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Analysis

Evaluation of Profitability and Liquidity Relationship through Multivariate Working Capital Analysis

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Abstract

This paper is empirical investigation of the evaluation of relationship between profitability and liquidity trade off through the application of working capital analysis. The trade off have been studied of the firms operating in pharmaceutical sectors in India, and they are privately owned public limited companies. The secondary data from the published annual reports of the five years are taken into consideration to form the financial analysis and development of profitability line and liquidity line. I investigated two major privately owned public limited pharmaceutical manufacturers, with five years' actual and published historical data. This paper also focuses on the conflicting dimensions of involvement of individual ratios in framing the conclusion with respect to profitability and liquidity measurement in traditional and old age way. Researcher has framed the multi variate relationship between set of financial ratios instead of traditional performance measurement of individual ratio. That is among other characteristics, researcher has used a state space of time, with time series data, and based on that formed the multi linear equation to verify the validity of the data base. It argues that advising is congruent while monitoring is dissonant with respect to measurement and analysis of financial performance and soundness. This analysis provides possible existences of set of ratios

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relationships. The implication of the model coincides with observed features of financial ratio, and additionally tries to establish the statistical measurement and confidence level with respect to set of them. The paper has provided a strong relationship between the sets of ratios based on four distinct but interrelated issues.

Keywords: Assessment of Gross Operating Cycle Period, Quick Ratio, Operating Cash Profit, Loan Repayment Capacity; Chi-Square; Correlation Coefficient; Friedman Test; Wilicoxon Test; Liquidity Line, Net Operating Profit Return Line

Introduction

Researcher feels that profitability and liquidity are vital and contradictory aspects of corporate business life. Liquidity measures the ability of a firm to honour all the obligations on due date. No firm can endure without liquidity. Profitability is the rate of return on company's investment. An unwarranted high investment in current assets would reduce this rate of return. Determining the appropriate levels of working capital involves fundamental decisions with regard to the firm's liquidity and trade-offs between risk and profitability.

Efficient working capital management involves planning and controlling of current assets and current liabilities in a manner that eliminates the risk of inability to meet due short term obligations on the one hand and avoid excessive investment in these assets on the other hand. Liquidity for the on going firm is not reliant on the liquidation value of its assets, but rather on the operating cash flows generated by those current assets. The working capital management of a firm in part affects its profitability.

The ultimate objective of any firm is to maximize the profit.

But, preserving liquidity of the firm is an important objective too. The problem is that increasing profits at the cost of liquidity can bring serious problems to the firm. Therefore, there must be a trade off between these two objectives of the firms. One objective should not be at cost of the other because both have their importance. If firm do not care about profit, firm can not survive for a longer period. On the other hand, if firm do not care about liquidity, firm may face the problem of insolvency or bankruptcy. For these reasons working capital management should be given proper consideration and will ultimately affect the profitability of the firm.

Literature Review

Firm may have an optimal level of working capital that maximizes their value. Large inventory and a generous trade credit policy may lead to high sales. Larger inventory reduces the risk of a stock-out. Trade credit may stimulate sales because it allows customers to assess product quality before paying. Another component of working capital is accounts payable. Delaying payments to suppliers allows a firm to assess the quality of bought products, and can be an inexpensive and flexible source of financing for the firm. On the other hand, late payment of invoices can be very costly if the firm is offered a discount for early payment.

The actual amount of working capital required by a firm depends upon the length of gross operating cycle period and the operating expenses needed for the period. The duration or time required to complete the sequence of events right from purchase of raw materials or goods for cash to the realisation of sales in cash is called the operating cycle or working

capital cycle. Longer the time lag, the larger the investment in working capital. A longer operating cycle might increase profitability because it leads to higher sales. However, corporate profitability might also decrease with the operating cycle, if the costs of higher investment in working capital rise faster than the benefits of holding more inventories and/or granting more trade credit to customers. This discussion of the importance of working capital management, its different components and its effects on profitability leads to the problem statement which researcher will be analyzing.

Decision makers need a variety of information in the decision-making process. Bankers and other lenders interested in the ability of an organization to repay loans and fixed regular charges associated with loans, i.e., long term borrowed funds. Stock holders or potential stockholders are interested in earning a fair return on their investment. The management team of a company is concerned about these issues and more-the adequacy of cash flow to pay operating expenses, the efficient use of company resources, and how to improve the overall performance of the company.

The researcher feels that the operating cycle period should be given more importance than the current ratio and quick ratio, as a measure and its impact on profitability. In addition to the above factor, another important factor to be considered is the fixed regular charges and loan repayment capacity of the firm. The size variable would have significant effect on the profitability of the firm.

The basic causes of business failure can be categorized in to four major heads – economic factors, the financial factors,

factors relating to neglect, disorder and fraud and some other factors. Among that, the financial factors relate to the over burdening of debt capacity and the insufficient capital. Considering the financial factors, researcher has considered as one of the variable the debt repayment capacity along with interest burden.

The L.C.Gupta model was the first Indian model to predict failure. Numbers of ratios are considered by Gupta model. The researcher has found the ratio of number of times the Earnings before depreciation, interest and tax (EBDIT) as annual interest burden added by 25 percent of debt outstanding as one of the major variable.

Although the univariate models (a model pertaining to only one variable is known as Univariate Model) are still in use today in many institutions. Most academicians and an increasing number of practitioners seem to disapprove the ratio analysis as a means of assessing the performance of a business firm. Many respected theorists downgrade the arbitrary rules of thumb (such as firm comparison) that are widely used by practitioners and favour instead the application of more rigorous statistical techniques. In some respects, however, these latter techniques should be viewed as a refinement of traditional ratio analysis rather than a radical departure from it.

From the above, the researcher thought, to establish relationship between accepted financial parameters by adopting the Novel approach through the application of multi variate analysis and application. Each ratio imparts information in an absolute and comparative sense, those needs to be studied with relative parameters.

Research Methodology

Traditionally, researcher would have preferred to examine a list of ratios in time period *t* in order to make predictions about other firms in the following period, *t+1*. But considering the limitations of financial ratio analysis to understand and frame the theoretical development, a Novel approach has been thought for. A novel approach indicates the relationships between few set of financial ratios, along with the concept of working capital management and financial distress model suitable in Indian environmental.

In the beginning, researcher has tried to establish the profitability and liquidity relationship through working out the Pearson's correlation coefficient, by considering the classical financial management view of existence of the negative correlation between two. The results are not supporting the hypothesis. (Refer Annexure A). These results have motivated the researcher, to think differently. In this course of thought, following research study has been undertaken.

Novel approach concerns the assessment of a firm's Net Operating Earning Capacity with respect to Net Operating Assets (NOPR). The operating earning capacity is measured with respect to cash operating profit, i.e., earnings before depreciation, interest and tax (EBDIT), and net operating assets, i.e., the total assets minus financial assets of the firm. To assess and measure the operating earning capacity, I have used the multi variate analysis. To work out the same four variables i.e., X_1 (Gross Operating Cycle period), X_3 (Operating cash profit to net working capital), X_4 (Direct operating costs to gross sales

revenue) and X_5 (Operating cash profit to interest costs plus 25% of long term debt) are taken into consideration.

In addition to the assessment of firm's NOPR, I have considered the liquidity measurements as one of the vital factor. The liquidity measurement is done through the establishment of the linear regression model. For this purpose, researcher has consider the current ratio as a dependent variable and consider the X_1 (gross operating cycle period) and X_2 (quick ratio) as independent variables.

Rule based or expert systems are used to try to mimic in a structured way the process that an experienced analyst uses to arrive at the financial analytical decision. Rule based systems are characterized by a set of decision rules, a knowledge base data such as financial ratios used by the researcher in obtaining inferences on a particular firm.

The analysis involves three steps: determination of group of ratios to be chosen to establish the relationship, frame the hypothesis with respect to profitability and liquidity measurement, and finally make the strategic evaluation by applying the mathematical and statistical workings on group of data.

Many separate elements go into the construction of a working capital analysis. First relationship must be postulated among the variables that seem to affect the profitability through the relationship among gross operating cycle period, operating cash profit with respect to net working capital investment, direct operating expense as a proportion to gross sales revenue, and lastly operating cash profit with respect to loan repayment along with interest payment capacity. Secondly,

the relationship postulated with respect to liquidity by considering the gross operating cycle period and quick ratio. Thirdly, an attempt has been made to establish the relationship between profitability and liquidity.

Then, to derive a formal model, a set of tools must be employed to estimate or stimulates outcomes. A body of data is crucial at this point, because a model cannot be created in vacuum. Lastly, a series of tests must be applied to establish that the model does, indeed, perform as expected. There are also times when the only way to unearth new relationships is to mine data without having any particular theory in mind. Econometric techniques such as central value theorem, variability of data, correlation, linear analysis model, multi linear analysis model, and different types of statistical test models have been used to establish the acceptability of the development of models.

Data Set and Samples

Recent heavy activity of financial distress and bankruptcy, including the sell out of few leading pharmaceutical corporate in India, provided the more fertile environment to find out the novel application of ratio analysis to study the financial position i.e., profitability and liquidity relationship, of pharmaceutical sectors in India. Recognizing this need, researcher has made a careful selection of non-bankrupt i.e., non distressed family controlled firms engaged in Pharmaceutical industries in India. The samples selected are Cadila Healthcare Limited (CHL), and Torrent Pharmaceuticals Limited (TPL). After the firms were selected, balance sheet and income statement are collected for the period of last five financial years, i.e., year 2003-4 to 2007-8.

The researcher have intentionally omitted the period of 2008-09, because it was the year when economy at large have sustained higher level of recession in India too. Considering the normal economical and policy model of Government of India, data of five years are taken in to consideration to frame the model.

Variables

This study undertakes the identification of the key variables that influence the working capital management and its impact on profitability and liquidity of pharmaceuticals manufacturers in India. Choices of variables have been greatly influenced by the concept of financial ratio analysis as used by financial practitioner all over the globe. The researcher has tries to select the variables with respect to financial ratios, and modified them to establish the multivariate relationship between six set of ratios. All or few of variables stated below have been used to test the hypothesis of this study:

1. Gross operating cycle period,
2. Quick ratio,
3. Operating cash profit to net working capital,
4. Direct operating cost to gross sales revenue,
5. Operating cash profit as a ratio of interest payment plus 25% of long term debt,
6. Current ratio.

All the above variables have relationship that ultimately affects profitability and liquidity to form the financial soundness of the pharmaceutical firms specifically operating in India. It is expected that there is a negative relationship and/or positive relationship between set of ratios for the individual firms, and in sum of two samples, it may be in

either way. The formation of problem is done through the development of null hypothesis as explained hereunder.

Hypotheses Testing

Since the objective of this study is to examine the relationship between the different sets of ratios and liquidity and profitability measurement with respect to working capital management, the study makes a set of testable hypothesis {the Null Hypothesis H_0 versus the Alternate hypothesis H_1 }. The evaluation is done with respect to 5 per cent level of significance (α) of normal distribution curve.

Hypothesis 1:

The first hypothesis of this study is as follows:

H_{01} There is negative correlation ship between Net operating profit return and Liquidity.

H_{11} There is positive correlation ship between Net operating profit return and Liquidity.

Hypothesis 2:

The second hypothesis of this study is as follows:

H_{02} There is significant relationship between Net operating profit return as a dependent value, and independent variables like Gross operating cycle period, Operating cash profit to net working capital, Direct operating costs to gross sales revenue, and Operating cash profit's loan payable capacity.

H_{12} There is no significant relationship between Net operating profit return as a dependent value, and independent variables like Gross operating cycle period, Operating cash profit to net

working capital, Direct operating costs to gross sales revenue, and Operating cash profit's loan payable capacity.

Hypothesis 3:
The third hypothesis of this study is as follows:

H_{03} There is significant relationship between Liquidity as a dependent value, and independent variables like Gross operating cycle period and Quick ratio.

H_{13} There is no significant relationship between Liquidity as a dependent value, and independent variables like Gross operating cycle period and Quick ratio.

Hypothesis 4:
The fourth hypothesis of this study is as follows:

H_{04} There is significant relationship between actual and estimated value worked out for NOPR and Liquidity, through the application of NOPR line and Liquidity line developed.

H_{14} There is no significant relationship between estimated and actual value worked out for NOPR and Liquidity, through the application of NOPR line and Liquidity line developed.

Analysis Used in Study

The correlation coefficient (Γ) techniques as developed by Pearson have been used in measuring the closeness of the relationship between liquidity and profitability with respect to working capital management. The liquidity is measured as current ratio. The profitability is measured in terms of earning

before depreciation, interest, and tax (EBDIT) as a percentage of net operating assets.

To frame the theory, researcher has extensively used various statistical tools. The Pearson Correlation coefficient worked out for different set of variables. The mean value is a value which is calculated for a group of data, i.e., specifically and relatively two variables relationship, and is used to describe the data in understandable way. The standard deviation (σ) is calculated to summarize how far away from the mean or average (μ) the data values typically are. It is used to measure of spread because it improves interpretability by removing the variance's square and expressing the deviations in the original value. It reveals the variability within the data set in absolute term. To get the understanding in relative way, I used the coefficient of determinants (Ω). Additionally, the Friedman Test (ي), and Wilicoxon Signed Ranks Tests (א) have been performed on model developed, to test the hypothesis.

The computation concerning the degree of the closeness is based on the multi linear equation; which has been used to measure the estimated value for the chi-square calculation. Chi-square (χ^2) is used to test the significant difference between observed relationship between two variables of data among specific categories and expected relationship based on the null hypothesis. χ^2 has been performed on the Friedman Test's results.

This study uses the panel and pooled data analysis of cross-sectional and time series data. Here the cross-sectional means the pooled ratios relationship based analysis. The pooled multi linear equation has been formed, for each sample under study, and based on that the trend values have been estimated. The

pooled multi linear equation model is one where both intercepts and slopes are constant, where the cross section of independent ratio are pooled together in a set of columns assuming that there is no significant cross section or temporal effects, to work out the trend based dependent variable value. Then the actual value of dependent variable compared with trend estimated value, and Chi-square is applied.

The general form of model is:

$TDV_{it} = \S + \beta i\, x_{it} + \varepsilon$

TDV_{it} : Trend variable of firm i at time t; i = 1, 2 firms

§ : The intercept of equation

βi : Coefficient of X_{it} variables

X_{it} : The different independent variables for measurement of financial soundness of firm i at time t

t: Time = 1,2,… 5 years

ε : The error term

Specifically, when the conversion of the above model into specified variable to be done, it change with each hypothesis under study. The following three hypothesizes have been framed for study.

Hypothesis number 1:

$TDV1_t$ means NOPR (EBDIT as a proportion of net operating assets).

X_{6t} means Current ratio

In this hypothesis, the Pearson's Correlation Coefficient between NOP Return and Current Ratio are to be tested.

Hypothesis number 2:

TDV_{2t} means EBDIT as a proportion of net operating assets.

X_{1t} means Gross operating cycle period

X_{3t} means Operating cash profit (EBDIT) as a proportion of net working capital.

X_{4t} means Direct operating costs as a ratio of gross sales revenue.

X_{5t} means Operating cash profit as a ratio of loan payable capacity.

ε means error term

Model framed for Hypothesis number 2 as under:

$NOP_{it} = \S + \beta 1\ x_1 + \beta 2\ x_3 + \beta 3\ x_4 + \beta 4 x_5 + \varepsilon$

Hypothesis number 3:

$TDV3_t$ means measurement of liquidity i.e., Current ratio

X_{1t} means Gross operating cycle period

X_{2t} means Quick ratio

ε means error term

Model framed for Hypothesis number 3 as under:

$Liq_{it} = \S + \beta 5\ x_1 + \beta 6\ x_2 + \varepsilon$

Data Analysis and Inferences

The Annexure A to F indicates the components used in multi variate working capital analysis along with calculation of different statistical data and inferential statistics, for the both firms under study, i.e., Cadila Healthcare Limited (CHL), and Torrent Pharmaceuticals Limited (TPL).

Hypothesis number 1: Pearson's Correlation Coefficient between NOP Return and Current Ratio.

Traditional financial theory states, that there is a negative correlation ship in existence between NOP return and current ratio. It means that if the current ratio increases the NOP return decreases. Researcher has worked out the Pearson's correlation coefficient as per Annexure A.

The Γ of CHL 0.0577 while of TPL is -0.4437. The results achieved by this hypothesis, supports that, it is unwise to assume the negative correlation between current ratio and net operating profit return. Hence, the researcher feels that, there is a need to work out the multi variate analysis to find out the relationship between NOP return and components of working capital.

Hypothesis number 2: Relation ship between NOP Return and Components of Working Capital in addition to Loan Payable Capacity.

This hypothesis signifies two types of relationship – the relationship between NOPR (dependent variable) and GOC, OCPNW, DOCGS, and OCPINT (independent variables). The net operating profit at large reflects the earning ability of the firm, i.e., economical productivity of the employment of borrowed funds and owners' equity invested in current assets and represents an overall measure of efficiency of the business.

The multiple regression line for H_{02} worked out by following equation.

For CHL: $NOPR_{CHL} = 1.883 + 0.001X_1 + 0.110\ X_3 - 4.107\ X_4 + 0.166\ X_5$

For TPL: $NOPR_{TPL} = 0.292 - 0.002X_1 + 0.091\ X_3 + 0.318\ X_4 + 0.000\ X_5$

The CHL's and TPL's partial Γ indicates that a negative relation ship is in existence between NOPR and DOCGS. In case of CHL, OCPNW negatively impact the NOPR (-0.100), while for TPL it indicates the positive relationship of 0.902. In case of TPL, the NOPR and GOC is negatively Γ with 0.848, while in case of CHL, the Γ is positive with 0.297.
In the case of both firm under study, the Ω is 1.00, which indicates that 100% variations in NOPR is explained by all four variables considered.

Hypothesis number 3: Relationship between Liquidity and Components of Working Capital.

The liquidity of the firm can be increased by the proper monitoring and use of GOC and QR. The liquidity has been measured through the current ratio. Proper management of both independents variables indicates utilization of current assets in effective and efficient way, which in turn supports the NOPR.

This hypothesis has considered the QR and GOC (independent variable) and CR (dependent variable) to frame the liquidity line for the both firm under study.

This hypothesis tries to evaluate the attitude of management to maximize the benefit in term of liquidity by managing regularly and consistently the two important components of operating cycle of the firm. This ratio indicates the willingness and attitude of the management to enhance the liquidity through employment of better management techniques.

The multiple regression line for H_{03} worked out by following equation:
The estimated value for chi-square for H_{03} worked out by following equation:

For CHL : $LIQ_{CHL} = 0.778 + 0.001X_1 + 0.069\ X_2$

For TPL : $LIQ_{TPL} = 0.715 + 0.002X_1 + 0.531\ X_2$

The partial Γ of both CHL and TPL indicates the positive Γ between CR (dependent variable) and QR and GOC (independent variables). In case of CHL positive Γ in existence between QR and GOC (0.281), while for TPL negative Γ in existence (-0.213). This indicates that, it is unwise to mention that always there is a positive correlation between QR and GOC. The liquidity line worked out above indicates that R^2 is 0.449 for TPL and 0.437 for CHL. It indicates that, in case of CHL - 43.70 % ; and TPL – 44.90% of the variations in liquidity is explained by the two independent variables. In other words, it indicates that balance i.e., for CHL – 56.30%; and TPL – 55.10% remains unexplained(9).
The ANOVA table indicates the F value for TPL is 0.815, and for CHL 0.776. The calculated value of F is lower than the table value at *α of 5, for degree of freedom- 4 is 19;* it

indicates that null hypothesis is accepted. It means there is a significant relationship is in existence between liquidity as a dependent value, and independent variables like GOC and QR.

The significance of F value is 0.563 for CHL and 0.551 for TPL. It indicates the probability associated with F, i.e., significance of liquidity line. The significance is more than 0.50, confirms that there is no significant difference between the groups being compared. Hence, the null hypothesis accepted.

Hypothesis number 4: Relationship between Actual and Estimated Value worked out for NOPR and Liquidity.

Researcher has used a state space of time, with time series data, and based on that framed the multi linear equation to verify the validity of the data base. Researcher has applied the NOPR line and liquidity line, to test the time series analysis. For this purpose, for CHL and TPL, the NOPR as a proportion of current ratio have been studied. Through the application of the NOPR line and liquidity line, the estimated values for the both firms understudy have been worked out. The resultant value is named as Estimated value. Then the paired samples correlation and tests have been performed (Annexure: D).The TPL's correlation between estimated and actual is worked out 0.964; while of CHL's worked out is 0.905, indicates that both multi variate line framed are supporting the hypothesis framed. The same results show the significance of 0.86 for CHL, and 0.094 for TPL. It indicates that CHL's probability of 86% indicates that mean of actual and estimated does not differ significantly. The CHL's T value -0.188 indicates that, the calculated value of t is less than the table value at *α of 5, for degree of freedom- 4 is 2.78.* It indicates that null hypothesis is accepted for CHL. It also

indicates that there is no significant difference between estimated and actual value of NOPR as a proportion of Liquidity in case of CHL. It indicates that TPL's probability of 9.40% indicates that mean of actual and estimated does differ significantly. The TPL's T value 2.185 indicates that, the calculated value of t less than the table value at *α of 5, for degree of freedom- 4 is 2.78.* It indicates that null hypothesis is accepted for TPL also. The same contradictory results have been supported by the Wilicoxon Signed Ranks Test (א) (Annexure E). The Asymp. Sig. (2 tailed), i.e., significance, for the value of Z indicates that 68.60% for CHL and 8% for TPL for the relationship between actual and estimated value.

The same results have been supported by additional test of Friedman (ي). The Asymp. Sig. of (ي) of CHL is 0.655 and of TPL is 0.180. The value of ي is more than 0.50 indicates that there is no significant difference between scores on the two variables, i.e., NOPR and Liquidity in case of CHL. In the case of TPL the calculated value of ي is lower than 0.50, which indicates that there is a significant difference between scores of two variables, i.e., NOPR and Liquidity. The calculated value of χ^2 as per ي test is 0.200 for CHL and 1.80, which is lesser than the χ^2 *value at α of 5 is 11.0705,* which means that null hypothesis accepted, i.e., there is a significant relationship between estimated and actual value of NOPR and Liquidity.

Conclusions

The research paper has revealed that liquidity and profitability are vital and contradictory aspects of corporate business life. The research study indicated that the operating cycle period should be given more importance than the current ratio and quick ratio, as a measure and its impact on profitability. In

addition to the above factor, another important factor to be considered is the loan payable capacity of the firm. The size variable would have significant effect on the profitability of the firm.

Research study has not supported the classical financial management view, with respect to existence of the negative correlation between NOPR and Liquidity.

The study have shown the existence of two types of relationship – the relationship between NOPR (dependent variable) and GOC, OCPNW, DOCGS, and OCPINT (independent variables).

It indicates the probability associated with F, i.e., significance of liquidity line. The liquidity line indicates the relationship or impact on liquidity of the firm by independent variables like GOC and QR. The study also indicates that, there is a significant relationship in existence between profitability line and liquidity line as developed under hypothesis number 2 and 3.

The above study clearly indicates that, there is dearth need to move from traditional and classical belief of liquidity and profitability relationship to the novel approach of relative relationship between different sets of ratios through the application of multi variate analysis.

Areas for Further Research

In this research study, I have tried to limit the self to the measurement of profitability and liquidity with respect to working capital study only. The further areas have been

opened up for study and establish the relationship with respect to profitability by considering the capital structure of the firm.

Reference

Shah, Paresh, (2009), *Financial Management,* 2nd edition, Biztantra, India,p.396

Eljelly, A. (2004), "Liquidity-Profitability Tradeoff: An empirical Investigation in an Emerging Market", *International Journal of Commerce & Management*, Vol 14 No 2 pp. 48 - 61

Soenen, L. A. *(*1993), **"**Cash conversion cycle and corporate profitability", *Journal of Cash Management, V*ol 13 No 4 pp. 53-58

Long, Michael. S, Malitz. Lleen. B, and Ravid, S. Abraham, (1993) "Trade Credit, Quality Guarantees, and Product Marketability" *Financial Management*, pp. 117 - 127

Shah, Paresh, (2009), *Financial Management,* 2nd edition, Biztantra, India,p.398

Shah, Paresh, (2009), *Management Accounting*, Oxford, India, p. 380

Caouette, John, B., Altman, Edward, I., and Narayanan, Paul, (1998), *Managing Credit Risk – The Next Great Financial Challenges;* John Wiley and sons; USA.

ICFAI publication (2006), Strategic Financial Management, pp.270-276

Keller, Gerald, (2007) Statistics for Management and Economics, Thomson, p.632.