

Understanding the decision making process of Sovereign Wealth Funds :The case of Temasek

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"SWFs are a watershed in the balance of world economic power. [These funds] have been **particularly active** with financial institutions in the developed world, which they broadly consider as strategically important. In our view, this is not a fad but **the beginning of a long-term trend**, as the sovereign wealth fund will form **the most powerful new category of investors in the world**, with Japan likely the next new member." (Morgan Stanley chief currency economist Stephen Jen, 2012)

⇒ SWFs : major players in the world

Outline of the Presentation

- ① Motivation Objective
- ② Literature Review
- ③ Data Analysis
- ④ Methodology
- ⑤ Results
- ⑥ Conclusion

Motivation Objective

- A SWF is an investment fund that meets 5 criteria (Monitor-FEEM definition) :
 - 1 It is owned by a sovereign government
 - 2 It is managed independently from the central bank
 - 3 It does not have predominant pension obligations
 - 4 It invests in a diverse set of financial asset classes in pursuit of financial returns
 - 5 It has made a significant proportion of publicly-reported investments internationally

Objective of this paper

- To understand the underlying strategy of SWF by **analyzing the decision-making process**
 - ① why does Temasek invest in a company ?
 - ② If so, why does Temasek invest in a listed vs unlisted company ?
 - ③ If so, why does Temasek take a significant stake of a listed company ?
- A SWF takes these decisions simultaneously.
- Focus on Temasek (Singapore's SWF) :
 - ① ... represents 26% of foreign investments of all sample
 - ② ... is in the top 5 of SWF size
 - ③ ... has the highest score of transparency (Linaburg-Maduell index)
 - ④ ... is one of the oldest fund
- With a unique hand-collect database

Literature Review

Litterature review 1 :Impact

- Short and long-term valuation impact of SWF investments with event study methodology (Bortolotti et al. 2010, Dewenter et al. 2009, Fernandes 2009, Karolyi et al. 2009, Kotter et al. 2009, Knill et al. 2009, Sun et al. 2009, D. Euler 2013, E. Sojli and Wing Wah Tham 2011, H. Raymond 2009, Dinh Bao Ngoc 2011, R. Beck et al. 2008, Fotak et al. 2008)
 - ① Significant positive abnormal returns in the short-term
 - ② The sign of long-run returns is ambiguous ($0?$ or $<0?$)

Litterature review 2 : Determinants

- Analysis of SWF investment's determinants (Lyons 2007, Balding 2008, Aizemann and Glick 2008, Avendano et al. 2009, Bernstein et al. 2009, Knill et al. 2012 and 2013, Jan Zilinsky 2010, Candelon et al. 2012, Fernandez 2009)
 - ① Financial characteristics of the firm
 - ② Cultural and geographical considerations
- Investments are not entirely driven by profit maximization

Let's summarize now the aim of the paper

Contribution to the literature :

- Objective : to gain some insight into the decision making process of an active SWF (Temasek, Singapore)

To reach this objective, we have to address 3 questions :

- ① Why does Temasek invest in a company? \implies Wealth effect
- ② If so, why does Temasek invest in a listed or non listed company? \implies Asymmetry of information & financial characteristics of the country of the SWF
- ③ If so, why does Temasek take the decision to have a significant stake in a listed company? \implies performance of the firms & risk of the country of the firm

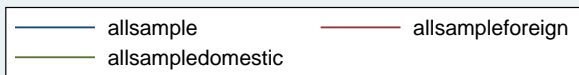
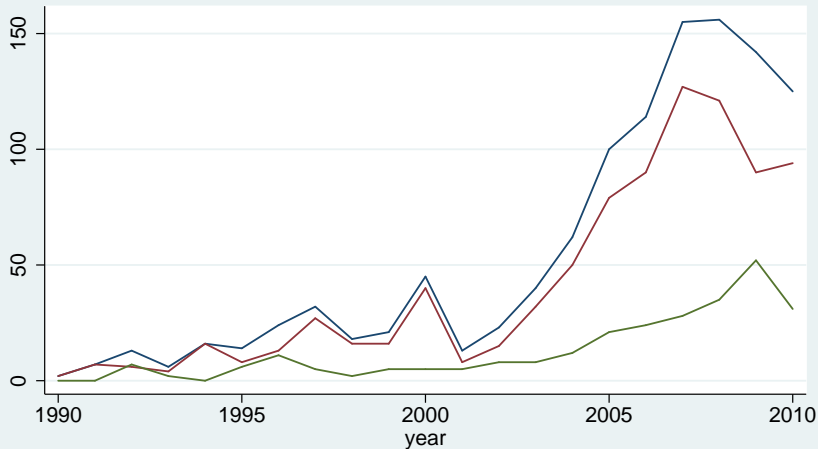
How to do ?

- Hand-collection of large scale database from 1990 to 2010, including the financial crisis (1123 acquisitions)
- The successive steps of this procedure are likely to be highly interdependent \implies Nested logit model for a joint estimation of these 3 levels of decision

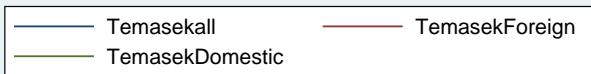
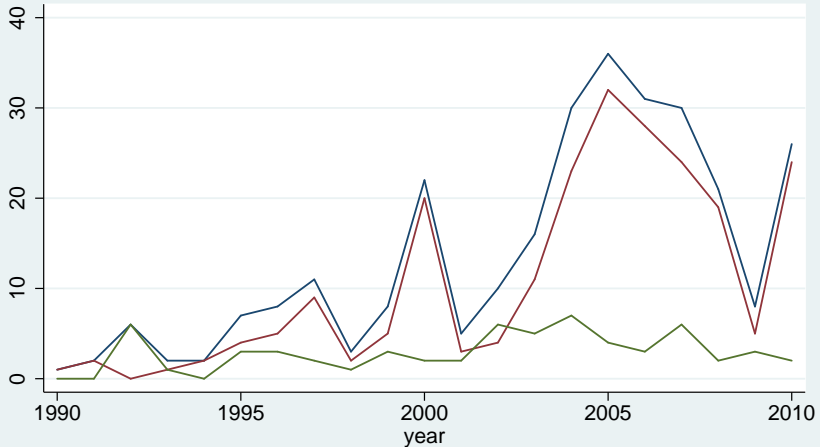
Data Analysis

All Sample : SWFs' Transaction Database, without Norway

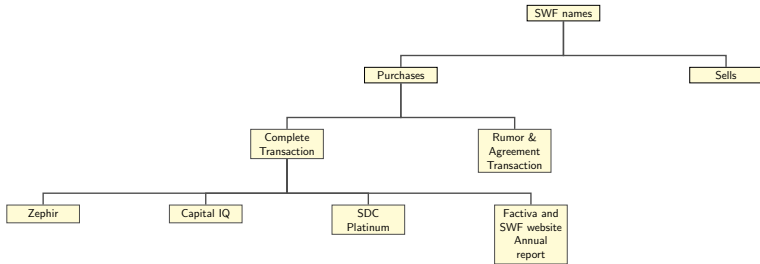
All Sample: Number of investments



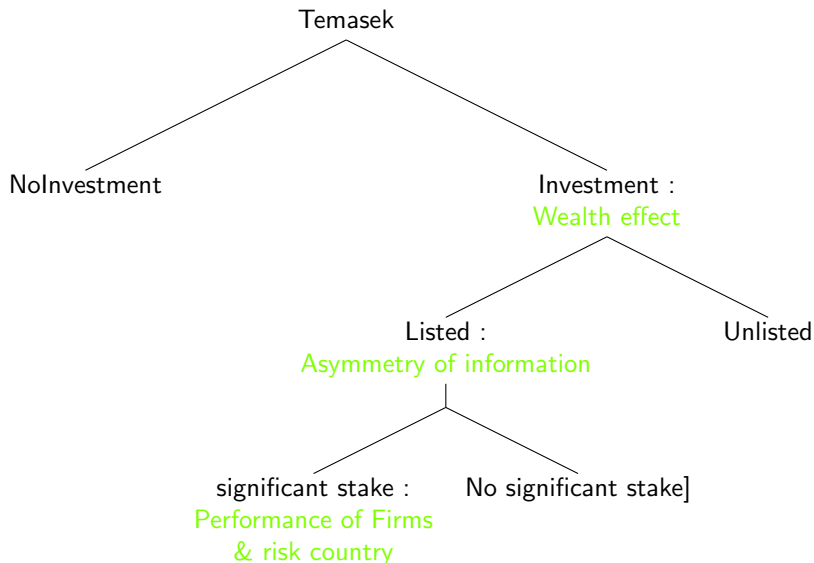
Temasek: Number of investments



Database construction



Methodology



- $P_{ilc} = P_{c|i,l} * P_{l|i} * P_i$:The probability of investing (i) in a listed company (l) by taking a significant stake (c) depends on the probability of having a significant stake (c) in a listed firm weighted by the probability of Temasek opting for a listed firm (l),which in turn is weighted by the probability of Temasek deciding to invest (i).
- Utility function : $U_{ilc} = \tilde{V}_{ilc} + \varepsilon_{ilc} + \tilde{V}_{il} + \tilde{V}_i + \varepsilon_i$. \tilde{V}_{ilc} is the specification (explanatory variables) of the alternative 's decision to take a significant stake.And ε_{ilc} is its error term. \tilde{V}_{il} is the specification of the second level and \tilde{V}_i is the model of the first level.
- The analytical forms of $P_{c|i,l}$, $P_{l|i}$ and P_i respectively depend on the specification of \tilde{V}_{ilc} , \tilde{V}_{il} , \tilde{V}_i

Intuition on the Small-Hsiao Independence of Irrelevant Alternatives test (IIA)

- the Multinomial Logit model assumes that the probability of any pairs of outcomes are determined without reference to the other outcomes that might be available=IIA property. i.e. **the odds of choosing any two alternatives should be independent of the choice set.**
- For example, if IIA holds, it means that the results do not change if we exclude one category from the regression compared with the full sample.
- we should reject the IIA hypothesis to justify the nested model and the construction of all categories of our model (no investment ;private ;public with significant stake ;public no significant stake)

Statistic of the Small-Hsiao IIA test

- To compute Small Hsiao IIA, the sample is divided into 2 random subsamples of approximately equal size
- The unrestricted Multinomial Logit model is estimated on both subsamples
- The weight average of the coefficient subsamples is defined as follows :

$$\widehat{\beta}_u^{S_1 S_2} = \left(\frac{1}{\sqrt{(2)}}\right)\widehat{\beta}_u^{S_1} + \left[1 - \left(\frac{1}{\sqrt{(2)}}\right)\right]\widehat{\beta}_u^{S_2}$$

- We construct now the restricted model from the second subsample by eliminating one category and we obtain $\widehat{\beta}_r^{S_2}$
- We finally compare the **likelihood of the unrestricted and restricted models** with the following statistic :

$$SH = -2[L(\widehat{\beta}_u^{S_1 S_2}) - L(\widehat{\beta}_r^{S_2})]$$

- If the likelihoods are very different, the statistic will be high and then we reject the IIA hypothesis

The nested logit model is supported by the data

1. **The Small Hsiao Test** \implies **we reject the IIA hypothesis for all categories**

TABLE: IIA test, Pvalue

1st and 2sd levels			
	no Investment	private	public
small-Hsiao	0.008	0.00	0.00
2sd and 3rd levels			
	private	public sign. stake	public no sign. stake
small-Hsiao	0.0001	0.0027	0.0008

2. **The Theta from regression** : Inclusive values Theta1 and Theta2 are significant :The nested logit model outperforms the multinomial logit

Results

Explanatory variables by level

Variable	expected effect	expected sign
invest or not ? $y=1$ if investment		
<i>MSCI World</i> _t	expectation of high returns	+
<i>MSCI Singapore</i> _{t-1}	wealth effect	+
Singapore Debt growth rate	substitution effect	-
Singapore foreign exch. reserves growth rate	wealth effect	+
Singapore Inflation stability	Singapore may use its budget surplus and the excess of its FX reserves to fund its SWFs	+
GDP growth rate	wealth effect	+
Listed or unlisted firm ? $y=1$ if listed company		
Close (10%)	asymmetry of information	-
Language	asymmetry of information	-
Market correlation	diversification	-
Financial openness	private firm accessibility	-
significant stake or not ? $y=1$ if stake $\geq 10\%$		
ROE growth rate	capacity of firm to pay shareholders	+
CAPEX growth rate	Long Term investment	+
Debt growth rate	risk management	-
Asset growth rate	size of the company	+
Book-value growth rate	under-evaluated by the market	+
Diff governance dummy	Risk management	+

1st level : $y=1$ if investment		3rd level : $y=1$ if stake $\geq 10\%$	
MSCI World	0.2888	tx ROE	0.0081
AM 3m	[0.444]		[0.0133]
MSCI Singapore	-0.4286	tx CAPEX	0.1985
AM 3m	[0.301]		[0.165]
tx Debt	-0.0286	tx Book Val.	0.2524
	[0.157]	per Share	[0.353]
tx Res. change	0.2529*	tx debt	-0.9613***
	[0.149]		[0.288]
tx GDP	0.4488*	tx asset	1.894***
	[0.25]		[0.645]
Dum. Sells	0.0593	diff governance	2.263***
AM 3m	[0.508]	dummy	[0.66]
Stability Inflation	0.3675***		
	[0.127]		
Constant	-5.644***		
	[1.45]		
2nd level : $y=1$ if listed company		Interdependence between levels	
close(10%)	-1.23***	Theta2	0.8304***
	[0.35]		[0.209]
language	-2.022***	Theta1	5.514***
	[0.497]		[0.74]
Market corr	-4.37***		
	[0.804]		
kaopen	-0.3296***	Log-like	-308.6309
	[0.0714]		

Robust standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

1st level :

- Temasek invests when the variation of foreign exchange reserve increases
- Inflation stability in Singapore encourages foreign investments

2sd level :

- The probability to invest in a private firm increases when the targeted country has the same language and is close to Singapore : the asymmetry of information decreases
- Temasek prefers to invest in private firm when market correlation is high with the targeted country : portfolio diversification
- The odds to invest in a private firm increases when the degree of financial openness of the target country is high

3rd level :

- The probability of taking a significant stake decreases when the Debt growth rate of the firm increases. Probably because the risk of failure increases
- When the size of the firm increases, Temasek tends to take a significant stake in the firm
- Temasek tends to take a significant stake in a company when the risk of expropriation and corruption are lower, the bureaucracy quality and the respect of the rule of the law are better in the targeted country than in Singapore

Conclusion

- Temasek invests abroad when the excess of Singapore foreign exchange reserves increases
- Temasek is likely to invest in private firms when the language is the same, the distance is low and when the market correlation and the financial openness are high between the targeted country and Singapore
- Temasek prefers to take a significant stake in firms which are growing up, with a weak debt growth rate, and with a high total asset growth rate.
- The determinants are not only financial because the stability of the target country plays a major role in the decision of Temasek to take a significant stake in a firm. The odds that Temasek takes more than 10% of a firm increase with bureaucracy quality and the respect of the rule of the law of the targeted country, relatively to Singapore