CAPITAL EXPENDITURE DECISIONS: A STUDY OF MALAYSIAN LISTED COMPANIES USING AN ORDERED LOGISTIC REGRESSION ANALYSIS

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ABSTRACT

Capital expenditure (*capex*) decisions have been extensively studied except in developing countries (Mansor and Hamidi, 2008). *Capex* implicitly affects institutional aggregate demand, gross national product and business cycles. This research focuses on the *capex* decisions by Malaysian public listed companies (PLCs) between the years 2002 to 2006. Using the Pecking Order Hypothesis (*POH*) and Managerial Hypothesis (*MH*) frameworks, four independent variables are examined. These are (i) internal cash flows (*ICF*); (ii) Insider Ownership (*I_O*); (iii) Investment Opportunities (*IOP*); and (iv) the interaction effects of the variables. In addition, sales revenue is used as a control variable. Both hypotheses predict a positive effect of (*IFC*) on *capex*. However, their arguments differ in relation to the effects of (*I_O*) on *capex*. *MH* argues for a negative relationship but *POH* proposes no effect between the two. *POH* suggests a positive effect of (*IOP*) on *capex* whereas *MH* predicts no relationship between them. Using a pool Ordered Logistic Regression (*OLR*) model, *capex* is categorised into five ordinal categories and the control variable is divided into four groups, which are ranked to capture the variability of the *capex*. The result of this study shows that the (*ICF*) has a positive and significant effect on *capex*, and this finding supports both studied hypothesis. However, (*I_O*) and (*IOP*) show a negative and significant effect on *capex*. The study also found that there is a conflict of interest between managers and shareholders base on the negative coefficient of (*I_O*). This finding is consistent with Kim (2006) and supports the *MH*. This study provides mixed-support for the two hypotheses and reveals interesting characteristics with regards to the managerial style in Malaysian PLCs.

Keywords: capital expenditure, managerial style, Malaysian public-listed companies, ordered logistic regression, group effect

INTRODUCTION

Capital expenditure (*capex*) is one of the most crucial managerial decisions whether at the institutional (macro) or the organizational (micro) levels. At the macro level, *capex* affects aggregate demand and gross national product, economic development, and business cycles (Dombusch and Fisher, 1987). At the micro level, it influences production decisions (Nicholson, 1992) and strategic planning (Bromiley, 1986). McConnell and Muscarelle (1985) report that *capex* affects and is affected by firm performance. Several studies examine factors which influence the *capex* level (e.g., Nair (1979), Berndt *et al.*, (1980), Larcker (1983), Fazzari dan Athey (1987), Fazzari *et al.*, (1988), Waegelein (1988), Madan dan Prucha (1989), Gaver (1992), and Griner and Gordon (1995)). In general, their work extends several earlier conceptual discussions of *capex* including Kuh and Meyer (1957), Dusenberry (1958), Jorgenson (1963), Kuh (1963), Jorgenson and Siebert (1968), Grabowski and Mueller (1972) and Elliot (1973).

One of the most widely-discussed determinants of c*apex* decisions is the Internal Cash Flow (*ICF*) of the firms (e.g., Myers (1984); Myers and Majluf, (1984); and Griner and Gordon, (1995)). Managerial Hypothesis (*MH*) and Pecking Order Hypothesis (*POH*) represent two popular theoretical explanations for the relationships (Griner and Gordon (1995)**.** Both theories suggest a positive effect of *ICF* on the level of *capex*. However, *POH* and *MH* hold different explanations and thus, contrasting predictions with respect to the relationships between Insider Ownership (*I_O*) and Investment Opportunities (*IOP*), and the level of *capex*.

Kim (2006) studies the impact of family ownership and capital structure on the performance of Korean manufacturing firms and reports a significant positive association between the two variables. Maury (2006) also finds increased performance due to family ownership in Western European firms. It was further documented that firms with high government and institutional ownerships are generally profitable and have low leverage (Fraser *et al.*, 2006). In Malaysia, the importance of family-share ownership should not be under-estimated. In addition to government ownership which is at 11% (average), institutional ownerships stand at an average of 62% (Fraser *et al.*, (2006)). This unique characteristic of firms' ownership in Malaysia provides one of the motivations for this study. Furthermore, empirical results are inconclusive with respect to the association between *I_O* and *capex*. Thus, the main objective of this study is to determine which of the two hypotheses (*MH* or *POH*) dominates the *capex* decisions in Malaysia.

The remainder of the paper is organised as follows. Section two presents the literature review of *capex* decisions and the proposed hypotheses. Comparison between the *POH* and *MH* is presented in section three. Section four discusses the methodology and sample data. Discussion and analysis are covered in section five while section six summarizes the paper and provides suggestion for future research.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Capital expenditure decisions and firm performance have been shown to be positively related (McConnell and Muscarella, 1985). Sartono (2001) investigates the impact of *ICF* and *I_O* on *capex* for companies listed on Bursa Efek Jakarta (BEJ) using a sample of 223 companies (1994 to 1998). He reports *ICF* to be positively related to *capex*. However, in the case of *I_O*, the effect on *capex* is not significant. This finding implies that *POH* prevails in the Indonesian context. More recently, a study by Marchica and Mura (2007) using a sample of UK non-financial listed firms (1991 to 2001) examine how alternative cash-holding policies influence the firm's ability to invest. They conclude that a cash-rich firms show a strong positive impact on *capex* while those persistently display low cash policy invest less in *capex*. Masulis *et al.* (2007) conclude that the scaled change in *capex* has a significantly positive effect on excess stock returns, indicating that on average, capital investments add to shareholders value.

Pecking Order and Managerial Hypotheses

In explaining the influence of *ICF* on *capex* decision, *POH* assumes the superiority of shareholders' wealth concept. Therefore, the level of insider ownership (*I_O*) is insignificant in managerial *capex* decisions. *POH* assumes that agency problems do not influence *capex* decision-making process (Griner and Gordon 1995; Sartono 2001). Since shareholders' wealth is the main managerial priority, the level of *CE* will increase with the increase in *IOP*. This is further strengthened in the absence of conflicts between managers and owners. It is assumed that beneficial investments to the owners will also benefit managers through financial rewards and career advancement (Aggarwal and Samwick, 2003). In addition, according to Griner and Gordon (1995), managers are motivated to utilise *ICF* rather than external funds due to the information asymmetry. Since managers are more informed than owners regarding both *ICF* and *IOP*, the former are in a better position to over or under invest at the expense of limited information of the owners (Stulz, 1990),

Contrary to *POH, MH* emphasizes the significance of managers' ownership and conflict of interest between managers and stockholders in *capex* decision, termed as agency cost (Jansen and Meckling, 1976). In this view, managers' decisions are influenced by self interests and profit maximization (Scott, 2003). *Capex* entails financing risk which may jeopardise firm's survival and affect the portion of managerial ownerships. It follows that large managerial stockholdings tend to result in under-investment using internal cash flow. Thus, this theory predicts a negative relationship between *I_O* and *capex*. In addition, *MH* argues that *capex* decision is not determined by the availability of *IOP* but the personal interest of managers.

Griner and Gordon (1995) suggest three main reasons why managers with small stocks ownership prefer to finance *capex* using ICF rather than external financing: (i) *ICF*

carries low risk since firms are not committed to pay interest and thus, low bankruptcy risk; (ii) using *ICF* implies manager's performance is reliable since shareholders are willing to sacrifice dividend from retained earnings; and (iii) further investment of *ICF* signals the perception of a long-term investment opportunity and firm survival. Thus, managers would be loyal to the firm and owners would be interested in the survivorship of the firm.

The above discussion reflects the importance of *ICF* in deciding the *capex* level. However, these relationships need further examination to understand the interplay of managerial relationship, especially between the managers and the owners. To date, studies of this nature are relatively scant especially in developing economies (see for example, Fazzari and Athey, 1987; and Fazzari *et al.*, 1988)

Internal Cash Flow (*ICF*) and Capital Expenditure (*CE*)

Elliot (1973) performs a cross-section time series of 184 manufacturing and non-manufacturing companies. He concludes that *capex* is affected by liquidity, which in turn is determined by *ICF*. Fazzari and Athey (1987) and Fazzari, *et al.*, (1988) provide further evidence that liquidity significantly strengthens the effect of *ICF* on *capex*. Similarly, Fazzary and Athey (1987) and Fazzary, *et al.*,(1988) report that *ICF* is an important factor in *capex* decisions.

POH's explanations on the use of *ICF* for *capex* financing is based on the argument that managers and current stockholders do not have conflicting interests (e.g., Myers (1994) and Myers and Majluf (1984)). Rather, asymmetric information is the main motivation for managers' preference to use *ICF* in financing *capex*. Potential investors believe that managers possess and use information not available to outsiders in attempting to maximise the current stockholder's welfare. Thus, using *ICF* to finance *capex* signals a positive effect on the wealth of current shareholders.

Contrary to *POH*, the basis for *MH's* explanation is the managers-shareholders' conflict of interest. Marris (1964) studies *ICF* and *capex* as focal points for this conflict and argues that managers prefer to retain and re-invest a large portion of earnings that is in the best interest of shareholders. Jansen (1986) states that the agency conflict increases with excess cash flow since managers attempt to increase their authority by over investing in non-core activities. These activities may not be parallel with the shareholders' interests. Meanwhile, other researchers argued that although agency conflict can be reduced, it can not be eliminated by the market mechanism (Jansen and Menkling, 1976; Fama, 1980; Jensen and Ruback, 1983; Hart, 1983; Jensen 1986).

Based on the explanation above, both *POH* and *MH* propose that *ICF* is an important determinant of *capex*, whereby the two variables are positively related. Accordingly, this lead to our first hypothesis (in alternative form):

H1: Internal cash flow (ICF) has a positive effect on the level of firms' capital expenditure (capex).

Insider Ownership (*I_O*) and Capital Expenditures (*Capex*)

Even though previous empirical research has investigated the effect of *I_O* on many issues, none has documented the relationship between *I_O* and *capex*. For example, Haugen and Senbet (1981) study the effect of *I_O* in options trading. Morck *et al.* (1988) look at the correlation between *I_O* and financial performance, and report a significant non-linear effect. Further, Wu and Wang (2005) conclude that *I_O* positively affects firm value. The empirical findings of Jensen *et al.* (1992) suggest that there exists interdependency among *I_O*, debt level, and dividend policy. Walkling and Long (1984), Benston (1985), Agrawal and Mendelker (1987), and Sicherman and Pettway (1987) have also provided evidence that *I_O* influences the levels and characteristics of mergers and acquisitions.

A more recent study by Kim (2006) involving Korean manufacturing firms (1991 to 1998) investigates the impact of family ownership and capital structure on firms' performance. His findings suggest a positive association between the two variables. Maury (2006) also finds increase performance due to family ownership in Western European firms. In particular, where families hold at least one of the top two positions, profitability is improved. This suggests that family ownership lowers the classical agency problem between managers and owners. In Malaysia, where the government and institutional ownerships are relatively high, the ownership impact on business decisions may be underestimated. Fraser *et al.*, (2006) document that firms with high government and institutional ownerships are generally profitable and have high leverage. *POH* assumes no conflicting interest between managers and the current stockholders and thus, there is no effect between *Capex* and *I_O*. In contrast, *MH* argues that managers increase their self-interest in deciding the *capex* level. Low managerial ownership may provide incentive for them to take risk in committing to high level *capex*. In other words, increase in *I_O* is expected to reduce managerial over-investment in *capex*. Accordingly, *MH* predicts a reverse relationship between *capex* and *I_O*. In line with *MH* argument, our second hypothesis is:

H2: Insider ownership (I_O) has a negative impact on the level of firms' capital expenditure (capex).

Investment Opportunity (*IOP*) and Capital Expenditure (*Capex*)

Following Myers (1977), *IOP* is defined as a combination of real assets (assets in place) and future investment options. According to Graver and Gaver (1992), future investment option is implied by projects supported by research and development as well as the company's relative ability to determine viable investment opportunities (in comparison to others) within its industry. Myers (1977) suggests that company's ability is negatively

correlated with firm value which in turn depends on future *IOP*. Furthermore, managers tend to reach a debt ratio target to asset from *IOP*. A high asset proportion implies a high debt ratio and these findings support Smith and Watts (1992).

Gaver (1992) argues that in determining the investment opportunity sets, companies adopt a long-term view to balance management incentive and stockholder's interest. In general, the literature shows that *capex* is influenced by policies and compensation plans that are incentive-based, designed to align the interests of managers and stockholders. Wu and Wang (2005) report a strong positive relationship between announcement effects and *IOP* but fail to uncover the effect for issuing firms with high *IOP.*

Jung *et al.*, (1995) conclude that managers of growth-oriented companies prefer to increase capital through equity financing since it allows firms to increase capital without commitment to pay interest as in the case of debt financing. They argue that companies with profitable *IOP* tend to issue equity while those with poor *IOP* prefer to issue debt. In addition, they report that stock price reacts favorably to equities issued by companies with good *IOP*. According to Chung *et al.* (1998), share price reactions to a firm's *capex* decision reflects the market's assessment of the firm's quality of *IOP*.

On the contrary, Donaldson (1961) as cited in Brigham and Gapenski (1996) summarises that firms prefer to utilise internal rather than external financing (from retained earnings and non-cash depreciation). Those with *ICF* greater than *capex* requirement will invest the excess *ICF* in marketable securities, increase the payout ratio, or buy the treasury stocks. Whenever the *ICF* is insufficient to finance new projects, it will be reflected by decreasing the size of marketable securities portfolio, followed by selling bonds, convertible bond, and common stock as the last resort. In Hong Kong, Fan and So (2004) conclude that the pecking order principle is practised to maintain target debt-equity mix. Internal equity was ranked first, followed by bank debt and new common equity. In the US, Graham *et al.*, (1992), Kester *et al.*, (1994), Wivattanakantang (1999), and Arsiraphongphisit *et al.*, 2000) provide support for this conclusion.

MH argues that managers tend to over-invest if the future *IOP* is better than the current condition without considering the stockholders' welfare. According to this view, there is no impact of *IOP* to company's *capex*. On the contrary, the *POH* predicts that in this condition, managers will increase the level of *capex* to improve stockholders' welfare. Therefore, *capex* is positively related to *IOP*. This argument leads to our third hypothesis:

H3: Investment opportunities (IOP) have a positive impact on the level of firms' capital expenditure (capex).

RESEARCH METHODOLOGY

Data, Samples and Measurements

This research uses secondary data drawn from manufacturing companies listed on Bursa Malaysia. Data are acquired from published company reports covering a period of 5 years (2002 - 2006). The study focuses primarily on manufacturing companies since they are more likely to invest heavily in property, plant and equipment compare to those in service industries. The data are selected using purposive sampling method. Following Emory and Cooper (1995 p.228), the following criteria were used to select the sample companies: (i) legally registered as public companies with Bursa Malaysia during the study period; (ii) having insider ownerships (i.e., the CEO and the board of directors are listed as shareholders); and (iii) having complete financial reports published by Bursa Malaysia during the 5-year period.

A total of 157 manufacturing companies was obtained and based on the above criteria, 48 companies were excluded since their dates of incorporation was later than the year 2002. The final sample of 109 companies represents various sectors as presented in Table 1.

Table 1 Companies representation by sector

Sector	Number	%
Food	1	0.9
Petroleum Refineries	4	3.7
Rubber	4	3.7
Plastic	5	4.6
Wood	14	12.8
Iron and Steel	11	10.1
Furniture and Fixtures	11	10.1
Paper	2	1.8
Fabricated Metal	11	10.1
Machinery and Electrical Machinery	4	3.7
Equipment	10	9.2
Other Manufacturing	19	17.4
Unspecified	13	11.9
Total	**109**	**100.0%**

Source: Author's sample data

Variables and Measurements

Capital Expenditure (*Capex*)

Capex as explained by Griner and Gordon (1995) represents the amount of fund disbursed by management to acquire property, plant and equipment. *Capex* can also be described as the amount paid for additional assets to support firm development (Sartono, 2001). As defined by Griner and Gordon (1995) and Sartono (2001), *capex* might be stated as the difference between total fixed assets in the current period and total fixed assets in the previous period. The mathematical form can be stated as follows:

$$\text{Capex}_{it} = \text{TFA}_{t} - \text{TFA}_{t-1}$$

where:

Capex = Capital Expenditure of company (i) for period (t)
TFA_t = Total Fixed Asset at time (t)
TFA_{t-1} = Total Fixed Asset at time (t – 1)

Capex is categorised into five ordinal categories. In ordered logit model, observed response categories of capital expenditure (y_i) are tied to the latent variable (y_i^*) by a measurement model that divides y_i^* into five ordinal categories according to the following estimates of cut-off-points:

$$Y = \begin{cases} 0 = \text{"negative capex"} & \text{if } y_i^* = 0 \\ 1 = \text{"positive first 25\%"} & \text{if } 0 < y_i^* \leqslant 56.32 \\ 2 = \text{"positive between 25\% and 50\%"} & \text{if } 56.32 < y_i^* \leqslant 152.63 \\ 3 = \text{"positive between 50\% to 75\%"} & \text{if } 152.63 < y_i^* \leqslant 481.98 \\ 4 = \text{"positive above 75\%"} & \text{if } 481.98 < y_i^* \end{cases}$$

The categorisation of *capex* is based on a simple arithmetic procedure. Companies with negative capex are categorized as group zero[1]. On the other hand, firms with positive capex values are divided into four different categories using the median value as the cut-off point. Companies having *capex* value below and above the median value is further divided into two different categories with "25 per cent and below" and "75 per cent and above", respectively.

[1] Almost 54 per cent of the total usable capex observations recorded negative values. According to accounting and finance approach (Griner and Gordon, 1995 and Sartono, 2001), a negative value of capex is not an indication of loss to a company but only reduces its total fixed-asset holding. Therefore, the decision to regroup a negative capex into lowest ordinal category is simply to avoid the elimination of such observations from the analysis.

The above categorisation separates companies into more homogeneous groupings. This allows for better comparison in terms of firms' capacity and growth performances among the different categories. The classifications simply follow an ordinal categorisation of firm performance. It assumes that, the lower (higher) ordered the firm, the lower (higher) its utilisation (performance).

Internal Cash Flow (*ICF*)

Free cash flow has been defined as the cash flow remaining after firms' have invested in all positive NPV projects' (Lang *et al.*, 1991, p. 319). The liquidity measure used in this study is described as Internal Cash Flow *(ICF)* rather than free cash flow, although its operational definition is identical. In this study, following Lehn and Poulsen (1989) and Lang *et al.* (1991), ICF is defined as:

ICF = INC – TAX – INTEXP – PFDIV – COMDIV

where:

INC	=	operating income before depreciation
TAX	=	total income taxes
INTEXP	=	gross interests expense on short and long-term debt
PFDIV	=	total amount of preferred dividend requirement on cumulative preferred stock and dividends paid on noncumulative preferred stock
COMDIV	=	Total value of dividends declared on common stock

Insider Ownership (*I_O*)

I_O is the percentage of shares owned by managers and executive boards of company (i) during period (t) for each observation period. It is mathematically formulated as follows:

$$I\_O_{it} = \frac{D \,\&\, C\ SHRS_{it}}{TOTSHRS_{it}}$$

where:

$TOTSHRS_{it}$ = Total value of shares issued

$D \,\&\, C\ SHRS_{it}$ = Shares owned by managers and executives of company (i) during period (t) (Chen and Steiner, 1999; Crutchley and Hansen, 1989; Wiwattanakantang, 1999).

According to the *MH*, *I_O* is expected to reduce the tendency of managers to over-invest in *capex* by forcing them to support more of the financial consequences of their actions. Thus, an inverse association between *capex* and *I_O* would support the *MH*. *POH*, however, believes that there is no conflict of interest between managers and the current shareholders and thus, no association is predicted between *capex* and *I_O*. The *POH* argument is taken as the null hypothesis and analysed against the alternative hypothesis of an inverse association as implied by the *MH*.

Investment Opportunity (*IOP*)

IOP is a combination of real assets (assets in place) and future investment option (Myers, 1977). The measure used is the book value of gross property, plant and equipment (PPE) ratio with the book value of the asset (BVA) (Sami *et al.*, 1999).

$$IOP_{(t+1)} = \frac{PPE_t}{BVA_t}$$

where:
IOP = Investment opportunity
PPE_t = Book value of property, plant and equipment in year (t)
BVA_t = Book value of total assets in year (t)

Interaction Effects

The Managerial Hypothesis predicts a positive interaction coefficient between *ICF, I_O* and *IOP.* In this study, the effect is estimated by the following:

$$\left[\frac{ICF(it)IOP(t+1)}{I\_O(it)}\right]$$

Total Sales

According to Griner and Gordon (1995), *sales* is normally used to control for firm size and measured by total revenues generated by company (i) during period (t). This variable also acts to isolate the impact of *ICF, I_O*, and *IOP* on *capex* and thus, reduce the minimum rate of bias (Gordon and Griner, 1995, Sartono 2001 and Myers and Majluf 1984). Without the isolation process, the correlations between *capex* and *ICF* may not be recognised, because *capex* and *ICF* may be positively correlated with the company's size, as well as *IOP*. Furthermore, the correlations between *capex* and *I_O* could be unexpected since the existence of the *I_O* in large companies is usually small.

In this study, total annual sales are used as a proxy to control for firm size. Therefore, sales are also grouped into four different categories based on simple arithmetic procedure. All groups are equally divided so that the effects of sales become easily identified. The cut-points are estimated as follow:

$$D = \begin{cases} 1 \text{ if total sales } \leqslant 25\% \\ 2 \text{ if } 25\% < \text{total sales} \leqslant 50\% \\ 3 \text{ if } 50\% < \text{ total sales} \leqslant 75\% \\ 4 \text{ if total sales } > 75\% \end{cases}$$

Group "1" represents the first 25 per cent of the sales distribution and the second 25 per cent of the data is grouped as "2". Group "3" falls between 50 to 75 per cent of the distribution and finally, the upper 75 per cent of sales is categorized as Group "4". Each group is identified as an ordinal category. It is assumed that, the higher (lower) the order of the group, the higher (lower) the total annual sales.

Model Development

The ordinary regression model assumes that the distances between categories of responses are equal. In order to avoid this basic assumption, the Ordered Logit Model (OLM) is utilised. The OLM or proportional odds models have been widely used to analyse a latent variable model (i.e., responses dependent variable). This model assumes that the categories of an ordinal response can be ranked, but the distances between the categories are unknown. The ordered logistic regression model with multiple independent variables is expressed as:

$$y^* = X_t\beta + \varepsilon_t \quad \varepsilon_t \sim NID(0, 1)$$

The vector of X_t variables could be a combination of interval, ratio and categorical variables. In the ordered logistic model observed response categories (y_i) are tied to the latent variable (y_i^*) by a measurement model that divides y_i^* into J ordinal categories so that $J - 1$ cut-points are estimated. The unobserved cut-points (threshold value) are depicted as below:

$$Y = \begin{cases} 0 & \text{if } y^* \leqslant 0 \\ 1 & \text{if } 0 < y^* \leqslant \gamma_1 \\ 2 & \text{if } \gamma_1 < y^* \leqslant \gamma_2 \\ \vdots & \\ J & \text{if } \gamma_{J-1} \leqslant y \end{cases}$$

In the latent variable model, the dependent variable y* could be divided by some thresholds parameters (i.e., limited, known, number of values), which usually must be estimated (i.e., $\gamma_1, \gamma_2, \gamma_3, \cdots, \gamma_J$), and it is essential that $\gamma_1 < \gamma_2 < \gamma_3 < \cdots < \gamma_J$.

In general, the latent variable model with multiple independent variables is express as:

$$\ln\left(Y_{j'}\right) = \ln\left(\frac{\pi_j(x)}{1-\pi_j(x)}\right) = \gamma_j + \left(\beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n\right)$$

where parameters γ_j and β_p are those to be estimated.

However, since the ordered logistic model estimates one equation over all levels of the dependent variable, a concern is whether a one-equation model is valid or a more flexible model is required. A parameterisation of each of the parallel equation when a constant is present in the model is assumed homogenous across other individual parallel model.

The final OLR model with total annual sales as a dummy variable is as depicted below:

$$\ln\left(Y_{j'}\right) = \ln\left(\frac{\pi_j(x)}{1-\pi_j(x)}\right) = \gamma_j + \left(\beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \delta D_{X5}\right)$$

where, the coefficients for each variable are as follows:

γ_j Cut - point (intercept)

β_1 *ICF*

β_2 *I_O*

β_3 *IOP*

β_4 interaction *ICF* I_O* IOP*

δ if D $\begin{cases} 1 \text{ if total sales} \leqslant 25\% \\ 2 \text{ if } 25\% < \text{total sales} \leqslant 50\% \\ 3 \text{ if } 50\% < \text{total sales} \leqslant 75\% \\ 4 \text{ if total sales} > 75\% \end{cases}$

In the proportional odds model, the covariates have the same effect on the odds as the response variable has at any dividing point. Different values of the covariates are regarded as shifting the response distribution to the right (or left) without changing its spread or shape. In the proportional odds model, the cumulative logistic model the effect of covariates on odds of response below or equal to the cut-point *m* in the latent variable.

First, the odds that an outcome is less than or equal to *m*, versus being greater than *m,* given X is defined as follow:

$$\Omega_{\leqslant m|>m}(X)=\frac{P(y\leqslant m\mid X)}{P(y>m\mid X)} \qquad \text{for m = 1, ... } J-1$$

The log of the odds is defined as follows:

$$\log\Omega_{\leqslant m|>m}(X)=\tau_m - X\beta \qquad \text{where } \tau_m \text{ is a cut-point of } m, \text{ so that}$$

$$P(y=m\mid X)=F(\tau_m - X\beta)-F(\tau_{m-1}-X\beta) \text{ and } P(y\leqslant m\mid X)=F(\tau_m - X\beta)$$

The estimation of $J-1$ cut-points and the intercept for each individual parallel equation is achieved by equating the intercept to zero.

Model Specification

Measuring goodness of fit in the OLM is one that needs to be cautiously interpreted. Since the logistic regression does not have an equivalent of the R-squared value in OLS regression, the fitted model in this study is evaluated using (i) Akaike information criterion, AIC; (ii) The Bayesian information criterion, BIC; and (iii) McFadden's R^2.

According to (Long and Freese, 2001), there is no convincing evidence that the selection of a model which maximises the value of a given measure necessarily results in a model that is optimal in any sense other than the model having a larger (or smaller value) of that measure. However, it is still helpful to examine any differences in their level of goodness of fit, and hence provide some guidelines in deciding the appropriateness of the model.

Brant (1990) test is employed to test the individuality of each parallel equation. Whenever a significant p-value is obtained, then the parallel regression assumption is violated, and a more robust technique is required.

RESULTS AND DISCUSSION

This research focuses on the capital expenditure (*capex*) decisions by Malaysian manufacturing companies listed on the Malaysian Bourse. Four independent variables are examined, namely, internal cash flows (*ICF*), insider ownership (*I_O*), investment opportunities (*IOP*), interaction terms between *ICF*, *I_O* and *IOP* and total annual sales being treated as the control variable. *Capex* is categorized into five ordinal categories while total sales are ranked into four groups. According to Griner and Gordon (1995),

using sales as the control variable captures the variability of the interaction terms between *ICF*, *I_O* and *IOP*.

Table 2 demonstrates that a unit increases in *ICF* (β_1) results in the ordered log-odds of a higher *capex* group to increase by 0.0009 unit (significant at 1% level) and thus, supports the first hypothesis. However, the proportional odds ratio for *ICF* (β_1) is 1.0009 times higher for high *capex* group as compared to other *capex* group, *ceteris paribus*. The proposed sign of *ICF* is consistent with both theory (i.e., *POH* and *MH*) and also provide support for Griner and Gordon (1995), and Sartono (2001).

β_2, the coefficient for Insider Ownership (*I_O*), shows a reverse relationship with *capex* (significant at 5 per cent level). This result suggests that a unit increase in β_2, the ordered log-odds of being in a higher *capex* category decrease by 0.0277 units, *ceteris paribus*. In terms of proportional odds ratio, it is found that an increase in β_2 reduces the effect of higher *capex* group compared to others by 0.9726 times. The significance of *I_O* towards *capex* is assumed to follow the managerial hypothesis and consistent with Scott (2003). This implies that conflict of interest between managers and shareholders do exist, and provide the incentives for over-investment on the part of the managers.

This study hypothesises that investment opportunity (*IOP*) is positively related to *capex*. Rather, the findings show that the *IOP* coefficient is negatively correlated and significant at 10 per cent level. This particular result demonstrates that companies in Malaysia tend to behave according to the argument of the managerial hypothesis. In other words, managers attempt to capitalise on the investment opportunities more for personal wealth maximisation rather than for shareholders' value (Mansor and Hamidi, 2008). The proportional odds ratio indicates that a unit increase in β_3 would lower the higher *capex* group utilisation by 0.3975 times in comparison to the other groups.

Table 2 also shows that as predicted by the managerial hypothesis, the interaction terms between *ICF*, *I_O* and *IOP* are positive but insignificant. Compared to other groups, the effect of the interaction terms increases the proportional odds ratio of higher *capex* group nearly one time. This finding is similar and consistent to study conducted by Fazzari and Athey (1987), Fazzari *et al.* (1988), and Griner and Gordon (1995).

At 10 per cent level, the sales variable is statistically significant and the level improves as sales progress to a higher than the basic group. In short, sales within group "2" affect higher *capex* level at 0.4292 units compared to group sales "1". Similarly the effect of sales of group "2" towards higher *capex* group is recorded at 1.5 times higher compared to others. Moreover, the proportional odds ratio increases to about 1.7 times for sales group "3", and almost 2 times higher for the highest sales group. Overall, annual sales and *capex* are positively correlated. This result thus, supports Griner and Gordon (1995), and Myers and Majluf (1984).

Table 2 Results of Ordered Logistic Regression with Odd-ratios

	Form Level		**Odd-ratio Level**	
$\ln\left(\frac{\pi_j(x)}{1-\pi_j(x)}\right)$	Coef	Z-value	Coef	Z-value
γ_1	–0.1764		–0.1764	
γ_2	0.4491		0.4491	
γ_3	1.1173		1.1173	
γ_4	2.1225		2.1225	
β_1	0.0009	3.09***	1.0009	3.09***
β_2	–0.0277	–2.17**	0.9726	–2.17**
β_3	–0.9226	–1.79*	0.3975	–1.79*
β_4	0.00003	1.58	1.0000	1.58
δ_2	0.4292	1.83*	1.5360	1.83*
δ_3	0.5287	2.21**	1.6967	2.21**
δ_4	0.6913	2.34**	1.9963	2.34**
	Diagnostic test			
LR Chi-sq (7)	57.30***			
McFadden R-sq	0.0413			
AIC	1353.692			
BIC	1399.396			
Brant (1990) test	23.44 (**0.321**)			

Notes:
***,**,* denotes a significant value at 1%, 5% and 10% respectively.
Values in parenthesis denote p-value.
Brant test: test conducted to identify the parallel regression equation for each of the individual model. A significant test signifies that parallel regression (homogeneity) assumption is violated.

The consistency of each of the parallel regression is tested using the procedure proposed by Brant (1990). According to Brant (1990), if each of the coefficients is found to be similar for each single equation, then the OLR assumption is violated. As reported in Table 2, the chi-square value is 23.44 (not significant) and therefore, confirms that

the coefficients across the four parallel individual regressions were homogenous. The McFadden R-square should be interpreted cautiously since in limited dependent variables the measurement of goodness of fit is incomparable with the OLS, but then again, it is still helpful to examine any differences in their level of goodness of fit, and hence provide some guidelines in deciding the appropriateness of the model.

CONCLUSION

This research extends the previous work on the capital expenditure (*capex*) decisions by Malaysian manufacturing companies (Mansor and Hamidi, 2008). Based of the gap in expectations between the arguments of the Pecking Order Hypothesis (*POH*) and the Managerial Hypothesis (*MH*), four main hypotheses are proposed. Four independent variables are examined, namely, internal cash flows (*ICF*), insider ownership (*I_O*), investment opportunities (*IOP*) and *sales* as the control variable. Unlike the earlier study which used the OLS method, this research applies the Ordered Logistic Regression (OLR) model. The independent variable (*capex*) is categorised and ranked into five ordinal categories. The control variable is divided into four groups, which are also ranked ordinarily to capture the variability of the independent variables. This study also provides mixed support for the two hypotheses and reveals interesting characteristics with regards to the managerial style among the Malaysian PLCs.

As predicted by both *POH* and *MH*, the results show positive and significant impact of *ICF* on higher *capex* group. Both theories, however, predict different outcome with respect to the relationship between *I_O* and *IOP*. The *POH* predicts no effect of *I_O* on *capex* while the *MH* argues for a negative relationship between the two. In this study, *I_O* is found to have a significant negative impact on higher *capex* group (at 5 per cent) and thus, supports the *MH*. With respect to *IOP*, the *POH* suggests that it is positively related to *capex* since managers attempt to maximize shareholders' wealth. However, the *MH* holds that *capex* is not affected by *IOP*. Contrary to both the *MH* and *POH*, this study documents a significant negative effect of *IOP* on higher *capex* group.

As predicted, the results suggest that *ICF* and *capex* are positively related and thus, provide further support for the importance of *ICF* in *capex.* In contrast to the argument of *POH*, there is no evidence that the use of *ICF* to finance *capex* is due to information asymmetry. Rather, such action is motivated by managerial intention to optimise personal benefits. The conflict of interest between managers and shareholders is detected from the negative (significant at 5%) coefficient for *I_O*. This finding is consistent with Kim (2006) and supports the MH. It reflects that in Malaysia, even in publicly-owned companies, the family-effect may still dominate. To a certain extent, the family-ownership effect influences the directors' *capex* decisions and helps to reduce the significance of agency cost in capital expenditure decisions. Also, unlike the case of Indonesia (Sartono, 2001), the study provides mixed results as to the dominance of *POH* and *MH* in Malaysia. More

specifically, the results partially support the *MH* and not fully neglect the *POH*, providing evidence of the significance of agency conflict between managers and shareholders in *capex* decisions. These results are beneficial to the shareholders in making a decision on how to tackle the conflict of interest between managers and shareholders, as well as reduce the tendency of over-doing investment by the management.

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