Can the coinsurance effect explain the diversification discount?

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ABSTRACT

Mansi and Reeb (2002) document that the coinsurance effect can fully explain the diversification discount. But their calculations of the excess value and diversification discount are problematic, making their conclusions unreliable. Using correctly calculated variables, a large diversification discount is found for both the full sample and the sub-sample of all-equity firms even after the coinsurance effect is controlled for. This paper also improves their model specification by using the interactive term of leverage and firm risk to capture the coinsurance effect. The results indicate that the coinsurance effect has limited power in explaining the diversification discount.

Keywords: coinsurance effect, diversification discount, excess value, leverage, firm risk

INTRODUCTION

The previous literature suggests that there is a diversification discount (Berger and Ofek, 1995). Some studies attribute the diversification discount to the inefficient internal capital markets of diversified firms. For example, Berger and Ofek (1995) and Scharfstein (1998) document evidence that diversified firms are prone to cross-subsidize investments in divisions with poor growth opportunities. However, Sanzhar (2004) examines a sample of pseudo conglomerates and documents a large and significant diversification discount for these firms. Since pseudo conglomerates are firms in which all segments operate within the same four-digit industry and face similar investment opportunities, his finding suggests that the internal capital market inefficiency is not the only reason for the diversification discount.

An alternative explanation for the diversification discount is related to firm risk. Due to the imperfect correlation among the cash flows of different segments, diversified firms are likely to have lower risk than the focused firms. Other things equal, lower risk will decrease the value of the call option the shareholders have on the firm's assets. Mansi and Reeb (2002) document that the loss in the shareholder's value due to diversification is related to firm leverage. Once the leverage and its interactive term with the multi-segment dummy are included, the diversification discount disappears. They conclude that coinsurance effect can explain away the diversification discount.

However, the excess value and diversification discount reported in Mansi and Reeb (2002) are not in line with other research. For example, Berger and Ofek (1995) point out that "By using multipliers for the median single-segment firm in each industry, the excess values are constructed with median values of approximately zero for the single-segment firms. The distributions of excess value for single-segment firms are quite symmetric around zero for the valuation multiples of assets and sales." Using both the asset multiples and sales multiples, Berger and Ofek (1995) document that the median excess value of the single segment firms is 0.000. The same median excess value for single segment firms is documented in this paper. In contrast, Mansi and Reeb (2002) find an excess value for the median single segment firms as 0.050, which is much higher than what other researchers find. Berger and Ofek (1995) estimate a regression of the excess value on firm diversification and some control variables. Their multi-segment indicator variable captures the percentage difference in average excess value between single segment firms and multi-segment firms. If the coefficient of the multi-segment indicator is negative and significant, there is a diversification discount. Otherwise, there is no diversification discount. They find that the lost value from diversification (i.e., diversification discount) ranges from 13% to 15% during 1986-1991. Using sales multiplier and the same control variables of Berger and Ofek (1995), this paper documents that the value loss due to diversification is 13.1% during 1984-2004. However, Mansi and Reeb (2002) use the same specification of model and find a diversification discount of only 4.5% during 1988-1999. Thus, it is possible that their conclusion that the diversification discount can be explained by the coinsurance effect is in no small part attributable to the high median excess value they compute for the single segment firms.

In their tests, Mansi and Reeb (2002) examine the relationship between the diversification discount and either firm leverage or firm risk separately. However,

leverage can affect firm value through many different ways, and coinsurance effect can be better captured by the interactive term of leverage and firm risk. Thus, this paper studies what happens to the coefficient on the multi-segment indicator variable in the Berger and Ofek (1995) model specification after the inclusion of firm leverage, risk, and their interactive term. In a further effort to examine whether the coinsurance effect can account for the diversification discount, a sub-sample of all-equity firms is studied to see whether there is a diversification discount for these firms. In all-equity firms, coinsurance effect should not play a role in determining the diversification discount. These firms have no leverage; as a result, there is no wealth transfer from shareholders to bondholders due to the coinsurance effect. Mansi and Reeb (2002) find that the coefficient associated with the multi-segment indicator variable is insignificantly different from zero for all-equity firms, thereby supporting their argument that the coinsurance effect drives the diversification discount. However, their results can be driven by the incorrectly calculated excess value and diversification discount. Using the same model specification but correct calculations of variables, this paper documents a large diversification discount for all-equity firms. This is consistent with other tests in the paper that suggest that coinsurance effect cannot explain away the diversification discount.

DATA AND METHODOLOGY

For the full sample that consists of 66,425 firm-year observations from 1984 to 2004, it is found that, firm risk is still significantly lower and leverage is significantly higher for diversified firms, after other variables that may affect firm risk and leverage are controlled for. However, the magnitude of the difference does not appear to be of much economic significance. The coinsurance effect can explain some part of the cross-sectional variation in the excess value, but does not appear to impact the diversification discount much. There is a large and significant diversification discount for all-equity firms. All the above results hold even after controlling for fixed firm and calendar year effects. The results imply that the coinsurance effect cannot explain the diversification discount.

The sample consists of all firms with data reported on the Compustat Industry Segment database from 1984 to 2004. The same sample selection criteria as in the Berger and Ofek (1995) are followed and the same method is used to measure the excess value. The same model specification is:

$$EXVAL = \beta_0 + \beta_1(DSEG) + \beta_2(LSIZE) + \beta_3(EBIT / SALES) + \beta_4(CAPX / SALES) + \varepsilon \quad (1)$$

where EXVAL is the excess value based on the Berger and Ofek (1995); DSEG is a dummy variable that is equal to one if the firm is a diversified firm, otherwise it is zero; LSIZE is the natural logarithm of total assets; EBIT/SALES is the income to sales ratio; and CAPX/SALES represents the capital expenditures to sales ratio. The variables of firm leverage, firm risk and an interactive term between firm risk and leverage are included to examine how much of the discount can be explained by the firm's leverage, risk and coinsurance effect. Like Mansi and Reeb (2002), the all-equity firms are used to test whether the coinsurance effect can explain the entire diversification discount. For all equity firms, there is no leverage, thus there cannot be any transfer of wealth between shareholders and bondholders. If there is any diversification discount for all-equity firms, it cannot be attributable to the coinsurance effect.

RESULTS

Table 1 displays descriptive statistics on the excess value, total assets (ASSETS), income to sales ratio (EBIT/SALES), capital expenditure to sales ratio (CAPX/SALES), firm leverage (LEVER), and long-term leverage (LTDLEVER) for multiple segment firms and single segment firms. Panel A is for the full sample of firms. For single segment firms, the median excess value is zero. This is consistent with Berger and Ofek (1995) and Campa and Kedia (2002). The mean of the excess value of single segment firms is -0.006, which is comparable with the one (0.001) reported by Berger and Ofek (1995). The median of excess value for multiple segment firms is -0.109, while the one from Berger and Ofek (1995) is -0.106. The mean excess value for the multiple segment firms is -0.102, which is close to the -0.097 reported by Berger and Ofek (1995). Consistent with the previous study (e.g., Berger and Ofek, 1995), it is found that the diversified firms have significantly lower excess value, bigger size, larger profitability ratio, and higher leverage ratio than the single segment firms. Consistent with Berger and Ofek (1995), the median multiple segment firms is about three times the size of the median single segment firms in terms of assets. The leverage ratio of multiple segment firms is higher than that of single segment firms, consistent with the findings of other research that diversified firms borrow more.

Panel B of table 1 is for the sub-sample of all-equity firms. The median (mean) excess value for the all-equity diversified firms is -0.091 (-0.076), which is higher than that of all diversified firms. The median (mean) excess value of the all-equity single segment firms is 0.098 (0.114), which is also much higher than that of all single segment firms reported in Panel A. The excess value of all-equity firms is also computed based on Mansi and Reeb's definition (long-term debt to assets ratio is less than one percent). The median (mean) excess value of all-equity diversified firms based on their definition is -0.132 (-0.121), which is even lower than what is reported for all diversified firms in Panel A. The median (mean) excess value of all-equity single segment firms is 0.027 (0.055) for their definition of all-equity firms. It is found that the all-equity diversified firms have significantly lower excess value, larger size and higher leverage ratio than the all-equity focused firms. The median all-equity diversified firm is about twice the size of the median all-equity focused firm in terms of assets.

In Table 2, the excess value is regressed on the leverage, firm risk, their interactive term and the controls for size, profitability, and growth opportunities. In the first column, the same independent variables as in Berger and Ofek (1995) are used and very similar results are found. The coefficient of the multi-segment indicator is -0.131, which means that the lost value from diversification is 13.1% (very close to 14.4% reported by Berger and Ofek, 1995) after other factors that could affect excess value are controlled for. In the second column, the leverage is included. It is found that both the coefficient and the t-statistic of the multi-segment indicator decrease, but the magnitudes of the changes are very small. As in Mansi and Reeb (2002), it is documented in this paper that the higher the leverage, the lower the excess value. In column 3, the firm risk variable is included. The leverage is still negatively related to excess value, and the firm risk is positively related to firm value. The significance of the multi-segment indicator decreases. Its coefficient becomes more negative, this is because the firm risk is not only related to the multi-segment indicator, but also related to other control variables in same

regression[1]. In the fourth column, an interactive term of leverage and firm risk is included. After the inclusion of this term, the coefficient of firm risk becomes insignificant, whereas the coefficient of the interactive term is positive and significant. In the last four columns, the fixed firm and calendar year effect is used to control for the unobservable firm characteristics that affect the excess value. Interestingly, the firm risk is no longer significant, but the interactive term is still positive and significant. This means that the firm risk affects the excess value mainly through its interaction with leverage. The leverage is still significantly related to excess value, implying that the leverage affects the excess value in ways other than the coinsurance effect. Although the coinsurance effect can explain the variation of the excess value, it does not decrease the magnitude of the coefficient of the multi-segment indicator. This means that the value loss from diversification (diversification discount) does not decrease after firm leverage, risk and their interactive term are included. It follows that coinsurance effect has very limited explaining power for the diversification discount.

This paper also tests the importance of coinsurance effect by examining a sub-sample of all-equity firms. Table 3 reports the results on all-equity firms. For all-equity firms, the multi-segment indicator is always negatively and significantly related to excess value in all the model specifications, which means even after controlling for other factors that may affect excess value, there is still a significant loss from diversification for all-equity firms. In column one, the Mansi and Reeb (2002)'s definition of all-equity firm is used, which is a firm with long-term debt less than one percent of its total assets. The diversification discount for this type of all-equity firms is 18.7%. In column two, a more strict definition of all-equity firm is used, which is a firm with short-term debt and long-term debt less than one percent of total assets. The diversification discount for this type of all-equity firms is 20.8%. In the last two columns, the fixed firm and calendar year effectsare controlled for. For Mansi and Reeb's definition of all-equity firm, the diversification discount is 11.2%. For the more strict definition of all-equity firm, the diversification discount is 8.3%. In sum, all model specifications demonstrate that there is a large and significant diversification discount for the sub-sample of all-equity firms. This implies that the coinsurance effect is not an important reason for the diversification discount.

CONCLUSION

Mansi and Reeb (2002) suggest that diversification discount can be fully explained by the coinsurance effect. However, their results are based on incorrect calculated excess value and diversification discount. Furthermore, they examine the relationship between the firm leverage and diversification discount without controlling for firm risk. Firm leverage affects firm value through many ways and the coinsurance effect can be more appropriately captured by the interactive term of leverage and firm risk.

[1] Four different measures are used to proxy for firm risk. For all these risk measures, diversified firms have a significantly lower risk than focused firms. These risk measures are negatively related to firm size and EBIT-to-sales ratio, positively related to firm leverage. These relationships are very significant. Even after controlling for the factors that affect firm risk, diversified firms still have lower risk than focused firms.

This paper examines whether the coinsurance effect caused by firm leverage/firm risk can explain the diversification discount. Based on carefully computed variables, it is found that the coinsurance effect can explain part of the variation in excess value, but not the diversification discount. It is also documented that there is a large and significant discount for all-equity firms, which suggests that there are reasons other than the coinsurance effect for the diversification discount. These results hold even after controlling for fixed firm and calendar year effects. The results stand in direct contrast to those reported in Mansi and Reeb (2002), which show a simple but important principle: be extremely careful when computing variables and running tests to make sure that they are done correctly. Otherwise, an incorrect conclusion may be reached even though the research is based on relevant and valid theories.

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Table 1 - Summary Statistics for Multiple-Segment Firms and Single-Segment Firms

This table displays descriptive statistics for the multiple-segment firms and single-segment firms. EXVAL is the natural logarithm of a firm's actual value to its imputed value. A firm's imputed value is the sum of the imputed value of its segments, with each segment's imputed value equal to the segment's sale multiplied by its industry median ratio of capital to sales. ASSETS is the book value of total assets. EBIT/SALES is the ratio of operating profits to total sales, CAPX/SALES is the ratio of capital expenditures to total sales, LEVER is the ratio of interest bearing debt to total assets, and LTDLEVER is the ratio of long-term debt to total assets. The table includes 66,425 firm-year observations from 1984 through 2004. 46,561 of them are single segment firms. The remaining 19,864 are multiple segment firms.

Panel A: Full Sample

Variable	Multiple (N=19,864)			Single (N=46,561)			Difference (Multiple – Single)	
	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.	T-Stat	Z-Stat
EXVAL	-0.102	-0.109	0.564	-0.006	0.000	0.584	-19.57[a]	-19.81[a]
ASSETS ($ m.)	2366.68	395.865	7349.360	937.457	132.413	4075.920	31.99[a]	60.58[a]
EBIT/SALES	0.067	0.073	0.146	0.045	0.068	0.254	11.33[a]	6.36[a]
CAPX/SALES	0.079	0.043	0.153	0.101	0.044	0.225	-12.48[a]	-0.38
LEVER	0.296	0.278	0.237	0.261	0.224	0.271	15.58[a]	26.84[a]
LTDLEVER	0.231	0.209	0.211	0.198	0.141	0.240	16.93[a]	31.39[a]

Panel B: Sub-Sample of All-Equity Firms

Variable	Multiple (N=992)			Single (N=5,751)			Difference (Multiple – Single)	
	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.	T-Stat	Z-Stat
EXVAL	-0.076	-0.091	0.680	0.114	0.098	0.650	-8.40[a]	-8.22[a]
ASSETS ($ m.)	352.368	109.503	1288.540	239.305	80.292	1082.530	2.95[a]	6.03[a]
EBIT/SALES	0.046	0.075	0.225	0.044	0.084	0.291	0.27	-2.36[a]
CAPX/SALES	0.066	0.032	0.123	0.064	0.038	0.129	0.57	-2.90[a]
LEVER	0.000	0.000	0.001	0.000	0.000	0.001	1.40	0.92
LTDLEVER	0.000	0.000	0.000	0.000	0.000	0.000	-1.73[c]	-1.50

Note: a: Significant at 1% level. b: Significant at 5% level. c: Significant at 10% level.

Table 2 - Regression Results for Multiple-Segment Firms and Single-Segment Firms

This table contains results from regressing excess value on multi-segment indicator, and various control variables. Excess value is computed using the Berger and Ofek (1995) method, which is the natural logarithm of the ratio of a firm's actual value to its imputed value. LSIZE is the natural logarithm of total assets, EBIT/SALES is operating profit to sales ratio, CAPX/SALES is the capital expenditure scaled by sales, and LEVER is the ratio of interest bearing debt to total assets. STD_ROA is the standard deviation of return on assets, LEVERISK is the interactive variable of LEVER and STD_ROA, LTDLEVER is the ratio of long-term debt to total assets, MULEVER is the interactive variable of multi-segment indicator and LTDLEVER, MULRISK is the interactive variable of multi-segment indicator and STD_ROA. Column 1a and 1b follow the model specification of Mansi and Reeb (2002) and include the interactive term of multi-segment indicator and LTDLEVER (STD_ROA). The final four columns provide results from the fixed firm and calendar year effects.

Variable	OLS regression				Fixed effects					
	(1)	(1a)	(1b)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Intercept	-0.367	-0.353	-0.421	-0.350	-0.394	-0.379	-1.318	-1.288	-1.298	-1.281
	(-50.12)	(-47.71)	(-31.55)	(-46.80)	(-29.09)	(-26.44)	(-6.49)	(-6.35)	(-6.39)	(-6.30)
Multi-segment	-0.131	-0.186	-0.146	-0.129	-0.132	-0.132	-0.080	-0.080	-0.080	-0.079
Indicator	(-27.24)	(-27.56)	(-12.93)	(-26.61)	(-19.16)	(-19.13)	(-7.10)	(-7.14)	(-7.13)	(-7.09)
LSIZE	0.039	0.040	0.042	0.041	0.045	0.045	0.094	0.089	0.090	0.090
	(27.00)	(27.33)	(19.75)	(28.19)	(20.94)	(21.06)	(16.61)	(15.60)	(15.63)	(15.71)
EBIT/SALES	1.306	1.295	1.540	1.279	1.494	1.502	1.462	1.508	1.511	1.524
	(57.16)	(56.66)	(44.12)	(55.60)	(42.52)	(42.66)	(38.24)	(38.74)	(38.66)	(38.67)
CAPX/SALES	0.977	1.000	1.016	1.014	1.072	1.075	1.564	1.562	1.562	1.561
	(36.55)	(36.97)	(26.53)	(37.64)	(27.77)	(27.83)	(29.71)	(29.71)	(29.70)	(29.70)
LEVER				-0.114	-0.162	-0.235		0.140	0.140	0.081
				(-10.32)	(-10.15)	(-8.85)		(6.18)	(6.18)	(2.46)
STD_ROA			1.097		1.034	0.128			0.306	-0.433
			(4.07)		(4.16)	(0.35)			(0.98)	(-1.01)
LEVERISK						3.899				3.091
						(3.44)				(2.52)
LTDLEVER		-0.099								
		(-9.10)								
MULEVER		0.247								
		(11.66)								
MULRISK			0.725							
			(1.22)							
Obs	66,425	65,540	31,235	65,540	31,235	31,235	66,425	65,540	31,235	31,235
R2	0.118	0.120	0.135	0.120	0.137	0.138	0.694	0.694	0.694	0.694

Table 3 - Regression Results for All-Equity Multiple-Segment Firms and Single-Segment Firms

This table contains results from regressing excess value on multi-segment dummy and various control variables. Excess value is computed using the Berger and Ofek (1995) method, which is the natural logarithm of the ratio of a firm's actual value to its imputed value. LSIZE is the natural logarithm of total assets, EBIT/SALES is operating profit to sales ratio, CAPX/SALES is the capital expenditure scaled by sales. Column 1 gives results using Mansi and Reeb (2002)'s definition of all-equity firm, i.e., firms with long-term debt to total assets ratio below one percent. Column 2 results use a more strict definition of all-equity firm, i.e., firms with all interest bearing debt to total assets ratio below one percent. The final two columns provide results from the fixed firm and calendar year effects.

Variable	OLS regression		Fixed effects	
	(1)	(2)	(1)	(2)
Intercept	-0.506	-0.507	-0.268	0.394
	(-24.85)	(-16.62)	(-0.63)	(0.93)
Multi-segment	-0.187	-0.208	-0.093	-0.083
Indicator	(-13.47)	(-9.93)	(-4.53)	(-2.59)
LSIZE	0.086	0.097	0.078	0.114
	(19.54)	(14.72)	(6.88)	(6.67)
EBIT/SALES	1.566	1.535	1.647	1.551
	(34.15)	(24.09)	(28.00)	(18.77)
CAPX/SALES	1.371	1.251	1.471	0.917
	(16.52)	(10.54)	(11.17)	(5.11)
Obs	13,209	6,743	13,209	6,743
R2	0.158	0.151	0.735	0.733