

# Discounting and Price Alignment (PA) Transition

*Emerging Markets IRS and OTC FX Products*

January 2021

# Discounting Transition Overview

**Scope:** All existing Cleared MXN IRS, NDIRS, and OTC FX products at CME referencing either USD or EUR discounting, comprised of:

<b>LatAm IRS Products:</b>	MXN, BRL, CLP, COP
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<b>APAC IRS Products:</b>	KRW, INR, CNY
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<b>OTC FX Products:</b>	NDFs (11 Pairs), CSFs (20 Pairs), FX Options (3 Pairs)
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**Timing:** Close of Business March 26, 2021, pending regulatory approval

**Transition Process:** Following the standard EOD clearing cycle using Fed Funds/EONIA discounting and PA on Friday, CME will generate a discounting transition report that provides the NPV of all trades under SOFR/€STR discounting and corresponding cash adjustment amounts needed to account for the change in discounting rate.

**Cash Adjustment:** To neutralize the value transfer from the change to SOFR/€STR discounting, CME will process a cash adjustment that is equal and opposite to the NPV change on each trade in all accounts.

- In line with prior discounting transitions, the Cash Adjustment is settled as part of the Variation Margin calculated on the following Monday and settled Tuesday morning.
- CME will ***not be conducting*** a re-hedging and corresponding auction process given the relatively small size of the discounting risk carried in the products and weighting towards the short end of the curve.

**Methodology:** Mark-to-Market (MTM) in local currency for each of the swaps is computed by discounting the future cashflows in local currency. MTM for NDIRS is then converted to USD equivalent using a CME-calculated FX rate.

- When pricing under SOFR discounting for EM IRS and OTC FX products in scope, CME will keep the forward projected cashflows (i.e., forecast curves) unchanged.

# Overview - Variation Margin and Cash Adjustment

## Discounting Transition Cash Flow Example

	Date	Current NPV	Prior NPV	VM	Adjustment	Total Cash
1	T - 1 (Thursday)	\$100 (EFFR)				
2	T (Friday)	<b>\$125</b> (EFFR)	\$100 (EFFR)	\$25		\$25
	T + 1 (Monday)	\$140 (SOFR)	<b>\$125</b> (EFFR Friday)	\$15	-\$1	\$14

The purpose of generating the IRS Discounting Transition Report is to:

- Isolate the impacts of the discounting transition for each USD IRS trade cleared at CME. In the above example, the Friday SOFR NPV is \$126, generating the -\$1 cash adjustment
- Provide participants ability to reconcile settlement variation on Monday by referencing the cash adjustment amount and prior-day EFFR NPV

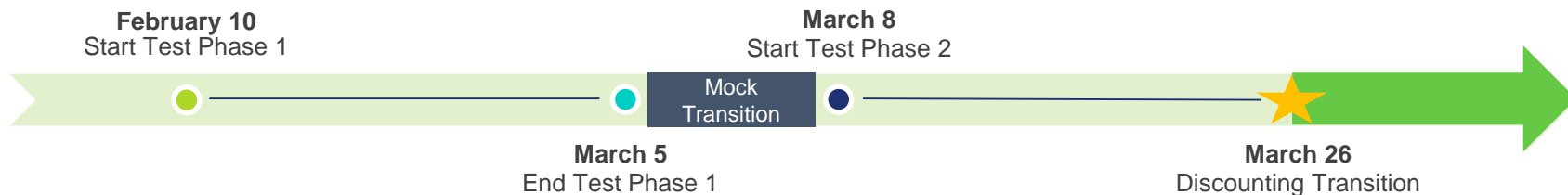
# Overview - Variation Margin and Cash Adjustment

## IRS Discounting Transition Report: Available in Production Beginning March 8<sup>th</sup>

- Shows revised NPVs under the new discounting methodology and the cash adjustment at the trade level for each position account
- Produced as part of transition processing after close-of-business
  - Publication targeted for 8 pm ET on the Transition Date
- CSV report delivered to firm and client FTP folders
  - All parties receiving IRS Trade Registers today will receive this report
- FCMs can find sample reports on CME's Intra-Links site
- Clients can reach out to [CME client services](#) for sample reports

Column Header	Description	Sample Value	Type
<b>Value Date</b>	Business Date	10/16/2020	Date
<b>Position Account ID</b>	Position Account	3TTNN7	VARCHAR(8)
<b>Cleared Trade ID</b>	CME Trade ID	6355844	Integer
<b>Platform ID</b>	SEF/Platform ID	7897868G9H	VARCHAR(255)
<b>Client ID</b>	Client ID	1423523IS	VARCHAR(255)
<b>REG_TRADE_ID</b>	USI	CCCIRS6355844	VARCHAR(255)
<b>Firm ID</b>	3 digit clearing firm ID	998	VARCHAR(3)
<b>ORIGIN</b>	HOUS or CUST	CUST	VARCHAR(4)
<b>PRODUCT_TYPE</b>	Type of swap	ZCS	VARCHAR(5)
<b>Currency</b>	Local currency	BRL	VARCHAR(3)
<b>NPV_NEW_DISC</b>	NPV under SOFR discounting (USDE for NDIRS)	2,266.34	Float
<b>NPV_PRIOR_DISC</b>	NPV under EFR discounting (USDE for NDIRS)	2,244.28	Float
<b>NPV_ADJ_NEW_DISC</b>	ADJ NPV under SOFR discounting (USDE for NDIRS)	2,266.34	Float
<b>NPV_ADJ_PRIOR_DISC</b>	ADJ NPV under EFR discounting (USDE for NDIRS)	2,244.28	Float
<b>NPV_ADJ_DIFF</b>	New ADJ NPV minus Prior ADJ NPV	22.06	Float
<b>FX_RATE</b>	Can be used to convert NPVs/ Adj NPVs to local currency for NDIRS	5.342940	Float
<b>OFFSET_ADJ_AMT</b>	Cash adjustment amount Prior ADJ NPV minus New ADJ NPV	-22.06	Float
<b>SETTLE_CCY</b>	Currency of settlement	USD	VARCHAR(3)

# Overview - Timelines and Testing Summary



## Test Phase 1: February 10 – March 5

- NR environment performs a daily simulation of the processing that occurs on transition date:
  - First, CME runs a normal end-of-day clearing cycle. NPVs and cash flows in this cycle are based on Fed Funds/EONIA.
  - Next, CME revalues trades with SOFR/ESTR and produces the Discounting Transition Reports and SOFR-based pricing curves

## Test Phase 2: March 8 – March 26

- Simulates the post-transition environment
- CME publishes Trade Registers reflecting SOFR/ESTR inputs:
  - IRS Trade Register (VM, PAA, and NPVs) are based on SOFR
  - FX Trade Register (VM, PAA, and MTMs) are based on SOFR/ESTR
- Discounting Transition Reports are no longer published in NR

## Mock Transition Weekend: March 5 – March 8

- **Mock Transition Date (Friday, Mar 5):** CME publishes the official Discounting Transition Reports with SOFR/ESTR based NPVs and cash adjustments
- **Mock Transition Date + 1 (Monday, Mar 8):** CME includes the cash adjustment as part of end-of-day VM calculation

## Discounting Transition Report live in PROD: March 8 – March 26

- During Test Phase 2, the Discounting Transition reports will be available in Production on FTP sites for further testing.
- This report will show the indicative NPV changes and Cash Adj. leading up to and on the Transition Date.

# Valuation and Curve Methodology

*MXN and Non-Deliverable IRS Transition*

# Transition for MXN and NDIRS

## Valuation Methodology

CME will transition swaps to SOFR discounting and PA on March 26, 2021 as highlighted below:

Products	<u>MXN</u> (31Y) <u>ND IRS</u> : BRL (10Y), CLP (20Y), CNY (10Y), COP (20Y), INR (10Y), KRW (21Y)
Current Method	Discount curves implied using Spot FX, FX forwards, cross-currency swaps and EFFR curve <u>PA NDIRS</u> : EFFR <u>PA MXN</u> : EFFR-based
Post Transition Method	Discount curves implied using Spot FX, FX forwards, cross-currency swaps and SOFR curve <u>PA NDIRS</u> : SOFR <u>PA MXN</u> : SOFR-based
Curve Snap Times	Consistent with the current pricing methodology, curves will be snapped at different times based on market closes. As such, FF-SOFR basis marks used for cash compensation will align as per current snap times for individual currencies.
Cash Compensation	<u>MXN</u> : Local currency <u>NDIRS</u> : USD

# Transition for MXN and NDIRS

## Overview: Mark to Market (MTM)

### MXN

- ✓ MXN Swaps variation margin (VM) and cashflows (CF) are settled in MXN. CME generates a discount curve and a forecast curve for MXN
- ✓ MTM of the MXN swaps is determined in local currency by discounting the future cashflows:

$$MTM_{MXN} = \sum_i Projected\ Cashflow^{local} * DF_{T_i}^{local}$$

### Non-deliverable IRS

- ✓ NDIRS referenced in BRL, CLP, COP, CNY, KRW and INR swaps VM and CF are settled in USD. CME generates a discount curve and a forecast curve for each of the currencies
- ✓ MTM of the NDIRS swaps is determined first in local currency by discounting the futures cashflows, and then converted to USD equivalents using FX rate:

$$MTM_{USD} = FX_{\$}^{local} * \sum_i Projected\ Cashflow^{local} * DF_{T_i}^{local}$$



# Transition for MXN and NDIRS

## Overview: Current Curve Construction Mechanism

### MXN and NDIRS Curve construction

- ✓ The discount curve for each of the currencies is generated using FX spot, FX forwards and cross-currency swaps instruments along the term-structure. Forecast curve is generated using Fix/Float swaps referencing the cleared rate index. Note that BRL forecast curve is generated using DI Futures
- ✓ FX forward instruments utilizes Effective Federal Fund Rate (EFFR) curve in the interest rate parity equation as shown below:

$$DF_{T_i}^{local} = \frac{Spot\ FX_{local}^{\$} * DF_{T_i}^{EFFR}}{Forward\ FX_{local\ T_i}^{\$}}$$

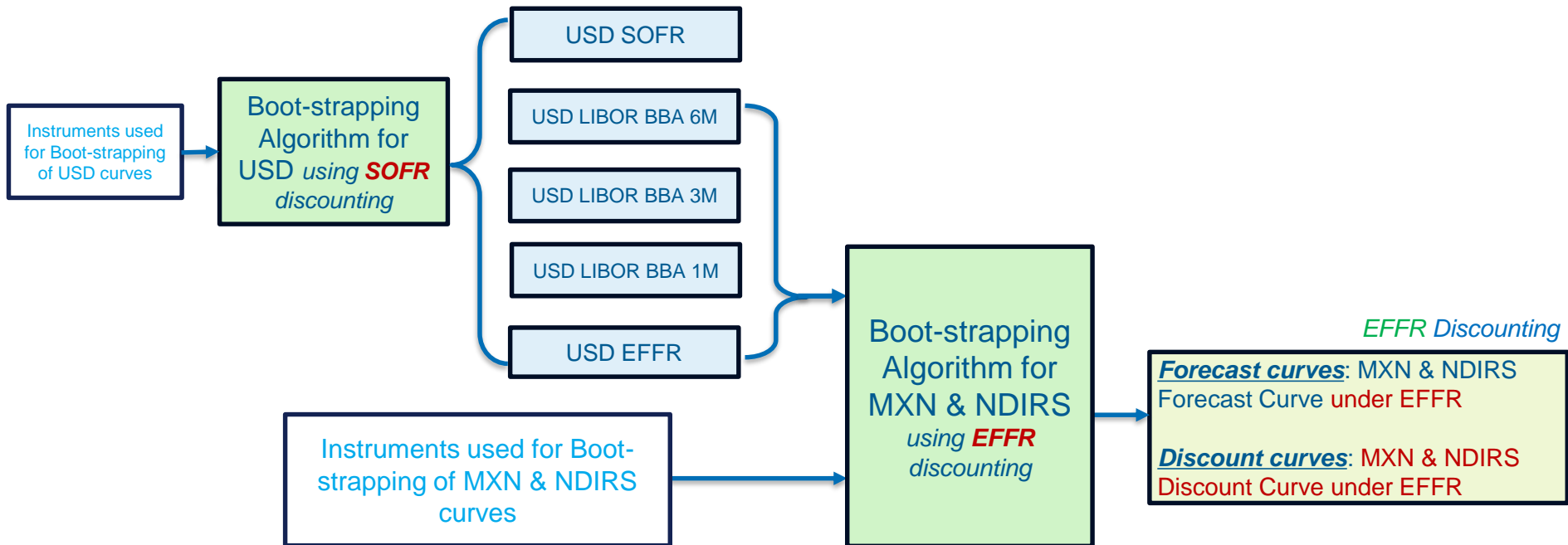
- ✓ For cross currency swaps, the USD leg utilizes EFFR rate for discounting of the USD cashflow referencing USD LIBOR 1M/3M/6M index; MXN/NDIRS leg of XCCY swap references the forecasting rate of MXN/NDIRS\* currencies. MXN/NDIRS swap cashflows is discounted using the implied discount curve
- ✓ Due to the cross dependency between the discount curves and forecast curves, the discount curve and forecast curve are generated simultaneously

\* BRL uses FX Forward instruments along the term structure and INR, KRW, CNY cross currency swap are fixed-float swaps with fixed rate defined for the non-USD leg.

# Transition for MXN and NDIRS

## Overview: Current Curve Construction Mechanism

The below shows the current curve construction process for NDIRS & MXN interest rate curves



# Transition for MXN and NDIRS

## Overview: Current Price Alignment Calculation

### MXN PA Calculation

In order to account for the USD funding used by most market participants, the MXN PA rate is currently calculated based on the Fed Funds rate. The rate is adjusted by the USD/MXN exchange rate as the actual cash flow moves in MXN.

$$MXN \text{ PA Rate} = FF \text{ Effective Rate} * \frac{FX_1}{FX_0} + \frac{\frac{FX_1}{FX_0} - 1}{\frac{n}{360}}$$

$FX_1$ : FX overnight rate

$FX_0$ : TOM next rate

The above MXN PA rate is then applied to the standard PA calculation:

$$PA = -Adjusted \text{ NPV}_{(previous \text{ Bus. day})} * MXN \text{ PA Rate} * (Days / 360)$$

### Non-deliverable Currency PA Calculation

All Non-deliverable currencies are settled in USD. The previous business day Adjusted NPV is calculated in local currency and converted into USD using CME's overnight FX rate. The calculation then uses the overnight Fed Funds effective rate and the day count to derive the final PA amount:

$$PA = -Adjusted \text{ NPV}_{previous \text{ Bus. day}}^{\$} * FF \text{ Effective Rate} * (Days / 360)$$

# Transition for MXN and NDIRS

## Cash Compensation Mechanism

The below highlights the process for cash compensation which is computed as:

$$\text{Adjusted NPV}_{\text{EFFR Discounting}} - \text{Adjusted NPV}_{\text{SOFR Discounting}}$$

Cash compensation for MXN and NDIRS will be local currency and USD equivalents, respectively.

To ensure forward rates for the forecast curve are unchanged under SOFR discounting, CME will imply the FX Forward rate along the maximum term-structure using the current generated curves

$$\text{Implied Forward FX}_{\text{local } T_i}^{\$} = \frac{\text{Spot FX}_{\text{local}}^{\$} * DF_{T_i}^{\text{EFFR}}}{DF_{T_i}^{\text{local}}}$$

CME will imply discount curve under SOFR discounting pricing using the implied FX forward rates and SOFR curves as illustrated below

$$DF_{T_i}^{\text{local}} = \frac{\text{Spot FX}_{\text{local}}^{\$} * DF_{T_i}^{\text{SOFR}}}{\text{Implied Forward FX}_{\text{local } T_i}^{\$}}$$

### Generated curves under current process

**USD EFFR curves:** Generated under SOFR discounting  
**Discount curves:** MXN & NDIRS Discounting Curve using EFFR

Imply FX forward Rates going along the term-structure using Interest Rate parity

### Generated curves under current process

**USD SOFR curves:** Generated under SOFR discounting

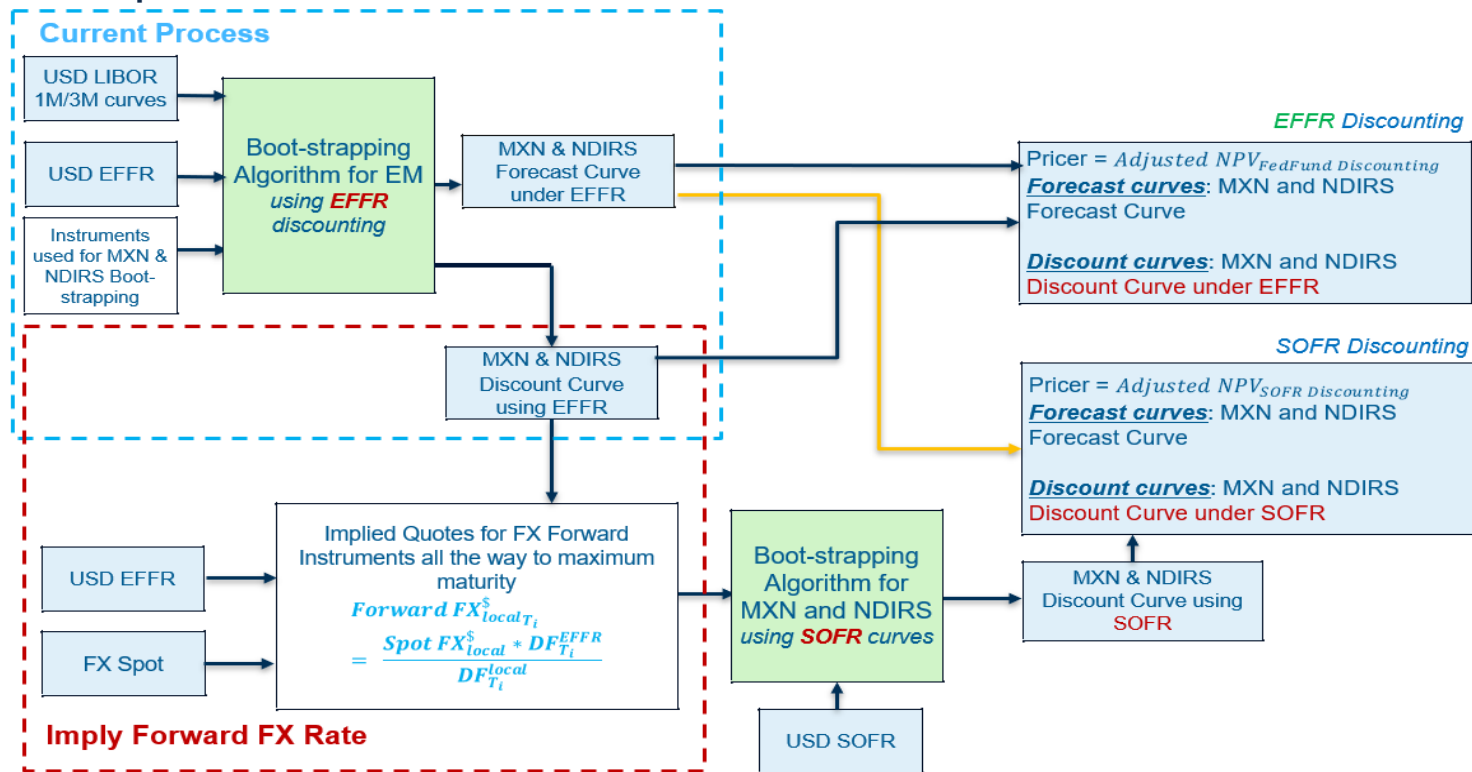
Boot-strapping Algorithm for USD using **SOFR** discounting

### Discount curve used for MTM computation under SOFR discounting

**Discount curves:** MXN & NDIRS Discounting Curve using SOFR

# Transition for MXN and NDIRS

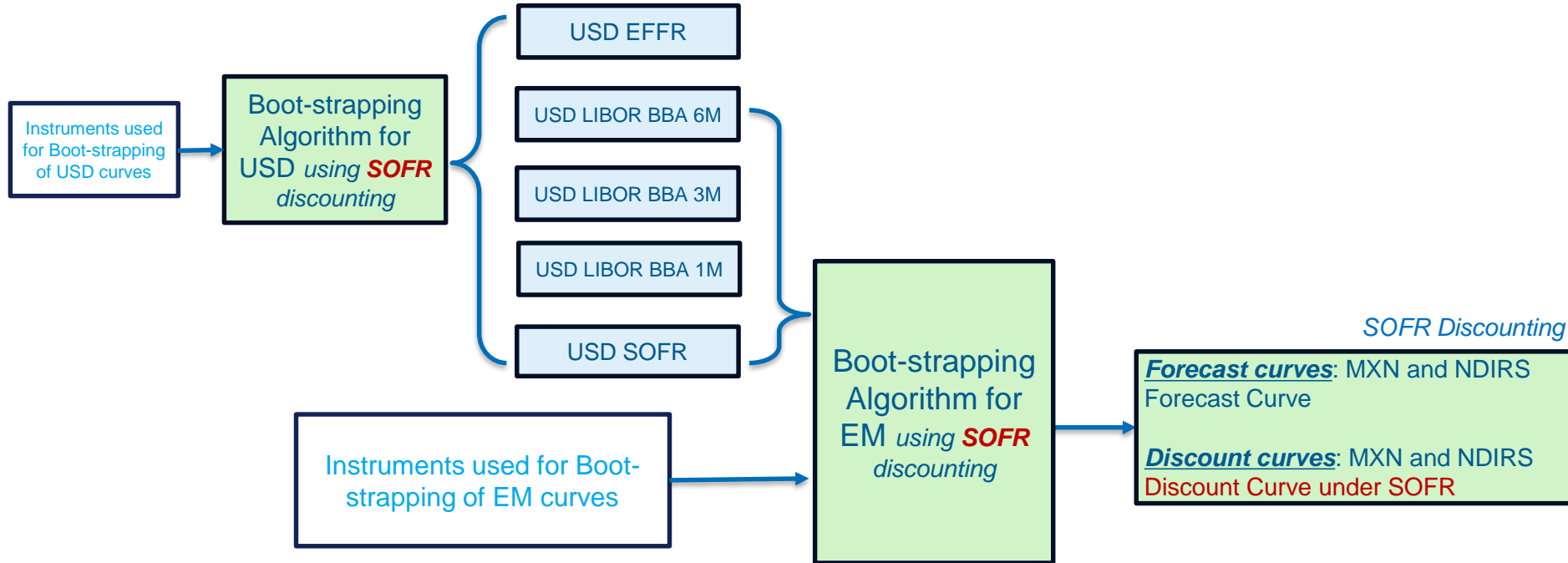
## Cash Compensation Mechanism – Curve Generation Process



# Transition for MXN and NDIRS

## Post Transition Curve Construction Mechanism

The below shows the curve construction process for EM interest rate curves after the discounting transition switch



# Transition for MXN and NDIRS

## Post Transition Price Alignment Calculation

### MXN PA Calculation

In order to account for the USD funding used by most market participants, the MXN PA rate will be calculated based on the SOFR rate. The rate will be adjusted by the USD/MXN exchange rate as the actual cash flow moves in MXN.

$$MXN \text{ PA Rate} = SOFR * \frac{FX_1}{FX_0} + \frac{\frac{FX_1}{FX_0} - 1}{\frac{n}{360}}$$

$FX_1$ : FX overnight rate

$FX_0$ : TOM next rate

The above MXN PA rate will then be applied to the standard PA calculation:

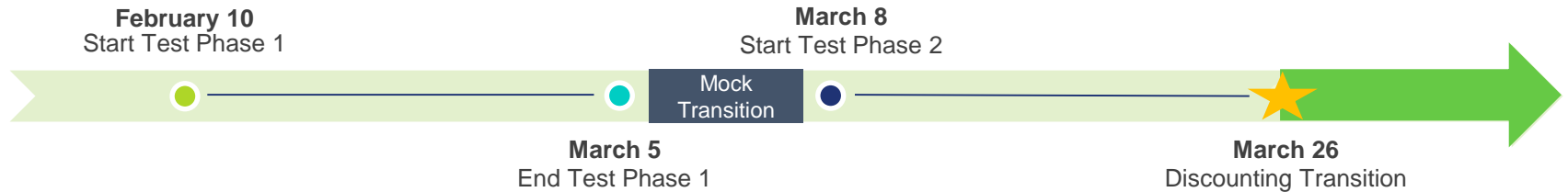
$$PA = -Adjusted \text{ NPV}_{(previous \text{ Bus. day})} * MXN \text{ PA Rate} * (Days / 360)$$

### Non-deliverable Currency PA Calculation

All Non-deliverable currencies are settled in USD. The previous business day Adjusted NPV is calculated in local currency and converted into USD using CME's overnight FX rate. The calculation will then use SOFR and the day count to derive the final PA amount:

$$PA = -Adjusted \text{ NPV}_{previous \text{ Bus. day}}^{\$} * SOFR * (Days / 360)$$

# IRS Pricing Curve Reports



CME will make SOFR-based pricing curves available on the Transition Date for reconciling to the SOFR-discounted NPV

## Curve Input Files

- Each discounting curve will have additional inputs for computing the SOFR-discounted MTM during transition processing
- These curve inputs will be added to the existing curve input files on the transition date only; the curve input file will revert to the standard inputs/format following the transition date
- Please reach out to [CME client services](#) for further details

## Daily Discount Factor Files

- An additional Daily Discount Factor file will be published for each SOFR-based discounting curve (BRL, CLP, COP, CNY, INR, KRW, MXN)
- The file layout will be identical to the standard file
- SOFR-based file names will include “**\_SOFR**”
  - Example of MXN Discount Factor File Names:
    - Standard File: IRSDFR\_TIIE\_20210326.csv
    - **SOFR-based File**: IRSDFR\_TIIE\_**SOFR**\_20210326.csv



# Valuation and Curve Methodology

*OTC FX Products*

## Transition for OTC FX

CME will transition OTC FX products to SOFR/€STR discounting and PA on March 26, 2021 alongside our emerging market IRS currencies.

Currency Pair	CME Cleared Instrument Type	Settlement Currency	Current Discounting and PAA	New Discounting and PAA
AUDUSD, EURUSD, GBPUSD, NZDUSD, USDCZK, USDDKK, USDHKD, USDHUF, USDILS, USDMXN, USDMYR, USDNOK, USDPLN, USDSEK, USDTHB, USDTRY, USDZAR	Cash-Settled Forward	USD	EFFR	SOFR
USDBRL, USDCNY, USDKRW, USDRUB, USDCLP, USDINR, USDPHP, USDIDR, USDTWD, USDCOP, USDPEN	Non-Deliverable Forward	USD	EFFR	SOFR
AUDUSD, EURUSD, GBPUSD	FX Option	USD	EFFR	SOFR
EURAUD, EURCHF	Cash-Settled Forward	EUR	EONIA	€STR

# Overview - Variation Margin and Cash Adjustment

## OTC FX Discounting Transition Report: Available in Production Beginning March 8<sup>th</sup>

- Shows revised MTMs under the new discounting methodology and the cash adjustment at the trade level for each position account
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Column Header	Description	Sample Value	Type
<b>Bus_Date</b>	Business Date	3/15/2021	Date
<b>PA</b>	Position Account	9FXONF1	VARCHAR(10)
<b>Trade_ID</b>	CME Trade ID	6355777	Integer
<b>EXEC_ID2</b>	SEF/Platform ID	1423523IS	VARCHAR(255)
<b>Order_ID</b>	Client Order ID	D91240-1	VARCHAR(255)
<b>Reg_Trd_ID</b>	USI	CCCIRS635577 7	VARCHAR(255)
<b>CMF</b>	3 digit clearing firm ID	998	VARCHAR(3)
<b>Origin</b>	HOUS or CUST	CUST	VARCHAR(4)
<b>Product_Type</b>	Type of FX forward or option	CSF	VARCHAR(5)
<b>Product_Code</b>	Currency Pair	USDBRL	VARCHAR(6)
<b>Setl_Cur</b>	Currency of settlement	USD	Float
<b>New_MTM_Amt</b>	MTM under SOFR/ESTR discounting	1,100.00	Float
<b>Prior_MTM_Amt</b>	MTM under EFFR/EONIA discounting	2,000.00	Float
<b>MTM_Amt_DIFF</b>	New_MTM_Amt minus Prior_MTM_Amt	-900.00	Float
<b>OFFSET_ADJ_AMT</b>	Prior_MTM_Amt minus New_MTM_Amt	900.00	Float

# Transition for OTC FX

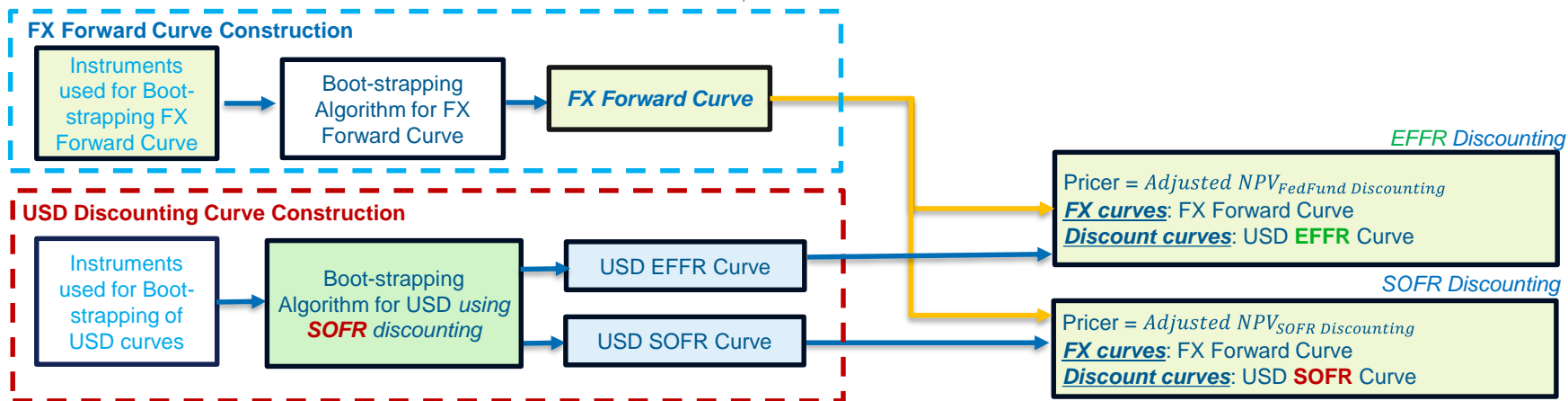
## Mechanism for products settled in USD

The below highlights the process for cash compensation which is computed as:

$$\text{Adjusted NPV}_{\text{EFFR Discounting}} - \text{Adjusted NPV}_{\text{SOFR Discounting}}$$

All FX products settled in USD are in scope for the SOFR discounting transition. For NPV calculation, future cashflows are calculated in quote currency first and converted to settlement currency (USD) using FX forward rate, before discounting back to value date using USD discounting.

$$\text{Adjusted NPV} = \text{Future Cashflow}_{\text{quote}} * \text{FX Forward Rate}_{\$}^{\text{quote}} * \text{DF}_{T}^{\$}$$



# Transition for OTC FX

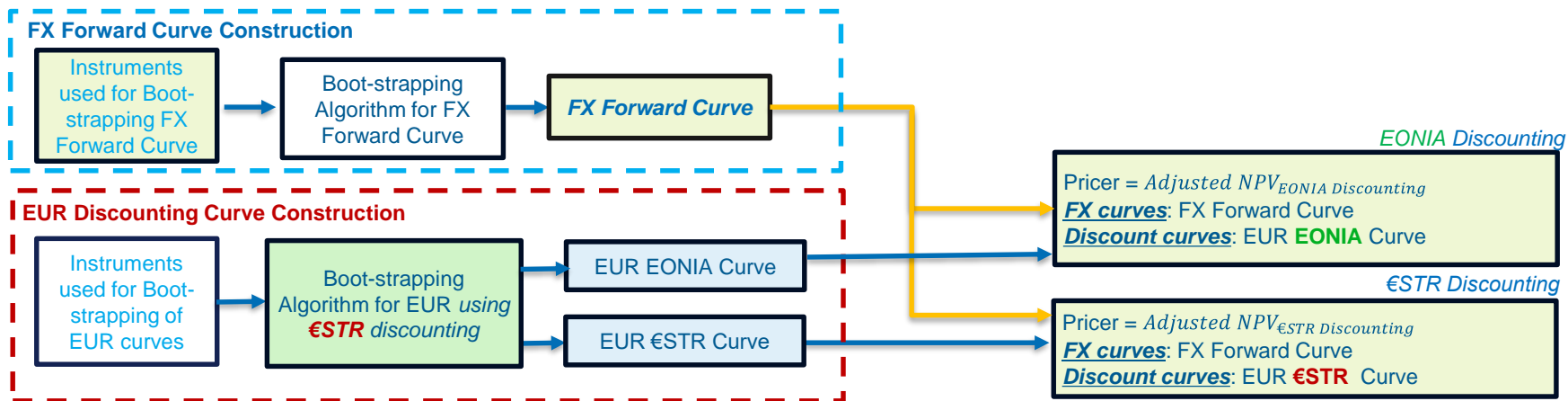
## Mechanism for products settled in EUR

The below highlights the process for cash compensation which is computed as:

$$\text{Adjusted NPV}_{\text{EONIA Discounting}} - \text{Adjusted NPV}_{\text{€STR Discounting}}$$

All FX products settled in EUR are in scope for the €STR discounting transition. For NPV calculation, future cashflows are calculated in quote currency first and converted to settlement currency (EUR) using FX forward rate, before discounting back to value date using EUR discounting.

$$\text{Adjusted NPV} = \text{Future Cashflow}_{\text{quote}} * \text{FX Forward Rate}_{\text{€}}^{\text{quote}} * \text{DF}_{\text{T}}^{\text{€}}$$



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