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RESEARCH NOTE

INFORMATION TECHNOLOGY INVESTMENTS AND FIRM RISK ACROSS INDUSTRIES: EVIDENCE FROM THE BOND MARKET

Keongtae Kim
Department of Decision Sciences and Managerial Economics, CUHK Business School,
Chinese University of Hong Kong, Shatin, HONG KONG {keongkim@cuhk.edu.hk}

Sunil Mithas and Michael Kimbrough
Robert H. Smith School of Business, University of Maryland,
College Park, MD 20742 U.S.A. {smithas@rhsmith.umd.edu} {mkimbrough@rhsmith.umd.edu}

Appendix A

Related Prior Studies and Robustness Tests

Table A1. Selected Studies Linking IT and Financial Market Measures

Study	IT Measures	Measures in Equity Markets	Measures in Bond Markets	Consider Industry Heterogeneity of IT Effect?	Consider IT Risk in Bond Markets
Anderson et al. (2006)	Y2K Spending	Market value of firm equity	No	Yes (automate, informate, and transform)	No
Bharadwaj et al. (2009)	News announcements about IT failures	Abnormal stock returns	No	No	No
Brynjolfsson et al. (2002)	IT capital	Total firm value	No	No	No
Chatterjee et al. (2001)	Announcements of new chief information officer positions	Abnormal stock returns	No	Yes (automate, informate, and transform)	No
Dehning et al. (2003)	Announcements of IT investments	Abnormal stock returns	No	Yes (automate, informate, and transform)	No
Dewan and Ren (2007)	Electronic commerce announcements	Risk-adjusted abnormal stock returns	No	No	No

Table A1. Selected Studies Linking IT and Financial Market Measures (Continued)

Study	IT Measures	Measures in Equity Markets	Measures in Bond Markets	Consider Industry Heterogeneity of IT Effect?	Consider IT Risk in Bond Markets
Dewan and Ren (2011)	IT capital	Average of monthly stock returns and standard deviation of monthly stock returns	No	Yes (manufacturing vs. non-manufacturing)	No
Dewan et al. (2007)	IT capital	Total firm value and standard deviation of daily stock returns	No	Yes (17 industries)	No
Kobelsky et al. (2008)	Annual IT budget	Market-adjusted returns	No	No	No
This study	*Annual IT budget*	*Market value of equity and standard deviation of monthly stock returns*	*Bond rating and yield spread*	*Yes (automate, informate, and transform)*	*Yes*

Note: This table is not exhaustive and lists only some representative studies to show the uniqueness and novelty of the current study in relation to relevant prior work. To the best of our knowledge, this study is perhaps the first to link firms' aggregate IT investments to measures in the bond markets at the firm level.

Table A2. Credit Rating Categories and Distribution of Credit Ratings

Panel A: Recording Schedule for Rating Categories

Conversion Number	Moody's Ratings	S&P Ratings	Rating Grade
7	Aaa	AAA	Investment
6	Aa1	AA+	Investment
	Aa2	AA	Investment
	Aa3	AA–	Investment
5	A1	A+	Investment
	A2	A	Investment
	A3	A–	Investment
4	Baa1	BBB+	Investment
	Baa2	BBB	Investment
	Baa3	BBB–	Investment
3	Ba1	BB+	Speculative
	Ba2	BB	Speculative
	Ba3	BB–	Speculative
2	B1	B+	Speculative
	B2	B	Speculative
	B3	B–	Speculative
1	Caa1	CCC+	Speculative
	Caa2	CCC	Speculative
	Caa3	CCC–	Speculative
	Ca	CC	Speculative
	C	C	Speculative
	D	D	Speculative

Panel B: Distribution of Bond and Issuer Ratings

	Bond Rating					
	Number of Observations			Share (%)		
	1995–1997	1999–2002	1995–2002	1995–1997	1999–2002	1995–2002
AAA	0	3	3	0	2.4	1.2
AA+ to AA–	15	8	23	11.9	6.3	9.1
A+ to A–	73	50	123	57.9	39.4	48.6
BBB+ to BBB–	29	45	74	23.0	35.4	29.2
BB+ to BB–	7	16	23	5.6	12.6	9.1
B+ to B–	2	5	7	1.6	3.9	2.8
CCC+ to D	0	0	0	0	0	0
Total	126	127	253	1	1	1

Table A3. Key Control Variables Used in Related Work

Study	Covariates Used in Various Studies	
	Bond Rating	**Yield Spread**
Anderson and Mansi (2009)	Total asset, profitability, leverage, market to book, advertising, cash flow volatility, customer satisfaction	Total asset, profitability, leverage, market to book, advertising, cash flow volatility, customer satisfaction, high yield, duration , bond age, bond rating
Anderson, Mansi and Reeb (2003)		Family ownership, size(debt + equity), leverage, cash flow volatility, cash flow/total asset, duration, bond age, bond rating
Ashbaugh-Skaife, Collins and LaFond (2006)	Leverage, return on assets (ROA), interest coverage, total asset, capital intensity, subordinate, corporate governance	
Czarnitzki and Kraft (2004)	Sales, value added/number of employees, age, R&D, patent stock	
Mansi, Maxwell and Miller (2011)	Analyst factor, total asset, idiosyncratic risk, firm risk(volatility of ROA), firm age, leverage, market to book, profitability, liquidity	Analyst factor, total asset, idiosyncratic risk, firm risk (volatility of ROA), firm age, leverage, market to book, profitability, liquidity, bond rating, high yield, duration, redeemability
Sengupta (1998)	Disclosure quality, debt to equity, operating income, interest coverage, total asset, standard deviation of daily stock returns, issue size, maturity, redeemability, convertible, subordinate	Interest cost, disclosure quality, debt to equity, operating income, interest coverage, total asset, standard deviation of daily stock returns, issue size, maturity, redeemability, convertible, subordinate, treasury bill rate
Shi (2003)	Debt to equity ratio, profitability, interest coverage, R&D, market value, issue size, maturity, subordinate	Debt to equity ratio, profitability, interest coverage, R&D, total asset, issue size, maturity, subordinate, bond rating, convertible, subordinate
This study	*Total asset, leverage, profitability, interest coverage, R&D, issue size, maturity, subordinate, redeemability*	*Total asset, leverage, profitability, interest coverage, R&D, issue size, maturity, subordinate, redeemability, bond rating, high yield bond*

Table A4. Industry Segmentation

Titles of Industries	Industry Type	Primary Two-Digit SIC Code	IT Budget Intensity	Firm-Year Observations
Metals & natural resources	A	10, 26, 33	1.36	26
Manufacturing (auto, building materials, etc.) & construction	I	15, 25, 26, 32, 37	2.10	53
Consumer goods	I	20, 23, 28	2.32	27
Transportation (ground & railroad)	A	40,41, 42	2.84	11
Airlines	T	45	6.63	2
Banking & financial services	T	61,62	7.16	7
Insurance	A	63	4.54	14
Chemicals & petroleum refining	I	28,29	2.00	18
Utilities	A	49	2.00	17
Electronics	I	36, 38	3.51	6
Retail	I	50-55, 59	1.09	26
Healthcare	I	38, 80	2.49	7
Media services	T	27	2.80	8
Pharmaceuticals	I	28	3.37	11
Computer manufacturing	A	35	3.47	2
Professional services	T	73	3.44	9
Telecom	T	48	6.06	7
Hotels, restaurants & services	I	70, 72	1.56	2

Note: Industry type is determined by the strategic role of IT during the 1995–1998 period, as Chatterjee et al. (2001) suggest: A = automate, I = informate, and T = transform.

Table A5. Correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) Ln (IT Investment)	1											
(2) Bond Rating	0.38[a]	1										
(3) Ln (Spread)	–0.13[c]	–0.67[a]	1									
(4) Ln (Firm Size)	0.76[a]	0.36[a]	–0.18[b]	1								
(5) Leverage	–0.28[a]	–0.50[a]	0.36[a]	–0.24[a]	1							
(6) Profit	–0.05	0.30[a]	–0.39[a]	–0.29[a]	–0.03	1						
(7) Interest Coverage	0.14[c]	0.40[a]	–0.28[a]	0.03	–0.51[a]	0.41[a]	1					
(8) MtB	0.16[b]	0.24[a]	–0.22[a]	0.13[c]	–0.18[b]	0.13[c]	0.21[a]	1				
(9) Maturity	0.08	0.11[c]	–0.11	0.05	–0.10	0.20[b]	0.08	0.05	1			
(10) Ln (BondAmount)	0.56[c]	0.09	0.03	0.57[a]	0.04	–0.21[a]	0.07	0.01	–0.07	1		
(11) Redeemable	0.09	–0.26[a]	0.45[a]	0.04	0.31[a]	–0.10	–0.01	–0.08	–0.01	0.45[a]	1	
(12) Subordination	–0.20[b]	–0.42[a]	0.29[a]	–0.21[a]	0.18[b]	–0.05	–0.03	–0.05	–0.06	0.29[a]	0.09	1
(13) Investment Debt	0.33[c]	0.71[a]	–0.57[a]	0.36[a]	–0.31[a]	0.13[c]	0.10	0.18[b]	0.13[c]	0.11[c]	–0.17[a]	–0.52[a]

[a]$p < .001$, [b]$p < .01$, [c]$p < .05$.

Table A6. Results of the 2SLS First-Stage Regressions Relating IT Investments to Bond Ratings and Yield Spread for Columns 1 and 3 in Table 5

	Bond Rating		Ln(Yield Spread)	
	IT Inv	**RD Inv**	**IT Inv**	**RD Inv**
Industry_IT	0.152** (0.077)	0.343* (0.203)	0.184** (0.079)	0.270 (0.191)
Industry_RD	0.056** (0.024)	0.560*** (0.046)	0.056** (0.024)	0.553*** (0.044)
Related diversification	–0.189 (0.150)	1.154*** (0.309)	-0.203 (0.147)	1.155*** (0.316)
Unrelated diversification	0.035 (0.128)	1.065*** (0.303)	0.008 (0.129)	1.146*** (0.306)
F stat	32.79	48.26	32.27	48.86
Hansen J	1.106 (p = 0.575)		2.490 (p = 0.288)	
Kleibergen-Paap rk LM statistic	8.854 (p = 0.031)		11.142 (p = 0.011)	

Note: We use *Automate* and *Informate* dummies to control for industry heterogeneity. Standard errors are clustered by firms. We assume that both IT and R&D are endogenous and use industry-level IT and R&D and total diversification as an instrument. For ease of presentation, we omit firm-specific variables, such as firm size, profitability, leverage, and interest coverage, and bond-specific variables, such as maturity, issue amount, redeemability, and subordination.
***significant at 1%; **significant at 5%; *significant at 10%

Table A7. Results of Random-Effects Estimation

	Bond Rating	Bond Rating	Ln(Yield Spread)	Ln(Yield Spread)
Ln(IT)	0.132** (0.057)	–0.131 (0.102)	0.023 (0.031)	–0.066 (0.050)
Ln(IT) × Automate		0.206* (0.111)		0.138** (0.066)
Ln(IT) × Informate		0.328*** (0.091)		0.091 (0.065)
Bond rating			–0.286*** (0.045)	–0.303*** (0.044)
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Observations	253	253	253	253

Note: We use *Automate* and *Informate* dummies to control for industry heterogeneity. Standard errors are clustered by firms. For ease of presentation, we omit firm-specific variables, such as firm size, profitability, leverage, R&D, and interest coverage, and bond-specific variables, such as maturity, issue amount, redeemability, and subordination.
***significant at 1%; **significant at 5%; *significant at 10%.

Table A8. Results of OLS Estimation with Additional Observed Variables

	Bond Rating	Ln(Yield Spread)	Bond Rating	Ln(Yield Spread)	Bond Rating	Ln(Yield Spread)	Bond Rating	Ln(Yield Spread)
Ln(IT)	–0.252**	–0.056	–0.249**	–0.057	–0.259**	–0.037	–0.261**	–0.043
	(0.108)	(0.050)	(0.105)	(0.053)	(0.111)	(0.049)	(0.110)	(0.048)
Ln(IT) × Automate	0.278**	0.137**	0.251**	0.125*	0.288**	0.125*	0.285**	0.127*
	(0.113)	(0.067)	(0.108)	(0.068)	(0.118)	(0.074)	(0.112)	(0.074)
Ln(IT) × Informate	0.391***	0.070	0.402***	0.072	0.360***	0.076	0.371***	0.090
	(0.102)	(0.066)	(0.100)	(0.069)	(0.104)	(0.066)	(0.105)	(0.065)
Bond rating		–0.397***		–0.404***		–0.381***		–0.401***
		(0.047)		(0.048)		(0.048)		(0.049)
SD of CF	–0.005	0.004					–0.003	0.005
	(0.006)	(0.004)					(0.006)	(0.004)
HHI			0.476**	0.203*			0.488**	0.200*
			(0.198)	(0.105)			(0.198)	(0.110)
Reg_ind			0.353**	0.100			0.464***	0.036
			(0.162)	(0.061)			(0.173)	(0.067)
Physical capital					0.124**	–0.027	0.157***	–0.024
					(0.051)	(0.021)	(0.050)	(0.023)
Ln(Patent stock)					–0.016	–0.004	–0.004	–0.003
					(0.038)	(0.017)	(0.037)	(0.018)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.5594	0.7782	0.5652	0.7797	0.5556	0.7816	0.5851	0.7828
N	249	249	253	253	248	248	244	244

Note: We use *Automate* and *Informate* dummies to control for industry heterogeneity. Standard errors are clustered by firms. For ease of presentation, we omit firm-specific variables, such as firm size, profitability, leverage, R&D, and interest coverage, and bond-specific variables, such as maturity, issue amount, redeemability, and subordination.

***significant at 1%; **significant at 5%; *significant at 10%

Table A9. Results of Falsification Tests

	Bond Rating	Ln(Yield Spread)	Bond Rating	Ln(Yield Spread)
Ln(IT)	0.048	0.016	0.045	0.031
	(0.063)	(0.032)	(0.071)	(0.032)
Ln(R&D)	–0.064	–0.065*	–0.031	–0.055
	(0.068)	(0.035)	(0.071)	(0.036)
Ln(R&D) × Automate	–0.006	0.050	–0.017	0.042
	(0.082)	(0.036)	(0.084)	(0.037)
Ln(R&D) × Informate	0.117*	0.053	0.089	0.050
	(0.066)	(0.036)	(0.070)	(0.036)
Herfindhal index			0.628***	0.233
			(0.226)	(0.152)
Industry dynamism			–1.158	0.174
			(1.079)	(0.532)
Industry growth rate			0.233*	0.047
			(0.119)	(0.045)
Bond rating		–0.386***		–0.414***
		(0.048)		(0.056)
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Observations	253	253	253	253

Note: We use *Automate* and *Informate* dummies to control for industry heterogeneity. Standard errors are clustered by firms. For ease of presentation, we omit firm-specific variables, such as firm size, profitability, leverage, and interest coverage, and bond-specific variables, such as maturity, issue amount, redeemability, and subordination.
***significant at 1%; **significant at 5%; *significant at 10%.

Table A10. Results of SUR and 3SLS Estimates

	SUR				3SLS			
	Bond Rating	Ln(Yield Spread)	Bond Rating	Ln(Yield Spread)	Bond Rating	Ln(Yield Spread)	Bond Rating	Ln(Yield Spread)
Ln(IT)	0.044	0.002	–0.131*	0.048	–1.073**	0.706**	–0.971***	0.530**
	(0.059)	(0.039)	(0.072)	(0.049)	(0.519)	(0.344)	(0.305)	(0.215)
Ln(IT) × Automate			0.266**	–0.015			0.534**	–0.265
			(0.116)	(0.079)			(0.247)	(0.174)
Ln(IT) × Informate			0.358***	–0.124*			0.761***	–0.320**
			(0.097)	(0.066)			(0.227)	(0.160)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	253	253	253	253	235	235	235	235

Note: We use *Automate* and *Informate* dummies used to control for industry heterogeneity. Standard errors are clustered by firms. For ease of presentation, we omit firm-specific variables, such as firm size, profitability, leverage, R&D, and interest coverage, and bond-specific variables, such as maturity, issue amount, redeemability, and subordination.
***significant at 1%; **significant at 5%; *significant at 10%

Table A11. Results with an Indicator for Observations with No R&D Investments

	OLS				2SLS			
	Bond Rating	**Bond Rating**	**Ln(Yield Spread)**	**Ln(Yield Spread)**	**Bond Rating**	**Bond Rating**	**Ln(Yield Spread)**	**Ln(Yield Spread)**
Ln(IT)	0.045 (0.064)	–0.257** (0.106)	0.022 (0.031)	–0.066 (0.050)	–1.095** (0.512)	–0.984** (0.390)	0.187 (0.172)	0.099 (0.152)
Ln(IT) × Automate		0.285** (0.111)		0.134** (0.066)		0.526* (0.315)		–0.088 (0.120)
Ln(IT) × Informate		0.395*** (0.099)		0.090 (0.066)		0.758*** (0.337)		–0.009 (0.142)
Bond rating				–0.295*** (0.045)				–0.294*** (0.050)
N	253	253	253	253	235	235	235	235

Note: We use *Automate* and *Informate* dummies used to control for industry heterogeneity. Standard errors are clustered by firms. For ease of presentation, we omit firm-specific variables, such as firm size, profitability, leverage, R&D, and interest coverage, and bond-specific variables, such as maturity, issue amount, redeemability, and subordination.
***significant at 1%; **significant at 5%; *significant at 10%

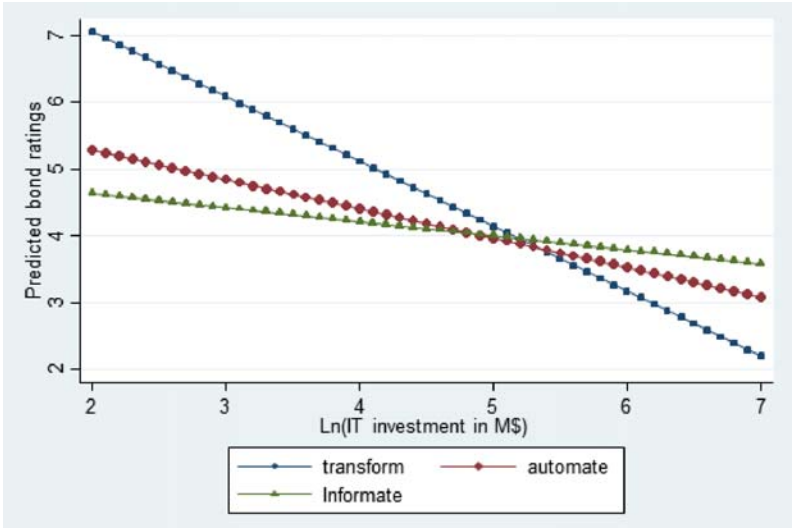


Figure A1. Marginal Effects of IT on Bond Ratings Across Industries

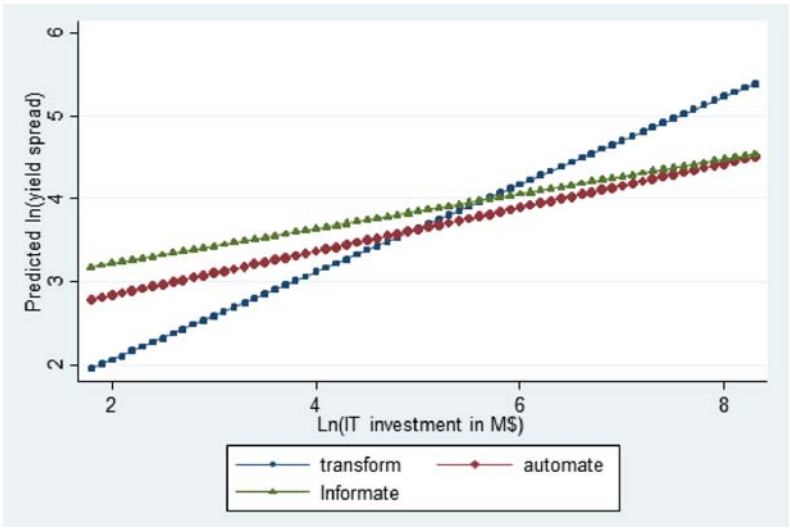


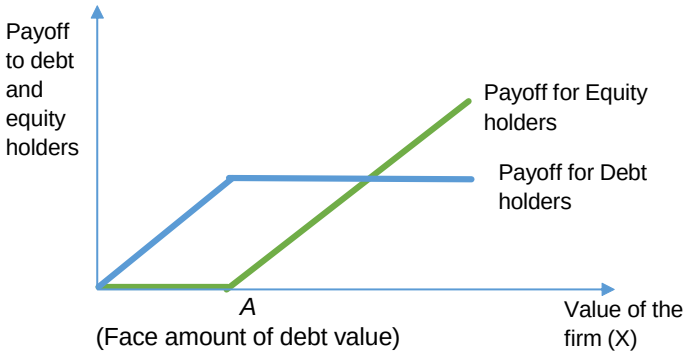
Figure A2. Marginal Effects of IT on Yield Spread Across Industries

Appendix B

How Bond and Equity Stakeholders Make the Risk–Returns Trade-Off

Viewing debt and equity claims from the perspective of option theory provides insight into bondholders' perspectives particularly on risky investments (Lerner 1995). The option pricing theory argues that shareholders in a firm can be viewed as having a call option on the total value of the firm. Merton (1974) shows that as the volatility of the payoff increases, so does the value of the call option (i.e., the shareholder claims). This implies the volatility in firm value induced by corporate investments will increase the value of a call option held by shareholders and, thereby, the value of shareholders' claims. Conversely, assuming that the total value of the firm (i.e., the sum of shareholders' and bondholders' claims) does not change with such investments, we should expect that the value of bondholder claims decreases accordingly. Intuitively, this is because an increased volatility from the investments leads to greater downside risk and a higher probability of not paying back debts fully.

To illustrate these ideas, consider Figure B1, in which *A* on the X axis represents the face amount of debt held by bondholders. Shareholders, as residual claimants on a firm's assets, benefit from any increases in value after the firm's debt is paid completely at point *A*, so they consider such benefits when valuing their claims. Thus, the payoff to equity holders is determined by Max [0, *V*-*A*], where *V* is the firm value and *A* is the debt value. Conversely, bondholders have a fixed claim on a firm's assets and therefore do not benefit from any increases in firm value over the face amount of their debt. Thus, the payoff to bondholders is Min [*V*, *A*]. As such, for firms with low credit risk (i.e., when firm value is generally over *A*), bondholders will consider the projected benefits from corporate investments irrelevant when valuing their claims, while the positive benefits from such investments may have higher value for bondholders for high-risk firms (i.e., when firm value is generally below *A*).



Source: Adapted from Figure 20.8 and Figure 20.9 in Berk and DeMarzo (2007).

Figure B1. Payoff Structures of Bondholders and Equity Holders

Note: In Figure B1, *A* on the X axis represents the face amount of debt held by bondholders. Shareholders, as residual claimants on a firm's assets, benefit from any increases in value after the firm's debt is paid completely at point *F*, so they consider such benefits when valuing their claims. Thus, the payoff to equity holders is determined by Max [0, *V*-*A*], where *V* is the firm value and *A* is the debt value. Conversely, bondholders have a fixed claim on a firm's assets and therefore do not benefit from any increases in firm value over the face amount of their debt. Thus, the payoff to bondholders is Min [*V*, *A*]. As such, for firms with low credit risk (i.e., when firm value is generally over *A*), bondholders will consider the projected benefits from corporate investments irrelevant when valuing their claims, while the positive benefits from such investments may have higher value for bondholders for high-risk firms (i.e., when firm value is generally below *A*.

Consider the following example at the firm level to illustrate differences in equity holders' and bondholders' perspectives (see Edmans 2012): A company has $1 billion in debt (all of which is composed of public bonds) but assets of just $900 million. If the company liquidates the business, bondholders get $.90 on the dollar, but equity holders are wiped out. Now imagine that the company is considering an investment opportunity that has an equal chance of gaining $200 million and losing $400 million. Clearly, the project is undesirable from a total company-value perspective, and it can leave bondholders even worse off (they will get $.50 to a dollar compared with $.90 to a dollar earlier). However, equity holders may still prefer such a project because they are not going to lose any more if the project fails, but they stand to gain if it succeeds, because in a success scenario the company will be worth $1.1 billion, and equity holders will gain $100 million after the bondholders get paid off. Note that the bondholders also gain extra value in a success scenario, but they stand to lose far more if the project fails. From an expected value perspective, the expected value for bondholders is $750 million (0.5 × $1 billion + 0.5 × $500 million), while the expected value for equity holders is $50 million (0.5 × 100 million + 0.5 × 0). Therefore, when a firm undertakes a risky project, it can lead to a higher equity value and a lower bond value, and the effects will be even stronger if the company plans to take on even riskier projects. Thus, if lenders expect the company to engage in risky investments such as those related to IT, they will demand a high interest rate and restrictive covenants.

Here is another example to understand different perspectives held by bondholders and shareholders toward risky investments (see Table B1): Suppose that a firm is composed of a stock and a bond whose values are 10 and 50 at time 1, respectively. At time 1, a firm chooses one of two possible IT projects, which produce the following cash flows: project A with high cash flow volatility (60 for up state, and –40 for down state) and project B with low cash flow volatility (40 for up state and –20 for down state). We assume that up and down states are equally likely. Table B1 shows the payoff of a bond and a stock at time 2. It shows that project A, which generates a higher volatility in the future payoff than project B, leads to a higher equity value and a lower bond value, while the total firm value (i.e., the sum of bond and equity values) are the same. From this perspective, firm cash flows are assessed in terms of likelihood that they will be sufficient to meet financial obligations. Prior studies suggest that this default aspect of risk is critical for bondholders (Rego et al. 2009).

In summary, because shareholders are residual claimants of a firm's assets while bondholders get only a fixed return from their investments, shareholders are more likely to favor risky investments than bondholders because of the positive but risky returns (e.g., from IT investments) will have a limited impact on the payoff of the bondholders (Jensen and Meckling 1976; Myers 1977). Due to the conflict of interests between bondholders and shareholders, bondholders also generally require firms to make protective covenants and implement monitoring devices to prevent risk shifting (Berlin and Loeys 1988; Eberhart et al. 2008). Furthermore, because these contracts are naturally incomplete, bondholders require higher risk premiums (Anderson et al. 2003; Shi 2003). Thus, when a bond is issued, its risk premiums reflect firm-level risk, including the risk associated with IT investments. Table B2 provides a summary of our arguments in this appendix.

Table B1. A Numerical Example

	T = 1			T = 2						
				Up (50% Chance)		Down (50% Chance)		Expected Value		
	Bond Value	Stock Value	Total Value	Bond Value	Stock Value	Bond Value	Stock Value	Bond Value	Stock Value	Total Value
Project A with high volatility (+60 and –40)	50	10	60	50	70 (= 10 + 60)	20 (= 60 – 40)	0	35 (= 50 × .5 + 20 × .5)	35 (= 70 × .5 + 0 × .5)	70
Project B with low volatility (+40 and –20)	50	10	60	50	50 (= 10 + 40)	40 (= 60 – 20)	0	45 (= 50 × .5 + 40 × .5)	25 (= 50 × .5 + 0 × .5)	70

Table B2. Impact of IT Investments on Bond Ratings and Yield Spread

	Effect on Bond Stakeholders	Effect on Equity Stakeholders
Positive returns (IT returns)	Has a limited positive impact, especially for firms with low credit risk (the impact is small also due to limited collateralizability of IT capability)	Has a positive impact
Increased volatility (IT risk)	Has a negative impact	Has a positive impact
Total effect	The IT returns and IT risk effects influence the bond investors in the opposite direction so the net impact is ultimately an empirical question, although we suspect that the IT risk effect may be larger than the IT returns effect. In other words, when the IT risk effect is larger than the IT returns effect, IT investments are negatively (positively) associated with bond ratings (yield spread).	The IT returns and IT risk effects influence equity investors in the same direction, so the net impact is always positive when IT increases both returns and risk. In other words, IT investments are positively associated with the value of equity holders' claims.

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