"Walking After Midnight: Measurements and Pricing Implications of Market Liquidity on Corporate Bonds"

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1. Introduction & Motivation

- Median among market makers
- Approximate market prices

- Fancy reported spread dynamics in Illiquid bond MKT →See Figure-1
  - Market with very low trade frequency (⇔"Walking after midnight")
- Determinants of the reported spreads (Bond Yield – JGB Yield)?
  - Macro-credit factors (MKT Index, MKT volatility etc.)
  - Micro-credit factors (Ratings, Abnormal individual volatility etc.)
  - Macro-liquidity factors (Tibor-JGB gap, MKT Trading Volume etc.)

This paper proposes a new "Micro-liquidity" factor

⇔ Dispersion of quoted spreads ⇔ Opinion difference

⇔ GAP ≡ (Highest – Lowest) reported spreads →See Figure-2

- Persistency/Resiliency = AR(1) Coefficient is also considered
- Connected with the recent development in theoretical studies
  - Heterogeneous belief, Liquidity spiral, Credit-spread puzzle

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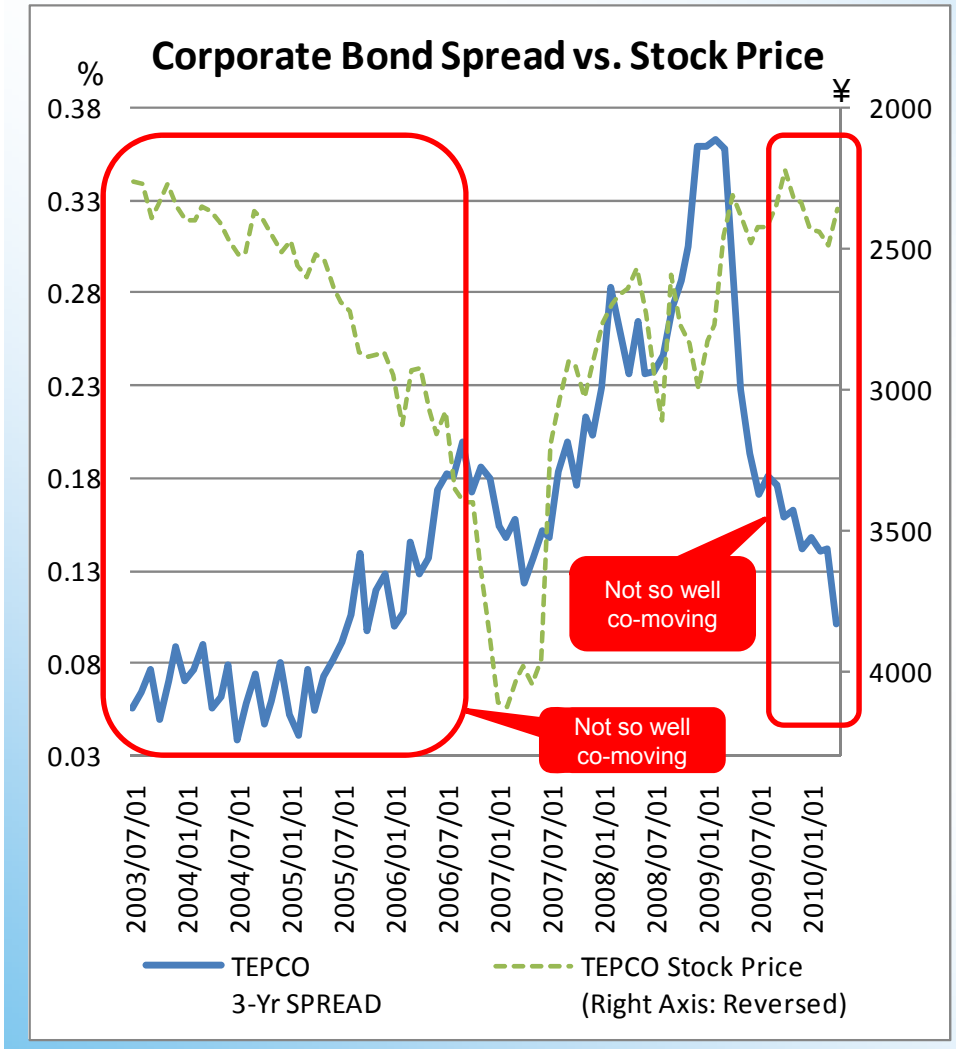

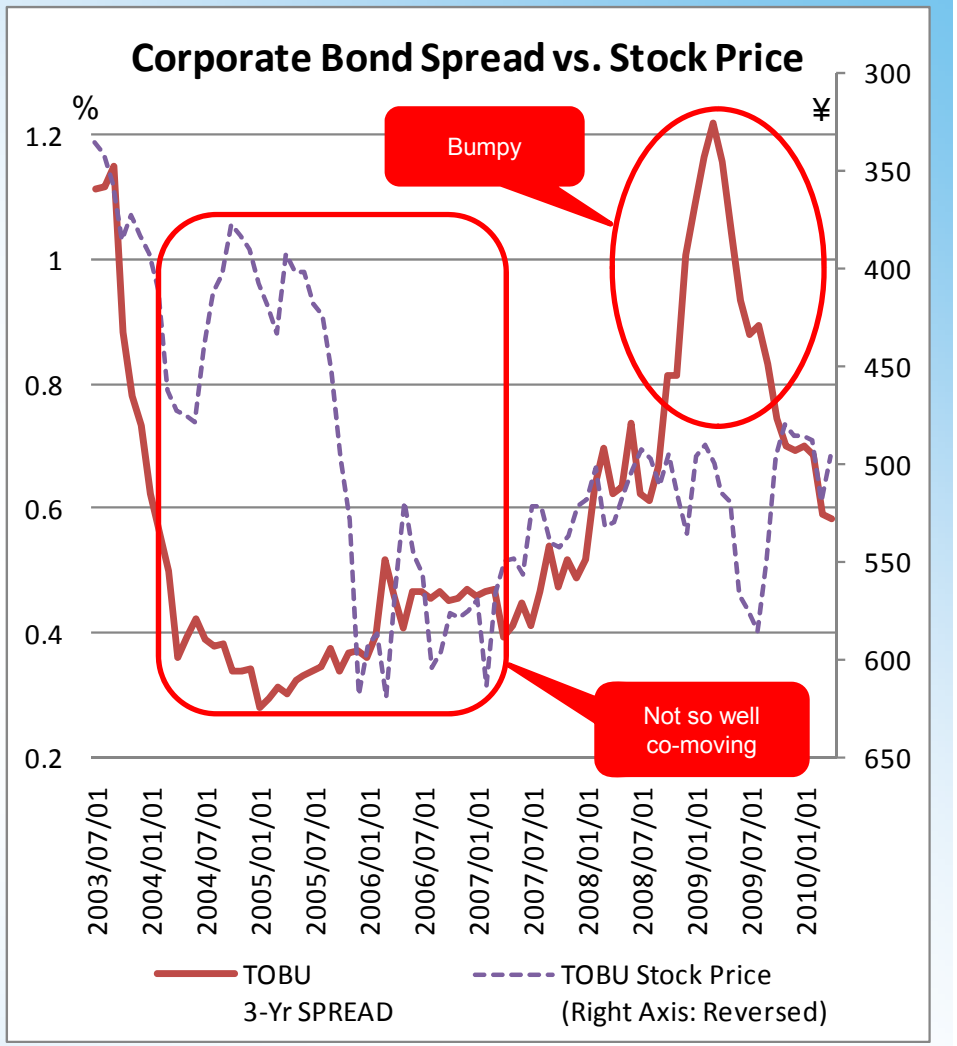

Figure-1 (2): 3-Year Spreads vs. Stock Prices

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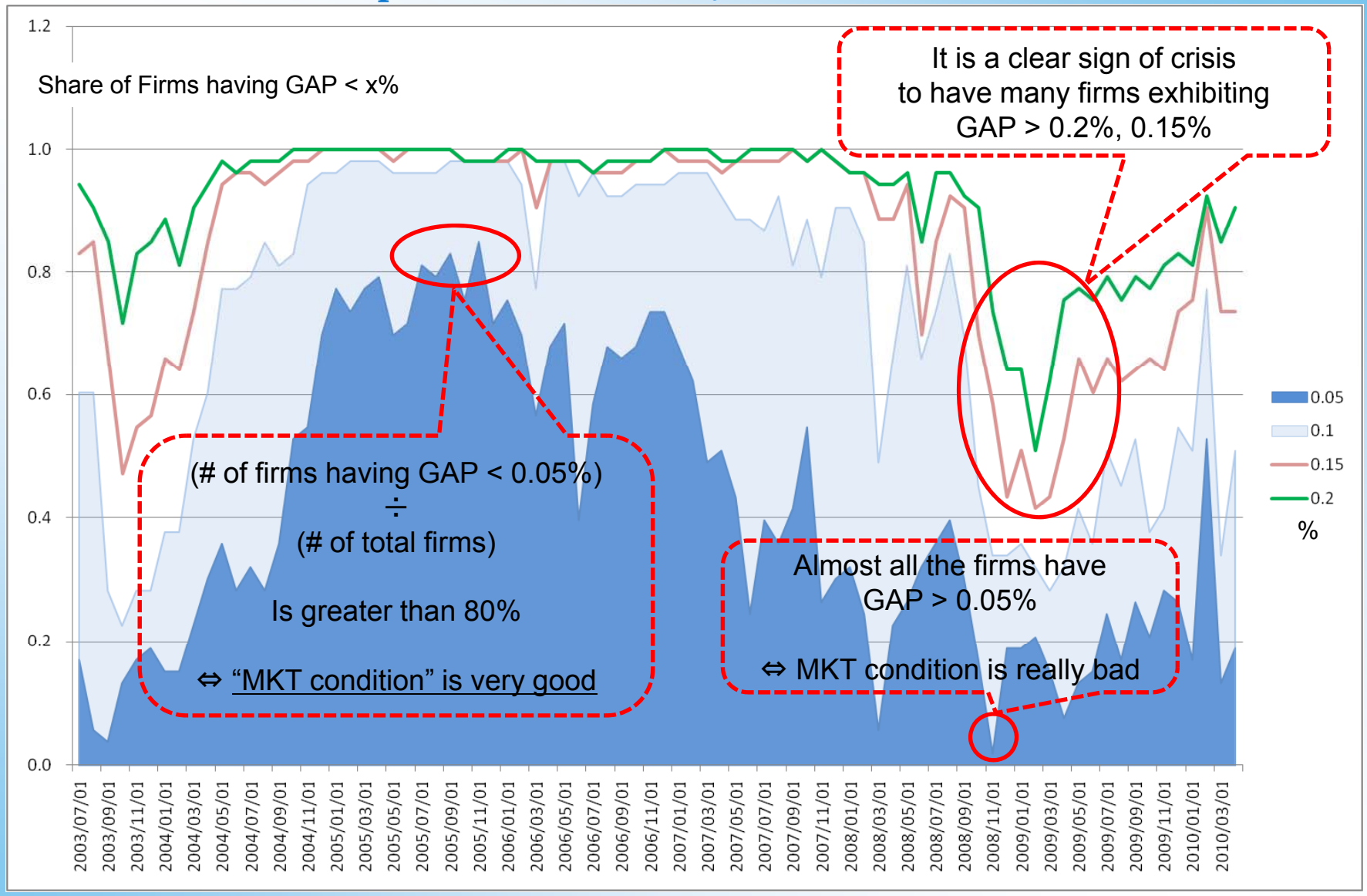

Figure-2 (1): The distribution of GAP measure

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2. Key Findings

- ✓ Inclusion of Lagged GAP to a standard multi-factor model significantly improves the explanation power

- ✓ Quantitative impact of GAP has "conditionality"
  - – $\beta_{GAP(Static)} \times \sigma_{GAP(Static)} \uparrow$ in static model
    as credit ratings ↓ and/or market condition ↓
  - – As in Watanabe & Watanabe (RFS2008) for stock return

- ✓ GAP is valid even after controlling the persistency on spreads
  - – $\beta_{Lagged\ Spread}$ in dynamic model can be another proxy

- ✓ $\beta_{Lagged\ Spread} \uparrow$ in dynamic model
  as credit ratings ↓ and/or market condition ↓
  - – Another "conditionality"

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3. Related Literature

- Theory
  - Heterogeneous Belief: Tychon & Vannetelbosch (JCR 2005)
    Heterogeneity in investors' beliefs for bond prices↑ ⇒ Marketability↓ ⇒ Spreads↑
    → Briefed in the next slide
  - Consideration for Learning Process: Banerjee & Kremer (JF 2010)
    Belief Heterogeneity↑ & Convergence takes time ⇒ Persistency on trade volumes↑
  - Liquidity Spiral: Brunnermeier & Pedersen (JF2005, RFS2009)

- Empirical
  - Credit factors are not enough: Collin-Dufresne et al. (JF 2001)
    ⇒Use macro and micro liquidity factors: Hauweling et al. (JBF 2005)
  - Japanese bond market (not so many):
    Shirasu & Yonezawa (Gendai Finance 2008)
    Nakamura (Shoken Analyst Journal 2009)
    Recent BOJ papers focusing on the effect of monetary policy

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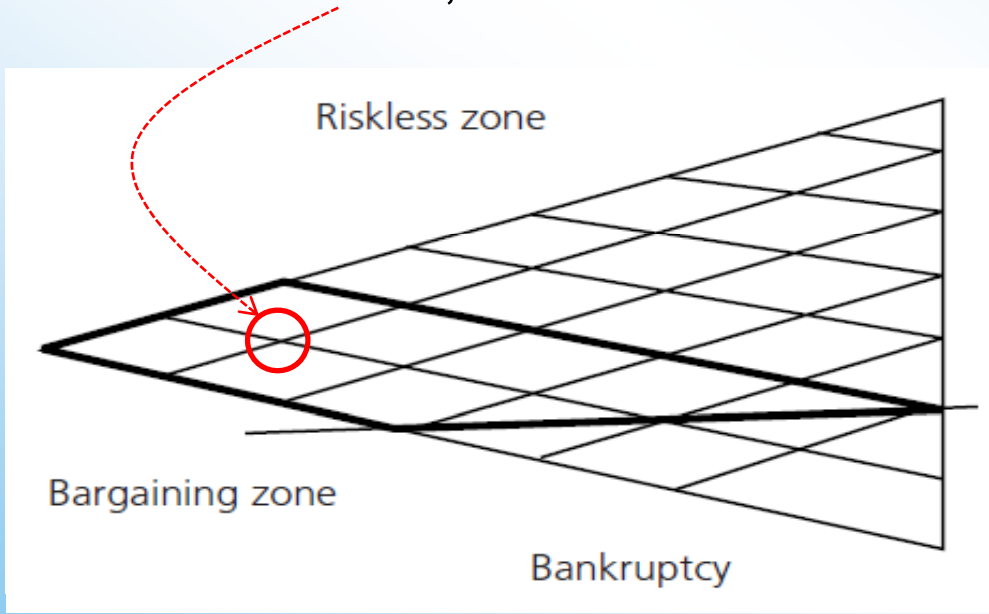
4-1. Theory(i): GAP & Spread

- Tychon & Vannetelbosch (JCR 2005)'s matching friction model
  - Consider a secondary-market populated by players with heterogeneous bond evaluations (due to the heterogeneity of technologies, clients etc.)
  - In each node, each bond-holder is matched with a potential investor



Case-1: Liquid MKT with low matching friction

Matched with an investor which provides a positive gain of trade

(i.e., $\text{PriceEvaluation}_{\text{Buyer}} \geqq \text{PriceEvaluation}_{\text{Seller}}$)

Case-2: Illiquid MKT with high matching friction

Matched with an investor randomly chosen from population

(i.e., Matching might end up with no trade)

- Price Diff b/w Case-1 and -2 ≡ Liquidity/Marketability Premium
- Belief heterogeneity ↑ ⇒ Premium↑ (⇔Price & Spread Diff ↑)

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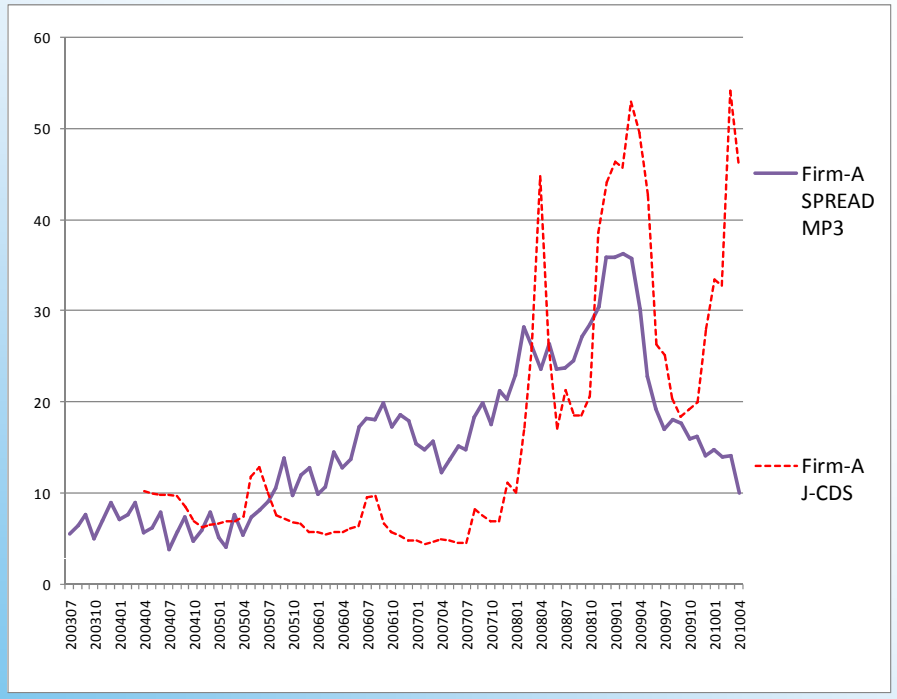
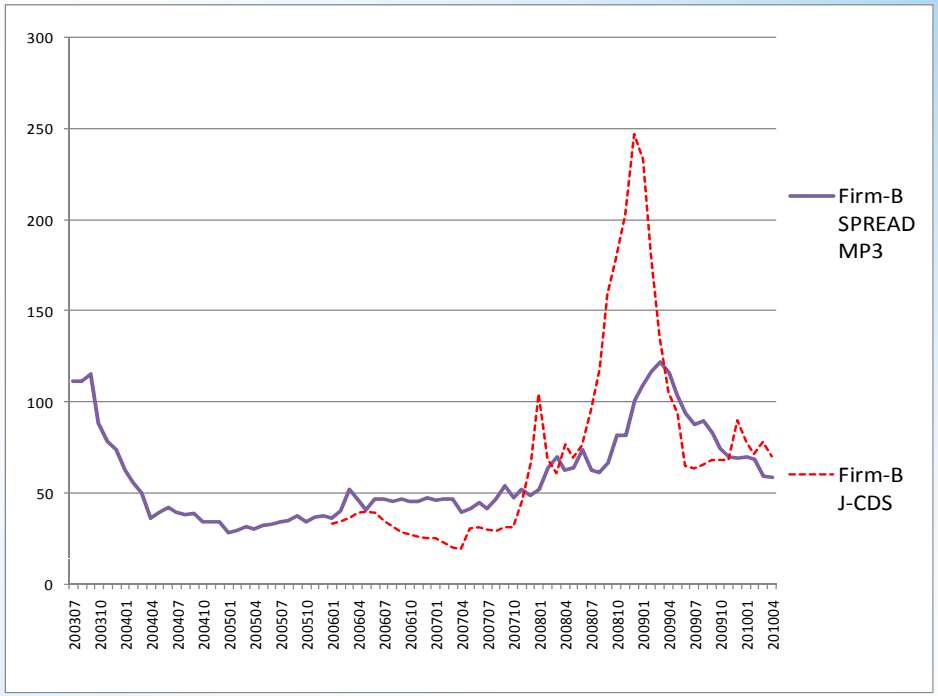
4-2. Theory(ii): Conjectured Source of GAP

- Brunnermeier & Pedersen (RFS2009)'s Liquidity spiral story
  - Consider investors financing with short-term debts
  - Some shock to liability ⇒ Difficulty in borrowing/rolling over debt(☆)
    ⇒ Fire-sale ⇒ Reduction in collateral price etc. ⇒ (☆) ⇒・・・





- Heterogeneous liability generates GAP? (Our companion paper!)

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5. Hypothesis Formulation (1)

- Hypothesis-1: *Median quoted spread is positively correlated with the absolute dispersion of market maker's quoted prices, which is captured by 1-day lagged GAP measure, even after controlling the market factor as well as its individual credit-factors (e.g., credit ratings, the volatilities of stock returns etc.).*

⇒Remarks:

- Our dataset does not contain the actual transaction price
- It would rather contain the prices conjectured by multiple market makers
- We treat the median quoted spread as an approximate market price
  (This point itself should be exposed to a discussion)

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5. Hypothesis Formulation (2)

- Hypothesis-2: *The impact of the GAP measure onto bond spreads has conditionality.*

  ⇒As the stock prices analyzed in Watanabe & Watanabe (RFS 2008)

- Hypothesis-3: *GAP measure is valid to measure the impact of illiquidity on the spreads even after controlling the resiliency (i.e., persistency on spreads).*

  ⇒Consider another liquidity proxy in the classic market liquidity literature

  ⇒Resiliency≡Speed of the restoration of normal market prices (BIS (1999)).

- Hypothesis-4: *The quantitative impact of resiliency has conditionality.*

  ⇒Similar to Hypothesis-2

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6. Empirical Framework

- Static Model (OLS, FE, RE, MLE): (2)～(4) in paper

Micro-credit factor

Macro-credit factor

Macro-liquidity factor

Micro-liquidity factor

$$SP_{it} = \beta_1 + \beta_2 f_{it} + \beta_3 F_t + \beta_4 L_t + \beta_5 l_{it} + \alpha_i + \epsilon_{it}$$

Individual-Effect (Fixed or Random)

- Dynamic Model (OLS, FE, RE, AB-GMM, MLE): (5) in paper

$$SP_{it} = \gamma SP_{it-1} + \beta_1 + \beta_2 f_{it} + \beta_3 F_t + \beta_4 L_t + \beta_5 l_{it} + \alpha_i + \epsilon_{it}$$

Persistency term

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7. Technical Notes (1)

- Static Panel Estimation
  - We guess the estimators in each model share a similar feature

    ⇔Reflecting the characteristics of financial data (bit different from micro labor data etc.)

  - But, we still prefer the random-effect GLS

    ⇔ Presumably, financial data could capture the level of the individual effect (i.e., fixed-effect) well

    ⇔ Still safe to assume the variation of the individual effect (random-effect) is not completely controlled

  - We might want to control the level of the quoted yields by constructing a "relative distance measure" as in the extant study

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7. Technical Notes (2)

- Dynamic Panel Estimation
  - Again, we guess the estimators in each specification look similar

    ⇔ This issue would become more prominent since one potentially missed observation is included

  - We prefer MLE in this case

    ⇔ OLS, FE, or RE could not give a consistent estimator for the dynamic model w/ individual effects

    ⇔ Arellano-Bond type GMM estimator might not work due to the large-T problem (Bowsher (2002))

    ⇔ Fortunately, we can almost ignore the initial observation problem for MLE thanks to the large-T

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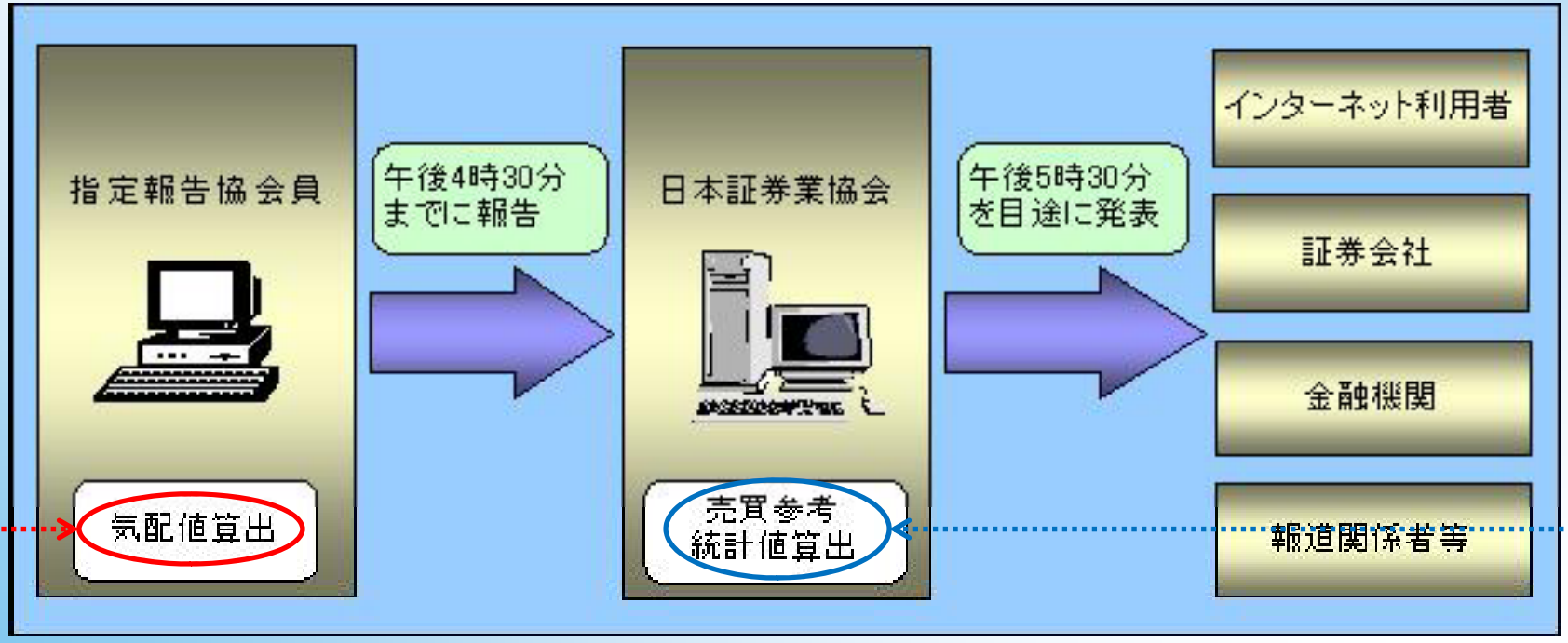
8. Data (1):JSDA Data

- Japan Securities Dealers Association (JSDA)
- 4 reference data (i.e., highest, lowest, mean, and median)
- Not actual transaction prices but reported estimated prices



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8. Data (2):Constructing Spread Data

- Not fixed maturity spreads in the original data
- Need to interpolate the data in order to make yield curves
  - Standard in practice but largely ignored in literature
  - Take out 3-year (current paper) and 5-year spreads from the curve
  - # (groups) ↓ from 120 firms to 52 firms: Potentially biased samples
- Sample periods: 82 months from July 2003 to April 2010 (where GAP is available)

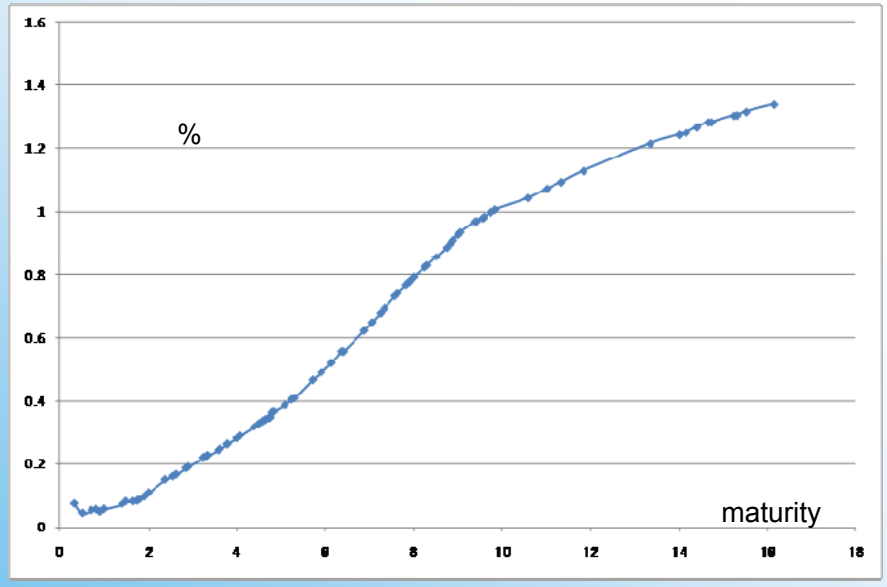

Figure-4(1) Interpolated Yield Curve for TEPCO
(July 31st 2003)

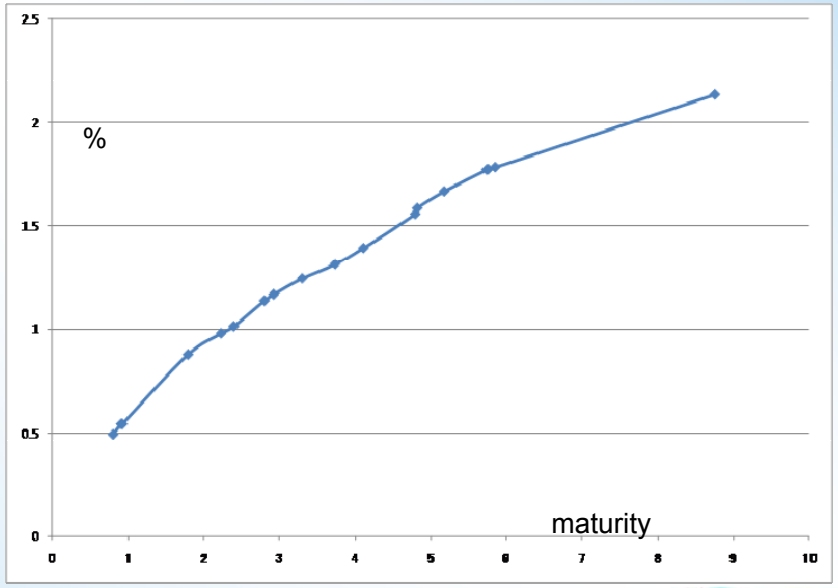

Figure-4(2) Interpolated Yield Curve for TOBU
(July 31st 2003)

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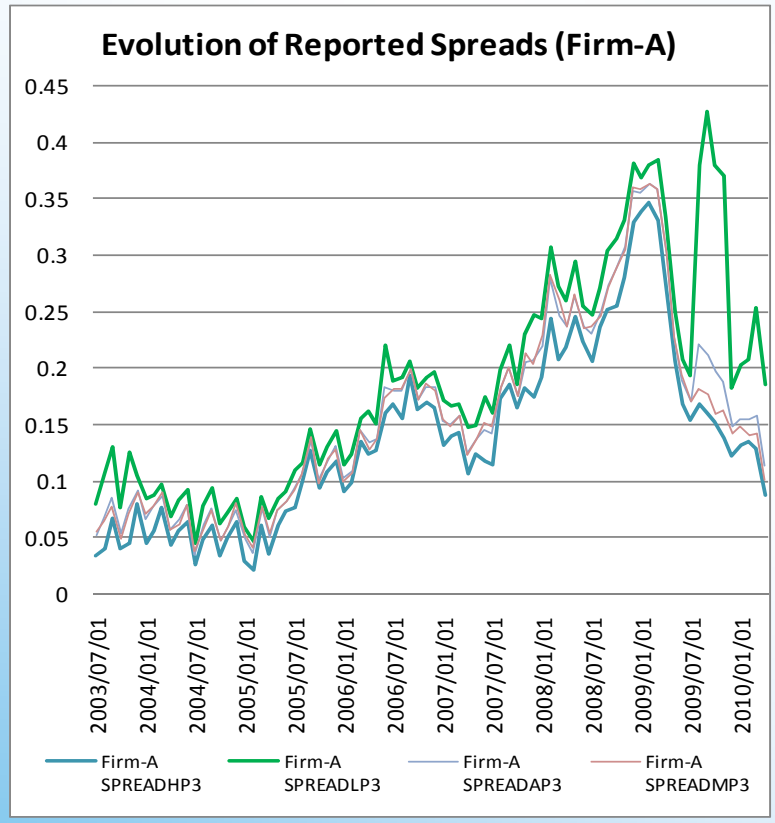
8. Data (3):Constructing GAP Data

- Similar fashion to the construction of Spread data
- Take 1-day lagged GAP for considering simultaneous bias



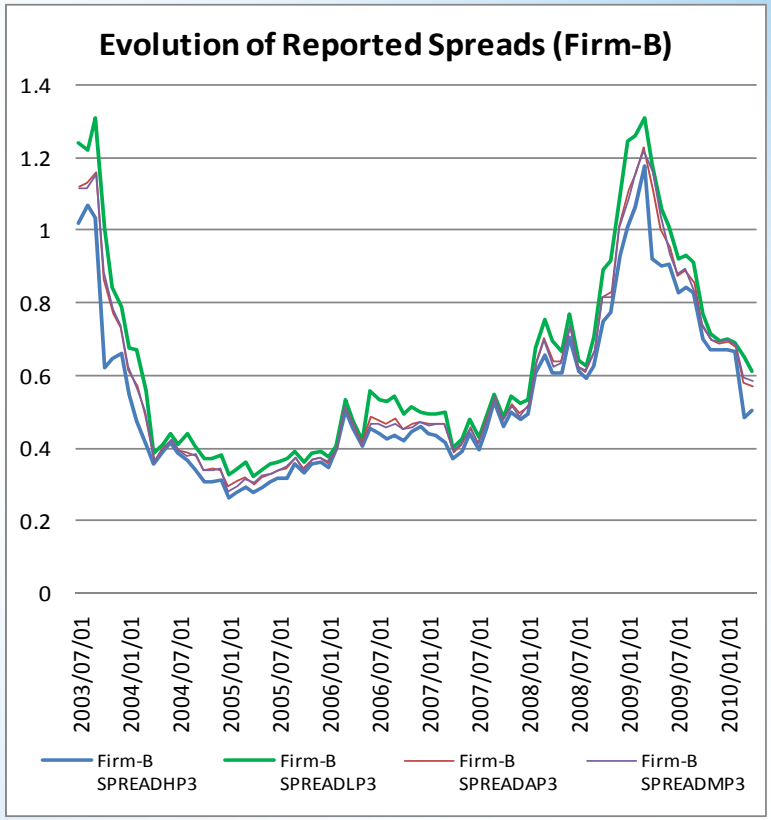


Figure-5 Interpolated Spreads (Highest, Lowest, Average, Median)

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8. Data (4):Summary Stat

Variable		Definition	Expected Sign	Obs	Mean	Std.	Min	Max
SP_t	3-Yr SPREAD	Coorporate bond yield minus JGB yield		4173	0.40	0.45	-0.11	4.21
L_t	T_JGBGAP	3-month Tibor minus 3-month JGB yield	+	4264	0.19	0.14	-0.03	0.54
F_t	JGBSLOPE (10Y-2Y)	10-year JGB yield minus 2-year JGB yield	−/+	4264	1.06	0.22	0.69	1.64
F_t	JGB10Y	10-year JGB yield	−/+	4264	1.49	0.20	0.95	1.93
F_t	NKYGROWTH	Growth rata of Nikkei stock index	−/+	4264	0.00	0.06	-0.24	0.13
f_{it}	eHV	20-day historical volatility of individual stock minus estimated historical volatility of each individual	+	4264	0.00	13.69	-76.03	83.84
f_{it}	RATE_RI	R&I credit ratings	+	4264	5.63	2.53	2.00	11.00
I_{it}	GAP3_1DLAG	Highest reported yield minus lowest reported yield in the previous day of 3-Yr SPREAD	+	4172	0.09	0.13	0.00	3.95
I_{it}	GAP3_1DLAG_Adj	GAP3_1DLAG divided by concurrent JGB yield	+	4172	0.25	0.34	0.01	8.51

− could be expected if we treat this as a proxy for monetary policy

Need to care simultaneous bias

"Relative distance measure" for robustness check

Ambiguous expectation from theoretical literature?

Certain level of variation

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8. Data (5):Correlation

	3-Yr SPREAD	3-Yr SPREAD (Lagged)	T_JGBGAP	JGBSLOPE (10Y-2Y)	JGB10Y	NKY GROWTH	eHV	RATE_RI	GAP3_ 1DLAG	GAP3_ 1DLAG_ Adj
3-Yr SPREAD	1.00									
3-Yr SPREAD(Lagged)	0.97	1.00								
T_JGBGAP	0.42	0.40	1.00							
JGBSLOPE (10Y-2Y)	-0.15	-0.12	-0.44	1.00						
JGB10Y	-0.17	-0.16	-0.42	-0.07	1.00					
NKYGROWTH	0.00	0.02	-0.19	0.28	-0.01	1.00				
eHV	0.32	0.31	0.09	-0.07	-0.03	0.04	1.00			
RATE_RI	0.44	0.45	-0.05	0.03	0.01	0.01	0.33	1.00		
GAP3_1DLAG	0.68	0.63	0.31	-0.06	-0.19	0.00	0.26	0.25	1.00	
GAP3_1DLAG_Adj	0.59	0.57	0.22	0.16	-0.38	0.07	0.21	0.25	0.89	1.00

Off course positively correlated But not strongly

Off course positively correlated

Off course positively correlated But not strongly

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9. Results on Static Model (1):Coefficients

	(2) Model 1		(3) Model 2		(4) Model 3 Pooling		(4) Model 3 FE		(4) Model 3 RE		(4) Model 3 MLE	
3-Yr SPREAD	Coef.	Std.	Coef.	Std.	Coef.	Std.	Coef.	Std.	Coef.	Std.	Coef.	Std.
T_JGBGAP	1.4094	0.2414 ***	1.4493	0.2390 ***	0.9239	0.0861 ***	0.9837	0.1670 ***	0.9686	0.1687 ***	1.1903	0.0365 ***
JGBSLOPE (10Y-2Y)	0.0530	0.0542	0.0415	0.0518	-0.0325	0.0212	-0.0223	0.0473	-0.0204	0.0446	-0.1311	0.0217 ***
JGB10Y	0.0167	0.0363	0.0297	0.0294	0.0962	0.0196 ***	0.0877	0.0205 ***	0.0876	0.0202 ***	0.3363	0.0240 ***
NKYGROWTH	0.6515	0.1106 ***	0.5901	0.1102 ***	0.4698	0.0944 ***	0.4754	0.0941 ***	0.4737	0.0942 ***	0.4247	0.0733 ***
e_HV			0.0039	0.0010 ***	0.0021	0.0005 ***	0.0020	0.0007 ***	0.0020	0.0007 ***	0.0025	0.0004 ***
RATE_RI			0.0926	0.0248 ***	0.0542	0.0029 ***	0.0763	0.0327 **	0.0628	0.0130 ***	0.0720	0.0057 ***
GAP3_1DLAG					1.7743	0.2907 ***	1.5833	0.2066 ***	1.6064	0.2073 ***	0.5638	0.0145 ***
GAP3_1DLAG_Adj												
3-Yr SPREAD (Lagged)												
_cons	0.0484	0.0623	-0.4874	0.1729 ***	-0.3611	0.0449 ***	-0.4758	0.1963 **	-0.4009	0.1054 ***	-0.7368	0.0614 ***
# Obs	4173		4173		4172		4172		4172		4172	
# Group	52		52		52		52		52		52	
R-sq:												
within	0.2673		0.3069				0.5273		0.5269			
between	0.0320		0.6124				0.7518		0.7719			
overall	0.1793		0.4070		0.6151		0.6029		0.6120			
sigma_alpha							0.0288		0.0000		0.1367	
sigma_e							0.0905		0.0905		0.2592	
rho: AR(1) on e											0.2178	

1-day lagged GAP matters !

Improving by including GAP !

Sign of misspecification

Note: ***:1%, **:5%, *:10%

- Test for model specification: FE wins (although results look very similar)

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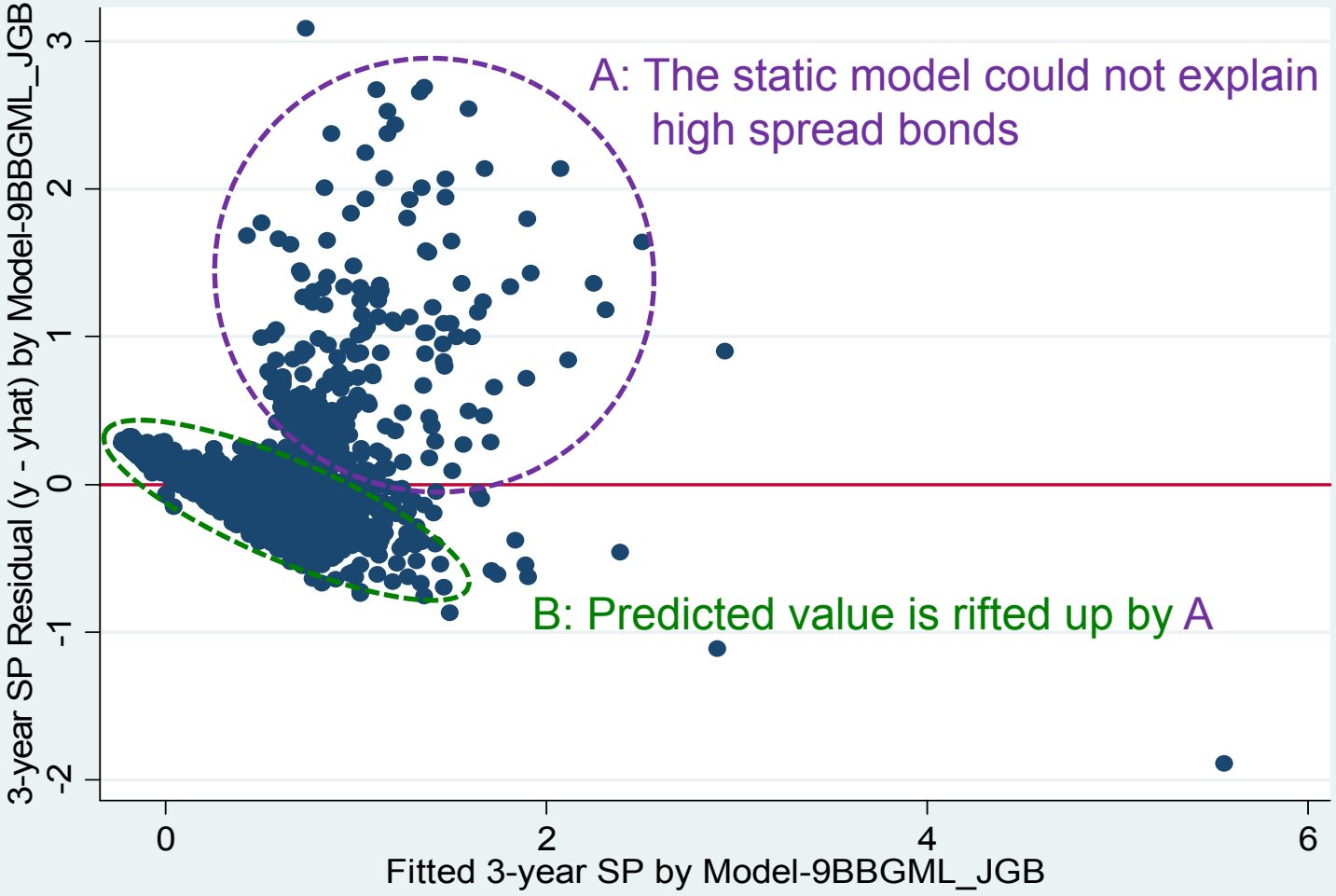
9. Results on Static Model (2):Residuals



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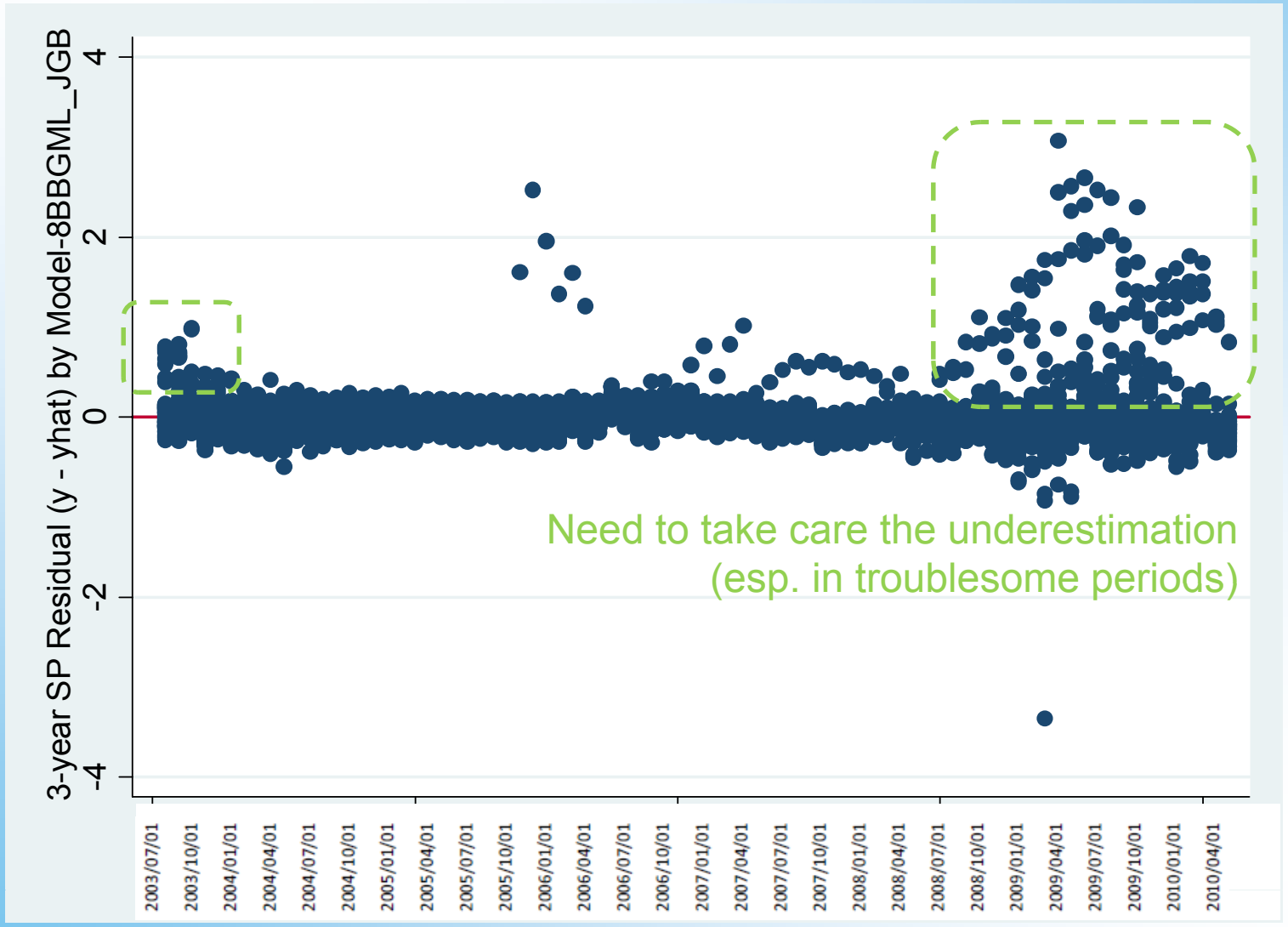
9. Results on Static Model (3):Residuals



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9. Results on Static Model (4):Conditionality

	RE Model 3 Hi-Rate		RE Model 3 Low-Rate		RE Model 3 Good-State		RE Model 3 Bad-State		RE Model 3 Hi- & Good-		RE Model 3 Low- & Bad-	
3-Yr SPREAD	Coef.	Std.	Coef.	Std.	Coef.	Std.	Coef.	Std.	Coef.	Std.	Coef.	Std.
T_JGBGAP	0.3968	0.0960 ***	1.6307	0.3182 ***	0.4215	0.0723 ***	1.2911	0.2265 ***	0.1080	0.0469 **	2.0908	0.4433 ***
JGBSLOPE (10Y-2Y)	-0.1466	0.0258 ***	0.1010	0.0713	-0.1096	0.0241 ***	0.0498	0.0773	-0.1475	0.0177 ***	0.3114	0.1287 **
JGB10Y	0.1224	0.0139 ***	0.0470	0.0275 *	0.0615	0.0161 ***	-0.0519	0.0480	0.0071	0.0130	-0.2066	0.0799 ***
NKYGROWTH	0.1522	0.0600 **	0.8234	0.1625 ***	0.2934	0.0842 ***	0.6141	0.1254 ***	0.4694	0.1114 ***	1.0550	0.2173 ***
e_HV	0.0020	0.0009 **	0.0014	0.0009	0.0015	0.0012	0.0006	0.0010	0.0018	0.0020	0.0009	0.0019
RATE_RI	0.1049	0.0297 ***	0.0830	0.0228 ***	0.0392	0.0093 ***	0.1175	0.0213 ***	0.0516	0.0246 **	0.1788	0.0527 ***
GAP3_1DLAG	1.3678	0.3602 ***	1.4970	0.2287 ***	2.0879	0.3816 ***	1.1167	0.1786 ***	2.4754	0.1378 ***	1.0770	0.2160 ***
GAP3_1DLAG_Adj												
3-Yr SPREAD (Lagged)												
_cons	-0.3211	0.1053 ***	-0.7509	0.2394 ***	-0.0957	0.0412 **	-0.5973	0.1771 ***	0.0409	0.0597	-1.3460	0.4914 ***
# Obs	2029		2143		2498		1674		1213		858	
# Group	25		27		52		52		25		27	
R-sq:												
within	0.6141		0.5761		0.4983		0.4754		0.6302		0.5192	
between	0.7017		0.7305		0.7771		0.6761		0.7787		0.5484	
overall	0.6117		0.5956		0.6301		0.5901		0.7041		0.5213	

Note: ***:1%, **:5%, *:10%

Rough sign of "conditionality"
Hi-Rate: Mean(GAP)=0.072, Std(GAP)=0.080
⇒1.3678×0.080=0.109
Low-Rate: Mean(GAP)=0.115, Std(GAP)=0.155
⇒1.4970×0.155=0.232

Rough sign of "conditionality"
Good-State: Mean(GAP)= 0.057, Std(GAP)= 0.056
⇒2.0879×0.057=0.119
Bad-State: Mean(GAP)= 0.150, Std(GAP)= 0.173
⇒1.1167×0.173=0.193

- (Hi or Low)Credit ratings better than 5 or not at the initial period
- (Good or Bad) Share of firms with GAP<10bp is greater than 75%

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10. Results on Dynamic Model (1):Coefficients

	(5) Dynamic Model 4 AR1		(5) Dynamic Model 5 Pooling		(5) Dynamic Model 5 FE		(5) Dynamic Model 5 RE		(5) Dynamic Model 5 AB GMM		(5) Dynamic Model 5 AH MLE	
3-Yr SPREAD	Coef.	Std.	Coef.	Std.	Coef.	Std.	Coef.	Std.	Coef.	Std.	Coef.	Std.
T_JGBGAP	0.4664	0.0409 ***	0.0496	0.0193 ***	0.0634	0.0150 ***	0.0496	0.0146 ***	0.0537	0.0253 **	0.0588	0.0148 ***
JGBSLOPE (10Y-2Y)	-0.1087	0.0273 ***	-0.0633	0.0055 ***	-0.0577	0.0078 ***	-0.0633	0.0078 ***	-0.0530	0.0049 ***	-0.0618	0.0077 ***
JGB10Y	0.0319	0.0218	0.0036	0.0089	0.0043	0.0087	0.0036	0.0088	-0.0016	0.0066	0.0043	0.0087
NKYGROWTH	0.1255	0.0211 ***	-0.0206	0.0247	-0.0136	0.0258	-0.0206	0.0259	-0.0126	0.0212	-0.0171	0.0258
e_HV	0.0002	0.0001	0.0003	0.0001 *	0.0004	0.0001 ***	0.0003	0.0001 **	0.0004	0.0002 *	0.0003	0.0001 ***
RATE_RI	0.0617	0.0078 ***	0.0030	0.0008 ***	-0.0052	0.0028 *	0.0030	0.0007 ***	-0.0126	0.0119	0.0031	0.0009 ***
GAP3_1DLAG	0.2900	0.0163 ***	0.3905	0.1306 ***	0.4096	0.0149 ***	0.3905	0.0146 ***	0.4310	0.1341 ***	0.3989	0.0149 ***
GAP3_1DLAG_Adj												
3-Yr SPREAD (Lagged)			0.8866	0.0249 ***	0.8682	0.0053 ***	0.8866	0.0048 ***	0.8625	0.0367 ***	0.8782	0.0054 ***
_cons	0.0105	0.0540	0.0449	0.0186 **	0.0860	0.0245 ***	0.0449	0.0196 **	0.1337	0.0636 **	0.0424	0.0198 **
# Obs	4172		4116		4116		4116		4059		4116	
# Group	52				52		52		52		52	
R-sq:												
within	0.4261				0.9384		0.9381					
between	0.6335				0.9972		0.9980					
overall	0.4435				0.9565		0.9584					
sigma_alpha					0.0288		0.0000				0.0101	
sigma_e					0.0905		0.0905				0.0906	
rho: AR(1) on e											0.0122	

Note: ***:1%, **:5%, *:10%

We suspect the problem pointed out in the previous slide

Results look very similar

This proxy works in a consistent way among the models

Results are significant and look very similar

Clearly improved

- MLE is our main model in this specification (discussed already)

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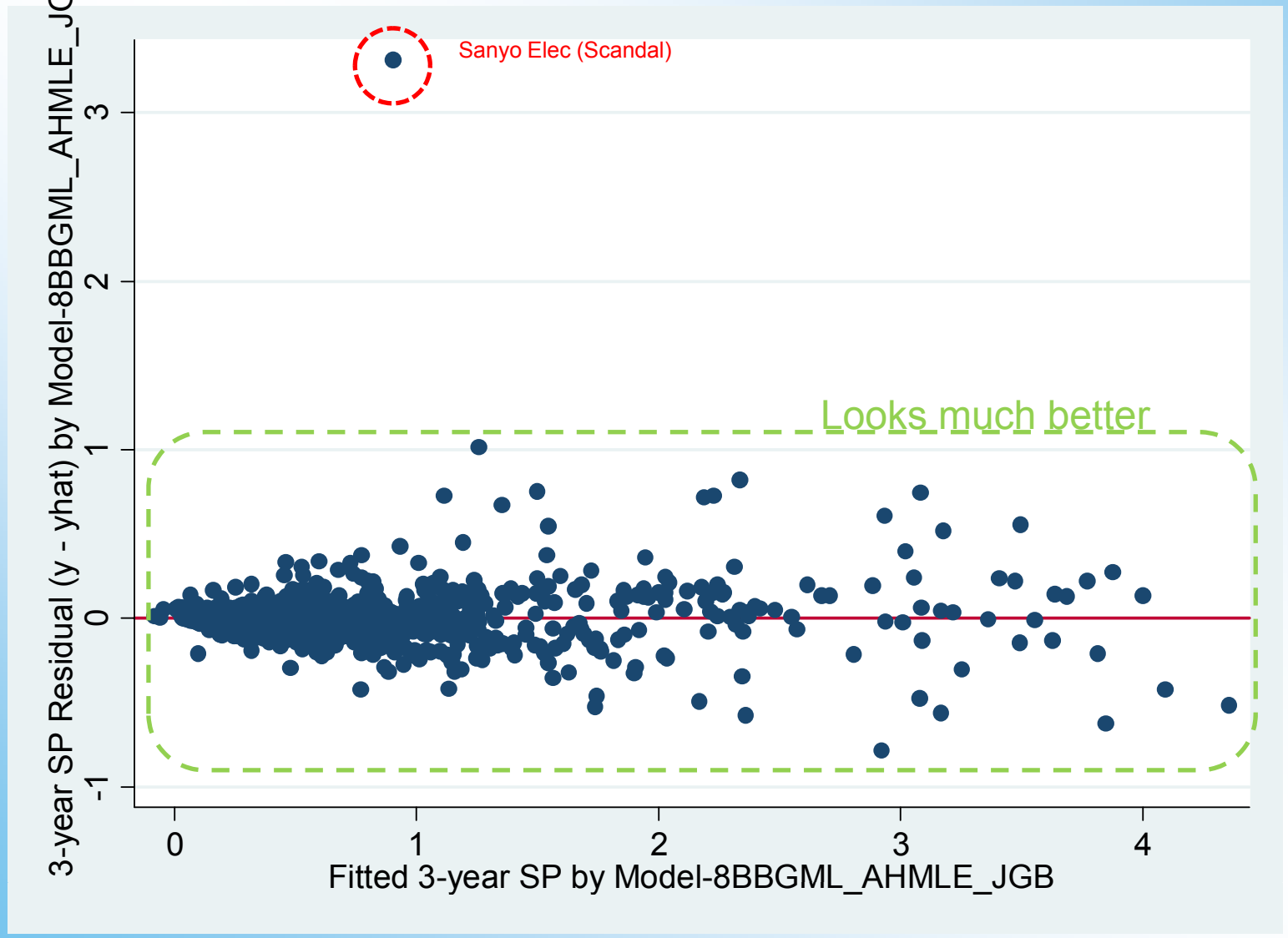
10. Results on Dynamic (2):Residuals MLE



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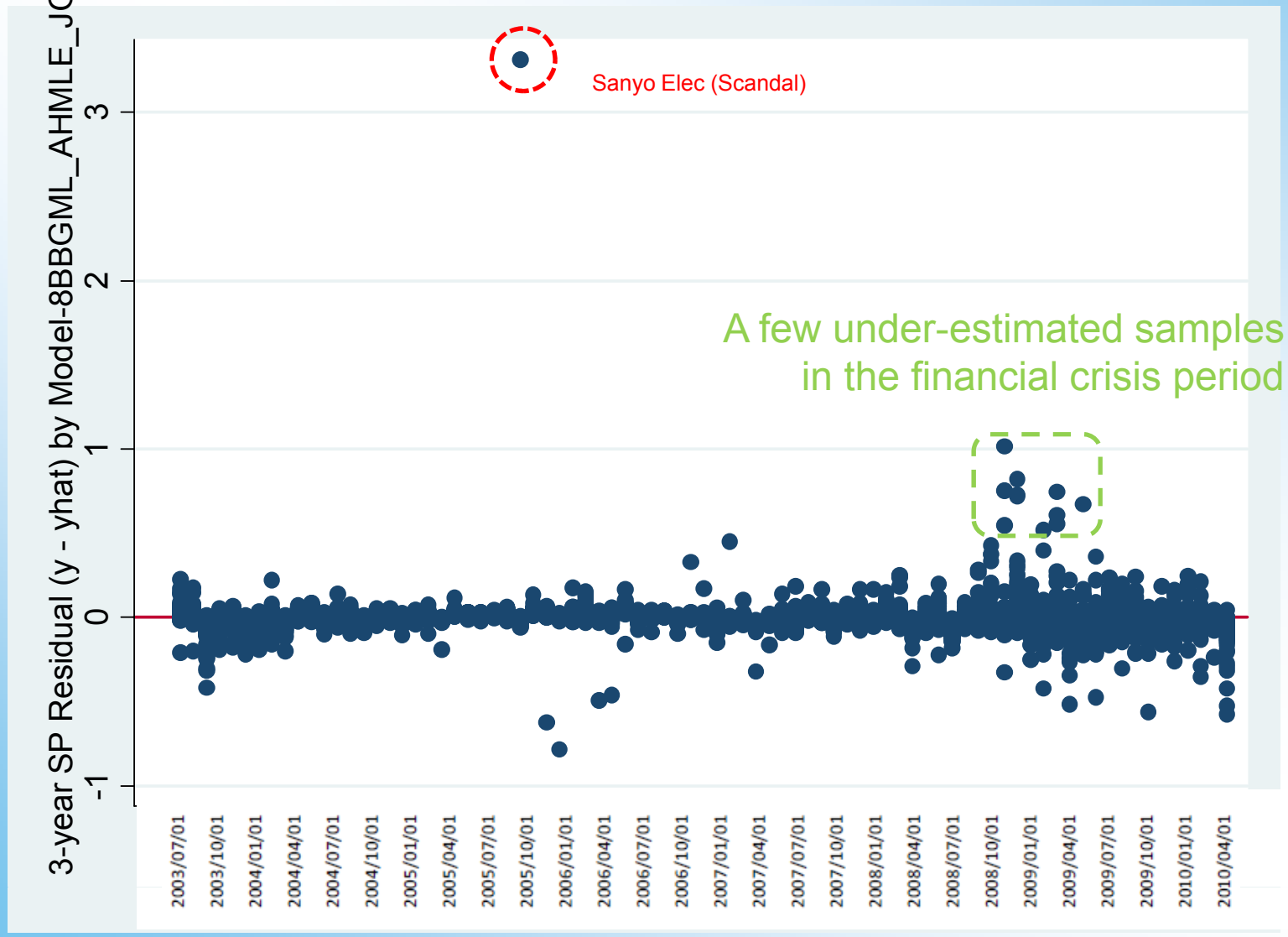
10. Results on Dynamic (3):Residuals MLE



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10. Results on Dynamic Model (4):Conditionality

	(5) Dynamic Model 5 AH MLE Hi-Rate		(5) Dynamic Model 5 AH MLE Low-Rate		(5) Dynamic Model 5 AH MLE Good-State		(5) Dynamic Model 5 AH MLE Bad-State		(5) Dynamic Model 5 AH MLE Hi- & Good-		(5) Dynamic Model 5 AH MLE Low- & Bad-	
3-Yr SPREAD	Coef.	Std.	Coef.	Std.	Coef.	Std.	Coef.	Std.	Coef.	Std.	Coef.	Std.
T_JGBGAP	-0.0150	0.0199	0.1555	0.0217 ***	0.0603	0.0209 ***	0.0838	0.0247 ***	-0.0385	0.0331	0.2120	0.0470 ***
JGBSLOPE (10Y-2Y)	-0.0800	0.0105 ***	-0.0710	0.0106 ***	-0.0611	0.0072 ***	-0.1286	0.0174 ***	-0.0763	0.0118 ***	-0.1664	0.0317 ***
JGB10Y	0.0129	0.0119	0.0117	0.0118	-0.0096	0.0078	-0.1226	0.0251 ***	-0.0425	0.0127 ***	-0.1524	0.0446 ***
NKYGROWTH	-0.0299	0.0347	0.0229	0.0351	0.2278	0.0348 ***	-0.0345	0.0362	0.2998	0.0572 ***	0.0592	0.0647
e_HV	0.0002	0.0002	0.0007	0.0002 ***	0.0001	0.0002	0.0006	0.0002 ***	0.0001	0.0003	0.0011	0.0003 ***
RATE_RI	0.0050	0.0024 **	0.0082	0.0020 ***	0.0050	0.0009 ***	0.0033	0.0017 **	0.0014	0.0023	0.0129	0.0048 ***
GAP3_1DLAG	0.8356	0.0314 ***	0.2851	0.0161 ***	1.1948	0.0313 ***	0.2848	0.0184 ***	1.7406	0.0436 ***	0.2881	0.0249 ***
GAP3_1DLAG_Adj												
3-Yr SPREAD (Lagged)	0.7352	0.0137 ***	0.8983	0.0060 ***	0.7132	0.0094 ***	0.9095	0.0085 ***	0.6207	0.0150 ***	0.8946	0.0117 ***
_cons	0.0577	0.0268 **	-0.0128	0.0306	0.0586	0.0184 ***	0.2671	0.0468 ***	0.1438	0.0296 ***	0.2525	0.0902 ***
# Obs	2003		2113		2495		1621		1212		830	
# Group	25		27		52		52		25		27	

Note: ***:1%, **:5%, *:10%

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10. Results on Dynamic Model (5):Adj GAP

	RE Model 3 (Robustness Check)			Dynamic Model 4 AR1 (Robustness Check)			Dynamic Model 5 AB GMM (Robustness Check)			Dynamic Model 5 AH MLE (Robustness Check)		
3-Yr SPREAD	Coef.	Std.		Coef.	Std.		Coef.	Std.		Coef.	Std.	
T_JGBGAP	1.1859	0.1676	***	0.4514	0.0415	***	0.0943	0.0248	***	0.0851	0.0157	***
JGBSLOPE (10Y-2Y)	-0.1311	0.0393	***	-0.1150	0.0277	***	-0.0772	0.0112	***	-0.0810	0.0083	***
JGB10Y	0.3377	0.0453	***	0.0686	0.0223	***	0.0404	0.0269		0.0370	0.0097	***
NKYGROWTH	0.4237	0.0868	***	0.1212	0.0214	***	-0.0275	0.0228		-0.0338	0.0272	
e_HV	0.0025	0.0007	***	0.0002	0.0001		0.0006	0.0003	**	0.0005	0.0001	***
RATE_RI	0.0672	0.0166	***	0.0593	0.0080	***	-0.0102	0.0113		0.0026	0.0008	***
GAP3_1DLAG												
GAP3_1DLAG_Adj	0.5669	0.0648	***	0.0928	0.0066	***	0.1137	0.0514	**	0.0970	0.0061	***
3-Yr SPREAD (Lagged)							0.8856	0.0368	***	0.9075	0.0058	***
_cons	-0.7120	0.1523	***	-0.0214	0.0554		0.0794	0.0403	**	0.0140	0.0210	
# Obs	4172			4172			4059			4116		
# Group	52			52			52			52		
R-sq:												
within	0.4914			0.4019								
between	0.7314			0.6204								
overall	0.5740			0.4177								

Note: ***:1%. **:5%. *:10%

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10. Results on Dynamic Model (6):Split GAP

	(4) Model 3 RE (Already Shown)			(5) Dynamic Model 5 AH MLE (Already Shown)			(4)' Model 3 RE GAP SPLIT			(5)' Dynamic Model 5 AH MLE GAP SPLIT		
3-Yr SPREAD	Coef.	Std.		Coef.	Std.		Coef.	Std.		Coef.	Std.	
T_JGBGAP	0.9686	0.1687	***	0.0588	0.0148	***	0.9447	0.0355	***	0.0617	0.0148	***
JGBSLOPE (10Y-2Y)	-0.0204	0.0446		-0.0618	0.0077	***	-0.0017	0.0202		-0.0593	0.0077	***
JGB10Y	0.0876	0.0202	***	0.0043	0.0087		0.0902	0.0215	***	0.0052	0.0087	
NKYGROWTH	0.4737	0.0942	***	-0.0171	0.0258		0.4561	0.0693	***	-0.0163	0.0258	
e_HV	0.0020	0.0007	***	0.0003	0.0001	***	0.0019	0.0004	***	0.0003	0.0001	***
RATE_RI	0.0628	0.0130	***	0.0031	0.0009	***	0.0591	0.0042	***	0.0030	0.0009	***
GAP3_1DLAG	1.6064	0.2073	***	0.3989	0.0149	***						
GAP3_1DLAG_Adj												
GAP3_1DLAG_UP							0.9055	0.0594	***	0.3247	0.0221	***
GAP3_1DLAG_DOWN							2.6199	0.0775	***	0.5237	0.0313	***
3-Yr SPREAD (Lagged)				0.8782	0.0054	***				0.8729	0.0056	***
_cons	-0.4009	0.1054	***	0.0424	0.0198	**	-0.4051	0.0528	***	0.0388	0.0198	**
# Obs	4172			4116			4172			4116		
# Group	52			52			52			52		
R-sq:												
within	0.5269						0.5503					
between	0.7719						0.7814					
overall	0.6120						0.6306					
sigma_alpha				0.0101						0.0106		
sigma_e				0.0906						0.0903		
rho: AR(1) on e				0.0122						0.0135		

Note: ***:1%, **:5%, *:10%

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11. Discussion

- Mark-to-Markets motive: U.S. FASB and SEC
  - Require internal Models for Level-2 and Level-3 Assets
- Extend to other low liquid (⇔low trade frequencies) assets?
  - CDS (now working), CDO, CLO, ABS, and Realty prices?
- Real transaction data?
  - Reuters3000 Extra: Hauweling et al. (JBF 2005) uses Euro MKT data
  - Nomura security/research + Nikkei + others: JS-Price
  - Daiwa: Nakamura (Shoken Analyst Journal 2009) uses this

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12. Conclusion and Some more…

- We establish a new individual liquidity proxy: GAP

- Fairly consistent w/ the extant study (Hauweling et al. (JBF 2005))

- Ongoing research projects
  - **Source of the GAP** (investor's heterogeneity in some dimensions (e.g., liability)?)
    Study the evolution of the reported spreads distribution & CDS market data
  - **Theoretical model** (w/ Kei Kawakami @Melbourne Uni.)
    i) Brunnermeier & Pedersen (RFS2009) meets **heterogeneous liability structures**

    ii) Do investors really prefer the **transparency of prices** in financial markets?
  - **Low bank loan spreads** (potentially affected by bond prices through "MKT approach")
  - **Use all the data** we have (Panel Tobit)

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