

# Does CEO learning improve takeover success ?

Nguyen Duc Giang  
Graduate school of Economics  
Waseda University  
Email: [giangnd@fuji.waseda.jp](mailto:giangnd@fuji.waseda.jp)

# I. Motivation

- Firms do M&A frequently. 82% of firms doing multiple M&As.
- CEO plays a central role in M&A investment decisions (Park, 2003; Bao and Edmans, 2011; Yim, 2013; Custodio and Metzger, 2013).
- CEO learns during the process of making multiple takeover transactions (Luo, 2005; Kau et al., 2008; Aktas et al, 2009; 2011; 2013)
- CEO has potentials to learn from experience (Hayward, 2002; Harding and Rovit, 2004).
- Why do they learn? Reward/Punishment

# I. Motivation

## **Learning type 1:** Learning during acquisitions

- CEO makes an M&A decision based on market reactions (Luo, [2005](#)).
  - ✓ Positive relation between total wealth/synergy and takeover outcome.
- Managers do listen to the market when making major investment decisions (Kau et al., [2008](#)).
  - ✓ Bidder's short-run CARs positively affect the success probability.
  - ✓ Managers' propensity to learn is high when their interests are aligned with stockholders, i.e. pay-performance sensitivity.

# I. Motivation

## **Learning type 2:** Learning from previous acquisitions

- The current deal performance and similarities with prior acquisitions forms an inverted U-shape (Hayward, 2002).
- Aktas et al. (2013) theoretically predict:
  - ✓ Under experience building curve, time between deals strictly decreases.
  - ✓ Under memory loss effect, time between deals increase significantly.
- Aktas et al. (2011) show that CEO's past experience has a correlation with the current experience.
  - ✓ Price premium/short-run CARs of the previous deal positively relates to the CARs of the current deal.

# I. Motivation

- Filling the gap: past learning (Type 2) vs takeover outcome i.e., how CEO learning from past M&As affects the likelihood of success?
- Compare CEO learning versus competence? What matters to the persistence of success.
- Is there adjustment towards market reactions?
  - ✓ Mixture between two types of learning.

## II. Hypothesis

- CEO learning theory (Aktas et al., 2009)
  - ✓ Call  $z_t$  = number of previously completed deals (from time 0 to time  $t - 1$ ) = Accumulated learning experience (ALE)
  - ✓  $\hat{\sigma}_{s,t}^2$  = the variance of the synergies at deal  $t$  as perceived by the CEO.

- Define  $\hat{\sigma}_{s,t}^2 = \left( \frac{1}{\hat{\sigma}_{s,0}^2} + z_t \frac{1}{\hat{\sigma}_{\eta}^2} \right)^{-1}$ , then  $\frac{\partial \hat{\sigma}_{s,t}^2}{\partial z_t} = - \left( \frac{1}{\hat{\sigma}_{s,0}^2} + z_t \frac{1}{\hat{\sigma}_{\eta}^2} \right)^{-2} \frac{1}{\hat{\sigma}_{\eta}^2} < 0$  (1)

- Other direct result from the optimal valuation of  $CEO_i, v_i^*$ . CEOs pay higher price for a takeover target when the valuation risk of the transaction is low.

$$\frac{\partial v_i^*}{\partial \hat{\sigma}_{s,t}^2} < 0 \quad (2)$$

## II. Hypothesis

- The effect of learning on the probability of winning the competition is:

$$\frac{\partial SUCC_{v_j^*}(v_i^*|v_i^*)}{\partial z_t} = f_{v_j}(v_i^*|v_i^*) \frac{\partial v_i^*}{\partial \hat{\sigma}_{s,t}^2} \frac{\partial \hat{\sigma}_{s,t}^2}{\partial z_t} \quad (3)$$

- From (1), (2) and  $f_{v_j}(v_i^*|v_i^*) > 0$ , (3) implies

$$\frac{\partial SUCC_{v_j^*}(v_i^*|v_i^*)}{\partial z_t} > 0 \quad (4)$$

Eq. (4) indicates that the number of completed deals (ALE) increase the success likelihood of the current deal.

# III. Data/method

- Bid outcome as a linear function of the bidder's learning experience and other explanatory variables:

$$\checkmark \text{ } SUCC_{it}^* = \delta z_{it} + X_{it}\beta + \varepsilon_{it}$$

- Although  $SUCC_{it}^*$  is unobservable, the bidding outcome is fully observed

$$\checkmark \text{ } SUCC_{it} = \begin{cases} 1 & \text{if } SUCC_{it}^* > 0 \\ 0, & \text{otherwise} \end{cases}$$

- I use the binary probit model to estimate the success likelihood of a transaction:

$$\checkmark \text{ } Prob_{it} = Pro(SUCC_{it}) = \phi(\delta z_{it} + X_{it}\beta)$$

- $\delta$  reflects the the effect of CEO learning on the takeover probability of success.



# III. Data/method

- I search the Thomson SDC M&A database for acquisitions announced by U.S. public acquirers during 1990-2014.
- I drop all financial and utility targets and acquirers
- I define an acquisition program as CEO-firm that has at least 2 transactions within 5 years.
  - ✓ Programs must have 2 years of clean M&A records < No transaction between 90-91; 13-14>
  - ✓ I then drop all deals between 90-91 & 13-14.
- The final sample consists 1507 programs (5587 transactions) spanning the period 1992-2012.
- I also keep the information of 1186 remaining single transactions.

# II. Data/method

**Table 1: Distribution of M&As across year and industry**

<b>Panel A: Distribution across year</b>				<b>Panel B: Distribution across industry</b>			
	Single transaction	Serial transaction	All		Single transaction	Serial transaction	All
1992	2	6	8	Business Services	160	707	867
1993	21	84	105	Retail	83	406	489
1994	64	250	314	Electronic Equipment	80	377	457
1995	65	312	377	Insurance	46	389	435
1996	58	420	478	Pharmaceutical Products	41	267	308
1997	76	410	486	Computers	45	225	270
1998	98	515	613	Trading	75	186	261
1999	87	451	538	Machinery	54	173	227
2000	63	347	410	Medical Equipment	29	196	225
2001	51	225	276	Wholesale	36	189	225
2002	37	171	208	Others	537	2376	2913
2003	37	174	211	<b>Total</b>	<b>1186</b>	<b>5491</b>	<b>6677</b>
2004	43	239	282				
2005	54	255	309				
2006	63	250	313				
2007	82	329	411				
2008	97	319	416				
2009	22	162	184				
2010	49	203	252				
2011	67	220	287				
2012	50	149	199				
<b>Total</b>	<b>1186</b>	<b>5491</b>	<b>6677</b>				

# II. Data/method

**Table 2: Descriptive statistics**

	Single transaction			Serial transaction			All		
	Mean	Standard deviation	Median	Mean	Standard deviation	Median	Mean	Standard deviation	Median
VAL	555.9	1880.5	100.0	1067.2	4951.6	175.0	976.3	4563.8	150.0
ROA	0.082	0.166	0.095	0.083	0.174	0.100	0.083	0.173	0.099
SIZE	4.725	1.679	4.605	5.146	1.818	5.165	5.071	1.801	5.011
SALEGR	1.178	0.385	1.097	1.195	0.446	1.097	1.192	0.436	1.097
LEVERAGE	0.506	0.250	0.502	0.522	0.245	0.521	0.519	0.246	0.517
CASH	0.829	0.364	1	0.815	0.375	1	0.817	0.373	1
SUCC	0.304	0.460	0	0.384	0.487	0	0.370	0.483	0
TENDER	0.070	0.255	0	0.083	0.276	0	0.081	0.273	0
DEFENSE	0.026	0.160	0	0.033	0.179	0	0.032	0.175	0
PUBLIC	0.944	0.229	1	0.964	0.187	1	0.960	0.196	1
CASH	0.829	0.364	1	0.815	0.375	1	0.817	0.373	1
INDUS	0.907	0.290	1	0.876	0.329	1	0.882	0.323	1
COMPETE	0.019	0.138	0	0.018	0.134	0	0.019	0.135	0
N		1186			5491			6677	

## II. Data/method

**Table 3: CEOs' accumulated learning experience and takeover success (the unconditional probability of success)**

ALE	Total	Failed	Completed	Completion proportion
0	1510	1061	449	29.74%
1	1313	810	503	38.31%
2	507	279	228	44.97%
3	270	149	121	44.81%
4	132	53	79	59.85%
5	90	36	54	60.00%
>5	162	65	97	60.00%
Total	3984	2453	1531	38.42%

# IV. Results

**Table 4: Probit models on completed and withdrawn transactions.**

Dependent variable SUCC=1 if transaction is completed								
	Model 1		Model 2		Model 3		Model 4	
	Coefficient	Standard errors	Coefficient	Standard errors	Coefficient	Standard errors	Coefficient	Standard errors
ALE	0.068***	0.014	0.066***	0.014	0.059***	0.014	0.056***	0.014
SIZE	0.020	0.014	0.045***	0.015	0.016	0.015	0.043***	0.016
ROA	-1.221***	0.175	-1.347***	0.180	-1.203***	0.186	-1.330***	0.190
SALEGR	0.084	0.059	0.045	0.061	0.073	0.061	0.033	0.062
LEVERAGE	-0.150	0.105	-0.242**	0.107	-0.126	0.122	-0.199	0.125
TENDER	1.807***	0.105	1.788***	0.107	1.872***	0.108	1.848***	0.110
DEFENSE	0.138	0.158	0.070	0.160	0.142	0.159	0.062	0.162
PUBLIC	-1.816***	0.244	-1.936***	0.248	-1.866***	0.251	-1.988***	0.257
CASH	-1.432***	0.075	-1.377***	0.077	-1.440***	0.077	-1.383***	0.079
INDUS	-0.936***	0.088	-0.955***	0.089	-0.964***	0.091	-0.988***	0.093
COMPETE	-0.956***	0.168	-0.965***	0.169	-0.920***	0.173	-0.929***	0.174
CONST	3.216***	0.282	3.870	0.452	3.561***	0.424	4.154***	0.566
Year	No		Yes		No		Yes	
Industry	No		No		Yes		Yes	
N	3984		3984		3984		3984	
pseudo R-sq	0.35		0.37		0.37		0.38	

# IV. Results

## Economic significance of ALE:

- Hold other control variables at mean (fixed).
- Compute  $\widehat{SUCC}_0$  at  $ALE = 0$ .
- Compute  $\widehat{SUCC}_5$  at  $ALE = 5$ .
- Generate the difference between predicted likelihood of success.

$$\Delta \widehat{SUCC} = 14.6\%$$

# IV. Results

- Distinguish between the effect of CEO learning and competence.
- Decompose the outcome of the first transaction in acquisition programs into 2 parts:

Predicted success versus Competence (SKILL)

- ✓ **Step 1:** Generating the industry year rate of success (IRS) for each year and industry. I exclude the first bid in acquisition programs from the computation of IRS.
- ✓ **Step 2:** I regress the outcome of the first deal in acquisition programs on IRS and other control variables.
- ✓ **Step 3:** I compute the residual terms called “CEO competence / skill/ inherent abilities” (SKILL).
- ✓ **Step 4:** I regress the outcome of the current transaction on SKILL, ALE, and other control variables.

# IV. Results

**Table 5: Regressions of takeover success on CEOs' experience and skill**

Dependent variable SUCC=1 if transaction is completed						
	Model 1		Model 2		Model 3	
	Coefficient	Standard errors	Coefficient	Standard errors	Coefficient	Standard errors
IRS	0.081*	0.046	-	-	-	-
ALE	-	-	0.050***	0.016	0.061***	0.017
SKILL	-	-	0.118*	0.071	0.234**	0.093
ALE*SKILL	-	-	-	-	-0.078**	0.041
SIZE	0.0004	0.007	0.048***	0.017	0.048***	0.017
ROA	-0.208***	0.060	-1.300***	0.198	-1.295***	0.198
SALEGR	-0.054**	0.023	0.026	0.066	0.028	0.066
LEVERAGE	0.038	0.045	-0.166	0.130	-0.160	0.130
TENDER	0.550***	0.043	1.887***	0.119	1.885***	0.119
DEFENSE	0.103*	0.059	0.098	0.181	0.087	0.181
PUBLIC	-0.412***	0.042	-1.980***	0.262	-1.985***	0.263
CASH	-0.521***	0.037	-1.394***	0.083	-1.394***	0.084
INDUS	-0.158***	0.037	-1.023***	0.099	-1.031***	0.099
COMPETE	-0.137	0.099	-0.856***	0.196	-0.868***	0.196
CONST	1.327***	0.071	4.160***	0.551	4.183***	0.553
Year/Industry	No		Yes		Yes	
N	1384		3624		3624	
R-sq/pseudo R-sq	0.38		0.39		0.39	



# V. Robustness check

**Table 6: Random-effects probit models on completed and withdrawn transactions**

Dependent variable SUCC=1 if transaction is completed								
	Model 1		Model 2		Model 3		Model	
	Coefficient	Standard errors	Coefficient	Standard errors	Coefficient	Standard errors	Coefficient	Standard errors
ALE	0.043**	0.018	0.049***	0.017	0.044***	0.018	0.046***	0.017
SIZE	0.025	0.016	0.049***	0.016	0.018	0.016	0.045***	0.017
ROA	-1.319***	0.192	-1.425***	0.193	-1.252***	0.196	-1.367***	0.198
SALEGR	0.090	0.063	0.052	0.064	0.076	0.063	0.035	0.064
LEVERAGE	-0.163	0.114	-0.250**	0.115	-0.123	0.128	-0.195	0.129
TENDER	1.926***	0.118	1.882***	0.118	1.941***	0.118	1.902***	0.118
DEFENSE	0.168	0.166	0.095	0.167	0.165	0.164	0.079	0.166
PUBLIC	-1.921***	0.258	-2.028***	0.261	-1.934***	0.262	-2.046***	0.266
CASH	-1.504***	0.083	-1.438***	0.085	-1.484***	0.083	-1.419***	0.085
INDUS	-0.990***	0.095	-1.002***	0.096	-0.993***	0.096	-1.014***	0.097
COMPETE	-1.034***	0.178	-1.032***	0.178	-0.965***	0.180	-0.967***	0.180
CONST	3.398***	0.304	4.012***	0.476	3.706	0.456	4.272	0.593
Year	No		Yes		No		Yes	
Industry	No		No		Yes		Yes	
N	3984		3984		3984		3984	

# V. Robustness check

**Table 7: Probit regressions of transaction outcome on ALE and CEO's characteristics.**

	Dependent variable SUCC=1 if transaction is completed			
	Model 1		Model 2	
	Coefficient	Standard errors	Coefficient	Standard errors
ALE	0.048***	0.015	0.047***	0.015
SIZE	0.045***	0.017	0.040**	0.017
ROA	-1.385***	0.195	-1.400***	0.195
SALEGR	0.003	0.065	-0.005	0.065
LEVERAGE	-0.182	0.127	-0.203	0.128
TENDER	1.816***	0.112	1.817***	0.112
DEFENSE	0.007	0.165	0.010	0.165
PUBLIC	-2.010***	0.261	-2.019***	0.261
CASH	-1.391***	0.082	-1.389***	0.082
INDUS	-0.970***	0.094	-0.965***	0.094
COMPETE	-0.957***	0.177	-0.953***	0.177
AGE	-0.240	0.211	-0.232	0.210
TENURE	0.004	0.058	-0.004	0.059
GENDER	0.192	0.236	0.189	0.235
EQPAY	0.085	0.109	-	-
VARPAY	-	-	0.247*	0.145
SLICEPAY	-0.018	0.092	-0.048	0.094
CONST	5.748***	1.13	5.674	1.128
Year/Industry	Yes		Yes	
N	3792		3792	
pseudo R-sq	0.378		0.378	

# V. Robustness check

**Table 8: Other robustness checks**

	Dependent variable SUCC=1 if transaction is completed					
	Model 1		Model 2		Model 3	
	Coefficient	Standard errors	Coefficient	Standard errors	Coefficient	Standard errors
PRISUCC	0.185***	0.052	-	-	-	-
ALE	-	-	0.056***	0.014	0.055***	0.014
CAR	-	-	-1.085***	0.422	-1.288***	0.533
ALE*CAR	-	-	-	-	0.170	0.273
SIZE	0.052***	0.016	0.041***	0.016	0.041***	0.016
ROA	-1.342***	0.189	-1.325***	0.190	-1.325***	0.190
SALEGR	0.033	0.062	0.032	0.063	0.030	0.063
LEVERAGE	-0.186	0.124	-0.196	0.125	-0.195	0.125
TENDER	1.844***	0.110	1.867***	0.111	1.871***	0.111
DEFENSE	0.051	0.162	0.050	0.162	0.049	0.162
PUBLIC	-1.960***	0.257	-2.017***	0.258	-2.018***	0.258
CASH	-1.381***	0.079	-1.359***	0.080	-1.360***	0.080
INDUS	-1.013***	0.093	-0.972***	0.093	-0.974***	0.093
COMPETE	-0.970***	0.174	-0.930***	0.174	-0.930***	0.174
CONST	4.109***	0.576	4.268***	0.577	4.281***	0.578
Year/Industry	Yes		Yes		Yes	
N	3963		3963		3963	
pseudo R-sq	0.381		0.383		0.383	

# VI. Conclusion

- ALE increases the takeover probability of success
  - ✓ Specifically, the takeover probability of success increases by 14.6% when ALE increases from 0 to 5, holding all other factors at mean.
- The learning effect on takeover success is lower when the CEO has a higher level of competence.
- CEO does not adjust his investment decision towards market reactions.
- The learning effect is also robust to the inclusion of various CEO-specific characteristics, compensation-related factors, and alternative definitions of acquisition programs, CEO continuity.

THANK YOU FOR YOUR TIME