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Libor Transition

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INSURTECH
VENTURE PARTNERS



Institute
and Faculty
of Actuaries

Puzzle

Which building is this?



Agenda

■ Macro environment and regulations

■ Derivatives in life & pensions

- Strategic use of derivatives
- Dual-curve discounting

■ Floating rate benchmarks

- Regulations
- State of play
- Transitioning the legacy book
- Capital consequences

■ Banking book

After the Credit Crunch

Regulatory Architecture regarding Capital, Trading, Derivatives, Conduct

Basel III

Capital requirement: scheduled to increase until 2019
Leverage constraint (LR): 3%
Liquidity coverage ratio (LCR)
Net stable funding ratio (NSFR)

Dodd-Frank Act Title VII

Trade Reporting: completed
Mandatory execution: completed
Mandatory clearing: completed
Margining requirements non-cleared: phasing in since Sep-2016

Brexit

EEA, EFTA, WTO market access?
Equivalence of capital models?

PRIIPs, IDD, MAD/MAR, MCD, AIFMD, GDPR

Business conduct, custody and depository arrangements,
market abuse, mortgage selling conduct,
cyber security and data protection

CRR / CRD IV / CRR II / CRD V

OTC Derivatives capital costs: **Completed**

Solvency II

Pillar 1: Valuation and risk-based capital requirements
Pillar 2: Governance and risk management requirements,
Pillar 3: Supervisory reporting and public disclosure.

EMIR, SFTR, EMIR Refit

Trade Reporting: completed since 2013 (but not matching well)
Mandatory clearing: phasing in since April 2016
Margining requirements non-cleared: phase in Dec 2016-2019

MiFID II / MiFIR

Market structure, execution venues,
trade and transaction reporting,
best execution,
algorithmic trading: anticipated January 2018

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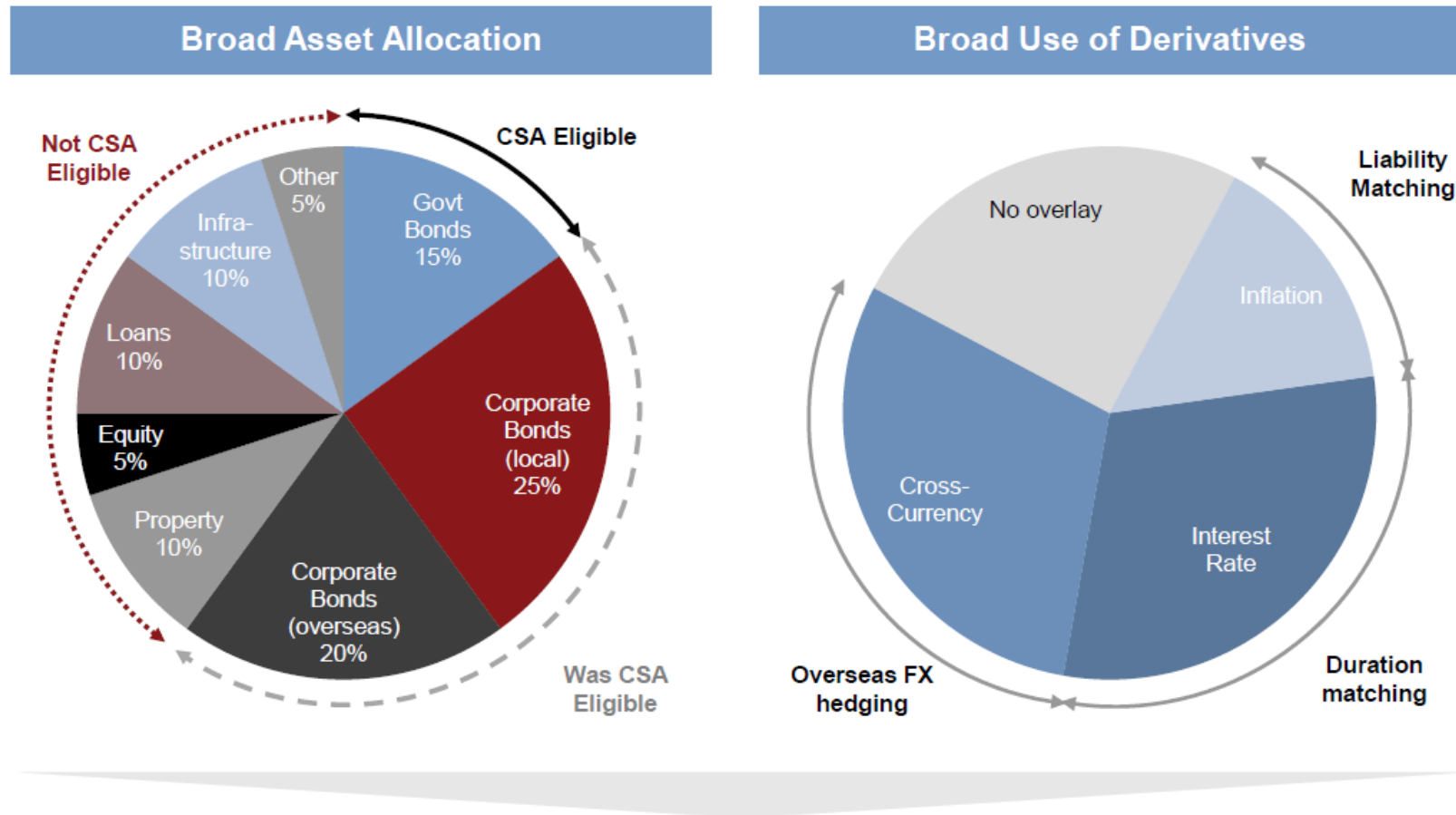
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Liability Driven Investment Investments in Assets and Derivative Overlays Requiring Collateral



Many assets require derivatives overlays to match liabilities –
but few assets provide eligible **collateral or cash for clearing**

Asset-Liability Management

Insurance Risks versus Derivatives

<i>Derivatives</i>	<i>Covered risk</i>	<i>Applications in insurance asset-liability management</i>
Interest rate swaps	Low or high rates	Annuities, pension buy-outs, P&C income support, with-profits books, variable annuity books
Receiver swaps	Low rates, guarantee risk	Annuities, pension buy-outs, P&C income support, with-profits books, variable annuity books
Payer swaps	High rates, surrender risk	[Not often encountered on its own in liability management]
Receiver and payer swaps	Low or high rates; asset-liability overlay for tighter matching	Annuities, pension buy-outs, P&C income support
Cross-currency swaps	Foreign and domestic yield curve, spot currency and basis risks	Annuities, pension buy-outs, P&C income support
Inflation swaps	High inflation	Annuities, pension buy-outs, P&C income support
RPI swaps	High inflation	Annuities, pension buy-outs, P&C income support
LPI swaps	Volatile inflation between floor and cap	Annuities, pension buy-outs
Inflation caps and floors	Volatile inflation between floor and cap	Annuities, pension buy-outs
Swaptions	Low, high or volatile interest rates	Open with-profits books, regular premium inflow
Receiver swaptions	Low rates, guarantee risk, guaranteed annuity options	Open with-profits books, regular premium inflow
Payer swaptions	High rates, surrender risk; low rates (receiver and put-call parity)	Open with-profits books
Repurchase agreements	(Depending on instrument) low rates, inflation, credit spread; cash	Alternative for interest rate or inflation swaps; liquidity support
Total return swaps	(Depending on instrument) low rates, inflation, credit spread	Alternative for interest rate or inflation swaps
Libor caps and floors	Low, high or volatile interest rates	Mutual pensions insurers
Constant maturity swaps (CMS)	Floating rate reflecting long tenors of the yield curve	[Not often encountered in liability management]
CMS caps and floors	Low, high or volatile interest rates, surrender risk	With-profits books
Equity puts	Equity bear market, guarantee risk	Closed (and open) with-profits books: guarantees
Equity collar	Equity put + equity call for neutral cost	Closed (and open) with-profits books: guarantees, smoothing
Variance swaps	Volatile and distressed markets, dynamic hedge slippage	Variable annuity books
Hybrid or cross-asset derivatives	Multi-asset risk or multi-asset liability mismatch, guarantee risk	With-profits books [, variable annuity books]
Credit default swaps	Default risk, credit spread widening, distressed markets	[Not often encountered in liability management]

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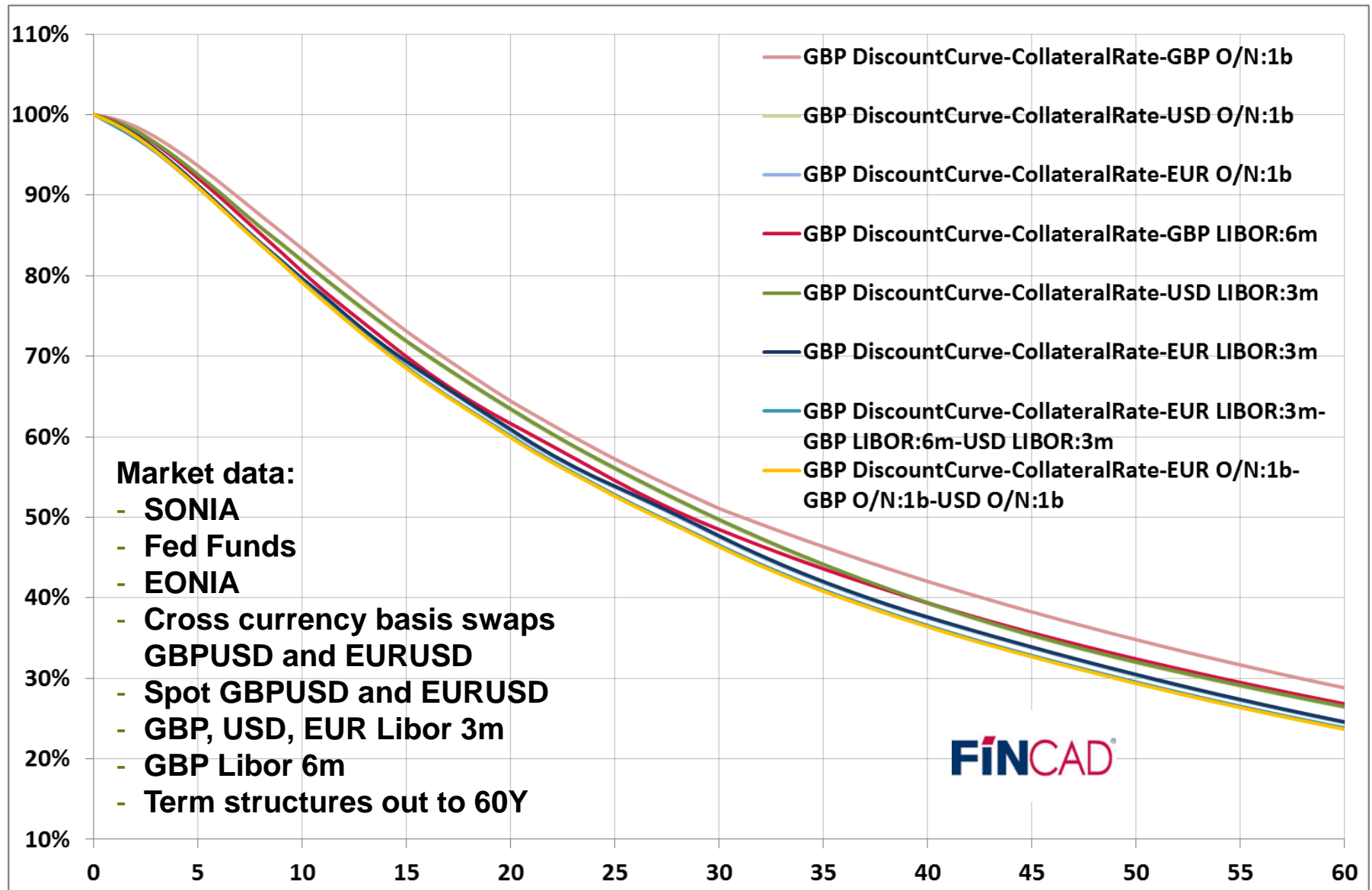
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Best-in-Class Analytics

CSA Discounting Example accounting for Collateral Optionality



Revaluation of GBP 4 billion interest rate swap portfolio

Pricing Impact of Floating Rate Benchmark and Credit Support Annex

- SONIA trading on average about 22 basis points below GBP Libor 6M on valuation day in 2015
- Reformed SONIA (as per Bank of England) another 1.3 basis points below SONIA

FiNCAD

	<i>GBP Libor 6M</i>	<i>SONIA</i>	<i>Basis Swap</i>
FullyCollateralizedInLiborGBP6m	812,917,673	707,157,049	105,760,624
FullyCollateralizedInLiborUSD3m	820,910,196	714,825,552	106,084,644
FullyCollateralizedInLiborEUR3m	807,003,191	702,450,625	104,552,566
MulticurrencyLiborCollateral	802,955,184	700,060,625	102,894,559

FullyCollateralizedInGBP	829,450,669	722,106,552	107,344,117
FullyCollateralizedInUSD	820,412,189	714,033,514	106,378,675
FullyCollateralizedInEUR	806,398,760	701,830,231	104,568,529
MulticurrencyOISCollateral	803,071,032	699,581,039	103,489,993

- Pricing differences of around GBP 100 million for SONIA
- You require the same analytic capabilities as your brokers!

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Regulations and Other Provisions

- International Organisation of Securities Commissions IOSCO
 - Principles for Financial Benchmarks
- European Union with European Economic Area relevance
 - Builds on MiFID II (Directive) which already contained stipulations
 - Regulation 2016/1011 “The Benchmark Regulation”: Regulations unlike Directives apply immediately
 - Libor, Euribor, Forex and Commodity benchmarks are considered
 - Delegates technical standards to ESMA which reviews competent authorities (national regulators)
- ISDA contractual definitions contain fallback provisions but they may fail to provide a suitable resolution or not apply:
 - Fail to be able to calculate the fallback or set a naïve solution (last fixing ever after)
 - There is no reason ISDA should apply to loans, floating rate notes, securitisations, mortgages
- European Central Bank sets ESTER methodology and policies and collects and publishes ESTER

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Choices to be Made

- Continue with a *reformed* term Libor/Euribor ... versus move to an overnight rate
- Use a secured rate versus an unsecured rate
 - Play it safe by using the overnight rate with presumably a reduced risk of default
 - Repo-rate for a set benchmark security or portfolio of securities
 - Both: overnight repo-rate
- Market considerations
 - Real transaction volume underpinning quotations
 - Number of independent quotations
 - Statistical handling: average versus median and handling of outliers
 - Volumes and trade weighting
 - Finality of publication versus correcting mistakes
 - Transparency: how much data is published & anonymity of submissions
- Governance
 - Choice of calculation agent
 - Overview and review

Reformed Libor Camp

Intercontinental Exchange Benchmark Administration IBA administers Libor

- British Banking Association BBA has stepped away from the task
- Five currencies USD, EUR, GBP, JPY, CHF
- Overnight/Spot Next, 1 Week, 1 Month, 2 Months, 3 Months, 6 Months and 12 Months
- Reference panel of between 11 and 16 quoting banks for each currency
- Banks quote, but for how long?
- UK Financial Conduct Authority will not enforce banks to quote beyond 2021
- Threat of misconduct leading to fines (US \$ 9 billion) means those who can stop quoting, stop
- The real issue is not resolved: next to no lending underpins quotations
- Limited information is published (no underlying volumes)
- <https://www.theice.com/iba/libor>
- ICE active in overnight secured and unsecured futures reflecting limited faith in IBA?

Reformed Libor Camp

The IBA Panel of Banks

BANK/CCY	USD	GBP	EUR	CHF	JPY
Bank of America N.A. (London Branch)					
Barclays Bank plc					
BNP Paribas SA (London Branch)					
Citibank N.A. (London Branch)					
Cooperatieve Rabobank U.A.					
Crédit Agricole Corporate & Investment Bank					
Credit Suisse AG (London Branch)					
Deutsche Bank AG (London Branch)					
HSBC Bank plc					
JPMorgan Chase Bank, N.A. (London Branch)					
Lloyds Bank plc					
Mizuho Bank, Ltd.					
MUFG Bank, Ltd					
National Westminster Bank plc					
Royal Bank of Canada					
Santander UK Plc					
Société Générale (London Branch)					
Sumitomo Mitsui Banking Corporation Europe Limited					
The Norinchukin Bank					
UBS AG					

Reformed Libor Camp Nordics

■ Sweden: Nasdaq OMX and 7 large Nordic banks

- STIBOR* (Stockholm Interbank Offered Rate) is a reference rate that shows the average interest rate at which a number of active banks on the Swedish money market ("the STIBOR banks") are willing to lend to one another, without collateral, at different maturities.

Rate	Last	Date	Danske Bank	Länsförsäkringar Bank	Nordea	SEB	SHB	Swedbank	SBAB
STIBOR Fixing 1W	-0.222	15/03/2019	-0.170	-0.230	-0.250	-0.181	-0.220	-0.250	-0.230
STIBOR Fixing TN	-0.200	15/03/2019	-0.170	-0.220	-0.170	-0.120	-0.220	-0.230	-0.220
STIBOR Fixing 1M	-0.156	15/03/2019	-0.160	-0.162	-0.139	-0.157	-0.151	-0.150	-0.160
STIBOR Fixing 2M	-0.103	15/03/2019	-0.118	-0.104	-0.096	-0.089	-0.108	-0.100	-0.105
STIBOR Fixing 3M	-0.039	15/03/2019	-0.038	-0.051	-0.048	-0.029	-0.030	-0.030	-0.048
STIBOR Fixing 6M	0.049	15/03/2019	0.072	0.041	0.041	0.067	0.048	0.050	0.038

■ Norway: Norske Finansielle Referanser AS (NoRe) with publication at Oslo Børs

Ticker	Last	Time	+/-	+/-%	DDB	DNM	NDA	SEB	SHB	SWD
NIBOR1W	1.11	15-Mar	0.03	2.70%	1.15	1.13	1.00	1.12	1.14	1.05
NIBOR1M	1.26	15-Mar	0.03	2.38%	1.28	1.27	1.24	1.21	1.26	1.25
NIBOR2M	1.29	15-Mar	0.01	0.78%	1.31	1.29	1.29	1.28	1.28	1.30
NIBOR3M	1.37	15-Mar	0.01	0.73%	1.36	1.40	1.35	1.35	1.38	1.37
NIBOR6M	1.46	15-Mar	0.00	0.00%	1.48	1.50	1.44	1.45	1.46	1.46

■ Danske, Jyske, Nordea, Nykredit, Sydbank and Spar Nord Bank participate in the CIBOR fixing.

- CIBOR is the interest rate at which a bank is prepared to lend Danish kroner to a prime bank on an uncollateralized basis for the following maturities: 1 week, 2 weeks, 1, 2, 3, 6, 9, or 12 months.

Overnight but Better Reformed GBP SONIA administered by the Bank of England

- Brokered and bilaterally negotiated overnight unsecured transaction
- Transactions at least £ 25 million
- Volume-weighted trimmed mean removing top and bottom quartile
- Aggregate volume and 10%, 25%, 75% and 90% percentile are published alongside mean
- Same day republication before midday if error is in excess of 2 basis points
- Launched 23 April 2018
- Published 09:00 am next day
- SONIA Oversight Committee
- SONIA Stakeholder Advisory Group
- Complies with IOSCO principles

Overnight but Better

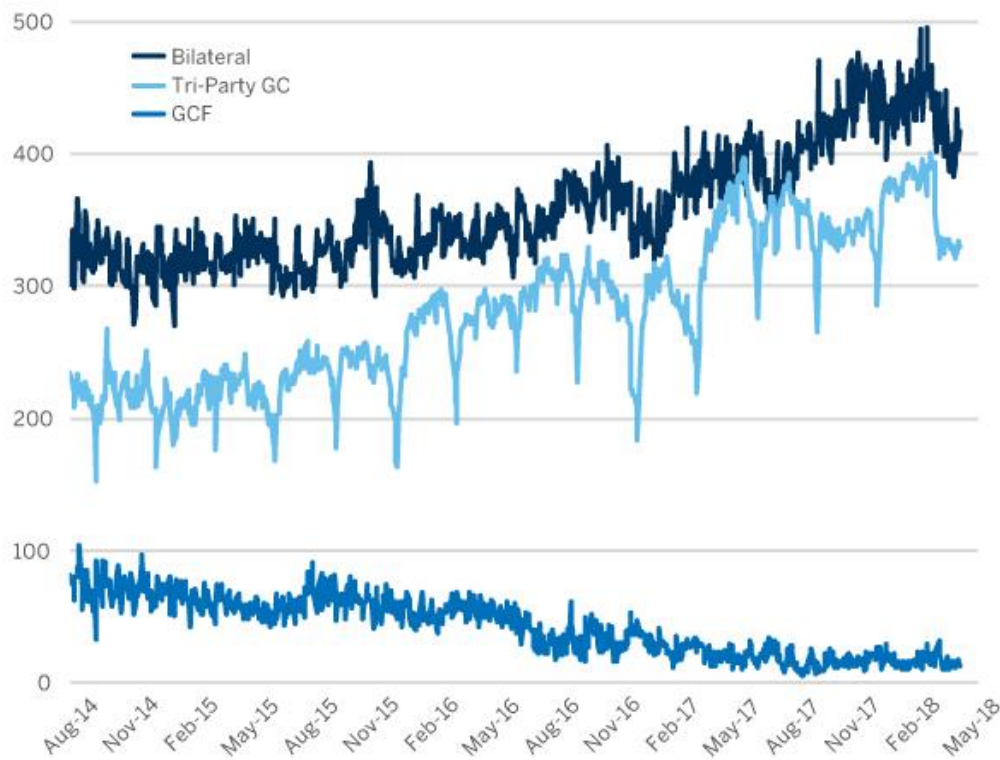
European Central Bank has announced Euro Short-Term Rate ESTER

- Wholesale Euro overnight unsecured borrowing of Euro banks
- Transactions over € 1 million
- Volume-weighted trimmed mean removing top and bottom quartile
- Aggregate volume, number of banks and transactions, percentage by largest 5 contributors and 25% and 75% percentile are published alongside mean
- Same day republication before 11:00 CET if error is in excess of 2 basis points
- Launched October 2019
- Published no later than 09:00 CET on next TARGET2 day
- Contingency arrangements for less than 20 banks reporting or 5 banks dominating 75% of volume consisting of adjustment to previous day's rate
- Complies with IOSCO principles

Try Something New

Liquid and Deep Overnight Repo-Market in US Treasuries

- Repo markets in US Treasuries 2017 average traffic flow of US\$ 745 billion per day
 - US\$ 393 billion in Fixed Income Clearing Corporation Delivery-versus-Payment bilateral Treasury repo
 - US\$ 332 billion in Bank of New York Mellon tri-party Treasury GC repo
 - US\$ 21 billion in Fixed Income Clearing Corporation General Collateral Finance Treasury repo

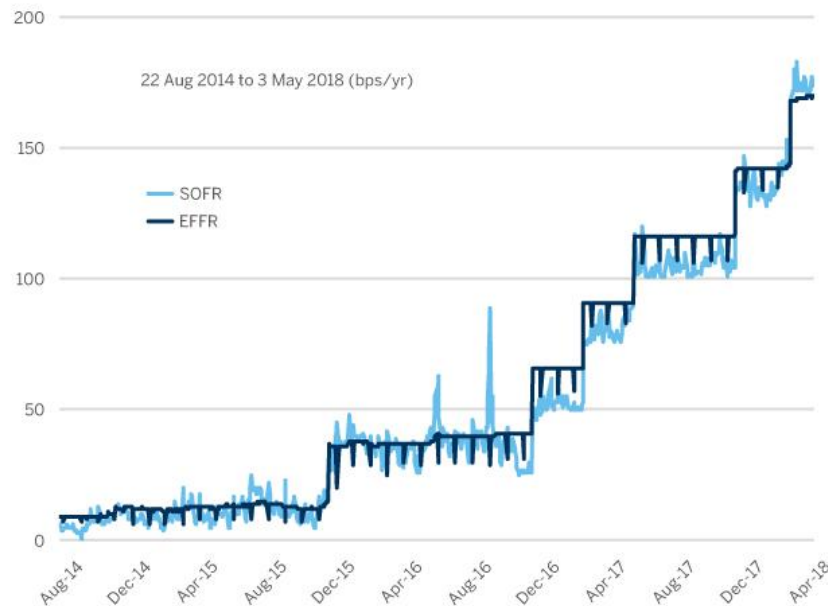


Try Something New

United States and Switzerland go for the Secured Variant

■ The Federal Reserve System convened the Alternative Reference Rates Committee (ARRC) in November 2014

- On 22 June 2017, the ARRC endorsed the Secured Overnight Financing Rate (SOFR).
- Regular production and publication of SOFR began Tuesday, 3 April 2018.
- Trade-volume weighted median more robust and aligns with Effective Federal Funds Rate (EFFR)
- CME and ICE 1 month and 3 month SOFR listed futures



■ SNB and SIX select Swiss Average Rate Overnight SARON from Swiss secured money market supported by approximately CHF 7.5 billion daily transactions

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Transitioning the Legacy Book Options

- Settlement at mark-to-market of old book with Libor references with back-to-back inception of novated book with Overnight references with same bank
 - Position is known to bank
 - Risk transfer is minimised making for a suitable transaction cost
- Trade basis swaps exchanging Libor for Overnight with any bank
 - Libor reference washes out between Libor swap and basis swap
 - Position can be guessed by bank
 - Risk transfer is minimised making for a suitable transaction cost
 - Complexity of multiple legs stays on the book
- Trade basis swaps exchanging Libor for Overnight with any bank followed by third-party trade compression services while maintaining confidentiality
 - Complexity is minimised after trade compression

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Fundamental Review of the Trading Book

Capital Treatment of Old and New Trades

- Basel Committee for Banking Supervision ordered a review of bank trading books in BCBS 352 – Minimum Capital Requirements for Market Risk
- Adequate history required for testing internal model
 - > 12 exceptions of 99% V@R or > 30 exceptions of 97.5% V@R over last year disqualify internal model
 - Is realised P&L adequately explained by internal model?
- Modellable and non-modellable risk factors
 - A continuously available real price for a risk factor must have at least 24 observable real prices per year with a maximum period of one month between two consecutive observations.
 - Real price is a conducted transaction; a verifiable arms-length price; a committed quote; or an equivalent arrangement with a vendor who can certify the three conditions
- Fundamental Review of the Trading Book requires minimum history for internal modeling
 - Libor reference may be disqualified as a modellable risk factor
 - Overnight reference may not qualify as a non-modellable risk factor
 - Internal Model Approach disallowed & Standard Model imposed

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The Banking Book

■ Floating rate notes

- Common in securitisations and covered bonds
- Legacy bonds may have unattractive features for handling benchmark discontinuation
- Dirty price requires more than just a day-count fraction and a known Libor term rate to update accrued coupon
- Coupon is known in arrears, which may require a delay between fixing and settlement
- First issues in the covered bond market have 5 business days settlement lag

■ Floating rate mortgages

- Mortgage Credit Directive 2014/17/EU – Article 24 on Variable rate credits: “Any indexes or reference rates used to calculate the borrowing rate are clear, accessible, objective and verifiable by the parties to the credit agreement and the competent authorities.”

■ Floating rate corporate loans