: IRWIN Professional Publishing, pp367-394, 1996.

[31] Wang, Y., & Campbell, M., "Business Failure Prediction for Publicly Listed Companies in China", Journal of Business and Management, vol. 16, no. 1, 75-88, 2010.

[32] Wang, Y., & Campbell, M., "Do Bankruptcy Models Really Have Predictive Ability? Evidence Using China Publicly Listed Companies", International Management Review, vol. 6, no. 2, 77, 2010.

[33] Zhao, Y., "The Relationship between Share Price Gains, Corporate Performance and Risk", OALib Journal. Available: http://www.oalib.com/paper/2993772 pp110-112, 2013.

[34] Foo, S.L., "Financial Health & Corporate Performance of Listed Manufacturing Companies in Hong Kong & Singapore: A Comparative Study of the Two Asian Tigers", Asian Journal of Business and Management, vol. 3, no. 2, 77, 2015.

[35] Karl, J., "Fields, Enterprise and the State in Korea and Taiwan", abstract available: http://soundideas.pugetsound.edu/faculty_pubs/756/, Cornell University Press, 1995.

[36] South Korea and Taiwan Exports, Trading Economics. Available: http://www.tradingeconomics.com/taiwan/exports, Accessed on 2016.