



NEW YORK UNIVERSITY

Clientele Effect in Sovereign Bonds: Evidence from Malaysia

Minxia CHEN (INSEAD)

Joseph CHERIAN (National University of Singapore)

Ziyun LI (Singapore Exchange)

Yuping SHAO (Société Générale)

Marti G. SUBRAHMANYAM (NYU-Stern)*

For presentation at the Imperial College Finance Seminar

Determinants of the Yield Spread

- between Two Subsets of Bonds

What can explain the yield spread between any two subsets of bonds in the same currency (e.g., U.S. corporate bonds versus U.S. Treasury bonds OR French green sovereign bonds versus French conventional sovereign bonds)?

- ▶ Maturity differentials
- ▶ Credit risk differentials
- ▶ Market microstructure factors
 - ▶ Market structures: OTC vs Exchange Traded
 - ▶ Market maker behavior: Designated Market Makers, e.g., Primary Market Dealers
 - ▶ Liquidity effects
- ▶ Clientele effects
 - ▶ Supply/demand factors: Investor preferences
 - ▶ Tax differentials
 - ▶ Other clientele effects (e.g., mandates and regulations)

How can we disentangle these various effects from each other?

What are *Sukuk*?

- *Sukuk* are also referred to as Islamic Bonds or *Shariah*-Compliant Bonds.

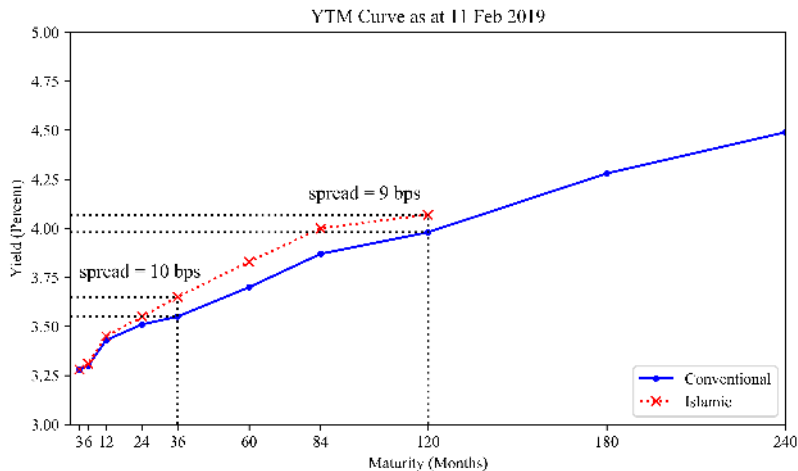
- ▶ *Sukuk* is the Arabic term for financial certificates. The funds raised by issuing *Sukuk* have to be halal ("permissible"), and cannot be involved in non-*Shariah*-compliant or haram ("forbidden") activities (e.g., gambling, alcohol, pork production or marketing).

The Malaysian sovereign bond market provides a unique laboratory for answering what drives the yield spread between any two bond subsets. Why?

- ▶ The government issues *both* sovereign *Sukuk* and Conventional sovereign bonds.
- ▶ The two subsets of bonds share the same level of overall credit risk exposure, as both are issued by the Malaysian government.
- ▶ There is no relative seniority between the two subsets of bonds: both are sovereign obligations.
- ▶ Malaysia is the largest and growing Islamic financial market and bond issuer in the world.
- ▶ It has a full-fledged *Islamic* financial system operating in parallel with the Conventional banking system.
- ▶ Research quality transaction-level bond database spans from Jan 2005 through Dec 2017.

Observed Yield Spread as at 11 Feb 2019

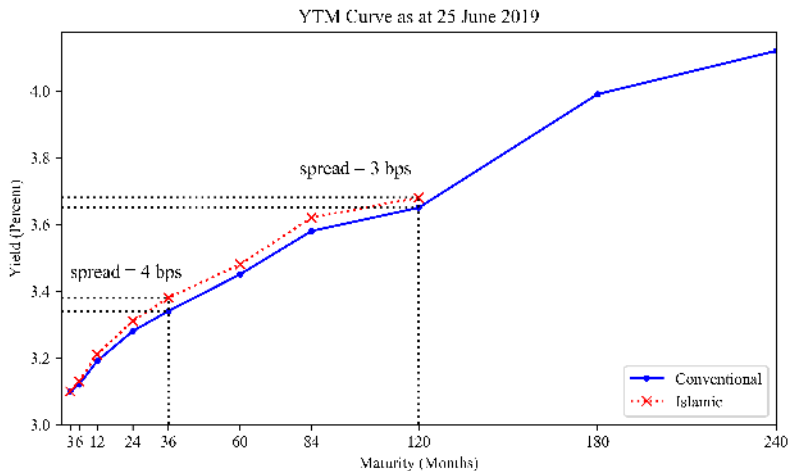
- Sovereign *Sukuk* versus Conventional Sovereign Bonds



Data Source: <http://bondinfo.bnm.gov.my>

Observed Yield Spread as at 25 Jun 2019

- Sovereign *Sukuk* versus Conventional Sovereign Bonds



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Research Questions

- and a Preview of our Main Results

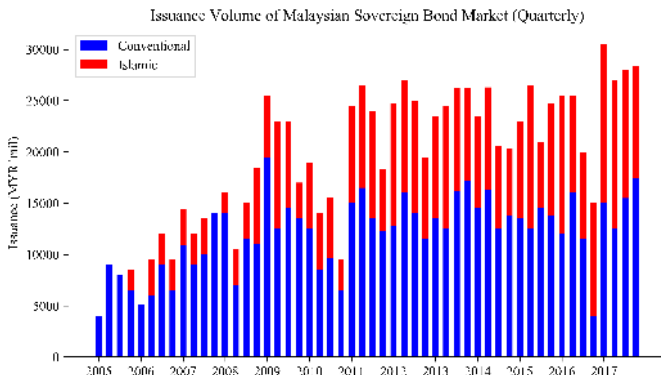
- ▶ Do sovereign *Sukuk* have higher or lower yields than Conventional sovereign bonds, *ceteris paribus*?
 - ▶ Yes. Our results indicate sovereign *Sukuk* have, in general, higher yields (lower prices) than their Conventional counterparts.
- ▶ Can liquidity and maturity effects (fully) explain the yield spread (if it exists)?
 - ▶ No. After controlling for bond characteristics and liquidity, sovereign *Sukuk*, on average, have a higher yield of 4.8 bps over the entire sample period (Jan 2005 - Dec 2017).
- ▶ If the yield spread survives after controlling for liquidity and maturity effects, what are the other explanatory factors?
 - ▶ Foreign clientele effects. Foreign investors purchase more conventional sovereign bonds than sovereign *Sukuk*, despite the fact that sovereign *Sukuk* have higher yields than their otherwise identical conventional counterparts.
 - ▶ Repo effects: Conventional bonds enjoy greater "specialness" in the repo market.

- ▶ **Institutional Background**
 - ▶ Malaysian Sovereign Bond Market
 - ▶ Malaysian Sovereign *Sukuk* and Conventional Sovereign Bonds
 - ▶ Comparison Between the Two Bond Subsets
- ▶ **Data and Methodology**
- ▶ **Main Results**
 - ▶ Actual (data-based) Yields by Maturities
 - ▶ Fama-MacBeth Cross-sectional Regression Results
 - ▶ Nelsen-Siegel Three-Factor Model Fitted Yield Curves
- ▶ **Multiple Structural Breaks**
- ▶ **Global Index Inclusion of *Sukuk***
- ▶ **Controlling for "Specialness" in the Repo Market**
- ▶ **Conclusions**

Institutional Background

- Issuance Volume of the Malaysian Sovereign Bond Market

- ▶ According to [AsianBondsOnline](http://AsianBondsOnline.com), Malaysia
 - ▶ has the 3rd largest bond market in the Asia-Pacific region (ex-Japan), after China and India.

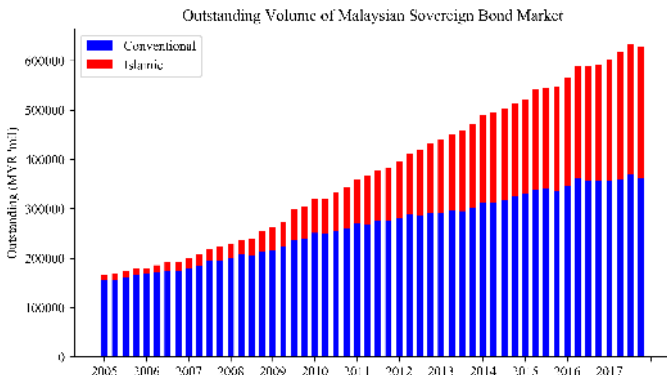


1 USD $\approx$ 3.92 MYR

Institutional Background (*continued*)

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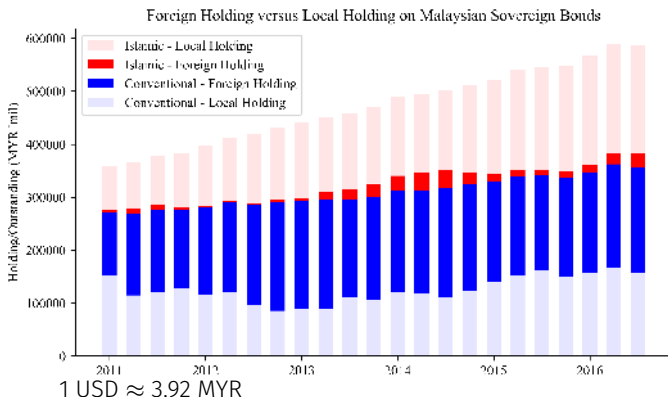


1 USD $\approx$ 3.92 MYR

Institutional Background (*continued*)

- Foreign Holdings on Sovereign *Sukuk* and Conventional Sovereign Bonds

- ▶ The Malaysian bond market is predominantly traded by institutional investors. Foreign investors are important players and have access to *both* Islamic and conventional bonds in Malaysia.



- Malaysian Sovereign *Sukuk*

- ▶ The Malaysia sovereign is currently the largest (and still growing) global issuer of *Sukuk*.
- ▶ Sovereign *Sukuk* represent over 50% of the Malaysian government's new issuance of bonds, and over 40% of the current sovereign bond outstanding.
- ▶ There is an under-participation of foreign investors in Malaysian *Sukuk* market, as compared to its conventional sovereign bond market.
- ▶ Malaysian sovereign *Sukuk* are similar to their conventional counterparts in terms of effective cash flows, issuance structure, tax incentives and other legal status.
- ▶ Certain Malaysian sovereign *Sukuk* were included in the J.P. Morgan Emerging Markets Bond Index (EMBI) starting on October 31, 2016.

Institutional Background (*continued*)

- Comparison between Sovereign *Sukuk* and Conventional Sovereign Bonds

Examples of MGS and GII

Conventional Sovereign

- ▶ Malaysian Government Securities (MGS)
- ▶ Government of Malaysia
- ▶ Over-the-counter
- ▶ Exempted from withholding tax; No capital gains tax.
- ▶ 3 to 20 years
- ▶ Issue size 500 - 4,500 million MYR
- ▶ Coupon rate

Sovereign *Sukuk*

- ▶ Government Investment Issues (GII)
- ▶ Government of Malaysia
- ▶ Over-the-counter
- ▶ Exempted from withholding tax; No capital gains tax.
- ▶ 3 to 10 years
- ▶ Issue size 1,000 - 4,500 million MYR
- ▶ Profit rate

1 USD $\approx$ 3.92 MYR

- ▶ Bond transactions-level data (both *cash* and *repo* markets): Bond Info-Hub web portal
 - ▶ set up by the Bank Negara Malaysia (BNM) - The Central Bank of Malaysia
 - ▶ similar to TRACE
- ▶ Issuance data: BNM's FAST (Fully Automated System for Issuing/Tendering)
- ▶ Sample period: January 2005 - December 2017

Data and Methodology (*continued*)

- Data Pre-processing and Sample Construction

- ▶ Apply six standard and proprietary filters to drop outliers.
- ▶ Further restrict our sample to six fixed-rate “straight” type instruments without optionality.
 - ▶ **Conventional** sovereign bond instruments
 - ▶ Malaysian Government Securities (**MGS**)
 - ▶ Bank Negara Monetary Notes - Discount Based (**BNMN-DB**)
 - ▶ Bank Negara Bills (**BNB**)
 - ▶ Sovereign **Sukuk** instruments
 - ▶ Government Investment Issues (**GII**)
 - ▶ Bank Negara Monetary Notes - Islamic Discount Based (**BNMN-IDB** and **BNMN-IDM**)
- ▶ Aggregate (reduce) data to bond-week level.
- ▶ Final sample consists of 432,633 transactions and 37,686 bond-week observations.

Data and Methodology (continued)

- Summary Statistics of Conventional Sovereign Bonds

Panel B: [Conventional](#)

	# of bonds per week	Mean	Median	Std. dev.
<u>Bond Characteristics</u>				
Maturity (year)	35.559	4.224	2.137	5.139
Duration (year)	35.530	3.333	1.963	3.523
Age (year)	35.559	2.937	1.380	3.702
Coupon Rate (%)	35.536	2.780	2.851	2.002
<u>Trading Activities</u>				
# of Trades	35.559	13.788	5.373	25.128
Amount Traded (million MYR)	35.536	313.592	146.714	456.110
Time Interval (day)	35.381	4.619	1.512	9.190
<u>Liquidity Measures</u>				
Amihud Ratio (bps per hundred million MYR)	35.364	2, 670.99	237.210	8, 686.240
Price Dispersion Measure (MYR)	28.747	0.079	0.043	0.101
Zero Return Dummy	35.040	0.429	0.459	0.287
1 st PC of Liquidity	28.333	0.212	-0.086	1.427

The 1st PC of Liquidity comprises of the 3 proxies for trading activity: (a) # of Trades, (b) Amount Traded, and (c) Time Interval, and 3 measures for liquidity effects: (d) Amihud Ratio, (e) Price Dispersion Measure, and (f) Zero Return Dummy.

Data and Methodology (*continued*)

- Summary Statistics of Sovereign Sukuk

Panel C : **Islamic**

	# of bonds per week	Mean	Median	Std. dev.
<u>Bond Characteristics</u>				
Maturity (year)	20.303	2.939	1.723	3.299
Duration (year)	19.896	2.733	1.849	2.579
Age (year)	20.303	1.291	0.783	1.459
Coupon Rate (%)	19.896	2.317	1.914	1.439
<u>Trading Activities</u>				
# of Trades	20.303	11.418	5.818	17.904
Amount Traded (million MYR)	20.301	239450	136.460	311.670
Time Interval (day)	19.976	7.974	3.029	13.999
<u>Liquidity Measures</u>				
Amihud Ratio (bps per hundred million MYR)	19.976	437.620	38.340	1,205.630
Price Dispersion Measure (MYR)	14.338	0.037	0.019	0.051
Zero Return Dummy	19.527	0.595	0.679	0.262
1 st PC of Liquidity	13.758	-0.373	-0.602	1.273

The 1st PC of Liquidity comprises of the 3 proxies for trading activity: (a) # of Trades, (b) Amount Traded, and (c) Time Interval, and 3 measures for liquidity effects: (d) Amihud Ratio, (e) Price Dispersion Measure, and (f) Zero Return Dummy.

- Summary Statistics Comparison

Cross-sectional mean comparison

	Islamic		Conventional
# of bonds per week	20.303	<	35.559
<u>Bond Characteristics</u>			
Maturity (year)	2.939	<	4.224
Duration (year)	2.733	<	3.333
Age (year)	1.291	<	2.937
Coupon Rate (%)	2.317	<	2.78
<u>Trading Activities</u>			
# of Trades	11.418	<	13.788
Amount Traded (million MYR) per week	239.45	<	313.592
Time Interval (day)	7.974	>	4.619
<u>Liquidity Measures</u>			
<i>Amihud Ratio (bps per hundred million MYR)</i>	437.62	<	2670.99
<i>Price Dispersion Measure (MYR)</i>	0.037	<	0.079
<i>Zero Return Dummy</i>	0.595	>	0.429
<i>1st PC of Liquidity</i>	-0.373	<	0.212

- Correlation Matrix of Combined Sample

Panel A : Combined Sample

	(a)	(b)	(c)	(d)	(e)	(f)	(g)
(a) # of Trades	1.00						
(b) Amount Traded	0.76	1.00					
(c) Time Interval	-0.25	-0.27	1.00				
(d) <i>Amihud Ratio</i>	-0.09	-0.17	0.15	1.00			
(e) <i>Price Dispersion Measure</i>	0.27	0.05	-0.16	0.34	1.00		
(f) <i>Zero Return Dummy</i>	-0.57	-0.51	0.41	0.069	-0.33	1.00	
(g) 1 st PC of Liquidity	0.86	0.80	-0.52	-0.08	0.37	-0.79	1.00

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Data and Methodology (*continued*)

- Empirical Specifications

- ▶ Actual (data-based) Yields by Maturities
- ▶ Fama-MacBeth Cross-sectional Regressions:

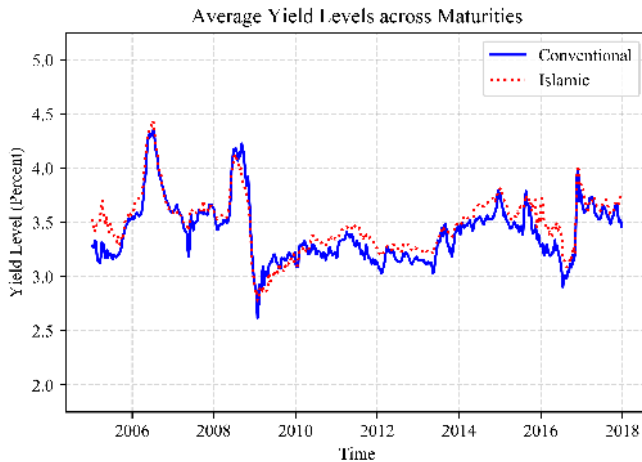
$$\begin{aligned}
 Yield_{i,t} = & \alpha_{0t} + \alpha_{1t} \times Islamic\ Dummy_{i,t} + \alpha_{2t} \times Maturity_{i,t} \\
 & + \alpha_{3t} \times Maturity_{i,t}^2 + \alpha_{4t} \times Coupon\ Rate_{i,t} \\
 & + \alpha_{5t} \times Age_{i,t} + \alpha_{6t} \times 1^{st}\ PC\ of\ Liquidity_{i,t}
 \end{aligned}
 \tag{1}$$

- ▶ Nelsen-Siegel Three-Factor Model:

$$\begin{aligned}
 y_t(\tau) = & \beta_{1t} + \beta_{2t}X_{2t} + \beta_{3t}X_{3t}; \\
 X_{2t} = & \frac{1 - e^{-\lambda_t\tau}}{\lambda_t\tau}, \quad X_{3t} = \frac{1 - e^{-\lambda_t\tau}}{\lambda_t\tau} - e^{-\lambda_t\tau},
 \end{aligned}
 \tag{2}$$

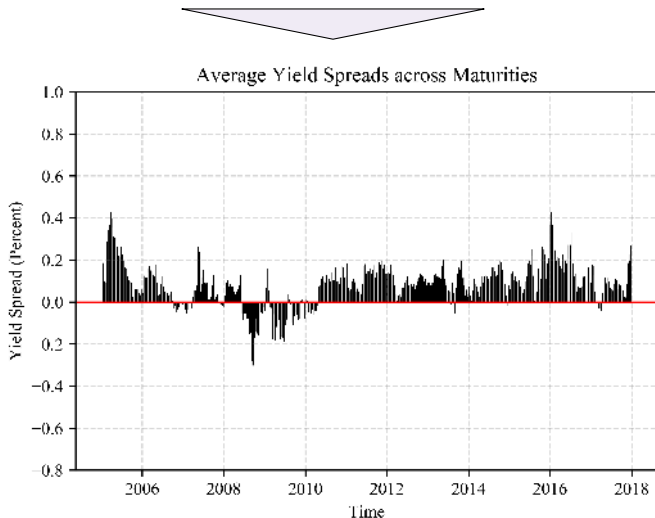
Main Results

- Actual (data-based) Yield *Levels* by Maturities



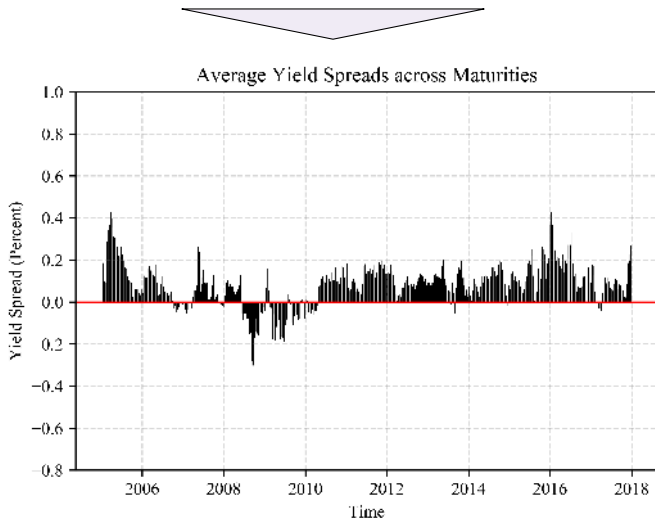
Main Results (*continued*)

- Actual (data-based) Yield Spreads by Maturities



Main Results (*continued*)

- Actual (data-based) Yield Spreads by Maturities



Main Results (*continued*)

- Fama-MacBeth Cross-sectional Regression Results

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intercept	3.374*** (122.53)	3.396*** (124.77)	2.897*** (77.19)	2.875*** (77.05)	2.875*** (76.79)	2.862*** (74.13)
<i>Islamic Dummy</i>		-0.035** (-2.46)	0.052*** (11.56)	0.049*** (11.30)	0.048*** (11.20)	0.048*** (11.15)
Maturity			0.166*** (17.75)	0.161*** (18.17)	0.161*** (18.19)	0.168*** (17.34)
Maturity ²			-0.005*** (-11.28)	-0.005*** (-11.41)	-0.005*** (-11.32)	-0.005*** (-10.19)
Coupon Rate				0.009*** (5.28)	0.010*** (4.07)	0.011*** (3.32)
Age					0.000 (-0.36)	-0.001 (-1.09)
1 st PC of Liquidity						-0.007*** (-8.24)
R ²	0.000	0.006	0.930	0.939	0.940	0.948
N	37,670	37,670	37,670	37,381	37,381	28,153

Significance at the 10%(*), 5%(**), or 1%(***) is indicated.

Main Results (*continued*)

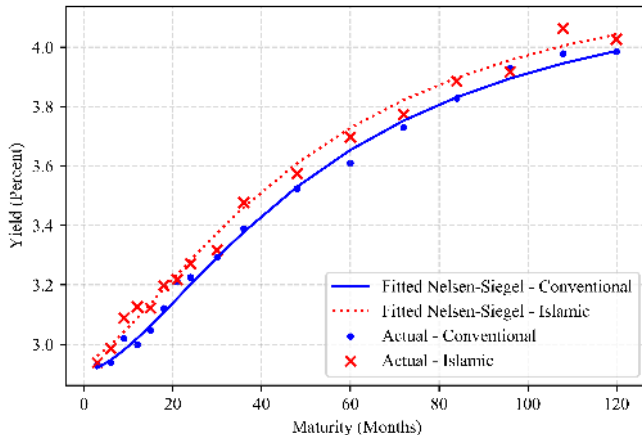
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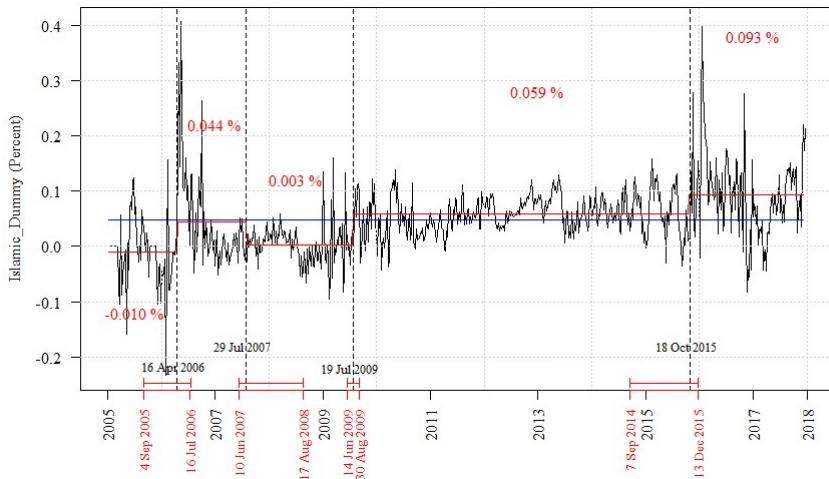
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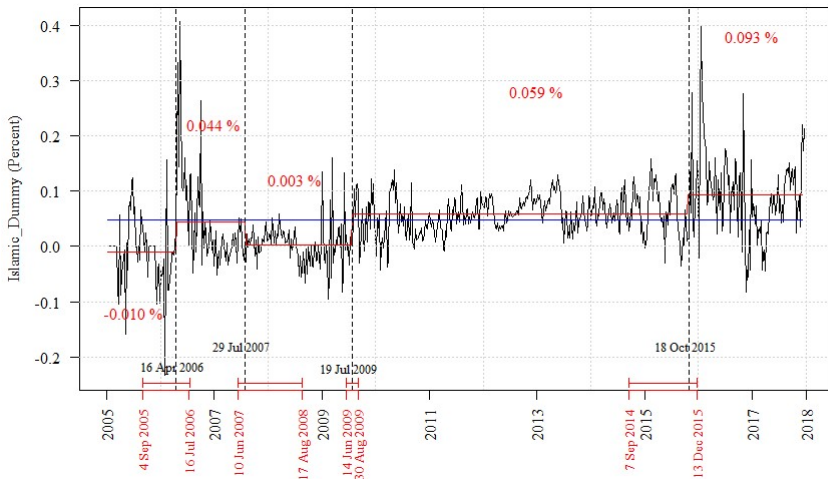
- Nelsen-Siegel Three-Factor Model Fitted Yield Curves



Multiple Structural Breaks



Multiple Structural Breaks



Global Index Inclusion of Two Sovereign *Sukuk*

- Fama-MacBeth Coefficient Test Pre- and Post- the Announcement

The announcement date is on August 19, 2016.

	full window	5 weeks		10 weeks		15 weeks	
		pre-event	post-event	pre-event	post-event	pre-event	post-event
Intercept	2.851*** (43.17)	2.311*** (81.30)	2.72*** (86.01)	2.409*** (36.26)	2.544*** (18.39)	2.543*** (22.81)	2.687*** (18.27)
Islamic Dummy	0.082*** (8.09)	0.116*** (6.56)	0.121*** (15.26)	0.116*** (6.84)	0.101*** (8.27)	0.108*** (7.80)	0.084*** (3.73)
<i>JPM Dummy</i>	-0.002 (-0.10)	-0.002 (-0.12)	-0.083*** (-4.85)	-0.008 (-0.75)	-0.076*** (-5.06)	-0.023* (-1.85)	-0.102*** (-4.61)
Maturity	0.015*** (39.10)	0.155*** (51.50)	0.151*** (142.70)	0.151*** (40.25)	0.156*** (35.31)	0.148*** (40.17)	0.151*** (32.66)
Maturity ²	-0.003*** (-25.47)	-0.003*** (-35.41)	-0.003*** (-59.54)	-0.003*** (-38.14)	-0.003*** (-10.46)	-0.003*** (-44.22)	-0.003*** (-15.88)
Coupon Rate	0.032*** (3.17)	0.0625*** (5.49)	-0.072*** (-8.94)	0.061*** (8.39)	-0.011 (-0.25)	0.053*** (5.73)	0.02 (0.48)
Age	-0.004** (-1.96)	-0.015*** (-5.10)	0.012*** (10.30)	-0.015*** (-6.02)	0.004 (0.88)	-0.016*** (-8.54)	0.001 (0.26)
1 st PC of Liquidity	-0.018*** (-7.77)	-0.022*** (-13.14)	-0.018*** (-7.77)	-0.018*** (-6.77)	-0.018*** (-7.77)	-0.015*** (-5.50)	-0.018*** (-7.77)
R ²	0.9446	0.9413	0.9284	0.9463	0.9206	0.9453	0.893
N	4,237	299	301	450	541	694	783
# of Weeks	21	5	5	10	10	15	15

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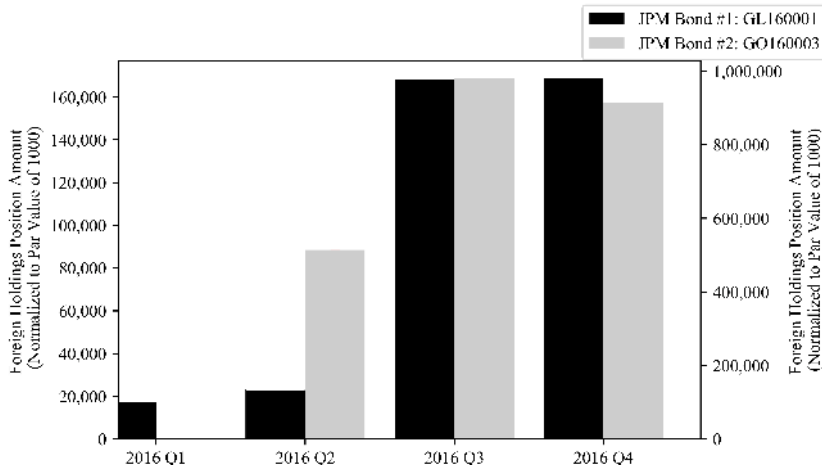
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Global Index Inclusion of Two Sovereign *Sukuk*

- Foreign Holdings of the two JPM Bonds

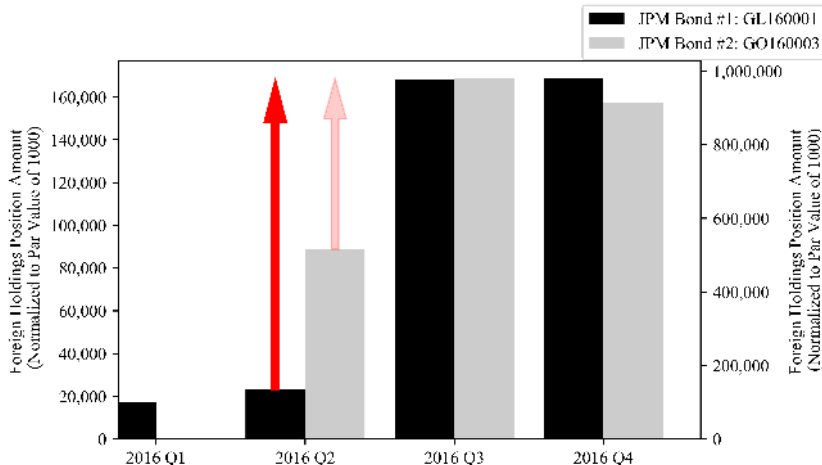
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Global Index Inclusion of Two Sovereign *Sukuk*

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Controlling for "Specialness" in Repo Market

- Repo Rate Differentials by Repo Tenures

	Average Repo Rates (%)			Average Repo Volumes (million MYR)		
	Conventional	Islamic	$diff(I-C)$	Conventional	Islamic	$diff(I-C)$
One-day	3.055	3.298	0.242	325.790	114.901	-210.889
Two-day	3.053	3.335	0.282	171.312	69.798	-101.514
One-week	2.902	3.002	0.100	93.144	42.742	-50.402
Two-week	2.460	2.925	0.466	106.203	74.857	-31.346
Three-week	2.957	3.037	0.081	119.292	103.089	-16.203
One-month	2.893	3.186	0.293	240.571	117.559	-123.012
Two-month	3.037	3.162	0.125	437.816	275.324	-162.492
Three-month	3.179	3.331	0.152	271.391	664.671	393.281
Six-month	3.127	3.300	0.173	289.071	248.091	-40.980

Controlling for "Specialness" in Repo Market

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Two-day	3.053	3.335	0.282	171.312	69.798	-101.514
One-week	2.902	3.002	0.100	93.144	42.742	-50.402
Two-week	2.460	2.925	0.466	106.203	74.857	-31.346
Three-week	2.957	3.037	0.081	119.292	103.089	-16.203
One-month	2.893	3.186	0.293	240.571	117.559	-123.012
Two-month	3.037	3.162	0.125	437.816	275.324	-162.492
Three-month	3.179	3.331	0.152	271.391	664.671	393.281
Six-month	3.127	3.300	0.173	289.071	248.091	-40.980

Controlling for "Specialness" in Repo Market

- Repo Rate Differentials using Fama-MacBeth Regressions

$$\text{Repo Rate}_{i,t} = \alpha_0 + \alpha_1 \times \text{Repo Tenure}_{i,t} + \alpha_2 \times \text{Islamic Dummy}_{i,t} + \alpha_3 \times \text{Controls}$$

	Model 1	Model 2	Model 3	Model 4
Intercept	2.522*** (25.23)	2.568*** (13.56)	2.541*** (11.48)	3.113*** (6.7)
Repo Tenure (years)	4.08*** (5.08)	3.544*** (4.8)	2.969*** (4.45)	0.274 (0.26)
<i>Islamic Dummy</i>	0.379*** (4.79)	0.416*** (3.55)	0.567*** (3.63)	0.185* (1.88)
Maturity	YES	YES	YES	YES
Maturity ²	YES	YES	YES	YES
Coupon Rate		YES	YES	YES
Age			YES	YES
1 st PC of Liquidity				YES
R ²	0.449	0.483	0.491	0.537
N	3,252	3,157	3,157	2,732
# of Weeks	197	197	197	197

Controlling for "Specialness" in Repo Market

- Repo Rate Differentials using Fama-MacBeth Regressions

$$\text{Repo Rate}_{i,t} = \alpha_0 + \alpha_1 \times \text{Repo Tenure}_{i,t} + \alpha_2 \times \text{Islamic Dummy}_{i,t} + \alpha_3 \times \text{Controls}$$

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# of Weeks	197	197	197	197

Controlling for "Specialness" in Repo Market

- Re-examine Main Results with Constrained Samples (1)

$$Yield_{i,t} = \alpha_0 + \alpha_1 \times Islamic Dummy_{i,t} + \alpha_2 \times Controls_{i,t}, \text{ for week } t = 1, 2, 3, \dots, 675$$

$$\alpha_{1t} = \beta_0 + \beta_1 \times Repo Week Dummy_t,$$

	Model 1	Model 2	Model 3	Model 4
Intercept	0.0446*** (15.858)	0.0408*** (10.396)	0.0404*** (10.102)	0.0435*** (10.483)
<i>Repo Week Dummy</i>	0.0255*** (4.898)	0.0283*** (3.668)	0.0265*** (3.491)	0.0138* (1.816)
R ²	0.033	0.044	0.039	0.009
N	37,670	37,381	37,381	28,153
# of Weeks	675	675	675	675

Control variables for Model 1: *Maturity* and *Maturity*²; for Model 2: *Maturity*, *Maturity*², and *Coupon Rate*; for Model 3: *Maturity*, *Maturity*², *Coupon Rate*, and *Age*, for Model 4: *Maturity*, *Maturity*², *Coupon Rate*, *Age*, and 1st PC of *Liquidity*.

Controlling for "Specialness" in Repo Market

- Re-examine Main Results with Constrained Samples (1)

$Yield_{i,t} = \alpha_0 + \alpha_1 \times \text{Islamic Dummy}_{i,t} + \alpha_2 \times \text{Controls}_{i,t}$, for week $t = 1, 2, 3, \dots, 675$

$\alpha_{1t} = \beta_0 + \beta_1 \times \text{Repo Week Dummy}_t$,

	Model 1	Model 2	Model 3	Model 4
Intercept	0.0446*** (15.858)	0.0408*** (10.396)	0.0404*** (10.102)	0.0435*** (10.483)
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Controlling for "Specialness" in Repo Market

- Re-examine Main Results with Constrained Samples (2)

$$Yield_{i,t} = \alpha_0 + \alpha_1 \times Repo\ Dummy_{i,t} + \alpha_2 \times Islamic\ Dummy_{i,t} + \alpha_3 \times Repo\ Dummy_{i,t} \times Islamic\ Dummy_{i,t} + \alpha_4 \times Controls_{i,t}$$

	Model 1	Model 2	Model 3	Model 4
Intercept	3.048*** (55.7)	3.008*** (53.49)	3.008*** (52.78)	2.984*** (47.16)
<i>Islamic Dummy</i>	0.074*** (6.56)	0.07*** (6.92)	0.067*** (6.81)	0.059*** (5.76)
<i>Repo Dummy</i>	-0.005 (-0.53)	-0.013** (-2.32)	-0.014*** (-2.58)	-0.014** (-2.03)
<i>Islamic Dummy * Repo Dummy</i>	0.023* (1.75)	0.028** (2.41)	0.028** (2.49)	0.019* (1.87)
<i>Maturity</i>	0.132*** (11.49)	0.131*** (11.76)	0.13*** (11.91)	0.129*** (11.9)
<i>Maturity</i> ²	-0.003*** (-7.33)	-0.003*** (-7.48)	-0.003*** (-7.41)	-0.003*** (-7.25)
<i>coupon_rate</i>		0.014*** (4.26)	0.016*** (3.53)	0.027*** (3.62)
<i>age</i>			-0.002 (-1.22)	-0.004** (-2.29)
<i>1st PC of Liquidity</i>				-0.01*** (-5.33)
R²	0.902	0.911	0.913	0.919
N	10,488	10,454	10,454	8,241
# of Weeks	197	197	197	197

Controlling for "Specialness" in Repo Market

- Re-examine Main Results with Constrained Samples (2)

$$Yield_{i,t} = \alpha_0 + \alpha_1 \times Repo Dummy_{i,t} + \alpha_2 \times Islamic Dummy_{i,t} + \alpha_3 \times Repo Dummy_{i,t} \times Islamic Dummy_{i,t} + \alpha_4 \times Controls_{i,t}$$

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N	10,488	10,454	10,454	8,241
# of Weeks	197	197	197	197

Controlling for "Specialness" in Repo Market

- Special Repo Rates and Bond Yields

$$Yield_{i,t} =$$

$\alpha_0 + \alpha_1 \times Islamic\ Dummy_{i,t} + \alpha_2 \times Repo\ Rate\ Residual_{i,t} + \alpha_3 \times Controls_{i,t}$,
 while *Repo Rate Residual* is computed by first regressing the special repo rate on the first principal component (1st PC of Liquidity) of all the liquidity proxies, and then taking the residual term.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intercept	2.897*** (77.19)	3.047*** (55.36)	3.013*** (47.84)	2.969*** (38.36)	2.689*** (22.2)	2.475*** (22.77)
<i>Islamic Dummy</i>	0.052*** (11.56)	0.07*** (7.39)	0.131*** (5.23)	0.141*** (3.69)	0.179*** (3.77)	0.175*** (2.95)
<i>Repo Rate Residual</i>				0.057*** (3.22)	0.115** (2.09)	0.102** (2.1)
Maturity	0.166*** (17.75)	0.134*** (10.98)	0.162*** (10.12)	0.167*** (7.93)	0.188*** (7.48)	0.167*** (10.15)
Maturity²	-0.005*** (-11.28)	-0.003*** (-6.42)	-0.007*** (-4.59)	-0.005** (-2.35)	-0.007*** (-2.77)	-0.005*** (-3.37)
Coupon Rate					0.049 (1.62)	0.143*** (5.7)
Age					0.019*** (3.09)	-0.008 (-0.93)
1 st PC of Liquidity						-0.058*** (-3.91)
R ²	0.93	0.899	0.923	0.936	0.956	0.961
N	37,670	10,488	3,252	2,783	2,769	2,769
# of Weeks	675	197	197	197	197	197

Controlling for "Specialness" in Repo Market

- Special Repo Rates and Bond Yields

$$Yield_{i,t} =$$

$\alpha_0 + \alpha_1 \times Islamic\ Dummy_{i,t} + \alpha_2 \times Repo\ Rate\ Residual_{i,t} + \alpha_3 \times Controls_{i,t}$,
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N	37,670	10,488	3,252	2,783	2,769	2,769
# of Weeks	675	197	197	197	197	197

- ▶ Malaysian sovereign *Sukuk* appear to be a “good deal” for investors.
 - ▶ In our baseline results, they have a 4.8 bps higher yield (=lower price) than their otherwise identical conventional counterparts.
- ▶ The yield spread cannot be (fully) explained by liquidity effects.
 - ▶ The yield spread survives after controlling for liquidity differentials.
 - ▶ Since the credit risk and taxation are identical, they do not explain the spread either.
 - ▶ It could be foreign clientele effects. Foreign investors purchase more conventional sovereign bonds than sovereign *Sukuk*, despite the fact that sovereign *Sukuk* have higher yields than their otherwise identical conventional counterparts.

- ▶ Three circumstances in which the baseline yield spread is amplified due to the potential foreign clientele effects.
 - ▶ During the 2008-2009 financial crisis, the yield spread dropped from 4.4 bps pre-GFC to 0.3 bps during GFC, and then recovers to 5.9 bps post-GFC. This is potentially due to the selling of Malaysian conventional sovereign bonds by foreign investors.
 - ▶ When two of Malaysian sovereign *Sukuk* were added to the J.P. Morgan Emerging Market Bond Index, the foreign holdings of the two chosen bonds increased dramatically (2 times and 7 times), resulting a 7.6-10.2 bps drop in bond yields.
 - ▶ When there is an active repo market, conventional sovereign bonds enjoy higher "specialness", leading to a wider yield spread.

Appendix A

- Data Filtering Steps

- ▶ Removing errors
- ▶ Removing missing yields
- ▶ Removing duplicated reporting
- ▶ Removing extreme values
- ▶ Price Filtering
 - ▶ price median filter: 10% from daily mean
 - ▶ price reversal filter: 10% from the lead(lag), and average lead(lag)
- ▶ Six instruments

year	before cleaning	errors	missing yields	after removing extreme values	dup-repo	after price-filtering	six instruments
2005	100.00%	100.00%	74.17%	73.70%	73.67%	73.67%	58.22%
2006	100.00%	100.00%	73.39%	73.14%	73.12%	73.12%	62.27%
2007	100.00%	100.00%	64.79%	64.48%	64.47%	64.47%	59.10%
2008	100.00%	100.00%	92.11%	91.09%	91.06%	91.06%	74.30%
2009	100.00%	100.00%	96.51%	94.23%	94.22%	94.22%	73.38%
2010	100.00%	100.00%	97.11%	96.87%	96.85%	96.85%	77.14%
2011	100.00%	100.00%	96.55%	96.25%	96.21%	96.21%	77.81%
2012	100.00%	100.00%	96.16%	95.84%	95.82%	95.82%	72.01%
2013	100.00%	100.00%	97.02%	96.71%	96.69%	96.69%	71.55%
2014	100.00%	100.00%	96.03%	95.74%	93.78%	93.78%	68.19%
2015	100.00%	100.00%	96.00%	95.62%	93.94%	93.94%	70.78%
2016	100.00%	100.00%	85.25%	84.91%	84.90%	84.89%	63.73%
2017	100.00%	100.00%	91.91%	91.69%	89.00%	89.00%	65.44%
TOTAL	100.00%	100.00%	89.66%	89.20%	88.65%	88.65%	68.81%

Thank you.