Internet Appendix

(Not for Publication)

Stapled Financing, Value Certification, and Lending Efficiency

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A. Estimation Details of the Switching Regression Model

The binary decision to offer or not offer stapled financing for deal i,namely, STAPLED_i is modeled as the outcome of an unobserved latent variable STAPLED_i^* so that:

$$\text{(A-1)} \quad \text{STAPLED}_i = \begin{cases} 1, & \text{if STAPLED}_i^* > 0 \\ 0, & \text{otherwise} \end{cases}.$$

The unobserved latent variable is assumed to depend on a vector of variables Z_i that are correlated with the propensity to offer stapled financing — these variables include target-specific characteristics, market conditions, industry, and time effects.

$$\text{(A-2)} \quad \text{STAPLED}_i^* = Z_i^{'}\gamma + u_i.$$

Here, u_i is an error or residual term with mean zero conditional on the variables in Z_i. Next, let y_{1i} (y_{2i}) be the target's abnormal returns if there is (is not) stapled financing. Of course, we only observe y_{1i} or y_{2i} and never both because $y_i = y_{1i}$ iff $E\left[y_{2i} \,|\, \text{STAPLED}_i^* > 0\right] = 1$, and $y_i = y_{2i}$ iff $\text{STAPLED}_i = 0$. The switching regression framework (see, Maddala (1983)) then models the the abnormal returns with or without stapled financing as two separate linear equations:

$$\text{(A-3)} \quad y_{ji} = x_i^{'}\beta_1 + \varepsilon_{ji}, \quad j = 1, 2.$$

Here, the ε_{ji}, $j = 1, 2$ are also mean zero error terms.

We model the endogeneity between the decision to offer (or not offer) stapled financing and the abnormal returns by allowing the residuals in the abnormal return equations (A-3) to correlate with the residual in the stapled decision equation (A-2) so that the unobserved or missing variables — for example, the private information of financial advisors and sellers — in the decision equation also affect the abnormal returns. Specifically, the error terms $(\varepsilon_{1i}, \varepsilon_{2i}, u_i)$ are assumed to be trivariate normal with means $(0, 0, 0)$ and the non-diagonal covariance matrix

$$\text{(A-4)} \quad \Sigma \quad \equiv \quad cov(\varepsilon_{1i}, \varepsilon_{2i}, u_i) \quad = \quad \begin{pmatrix} \sigma_u^2 & \sigma_{u1} & \sigma_{u2} \\ \sigma_{1u} & \sigma_1^2 & \sigma_{12} \\ \sigma_{2u} & \sigma_{21} & \sigma_2^2 \end{pmatrix}.$$

Estimation strategies involve sequential estimation procedures or maximum likelihood. The sequential procedure involves first estimating (A-2) by a probit regression, yielding consistent estimates of γ. With this in hand, then the abnormal return regressions (A-3) are augmented with inverse Mills ratios (see Greene (2003)) as additional regressors; these terms adjust for the conditional mean of the error terms and allow consistent estimation by OLS. It is generally easier (and results in a more efficient estimator) to estimate the model using maximum likelihood. We follow the latter approach.

To infer the net pricing or return improvement from stapled financing, we compute the difference between the actual abnormal return from a stapled deal for target i (i.e., y_{1i}) and the abnormal return *this target* would have obtained if it had received no stapled financing — the "counterfactual." This counterfactual return is easily computed by using

$y_{2i} = x_i^{'}\beta_2 + \varepsilon_{2i}$ from (A-3). The resultant quantity is what we will call the "staple finance price improvement" and is given by:

$$\text{(A-5)} \quad \delta_i \quad = \quad \underbrace{y_{1i}}_{\text{actual}} - \underbrace{E\left[y_{2i} \,|\, \text{STAPLED}_i^* > 0\right]}_{\text{hypothetical}}$$

Econometrically, the hypothetical abnormal return in the second term in (A-5) is the predicted value from evaluating stapled deal- and firm-specific attributes in the outcome equation for non-stapled LBOs:

$$\begin{aligned} E\left[y_{2i} \,|\, \text{STAPLED}_i^* > 0\right] &= E\left[x_i^{'}\beta_2 + \varepsilon_{2i} \,|\; Z_i^{'}\gamma + u_i > 0\right] \\ &= x_i^{'}\beta_2 + cov(\varepsilon_{2i}, u_i)\frac{\phi\left(Z_i^{'}\gamma\right)}{\Phi\left(Z_i^{'}\gamma\right)}. \end{aligned}$$

Here, ϕ and Φ are the density and cumulative distribution functions of the normal distribution, respectively, and $\left[\phi\left(Z_i^{'}\gamma\right)/\Phi\left(Z_i^{'}\gamma\right)\right]$ is the inverse Mill's ratio. The model is identified by construction and estimated by maximizing the logarithmic likelihood function:

$$\begin{aligned} \ln \mathcal{L} = \sum_{i=1} \Bigg\{ &\text{STAPLED} * \ln \Phi\left(\eta_{1i}\right) + \ln \phi\left(\frac{\varepsilon_{1i}/\sigma_1}{\sigma_1}\right) + (1 - \text{STAPLED}) * \ln \Phi\left(1 - \eta_{2i}\right) \\ &+ \ln \phi\left(\frac{\varepsilon_{2i}/\sigma_2}{\sigma_2}\right)\Bigg\}, \end{aligned}$$

where $\eta_{ji} = \frac{\left(Z_i^{'}\gamma + \rho_j \varepsilon_{ji}/\sigma_j\right)}{\sqrt{1-\rho_j^2}}$, $j = 1, 2$; $\rho_{1i} = \frac{\sigma_{1u}^2}{\sigma_u \sigma_1}$ is the correlation coefficient between ε_1 and u, and $\rho_{2i} = \frac{\sigma_{2u}^2}{\sigma_u \sigma_2}$ is the correlation coefficient between ε_2 and u.[1]

[1] To ensure that estimated ρ_1, ρ_2 are bounded between –1 and 1, and the estimated σ_1 and σ_2 are always positive, the maximum likelihood directly estimates $\ln \sigma_1$, $\ln \sigma_2$ and *atanh* ρ, where *atanh* $\rho_i = 1/2 \ln\left(\frac{1+\rho_i}{1-\rho_i}\right)$.

References

Greene, W. *Econometric Analysis*, 5th ed. Upper Saddle River, NJ: Prentice-Hall (2003).

Maddala, G. S. Limited-Dependent and Qualitative Variables in Econometrics. Cambridge, UK: Cambridge University Press (1983).

Table A.1 The Effects of Stapled LBO Financing on Shareholders' Gains: Switching Regressions

This table presents the maximum likelihood estimation of Equations (A.1)-(A.3) in the online appendix. Panel A presents the results for the propensity to staple finance the deal (selection equation), where the dependent variable is a binary variable that equals one a stapled financing is offered, and zero otherwise. Panel B reports estimation results for the two second-stage outcome equations, one for the stapled group and the other for the non-stapled group for the value-weighted CARs (CAR-VW). *Capital Availability* is the number of banks giving loans in the target firm's immediate area. Other covariates are defined as in the Appendix. σ denotes the square-root of the variance of the error terms ε_j for *j=1,2* in the outcome equations (A.3); ρ denotes the correlation coefficient between the error term *u* of the selection equation (A.2) and the error term ε_j of the outcome equation (A.3) for *j=1,2*. Our sample includes all stapled and non-stapled LBOs. *, ** and *** indicate significance at the 10%, 5%, and 1% levels.

Panel A. First Stage Results of Endogenous Switching Model

	Marginal Effect	Pr>ChiSq
LnTarget Size	0.039**	(0.04)
Illiquidity	0.024**	(0.02)
Leverage	0.017*	(0.06)
InstOwner	-0.810**	(0.02)
Capital Availability	-0.096***	(0.00)
Volatility	0.321**	(0.04)
Previous Relationships	0.026*	(0.06)
Credit Spread	0.008*	(0.08)
# of deals	186	
σ	-0.049	(0.29)
ρ	12.26	(0.00)
Pseudo R-squared	0.058	
Model *p*-value (Likelihood Ratio Test)	0.034	

Table A.1 (Continued) The Effects of Stapled LBO Financing on Shareholders' Gains: Switching Regressions

Panel B. Second Stage Results of Endogenous Switching Model

	Stapled LBOs Abnormal Return Equation						Non-stapled LBOs Abnormal Return Equation					
	(1) [-42, +126] CAR		(2) [0, +126] CAR		(3) CAR3		(4) [-42, +126] CAR		(5) [0, +126] CAR		(6) CAR3	
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
LnRelative Size	-0.066*	(-1.69)	-0.033**	(-2.40)	-0.030**	(-2.15)	-0.033	(-1.63)	-0.018*	(-1.75)	-0.019	(-1.58)
Leverage	-0.025	(-1.57)	-0.029	(-1.61)	-0.045*	(-1.89)	-0.084**	(-2.15)	-0.079**	(-2.04)	-0.098*	(-2.29)
Past Stock Return	-0.124**	(-2.36)	-0.118**	(-2.04)	-0.110**	(-2.14)	-0.072**	(-2.11)	-0.030**	(-2.42)	-0.021*	(-1.92)
Reputation	0.014	(1.13)	0.022	(1.29)	0.015	(1.21)	0.037***	(2.81)	0.044***	(2.51)	0.064***	(2.88)
Number of Bidders	0.027***	(2.68)	0.022**	(2.11)	0.010**	(2.58)	0.011*	(1.94)	0.017**	(2.00)	0.016**	(2.05)
Tender	0.139**	(2.15)	0.137**	(2.09)	0.093*	(1.66)	0.084**	(2.16)	0.120**	(2.44)	0.079**	(2.10)
Hostile	-0.015	(-1.62)	-0.019	(-1.40)	-0.021*	(-1.70)	-0.022	(-1.05)	-0.018	(-1.39)	-0.020	(-1.02)
Club Bidding	-0.042**	(-2.20)	-0.039**	(-2.11)	-0.027*	(-1.87)	-0.026**	(-2.05)	-0.021**	(-2.04)	-0.018*	(-1.71)
Cash	0.008	(1.50)	0.001*	(1.68)	0.006	(1.56)	0.008*	(1.88)	0.006*	(1.80)	0.009	(1.33)
Strategic Bidder	0.009	(1.57)	0.005	(1.50)	0.010*	(1.66)	0.008	(1.55)	0.008	(1.54)	0.011*	(1.69)
Takeover Defense	0.024**	(2.17)	0.029***	(2.57)	0.024**	(2.26)	0.037**	(2.27)	0.022**	(2.16)	0.016**	(2.09)

Table A.2 Counterfactual Analysis for Loan Terms

The table presents actual mean loan terms, hypothetical mean loan terms for stapled and unstapled deals, calculated via endogenous switching regressions model for the years 2002-2011. The first step in the model is the maximum likelihood estimate of Equations (A.1)-(A.3) in the online appendix. The computation of these imputed values is also discussed in the online appendix. Our sample includes all stapled LBOs and non-stapled LBO deals. All variables are measured in percentages. *, ** and *** indicate significance at the 10%, 5%, and 1% levels.

	Actual	Hypothetical	Difference (Actual-Hypothetical)
Panel A: Comparisons for Stapled LBOs			
Bank Loan Spread	275.1	314.7	-39.6***
Term B Loan Spread	277.9	305	-27.1**
Senior Spread	289.3	318.39	-29.0**
Maturity	71.8	63.2	8.6**
Panel B: Comparisons for Non-stapled LBOs			
Bank Loan Spread	325.5	288.1	37.4***
Term B Loan Spread	339.4	299.2	40.2***
Senior Spread	328.3	304.3	24.0**
Maturity	60.1	69.1	-9.0**