An Empirical Analysis of Financial Ratio Trends of Several Companies Listed in the Philippine Stock Exchange

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Abstract

This paper presents an analysis of the trends of financial ratios of one hundred fifty (150) companies that are currently listed in the Philippine Stock Exchange with the aim of helping equity investors in their investment strategies. Examining the annual company financial reports, a set of criteria was set in order to determine whether certain companies can be deemed equitable by investors. Stocks that passes the set criteria are added into a portfolio following an equally weighted strategy. The portfolio performance is then compared with the market index (Philippine Stock Exchange) which shows that the resulting portfolio can outperform the market. In addition, individually considering each ratio as the criteria of selecting stocks into the investment pool results to portfolios with negative returns. This implies that the portfolio selection with the proposed criteria is superior to the portfolio selection considering each ratio as the selection criteria. Overall, although white noise may occur in the stock market, this research provides investors with an unbiased forecast reference to help them evaluate their stock picks and build their investment portfolios.

Keywords
Financial ratios, forecasting, investment portfolios, stock picks, equitability

1. Introduction
As the famous saying goes, "the stock market is risky—even when it is going in the right direction." According to Lewis (2019), there are three reasons why the stock market is indeed risky: volatility, timing, and overconfidence. Volatility, which is the fluctuation in stock price that is beyond investor control, may include geopolitical events, monetary and fiscal policies, and inflation. Timing in the market, meanwhile, refers to the prediction of stock prices so that one can buy low and sell high. This entails the need to escape frustration that comes from trying to earn from stock capital appreciation but losing money after selling at a price lower than expected. Overconfidence all together leads to carelessness in picking stocks and not being able to dodge unnecessary risks. In order to avoid all these, it is important for an investor to analyze leading and lagging indicators prior to engaging in equity investment. This paper, therefore, aims to provide the possible course of movement of the following indicators to help investors anticipate future changes in stock price.

1.1. Current Ratio
The current ratio determines the competence of a business to meet short-term obligations or those that are due within a year. It can be computed by dividing the total current assets over the total current liabilities. Having a current ratio of the number two (2), for instance, means that a company has the ability to settle any debt or accounts payable twice. Hence, it can be said that this ratio may indicate how well a company can maximize the liquidity of its current assets in settling debts. According to the Corporate Finance Institute (2019), "a rate of more than 1 suggests financial well-being for the company". A current ratio that is too high, however, may not necessarily mean that a company is in a better position. It could also mean the following: stocks are moving slow, collection of receivables is poor, or the company is having cash surplus due to the lack of investment opportunities (Vaidya, 2019).

1.2. Quick Ratio

Quick ratio, also known as the acid test ratio, is very much like the current ratio, as it measures the ability of a company to meet short-term obligations. The only difference is that, in quick ratio, the company employs only its most liquid assets (Kenton, 2019). Having the most liquid assets allows a company to convert assets quickly into cash, enabling them to pay creditors immediately.

1.3. Solvency Ratio
The solvency ratio is often used by prospective business lenders, as it is a more comprehensive measure of solvency. It indicates whether the cash flow of a company is sufficient to meet both short- and long-term liabilities (Kenton, 2019).

1.4. Debt Ratio
Debt ratio, in its formal definition, is the ratio of total debt to total assets, expressed in decimal or percentage. It is the proportion of company assets that are currently financed by debt. According to Kenton & Hayes (2019), having a ratio greater than 1 means that a considerable portion of debt is funded assets, which also means that the company has more liabilities than assets. High ratios would indicate that a company could be at risk of loan defaults if the Central Bank suddenly increases interest rates (Kenton & Hayes, 2019).

1.5. Debt-to-Equity Ratio
The debt-to-equity ratio can be computed by dividing the company's total liabilities by equity. Joe Knight explains in an interview that this ratio measures how much debt a company uses to run its business (Gallo, 2015). Having a high debt-to-equity ratio could signal that the company is in a bad position and may not be able to pay off creditors (Gallo, 2015).

1.6. Interest Coverage
The interest coverage ratio can be calculated "by dividing a company's earnings before interest and taxes during a given period by the company's interest payments due within the same period" (Hayes, 2019). It is both a debt ratio and profitability ratio that determine how easily a company can pay off interest on all outstanding debts.

1.7. Asset-to-Equity Ratio
The asset-to-equity ratio shows the proportion of stockholder funds invested in current assets. This ratio communicates the overall financial strength of a company, as it tests the robustness of capital structure. Having a high asset-to-equity ratio means that a company has good position in solvency even in the long run. This is because the company will have more cash and will pay less interest, enabling them to give more dividends and drive company growth (Ready Ratios, 2013).

1.8. Gross Profit Margin
The gross profit margin reveals the amount of money left from sales after deducting the cost of goods sold. This can be computed by first calculating the gross profit, which is the difference between net sales and cost of goods sold. The gross profit margin is just the gross profit divided by the total net sales. According to Kenton (2019), the gross profit margin can inform prospective investors on how competitive a company is, in terms of the marketability of its product or service. It can also reveal the efficiency of the company when it is able to minimize costs to generate higher gross profit.

1.9. Return on Assets
Return on assets (ROA) can be computed by simply dividing net income over total assets. This indicator can reveal how well a company manages its assets in order to generate earnings. A higher ROA entails more asset efficiency and thus higher profitability (Hargrave, 2019). Note, however, that using ROA as an indicator is best applied in evaluating companies with the same level of capitalization, as the amount of capitalization highly affects ROA values.

1.10. Net Profit Margin
The net profit margin is computed by dividing net income by revenue, and multiplying the quotient by 100 to convert into percentage. The net profit margin illustrates how much in the revenue collected is translated into profit. By tracking the fluctuations in net profit margin, a company can assess and improve current practices in order to become more profitable. Murphy (2019) states that, when a company is able to expand net margins over a long period of time,

its share price increases. This is especially true when investors jump in to buy stocks. Remember that having higher demand drives price to increase, *ceteris paribus*.

1.11. Return on Equity

Return on equity (ROE) can be computed by dividing net income by the average shareholder equity. Similar to ROA, ROE will require a peer group in order to be considered as a useful indicator. A company that has an ROE equal or above its peers is deemed to be in good position (Hargrave, 2019). Hargrave (2019) warns investors, however, that sometimes a very high ROE may be due to having inconsistent profits, excess debts, and a negative net income.

1.12. Earnings Ratio

The earnings ratio, in its formal definition, is the "ratio for valuing a company that measures its current share price relative to its per-share earnings" (Hayes, 2019). It can be computed by dividing market value per share by earnings per share. Hayes (2019) states that a high earnings ratio could indicate either an overvaluation of stock or that investors are anticipating high growth rates. This may also signal that a company is losing money or not earning at all when the company does not have an earnings ratio. This is due to the fact that there is nothing to put in the denominator (Hayes, 2019).

Considering all the financial ratios mentioned above, the authors considered some simple criteria on selecting stocks into the investment pool. This investment pool is then used in selecting the optimal portfolio through application of any portfolio selection model. For testing purposes, only equally weight strategy for portfolio selection is applied to identify the optimal portfolio.

This paper is organized as follows. Section 1 discusses a brief introduction of the study. Section 2 shows the methodology employed in selecting stocks into the investment pool and obtaining the optimal portfolios. Section 3 explains the back-test results and analysis. Section 4 provides the concluding remarks. Lastly, the list of cited studies is also available in the references.

2. Methodology

2.1 Investment Pool Criteria

The investment pool used for the alternative investment proposed consist of stocks / assets / companies that meet a certain number n of favorable financial ratios in terms of their forecasted trends. E.g. if company X has at least 8 out of the 12 financial ratios (mentioned in the related literature) with favorable ratio trends, then company X is added into the investment pool. For comparison purposes, investment pools which are composed of stocks that have favorable ratio trends for a particular financial ratio r are also considered. E.g. if company Y, Z, and AA all have favorable ratio trend for their respective quick-ratio then all of them are included into the investment pool composed only of stocks with good quick-ratio trend. This analysis is done for all 12 financial ratios. Thus, for testing purposes, all ns are considered such that $n = \{1,2,\dots,12\}$. Therefore, if company X has n out of the 12 financial ratios with favorable ratio trends, then company X is added into the investment pool. Note that a favorable trend is a forecasted trend which is in the direction that shows that the company is going to perform even better. Following the analogy of better performance means better returns, the investment instruments are then added into the investment pool.

2.2 Portfolio Selection Model

In this preliminary study, portfolio P is selected through equal weight strategy, wherein considering the m number of added stocks into the investment pool based on the selection criteria considered, the portfolio weight (x_i) of each stock is equal to $\frac{1}{m}$, where $\sum_i^m x_i = 1$, $i = \{1,2,\dots,m\}$. In other words, given a budget B, the strategy is just to equally distribute B to all stocks in the investment pool. Overall, there are 3 types of portfolios considered. (1) M which denotes the portfolio return of the market index (Philippine Stock Exchange Index); (2) P_r portfolios which denote the portfolios consisting of stocks which have favorable ratio trends for a particular financial ratio r.; and (3) P_n portfolios which denote the portfolios consisting of companies that have at least n number of favorable financial ratios out of the 12 considered. The authors expect that P_n portfolios to be superior to the P_r portfolios and M portfolio.

2.3 Portfolio Performance Evaluation

Following the works of Chang and Young (2019a), Chang and Young (2019b), Chang et al. (2018a), Chang et al. 2015, Chang et al. (2018b) on how to evaluate portfolio performance, the portfolios obtained are then analyzed and

compared to a considered benchmark (PSE Index) or M. The return statistics between the P_n portfolios, P_r portfolios and M portfolio are compared to one another.

In summary, an individual stock is analyzed if it has favorable trends in terms of current ratio, quick ratio, solvency ratio, debt ratio, debt-to-equity ratio, interest coverage, asset-to-equity ratio, gross profit margin, net profit margin, return on assets, return on equity, and price over earnings. Those stocks with at least n number of favorable trends are considered into the investment pool. Considering these investment pools, equally weighted strategy is applied in order to have the portfolios. The resulting portfolios are then compared to the benchmark market and individual portfolios from investment pools considering only a specific type of financial ratio.

3. Back-Test Results

3.1 Data Description

The 5 year financial ratios of randomly selected 150 companies are collected online from the Philippine Stock Exchange and Philippine Stock Exchange EDGE Portal for years 2014-2018. The years 2014-2017 data are used to analyzed the trend and the 2018 data are used to validate the performance of the resulting portfolios. There are 12 considered financial ratios namely current ratio, quick ratio, solvency ratio, debt ratio, debt-to-equity ratio, interest coverage, asset-to-equity ratio, gross profit margin, net profit margin, return on assets, return on equity, and price over earnings. Using the strategy wherein n number of financial ratio(s) of a company are favorable for investment as the criteria for the selection of stock into the investment pool, 12 portfolios are generated. These portfolios are denoted as P_n where $n = \{1,2, \dots, 12\}$. Considering each ratio as the criteria for selection into the investment pool, another 12 portfolios are generated, denoted as P_r where r belongs to the 12 financial ratios e.g. $P_{quick\ ratio}$ and $P_{net\ profit\ margin}$. The market return (Philippine stock exchange index) is denoted as M. Moreover, P_n are portfolios composed of companies with at least n number of favorable financial ratios, and P_r are portfolios composed only of companies with favorable financial ratio r. The trading scheme is that the portfolios are built at the end of 2017 and liquidated at the end of 2018.

3.2 Back-Test Results

For evaluation, we first look at the performance of P_r portfolios as shown in Table 1.

Table 1. Performance of P_r Portfolios

P_r	Pool	Return	Difference with M
Current Ratio	59	-0.0217	0.1060
Quick Ratio	47	-0.0082	0.1194
Solvency Ratio	56	-0.0391	0.0885
Debt Ratio	58	-0.0192	0.1084
Debt-to-Equity Ratio	58	-0.0642	0.0634
Interest Coverage	49	-0.0727	0.0549
Asset to Equity Ratio	66	-0.0801	0.0476
Gross Profit Margin	49	-0.0216	0.1060
Net Profit Margin	41	-0.0959	0.0318
Return on Assets	52	-0.0929	0.0348
Return on Equity	54	-0.0951	0.0326
Price over Earnings	49	-0.1099	0.0177
M	1	-0.1276	0.8111

Table 1 shows that considering each financial ratio the investment pool out of 150 companies ranges 41-66. Looking at the portfolio returns, it shows that the all P_r portfolios have negative return but it is still superior to the market return (M) which has a lower portfolio return. The total return difference with M considering all P_r portfolios is equal to 0.8111. This implies that P_r portfolios can outperform the market. Note that even though the returns of P_n portfolios are mostly negative, the returns are better than the market performance. Therefore, if this is the case for all back-tests then profitability can be achieved using this information through alternative investment instruments. Next is to look

at the performances of our P_n portfolios based on the strategy of having at least n favorable financial ratios to be considered into the investment pool as shown in Table 2.

Table 2. Performance of P_n Portfolios

P_n	Pool	Return	Difference with M
1	142	-0.0541	0.0735
2	130	-0.0521	0.0755
3	106	-0.0601	0.0675
4	82	-0.0683	0.0593
5	65	-0.0929	0.0347
6	47	-0.0748	0.0529
7	29	-0.0041	0.1235
8	18	-0.0268	0.1008
9	12	-0.0099	0.1177
10	7	0.1551	0.2828
11	0	0.0000	0.1276
12	0	0.0000	0.1276
M	1	-0.1276	1.2436

Table 2 shows that considering n favorable financial ratios the investment pool out of 150 companies ranges 0-142. Looking at the portfolio returns, it shows that at certain values of n as n increases the portfolio return eventually becomes positive. Considering the total return difference with M for all P_n portfolios is equal to 1.2436. This also implies that P_n portfolios can outperform the benchmark (M). Note that even though the returns of P_n portfolios are mostly negative, the returns are better than the market performance. Therefore, if this is the case for all back-tests then profitability can be achieved using this information through alternative investment instruments.

Comparing the performances of P_n portfolios with P_r portfolios based from Tables 1 and 2, it can be said that P_n portfolios are superior to P_r portfolios. P_n portfolios have better returns than P_r portfolios. P_n portfolios outperform M more than P_r portfolios. Moreover, only P_n portfolios showed profitability that as n increase the portfolio return eventually becomes positive.

4. Conclusion

This research analyzed the trends of financial ratios of 150 random companies from the Philippine stock exchange. Using some simple criteria, investment pools are generated screening out companies with at least n number (out of 12 financial ratios) of favorable ratio trends. For comparison purposes, investment pools considering only 1 type of favorable financial ratio trend are also identified. For testing purposes, equally weighted portfolio strategy is applied to select for the optimal portfolio. Portfolios using the investment pool consisting of companies with at least n number (out of 12 financial ratios) of favorable ratio trends are denoted as P_n portfolios. Portfolios using only 1 type of favorable financial ratio trend are denoted as P_r portfolios. P_n portfolios, P_r portfolios, and the market portfolio (M) are compared to one another to identify the superior portfolio. As expected, back-test results show that P_n portfolios can outperform both P_r portfolios and M portfolio.

Overall, this study provides research contribution in 3 ways: (1) it presents an alternative investment procedure that can probably outperform traditional benchmark like the market portfolio.; (2) it provides a research study on portfolio selection using Philippine data.; and (3) it offers a simple variation on the basic framework of portfolio selection.

Further improvements can still be done to improve the results of this study. One way is to consider the actual investment environment wherein trading costs are considered which plays a huge role in the profitability of any portfolio. Next is to consider other portfolio selection models like safety-first model and different variations of the mean-variance model to have another point of comparison. Consideration of all the companies listed in the Philippine Stock

exchange can also show some significant difference to the current result. Lastly, modification of the basic parts of portfolio selection framework can also be a starting point for further studies.

Acknowledgements

References

Chang, T., Wysk, R., and Wang, H., *Computer-Aided Manufacturing*, 3rd Edition, Prentice Hall, New Jersey, 2006.

Chang, K. H., & Young, M. N. (2019a). *Behavioral stock portfolio optimization considering holding periods of B-stocks with short-selling*. Computers & Operations Research, 112, 104773.

Chang, K. H., & Young, M. N. (2019b). *Portfolios Optimizations of Behavioral Stocks with Perception Probability Weightings*. Annals of Economics and Finance. (in press).

Chang, K.-H., Young, M. N., & Diaz, J.F.T. (2018b). *Portfolio Optimization Utilizing the Framework of Behavioral Portfolio Theory*. International Journal of Operations Research, Vol. 15, no. 1, 1-13

Chang, K. H., Young, M. N., Liu, C.-C. & Chung, H.-P. (2018a). *Behavioral Stock Portfolio Optimization through Short-Selling*. International Journal of Modeling and Optimization, Vol. 8, no. 2, 125-130.

Chang, K. H., Young, M. N., Hildawa, M. I., Santos, I. J. R., & Pan, C. H. (2015). *Portfolio selection problem considering behavioral stocks*. In Proceedings of the World Congress on Engineering (Vol. 2).

Cook, V., and Ali, A., *End-of-line inspection for annoying noises in automobiles: trends and perspectives*, Applied Acoustic, vol. 73, no. 3, pp. 265-275, 2012.

Corporate Finance Institute, *Current Ratio Formula*, Available: https://corporatefinanceinstitute.com/resources/knowledge/finance/current-ratio-formula/, October 23, 2019

Gallo, A., *A Refresher on Debt-to-Equity Ratio,* Available: https://hbr.org/2015/07/a-refresher-on-debt-to-equity-ratio?fbclid=IwAR1v1HB1NdXf0dg1Nq9Z11kGFdlhLMXmJbF96hVBEM4E7WPJYlrQoHblK8U, July 13, 2015

Hargrave, M., *Return on Assets—ROA,* Available: http://www.investopedia.com/terms/r/returnonassets.asp, July 3, 2019

Hayes, A., *Interest Coverage Ratio Definition,* Available: https://www.investopedia.com/terms/i/interestcoverageratio.asp, June 24, 2019

Hayes, A., *Price-to-Earnings Ratio — P/E Ratio*, Available: https://www.investopedia.com/terms/p/price-earnings-ratio.asp, October 11, 2019

Kenton, W., *Quick Ratio Definition*, Available: https://www.investopedia.com/terms/q/quickratio.asp, July 8, 2019

Kenton, W., *Solvency Ratio Definition,* Available: https://www.investopedia.com/terms/s/solvencyratio.asp, July 1, 2019

Kenton, W., *Gross Profit Margin Definition,* Available: https://www.investopedia.com/terms/g/gross_profit_margin.asp, June 30, 2019

Kenton, W., and Hayes, A., *Debt Ratio Definition,* Available: https://www.investopedia.com/terms/d/debtratio.asp, April 20, 2019

Lewis, M., *3 Risks of Investing in the Stock Market – Volatility, Timing & Overconfidence,* Available: moneycrashers.com/risks-investing-stock-market-volatility-timing-overconfidence/, October 22, 2019

Murphy, C., *Net Profit Margin,* Available: https://www.investopedia.com/terms/n/net_margin.asp, June 25, 2019

Ready Ratios, *Equity Ratio,* Available: https://www.readyratios.com/reference/debt/equity_ratio.html, August 13, 2013

Vaidya, D., *Current Ratio,* Available: https://www.wallstreetmojo.com/current-ratio/, October 22, 2019

Biography / Biographies

Manuel Jose Mercado born in Manila, Philippines is a Service Engineering Management student at Mapúa University. Manuel is a student of professor Young in Financial Management. Manuel first took Mechanical Engineering because it is his parent choice. Manuel shifted from Mechanical Engineering to Service Engineering Management to continue his passion in management. Growing up Manuel always wanted to manage his own business. Manuel had his high school at Lourdes School of Quezon City. He was part of the student council in his high school year and a varsity player in basketball.

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