Sovereign Wealth Fund Investment Decisions: Temasek Holdings

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Abstract
Sovereign wealth funds are government controlled investment vehicles that invest in corporations around the world. While there is some concern about politically motivated investment and complaints about the lack of accountability and transparency there is little analysis of the investments that are actually made by sovereign wealth funds. We use t tests, logit and tobit in analysis of the Singapore based investments of Temasek Holdings, a sovereign fund controlled by the Singapore Government. The analysis is based on disclosures appearing in the annual reports of a sample of listed Singapore companies over the period 2000 to 2004. It is found that Temasek favours investment in larger listed companies with low levels of director blockholding. Further, the level of investment in a particular company is positively related with size and negatively related with director blockholding and the proportion of independent directors on the board.

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1. Introduction and Discussion

Sovereign wealth funds have become an important investor class across the financial markets of the world though there are some differences between this investor class and the better-known asset managers, private equity funds and hedge funds. While sovereign investment vehicles include central banks (monetary authorities), sovereign stabilization funds, sovereign savings funds, government investment corporations and affiliated corporate entities, sovereign wealth funds generally fall within the classification of sovereign stabilization fund or sovereign savings fund (Butt et. al., 2008).[1]

Blundell-Wignall et. al. (2008, p. 2) describe sovereign investment funds as "… pools of assets owned and managed directly or indirectly by governments to achieve national objectives." This description focuses on the ultimate control of the fund and the possibility of political interference in financial markets by powerful politically motivated sovereign wealth funds has been noted in the literature (Truman, 2007).[2] Alternatively, Butt et. al.(2008) defines these funds in terms of how the funds were generated, stating that these funds are "… government created investment vehicles that are typically funded by commodity export revenues or the transfer of assets directly from official foreign exchange reserves… " (Butt et. al., 2008, p.73). This suggests a longer term motivation for the creation and maintenance of wealth, with a view to transferring current wealth to future generations. These definitions suggest considerable variation in the management of sovereign wealth funds. A sovereign wealth fund designed to meet political initiatives will behave quite differently from a fund that creates wealth for future generations or one that is set up

[1] Temasek Holdings, the subject of analysis in this paper, falls within the savings fund classification with the long term objective of promoting domestic and regional development (Butt et al, 2007).
[2] Indeed, Truman (2007) argues for increased sovereign wealth fund transparency and accountability to allay fears concerning these issues.

for stabilization purposes.

Perhaps the most direct way of studying sovereign wealth fund investment is to analyse the investments that a fund makes but this is rarely possible as the sovereign wealth funds are generally reticent to divulge information about how they made their investments decisions. An exception is Temasek holdings, set up by the Singapore Government in June 1974. We use the information provided by Temasek holdings about its Singapore Stock exchange investments as well as data obtained from a panel of Singapore companies to gain insight into the firm characteristics that might determine Temasek domestic investment.

The period from 2000 to 2004 is selected to avoid the regional impact of the 1997 Asian crisis as well as the unusually strong equity boom spanning 2005 to 2008.[3] We find that Temasek Holdings is quite selective in its Singapore based corporate investment decisions. Logit analysis suggests that the likelihood of investing in a Singapore listed company is positively related with company size and negatively related with director blockholding. Further, tobit analysis shows that the level of investment in a particular Singapore listed company is positively related with company size and negatively related with both director blockholding and the proportion of independent directors on the board. While the Singapore companies that Temasek invests in exhibit statistically significantly stronger return on equity than other Singapore companies in the sample over much of the study period, current performance is not a statistically significant determinant of whether a company remains in Temasek's portfolio of investments. Data is described in the following section while the results from statistical analysis are reported in Section 3 with conclusions drawn in Section 4.

[3] This period does include variation in economic growth with the bursting of the dot.com bubble in April 2000, the destruction of the world trade centre on 11 September 2001 and the recovery that followed.

2. Data

The Temasek Holdings investment percentages for individual Singapore companies (TEMASEKHLD) are obtained from the Temasek Holdings annual review.[4] The sample of Singapore companies that is used in analysis consists of the largest 150 Singapore companies by market value in 2002, covered by the OSIRIS database, Bureau van Dijk.[5] Data is collected for these firms from 2000 through to 2004 to provide the final sample used in analysis. Listed Singapore company information is obtained from OSIRIS and from pdf copies of the original annual reports, supplied by Bureau van Dijk. Datastream is also used as a supplementary reference for some of the variables, particularly for the market value based variables where OSIRIS coverage was not complete in earlier years. A number of firms were dropped from the analysis due to incomplete data.

The variables collected for each of the Singapore firms included in the sample can be allocated to the broad classifications, performance, risk, liquidity and governance. Return on equity (ROE) is used to capture firm performance. Market to book value (MTBV) is included both as a measure of performance and also to capture the possibility of an investment bias towards value firms, as distinct from growth firms. The two risk variables used in the study include equity beta (BETA), which captures risk relative to the Singapore equity market, and a solvency ratio defined as the ratio of shareholders funds to totals assets (SOLVENCY). We use a measure of firm size, defined as the natural log of the market value of firm assets, to capture the impact of liquidity (LMV) as larger firms tend to be more liquid that smaller firms.[6]

[4] The most recent editions of the annual review are available from the Temasek holdings web site (http://www.temasekholdings.com.sg/).
[5] General information concerning Datastream is available on the web (http://www.bvdep.com/)
[6] Size may also proxy for risk as larger firms tend to be less risky than smaller firms.

Governance variables include shareholder concentration calculated as the percentage of shares held by the top 20 shareholders (CONCSHR). There are also variables that deal particularly with the board of directors. The level of director block-holding is estimated using a count of the number of directors with control of more than 5% of the company's shares (DIRBLK). Board independence is approximated by the percentage of independent directors on the board (INDDIR). Board size is estimated using the natural log of the number of directors on the board (LBSIZE). Further, it is not uncommon for directors to be allocated shares and options in the company. This can help to align director and shareholder incentives. The percentage of directors on the board with shares in the company (DIRSHARES) and the percentage of directors on the board with options in the company (DIROPTS) are included to capture this incentive alignment effect.

Table 1, Panel A provides descriptive statistics for the data pooled over the period from 2000 to 2004. The Temasek holdings investments (TEMASEKHLD) in our pooled sample of Singapore listed companies varies from 0.0% to 87.2% over the five year period for our sample with a full sample pooled average of 7.55%. Temasek Holdings does not invest in all of the listed Singapore companies and this is evident from the pooled average shareholding of 47.6% for Temasek holdings Singapore company investments (Panel B of Table 1). The average investment in our sample of Singapore companies varies over the period from a minimum of 39.11% in 2000 through to maximum of 50.87% in 2003. The number of Singapore firms that have Temasek Holdings shareholding have increased over the period from 11 in 2000 through to 21 in 2004. The sample size varies from 69 listed Singapore companies in 2000 through to 124 listed Singapore companies in 2004. It should be noted that while the original 2002 list of companies included 150 firms only companies with a

complete set of data were included in the study.[7] Correlation coefficients are also reported for the explanatory variables used in later analysis. There is fairly strong correlation between the size variable (LMV) and the variables, board size (BSIZE), shareholder concentration (CONCSHR) and the number of directors who are share blockholders (DIRBLK). Correlation is also evident between the return measures (ROE and MTBV) and between the proportion of directors holding shares in the company (DIRSHARES) and number of directors who are share blockholders (DIRBLK). While some of the correlation coefficients are fairly large, as indicated in Panel C of Table 1, these do not appear to lead to multicollinearity problems in later analysis.[8]

[Insert Table 1 about here]

3. Analysis

The analysis of the Temasek investment in Singapore companies includes univariate tests, t tests and Mann Whitney non-parametric tests, logit analysis of the propensity for Temasek to maintain investment in particular Singapore companies and tobit analysis of the proportion of shares that Temask chooses to hold in the company. While it is important to understand the differences that exist between those companies that Temasek invests in and those that it chooses not to invest in it is also important to get some sence of what marks a company as being suitable for Temasek investment and logit analysis is relied upon to address this question. Tobit is used in analysis of the determinants of the level of ownership in the company and this is quite a different, though important, question. Pooled logit and tobit are used in the analysis that follow.

[7] For example, of the 150 companies identified in 2002, there were 39 with incomplete governance information and three companies with incomplete market data leaving 108 firms for analysis.
[8] Separate analysis both including and excluding the more highly correlated variables had little impact on the final analysis.

3.1 Univariate comparisons

Univariate tests of the differences that exist between firms with Temasek Holdings shareholding (Temasek companies) and those without are reported in Table 2. The average for each of the variables for these two groups is report in Table 2 along with the two-tailed probability from a t test (adjusted for unequal variance) for difference between the two groups of firms. While not reported separately, Mann Whitney non-parametric tests are also conducted across the Temasek and non Temasek groups with similar results.

Temask companies earn higher ROE on average, except in 2001, and this difference is statistically significant in 2002, 2003 and 2004. The Temasek group of companies have greater MTBV though this is only statistically significant in 2001. Thus, the companies that Temasek has invested in have tended to out-perform the other companies in the sample both in terms of returns and standardised value.

BETA is also lower for the Temasek companies with statistically significant difference in 2001. The SOLVENCY is also generally smaller for Temasek companies with statistical significance in 2001. Thus, while Temasek companies exhibit lower risk relative to the Singapore market these companies also make greater use of credit with more liabilities per dollar of assets. Temasek company LMV is also statistically significantly greater in each of the five years, consistent with a Temasek investment focus on large Singapore companies.

For 2001 through to 2004 the Temasek companies exhibit more concentrated shareholding (CONCSHR) and this difference is statistically significant over this period, consistent with the Temasek Holdings preference for very large block holdings in its investments. The number of directors holding at least a 5% block-

holding in the company's shares (DIRBLK) is statistically significantly smaller for Temasek firms in all years, suggesting a preference for companies with a fairly diverse shareholding. The proportion of independent directors on the board (INDDIR) is greater for Temasek companies though this is only statistically significantly from 2002 onwards. This aligns with the statistically significantly larger board size (BSIZE) in the Temasek companies from 2001 onwards. Differences in both the proportion of the independent directors and board size could result from Temasek companies paying closer attention to the Code of Corporate Governance introduced on the 21 March 2001 in Singapore.[9]

Finally, while the difference is generally not statistically significant, Temasek companies have a lower proportion of directors on their board with shares in the company (DIRSHARES), statistically significant in 2004, and a greater proportion of directors on the board with options in the company (DIROPTS), statistically significant in 2003 and 2004. There are some important trends evident in Director option and shareholding evident in the data. First, the proportion of directors with options has almost doubled over the period from 2000 to 2004 for both Temasek companies and non-Temasek companies. Second, a greater proportion of directors holds shares in Singapore companies (relative to options), regardless of whether Temasek Holdings has an interest in the company or not. Finally, while there has been some increase in the level of director shareholding for Temasek companies this is not evident for non-Temasek companies over the period of the study.

[9] http://info.sgx.com/SGXWeb_LISTINGS.nsf/Code+of+Corp+Governance?openview

3.2 Logit analysis

We use the logit model of discrete choice in modelling the determinants of Temasek investment choice (Greene, 2003). The probability of a Singapore firm in our sample being a Temasek investment (*TEMASEK_INV*)is defined as follows:

$$\Pr ob(\mathbf{f}irm_i = TEMASEK\_INV \mid \mathbf{x}) = \frac{e^{x'\beta}}{1+e^{x'\beta}} = \Lambda(x'\beta) \quad (1)$$

$$\text{Where } x'\beta = \begin{cases} \beta_0 + \beta_1 ROE_{it} + \beta_2 MTBV_{it} + \beta_3 BETA_{it} + \beta_4 SOLVENCY_{it} + \beta_5 LMV_{it} \\ + \beta_6 CONCSHR_{it} + \beta_7 DIRBLK_{it} + \beta_8 INDDIR_{it} + \beta_9 LBSIZE_{it} \\ + \beta_{10} DIRSHARES_{it} + \beta_{11} DIROPTS_{it} \end{cases}$$

The final model is estimated using a random effects panel data approach. The results from logit analysis are reported in Table 3. This analysis focuses on what best explains the likelihood of Temasek Holdings investing in a particular Singapore listed company. The probability of a listed Singapore company having Temasek Holdings on its shareholder list is positively related with the size of the company (LMV) at the 5% level of significance and negatively correlated with the number of directors who are also blockholders in the company (DIRBLK) at the 10% level. Thus, large companies with few blockholders are most likely to include Temask Holdings on their register of shareholders.

While not statistically significant, Temasek Holdings investment is also more likely the greater the proportion of directors with shares (DIRSHARES) or options (DIROPTS), the larger the board size (BSIZE), the more concentrated the shareholding (CONCSHR) consistent with the large block of shares that Temasek Holdings generally purchases, and the greater the return on equity (ROE). Further, Temasek Holdings investment is less likely the greater is MTBV, BETA, SOLVENCY (lower levels of credit) and the fewer the number of independent directors.

Thus, while there are considerable differences identified between the Temasek companies and the remainder of the sampled companies in the t tests reported in Table 2, size and director blockholding are the key variables explaining the likelihood of a listed Singapore company being a Temasek company. Temasek's investment in larger companies seems reasonable given its focus on creating wealth in the future. These companies are reasonably liquid companies with good prospects. Further, the tendency to avoid investing in companies with greater levels of director blockholders results in investing in companies that are fairly widely held. Temasek appears to favour maintaining a controlling interest in the companies it invests in rather than sharing control with other groups such as founding families.

3.3 Tobit analysis

Random effects panel data based tobit analysis is used explore the variation in the proportion of the shares acquired in particular Temasek companies (Greene, 2003). The tobit model is a censored regression model in that the investment in Singapore companies can be viewed as a two step process. First, Temasek must decide whether to invest in the company and then once this decision is made it must then decide on the level of investment that should be made in the company. The latent variable, $TEMASEKHLD_i^*$, gives rise to the censored variable, $TEMASEKHLD_i$, that we are ultimately interested in. It has a value of zero where Tamasek chooses not to invest in the company and the actual proportion of shares where Temasek chooses to invest in the company. The tobit model can be written as:

$$TEMASEKHLD_i^* = x'\beta + \varepsilon_i \qquad (2)$$

Where $TEMASEKHLD_i = 0$ if $TEMASEKHLD_i^* \leq 0$

$TEMASEKHLD_i = TEMASEKHLD_i^*$ if $TEMASEKHLD_i^* > 0$

$$x'\beta = \begin{cases} \beta_0 + \beta_1 ROE_{it} + \beta_2 MTBV_{it} + \beta_3 BETA_{it} + \beta_4 SOLVENCY_{it} + \beta_5 LMV_{it} \\ + \beta_6 CONCSHR_{it} + \beta_7 DIRBLK_{it} + \beta_8 INDDIR_{it} + \beta_9 LBSIZE_{it} \\ + \beta_{10} DIRSHARES_{it} + \beta_{11} DIROPTS_{it} \end{cases}$$

This approach allows us to address the question, why in 2002 does Temasek Holdings control 57% of the shares in Singapore airlines yet only 32% of the shares in Keppel corporation? The results of this analysis are reported in Table 4 with a statistically significant positive coefficient for size (LMV) at the 5% level and negative coefficients for the number of directors with blockhlding (DIRBLK) and the proportion of independent directors on the board (INDDIR) at the 10% level of significance. Temasek prefers to hold a greater proportion of shares in large listed Singapore companies (LMV), while holding a smaller proportion of shares in those companies with more directors who are blockholders (DIRBLK) and those with more independent directors (INDDIR).

While the remaining coefficients are not statistically significant the level of investment in Temasek shares is positively correlated with ROE, shareholder concentration (CONCSHR), board size (BSIZE) and the proportion of directors with shares in the company (DIRSHARES). Further, the proportion of shares held in the company is negatively correlated with MTBV, BETA, SOLVENCY and the proportion of directors with options in the company (DIROPTS).

Thus while the probability of Temask Holdings investment in a Singapore listed company is positively related with size (LMV) and negatively related with the number of director blockholders in the company (DIRBLK) the actual magnitude of the investment by Temasek in these companies is also positively related with size (LMV) and negatively related with the number of director blockholders in the company (DIRBLK). There is also evidence that the greater the proportion of

independent directors on the board (INDDIR) the smaller the final investment in the Temasek company. This later result is consistent with Temasek Holdings maintaining sufficient control over the company to protect its investment. Where governance is strong, as might be expected with a high level of independent directors, Temasek Holdings may not need to maintain the same level of control over the company's listed shares that would be required for a company where governance is not so strong.

4. Conclusions

The activities of Sovereign wealth funds has generated some discussion in recent times though there is very little known about the investment activities of these funds. In this paper we analyse the characteristics and behaviour of Singapore Listed companies with Temasek Holdings, a Singapore based sovereign wealth fund, on their share register. The analysis suggests that Temasek Holdings invests in large listed Singapore companies with relative high return on equity. These Temasek companies tend to have less dispersed shareholding due to the size of investment that Temasek generally makes, with greater levels of independent directors and larger board size, particularly since 2001. There is also considerably less evidence of directors who are blockholders among the Temasek companies.

Both company size and the level of director block holding are important in determining the likelihood that a listed Singapore company remains part of the Temasek company portfolio and these variables are also important in explaining the level of investment in Temasek companies once Temasek decides to invest, though the level of independent directors also has a role to play in the decision. The interplay between the level of direct Temasek investment in a Singapore company and the level of independent directors on the board provides some evidence in support of the

inclusion of independent directors on Singapore company boards of directors.

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Table 1
Descriptive Statistics

The descriptive statistics, mean, median, standard deviation, maximum and minimum, are reported for the pooled sample of companies listed on the Singapore stock exchange spanning the period from 2000 to 2004. The number of pooled observations is 523. TEMASEKHLD, is the proportion of the shares in the company held by Temasek Holdings, ROE is the return on equity, MTBV is the Market to book value of equity, BETA is the risk of the share relative to the Singapore equity market, SOLVENCY is the ratio of shareholders funds to totals assets. LMV is the market value of firm assets, CONCSHR is the percentage of shares held by the top 20 shareholders, DIRBLK is a count of the number of directors with control of more than 5% of the company's shares, INDDIR is the percentage of independent directors on the board, LBSIZE natural log of the number of directors on the board, DIRSHARES is the percentage of directors on the board with shares in the company and DIROPTS is the percentage of directors on the board with options in the company, Avg. Tem. Inv. % is the average Temasek Holdings investment in listed Singapore companies included in the sample, N (Tem.) is the number of firms in the sample with Tem. Holdings shareholding, N (No Tem.) is the number of firms in the sample with without Temasek Holdings shareholding, N (Total) is the number of firms in the sample for the period.

Panel A, Pooled data, 2000 to 2004

Variables	*Mean*	*Median*	*Standard Deviation*	*Maximum*	*Minimum*
TEMASEKHLD	7.55	0.00	20.32	87.19	0.00
ROE	8.87	9.40	38.68	466.16	-414.44
MTBV	1.52	1.07	2.26	44.45	0.08
BETA	1.07	1.09	0.34	1.96	0.06
SOLVENCY	52.71	52.34	20.55	99.04	3.14
LMV	5.74	5.30	1.58	13.88	3.06
CONCSHR	79.74	82.28	12.17	100.00	28.10
DIRBLK	0.79	1.00	0.86	5.00	0.00
INDDIR	47.68	42.86	19.70	100.00	0.00
LBSIZE	2.05	2.08	0.27	2.77	0.00
DIRSHARES	52.70	54.55	26.30	100.00	0.00
DIROPTS	25.72	9.09	33.55	100.00	0.00

Panel B, Temasek Holdings investment in Singapore companies

Variables	*All years*	*2000*	*2001*	*2002*	*2003*	*2004*
Avg. Tem. Inv. %	47.60	39.11	50.05	47.42	50.87	47.32
N (Tem.)	83	11	15	16	20	21
N (No Tem.)	440	58	84	92	103	103
N (Total)	523	69	99	108	123	124

Panel C, Correlations for explanatory variables using pooled data, 2000 through 2004

Correlation coefficients are calculated using pooled data for the years 2000 to 2004 inclusive. ROE is the return on equity, MTBV is the Market to book value of equity, BETA is the risk of the share relative to the Singapore equity market, SOLVENCY is the ratio of shareholders funds to totals assets. LMV is the market value of firm assets, CONCSHR is the percentage of shares held by the top 20 shareholders, DIRBLK is a count of the number of directors with control of more than 5% of the company's shares, INDDIR is the percentage of independent directors on the board, LBSIZE natural log of the number of directors on the board, DIRSHARES is the percentage of directors on the board with shares in the company and DIROPTS is the percentage of directors on the board with options in the company. * (+) statistically significant at the 5% (10%) level of significance.

	ROE	*MTBV*	*BETA*	*SOLVENCY*	*LMV*	*CONCSHR*	*DIRBLK*	*INDDIR*	*LBSIZE*	*DIRSHARES*
MTBV	0.43									
BETA	-0.09	-0.10								
SOLVENCY	0.01	-0.14	-0.13							
LMV	0.14	0.12	-0.11	-0.26						
CONCSHR	0.17	0.04	-0.18	-0.07	0.34					
DIRBLK	-0.02	-0.04	0.19	0.17	-0.41	-0.20				
INDDIR	0.06	0.10	-0.07	-0.05	0.14	0.03	-0.18			
LBSIZE	0.03	-0.03	-0.12	-0.20	0.49	0.24	-0.18	0.04		
DIRSHARES	0.04	-0.05	0.07	0.05	-0.14	-0.17	0.42	-0.18	-0.14	
DIROPTS	0.13	0.10	-0.02	-0.09	0.09	0.00	-0.08	0.06	0.07	0.02

Table 2
Univariate tests across firms with and without Temasek Holdings shareholding

The results for t tests for statistically significant differences between companies with Temasek shareholding and those in the sample without Temasek shareholding for the years 2000 to 2004 inclusive. The t tests are adjusted for differences in variance between the two groups. Tem. refers to firms with companies with Temasek Holdings shareholding and No Tem. refers to companies without Temasek Holdings shareholding. Three columns are reported for each year. The first contains the mean value for the Temasek firms. The second column contains the mean for the remaining firms in the sample and the last is the two tailed t test probability. The sample counts are reported in Panel B of Table 1 above. ROE is the return on equity, MTBV is the Market to book value of equity, BETA is the risk of the share relative to the Singapore equity market, SOLVENCY is the ratio of shareholders funds to totals assets. LMV is the market value of firm assets, CONCSHR is the percentage of shares held by the top 20 shareholders, DIRBLK is a count of the number of directors with control of more than 5% of the company's shares, INDDIR is the percentage of independent directors on the board, LBSIZE natural log of the number of directors on the board, DIRSHARES is the percentage of directors on the board with shares in the company and DIROPTS is the percentage of directors on the board with options in the company. * (+) statistically significant at the 5% (10%) level of significance.

	2000			*2001*			*2002*			*2003*			*2004*		
Variables	Tem.	No Tem.	t test	Tem.	No Tem.	t test	Tem.	No Tem.	t test	Tem.	No Tem.	t test	Tem.	No Tem.	t test
ROE	55.49	12.10	0.33	6.23	7.37	0.92	14.19	2.29	0.05*	14.59	6.64	0.04*	21.38	7.29	0.01*
MTBV	5.79	1.32	0.28	2.71	1.12	0.05*	1.55	1.05	0.06+	1.65	1.61	0.86	1.79	1.55	0.33
BETA	0.99	1.04	0.78	0.85	1.07	0.05*	0.92	1.11	0.09+	1.05	1.08	0.71	1.04	1.10	0.46
SOLVENCY	44.52	52.25	0.31	41.48	57.04	0.02*	46.65	54.20	0.20	49.02	53.73	0.38	46.45	52.53	0.17
LMV	6.62	5.63	0.10+	7.59	5.34	0.00*	7.00	5.05	0.00*	7.59	5.60	0.00*	7.64	5.56	0.00*
CONCSHR	79.69	80.89	0.78	85.05	79.62	0.07+	84.87	78.87	0.02*	87.29	77.63	0.00*	86.20	77.71	0.00*
DIRBLK	0.36	0.84	0.05*	0.20	0.96	0.00*	0.31	0.89	0.00*	0.10	0.86	0.00*	0.19	0.89	0.00*
INDDIR	43.76	42.79	0.93	55.62	45.59	0.16	60.40	47.66	0.08+	56.84	45.87	0.05*	59.10	47.13	0.02*
LBSIZE	1.92	2.04	0.56	2.25	2.02	0.00*	2.24	2.00	0.00*	2.29	2.02	0.00*	2.30	2.01	0.00*
DIRSHARES	44.24	53.65	0.60	47.15	55.09	0.60	47.29	53.64	0.47	48.49	52.62	0.16	52.71	52.80	0.03*
DIROPTS	23.15	15.14	0.33	23.95	18.06	0.40	33.47	23.74	0.26	44.00	29.32	0.03*	44.61	28.02	0.02*

Table 3
Logit analysis of Singapore firms with Temasek shareholding

The results from pooled random effects logit analysis for the years 2000 to 2004 inclusive are reported below. Analysis focuses on those listed Singapore companies with Temasek Holdings shareholding relative to those without Temasek Holdings shareholding. ROE is the return on equity, MTBV is the Market to book value of equity, BETA is the risk of the share relative to the Singapore equity market, SOLVENCY is the ratio of shareholders funds to totals assets. LMV is the market value of firm assets, CONCSHR is the percentage of shares held by the top 20 shareholders, DIRBLK is a count of the number of directors with control of more than 5% of the company's shares, INDDIR is the percentage of independent directors on the board, LBSIZE natural log of the number of directors on the board, DIRSHARES is the percentage of directors on the board with shares in the company and DIROPTS is the percentage of directors on the board with options in the company. * (+) statistically significant at the 5% (10%) level of significance.

Variables	*Coefficient*	*z value*	*Prob.*
ROE	0.0160	1.01	0.31
MTBV	-0.0723	-0.40	0.69
BETA	-1.0396	-0.64	0.52
SOLVENCY	-0.0285	-1.13	0.26
LMV	1.2905	3.54	0.00*
CONCSHR	0.0042	0.13	0.90
DIRBLK	-1.2580	-1.69	0.09+
INDDIR	-0.0162	-0.91	0.36
LBSIZE	0.7255	0.62	0.53
DIRSHARES	0.0250	1.49	0.14
DIROPTS	0.0028	0.24	0.81
Wald Test, Chi. Sq. (11)		25.94	0.01*
N (total)	523		
N (groups)	129		

Table 4
Tobit analysis of Temasek shareholding Singapore firms

The results from pooled random effects tobit analysis for the years 2000 to 2004 inclusive are reported below. Analysis focuses on explaining the proportion of the Temasek company shares that are owned by Temasek Holdings. ROE is the return on equity, MTBV is the Market to book value of equity, BETA is the risk of the share relative to the Singapore equity market, SOLVENCY is the ratio of shareholders funds to totals assets. LMV is the market value of firm assets, CONCSHR is the percentage of shares held by the top 20 shareholders, DIRBLK is a count of the number of directors with control of more than 5% of the company's shares, INDDIR is the percentage of independent directors on the board, LBSIZE natural log of the number of directors on the board, DIRSHARES is the percentage of directors on the board with shares in the company and DIROPTS is the percentage of directors on the board with options in the company. * (+) statistically significant at the 5% (10%) level of significance.

Variables	*Coefficient*	*z value*	*Prob.*
ROE	0.1587	1.51	0.13
MTBV	-1.2987	-1.04	0.30
BETA	-6.6698	-0.40	0.69
SOLVENCY	-0.2223	-0.98	0.33
LMV	6.1939	2.15	0.03*
CONCSHR	0.2983	0.94	0.35
DIRBLK	-13.4342	-1.92	0.06+
INDDIR	-0.2078	-1.70	0.09+
LBSIZE	11.4191	1.24	0.22
DIRSHARES	0.1883	1.32	0.19
DIROPTS	-0.0591	-0.57	0.57
Wald Test, Chi. Sq. (11)		20.04	0.04*
N (total)	523		
N (groups)	129		
Left-censored	440		
Uncensored	83		