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Financial Health & Corporate Performance of Listed Manufacturing Companies in Hong Kong & Singapore: A Comparative Study of the Two Asian Tigers

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ABSTRACT— *Hong Kong and Singapore 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. Singapore and Hong Kong both registered moderate-to-high mean and median Z-Scores. However, Hong Kong 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. Two notable important economies that are riding on these economic growth trends are Singapore and Hong Kong¹. These two economies are important financial hubs in the Asia Pacific economic ecosystem. They 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 Stock Exchange of Singapore Limited (SGX) and The Stock Exchange of Hong Kong Limited (SEHK). 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 on countries in the Asia Pacific. These studies include 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 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 that reflected the likelihood of a firm going into bankruptcy using multiple discriminant analysis (MDA).

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

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

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) study 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 produced 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 done between Singapore and Hong Kong 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. They found that the profitability ratios, fixed asset turnover ratios and annual sales growth rates of Hong Kong's firms were significantly higher than those of Singapore's firms. 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 Hong Kong and Singapore 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 the 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 Hong Kong and Singapore.

The subprime crisis period is also captured in our analysis and allows us to examine its effect on Hong Kong and Singapore. With Asia's growing economic importance, the study hopes to serve as catalyst for similar research on other Asian economies.

4. RESEARCH QUESTION & HYPOTHESIS

The research question for study is: do higher performing listed manufacturing companies (as measured by the ROE – dependent variable) in Singapore and Hong Kong 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.

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

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

$X_1 = \text{Working Capital} / \text{Total Assets}$
 $X_2 = \text{Retained Earnings} / \text{Total Assets}$
 $X_3 = \text{Earnings Before Interest \& Tax (EBIT)} / \text{Total Assets}$
 $X_4 = \text{Market Capitalisation} / \text{Total Liabilities}$
 $X_5 = \text{Sales} / \text{Total Assets}$

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

A linear regression was run 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.

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 - Singapore (SGX) and Hong Kong (SEHK)

Singapore (SGX)				Hong Kong (SEHK)			
Year / Statistic	Median	Mean	Std. Dev.	Year / Statistic	Median	Mean	Std. Dev.
2000	2.35	2.94	1.90	2000	2.83	3.44	3.45
2001	2.35	2.84	1.90	2001	2.47	3.26	3.78
2002	2.47	2.69	1.47	2002	2.50	3.11	3.05
2003	2.68	3.00	1.72	2003	2.66	3.47	3.85
2004	2.85	3.14	1.62	2004	2.73	3.34	3.20
2005	2.42	2.86	1.60	2005	2.74	3.03	2.89
2006	2.85	3.25	1.73	2006	2.89	3.36	3.08
2007	3.09	3.70	2.30	2007	3.10	4.43	4.27
2008	2.55	2.68	1.40	2008	2.26	2.66	2.45
2009	2.55	3.00	1.88	2009	2.65	3.38	3.74
2010	2.87	3.18	1.81	2010	2.87	3.96	4.25
2011	2.48	2.72	1.48	2011	2.55	2.90	2.73
2012	2.28	2.70	2.01	2012	2.55	2.83	2.71
2013	2.36	2.66	1.87	2013	2.65	3.43	3.30

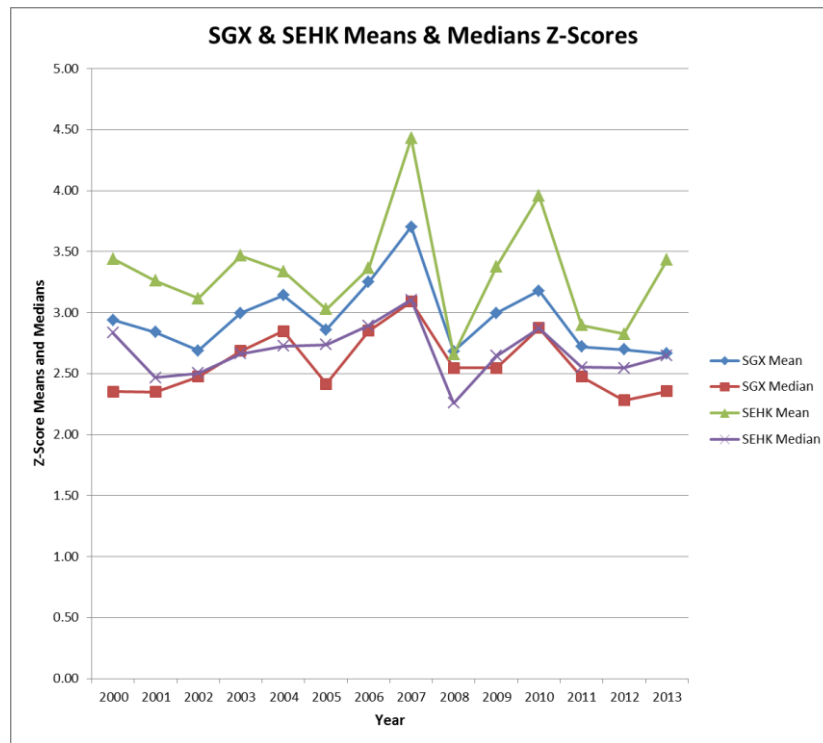


Figure 2: Mean and Median Z-Score Trends for Singapore (SGX) & Hong Kong (SEHK)

Table 1 presents the mean and median Z-Scores for SGX and SEHK 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. Hong Kong’s mean and median Z-Scores tend to be higher than Singapore’s. This might be attributable to the fact that the number and size of firms (e.g. market capitalization and total assets) in Hong Kong are relatively larger than the companies in Singapore.

For both markets, the median Z-Scores are considerably lower in magnitude than their mean Z-Scores. 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 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.

Singapore’s mean Z-Scores ranged between 2.66 to 3.70 and the median scores ranged between 2.28 to 3.09. This presents a medium-to-strong financial health outlook. However, in six out of fourteen years the mean Z-Scores exceeded the 2.99 benchmark.

Additionally, Hong Kong’s mean Z-Scores have remained within the range of 2.66 to 4 and the median scores ranged between 2.26 to 3.10. This presents a stronger financial health outlook. In eleven out of the fourteen years, the mean Z-Scores exceeded the 2.99 benchmark.

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

7. RESULTS & INTERPRETATION

Singapore

Table 2: Statistical Regression Outputs - Singapore (SGX)

roew	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
zscorew	3.864283	.2037045	18.97	0.000	3.464795	4.263771
_cons	-5.576235	.7928166	-7.03	0.000	-7.131038	-4.021431

A total of 2,067 observations were used for the regression of firms in Singapore (see Table 2). Based on these observations, Singapore has a regression coefficient of 3.864. The standard error was close to zero, at 0.203, whilst the t-statistic was significant and positive at 18.97 and the p-value was equal to zero, supporting the reliability of the regression output. This result confirms the Alternative Hypothesis by showing a positive (direction) and significant (magnitude) relationship between ROE, the dependent variable (representing corporate performance), and Z-Score, the independent variable (representing financial health).

Hong Kong

Table 3: Statistical Regression Outputs - Singapore (SGX)

roew	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
zscorew	1.923867	.113184	17.00	0.000	1.701977	2.145756
_cons	-7.272446	.7523058	-9.67	0.000	-8.747291	-5.797601

For the Hong Kong market, a total of 5,060 observations were used for the regression analysis (see Table 3). A regression coefficient of 1.924 was obtained. The standard error deviation was also close to zero, at 0.113, whilst the t-statistic was significant and positive at 17.00 and the p-value was equal to zero, supporting the reliability of the regression output. This result also confirms the Alternative Hypothesis by showing 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. Singapore's regression coefficient is far greater, and close to double that of Hong Kong's. This could be attributable to the relatively larger number and size of firms in Hong Kong as opposed to Singapore. 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.

8. LIMITATIONS

A limitation of this study is that it focuses on listed manufacturing corporations in Hong Kong and Singapore 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 Singapore and Hong Kong.

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 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 SEHK and SGX. 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, SGX had a much higher regression coefficient than SEHK. 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 moderately strong mean and median Z-Scores in both markets and they exhibited similar Z-Scores trends over the period.

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