# Nasdaq Calypso

## Calypso Pricing Script Examples

Version 18

Revision 3.0
August 2024
Approved

## Document History

| Revision | Published | Summary of Changes |
|---|---|---|
| 1.0 | February 2024 | First revision for version 18. |
| 2.0 | July 2024 | Added Cash settlement for FXTARF, Basket Worst M |
| 3.0 | August 2024 | Added Equity Reverse Convertible, Equity Single Reverse Convertible, Equity Single Reverse Convertible Swap, Hybrid Dual Digital. |

**This document provides Pricing Script examples.**

# Table of Contents

# Example 1 - Basket Performance Option

### *Description*

Performance Option on Equity Basket

### *Termsheet*

| | |
|---|---|
| Option Buyer | Bank XXX |
| Option Seller | Bank YYY |
| Start Date | 10-04-2023 |
| Maturity Date | 26-05-2023 |
| Notional | USD 1,000,000 |
| StrikePct | 100% |

### *Code*

Variables

Underlying | Complex Variables | Pricing Script | Event Grid | Script Results | Resets

```
Constant Start As ReferenceDate From Product.StartDate
Constant Exercise As PaymentDate From Product.Maturity
Constant BuySell As Integer From Product.BuySell
Constant PaymentCcy As Currency From Product.Currency
Constant Basket As Quotable[] From Product.Basket
Constant Notional As Double From Product.Notional
Constant PutCall As Enum 'Call','Put'
Constant StrikePct As Double From 0.9
Constant BasketWts As Double[] From Product.BasketWeights
Constant N As Integer From Product.BasketSize
i As Integer
InitialFixing As Double[] From Basket
Payoff As Double
BasketPerformance As Measure
OptionPrice As Measure To NPV
Prob_ITM As Measure
```

| Variable Name | Type | Description |
|---|---|---|
| Start | Reference Date | Trade Start Date |
| Exercise | Payment Date | Trade Maturity Date |
| BuySell | Integer | Multiplier to all flows to determine direction |
| PaymentCcy | Currency | Payment Currency |
| Basket | Quotable Array | Underlying Basket |
| Notional | Double | Trade Notional |
| PutCall | Enum | (Put or Call) Used to calculate payoff |
| StrikePct | Double | Strike Price of basket performance option in percentage |
| BasketWts | Double Array | Weights of each component of basket |
| N | Integer | Basket size |
| I | Integer | Internal counter for basket components |
| InitialFixing | Double Array | Initial value of each basket component |
| Payoff | Double | Trade Payoff |
| BasketPerformance | Measure | This measure shows basket performance |
| OptionPrice | Measure | This measure calculates the total price and is mapped to the NPV pricer measure |
| Prob_ITM | Measure | This measure shows the probability of in the money of option at maturity date |

## MetaData

Product Types: ScriptableOTCProduct Calculator: ForwardPayoff Payoff N

Script: Variables Swap

| Name | Type | Display N... | Format | Decimals |
|---|---|---|---|---|
| Basket | QuotableArray | Basket | DEFAULT | 2 |
| BasketWts | DoubleArray | BasketWts | DEFAULT | 2 |
| BuySell | Integer | BuySell | DEFAULT | 2 |
| Exercise | PaymentDate | Exercise | DEFAULT | 2 |
| N | Integer | N | DEFAULT | 2 |
| Notional | Double | Notional | DEFAULT | 2 |
| PaymentCcy | Currency | PaymentCcy | DEFAULT | 2 |
| PutCall | Enum | PutCall | DEFAULT | 2 |
| Start | ReferenceDate | Start | DEFAULT | 2 |
| StrikePct | Double | StrikePct | RATE | 2 |

StrikePct variable is declared as RATE.

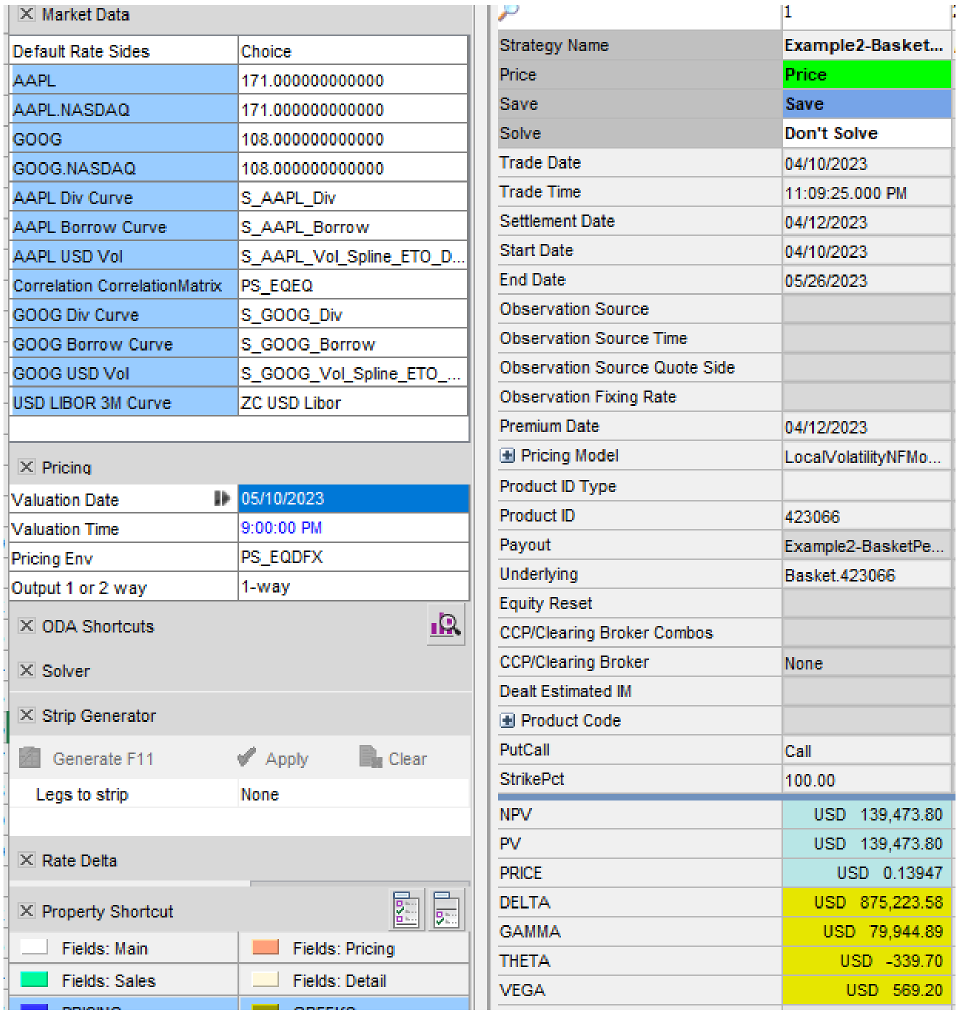
## Forward Script

```

Start:
  For i = 1 To N
    InitialFixing[i] = Basket[i]
  Next
Exercise:
  For i = 1 To N
    BasketPerformance += (BasketWts[i] * (Basket[i] / InitialFixing[i]))
  Next
  Select Case PutCall
    Case 'Call'
      Payoff = Max((BasketPerformance - StrikePct), 0)
    Case 'Put'
      Payoff = Max((StrikePct - BasketPerformance), 0)

  EndSelect
  If (Payoff > 0) Then
    Prob_ITM = 1.0
  Else
    Prob_ITM = 0.0
  EndIf
  OptionPrice += Cash((BuySell * Notional * Payoff), PaymentCcy, 1, 'REDEMPTION')
```

| | |
|---|---|
| Start | Start Date at which initial value of basket component is observed |
| Exercise | Maturity date at which payoff is calculated |

### *Trade Example*

Trade Entry

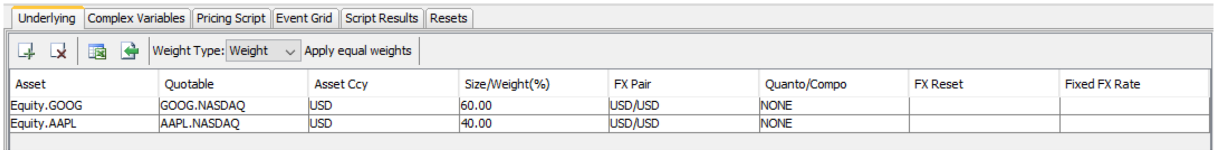



Trade Booked in Pricing Sheet

Notional 1M USD

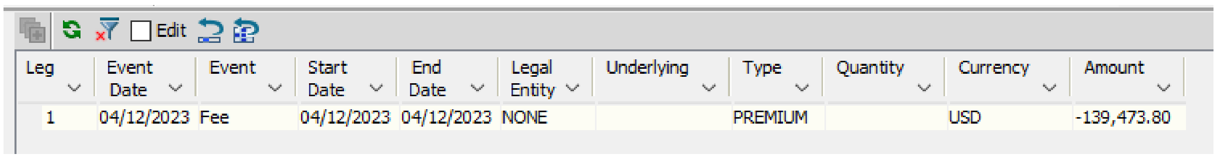
StrikePct 100% Call

## Underlying Basket




| Asset | Quotable | Asset Ccy | Size/Weight(%) | FX Pair | Quanto/Compo | FX Reset | Fixed FX Rate |
|---|---|---|---|---|---|---|---|
| Equity.GOOG | GOOG.NASDAQ | USD | 60.00 | USD/USD | NONE | | |
| Equity.AAPL | AAPL.NASDAQ | USD | 40.00 | USD/USD | NONE | | |

## Cashflows




| Leg | Event Date | Event | Start Date | End Date | Legal Entity | Underlying | Type | Quantity | Currency | Amount |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 04/12/2023 | Fee | 04/12/2023 | 04/12/2023 | NONE | | PREMIUM | | USD | -139,473.80 |

## Event Grid


| Date | Events |
|---|---|
| 04/10/2023 | [Start] |
| 05/26/2023 | [Exercise] |

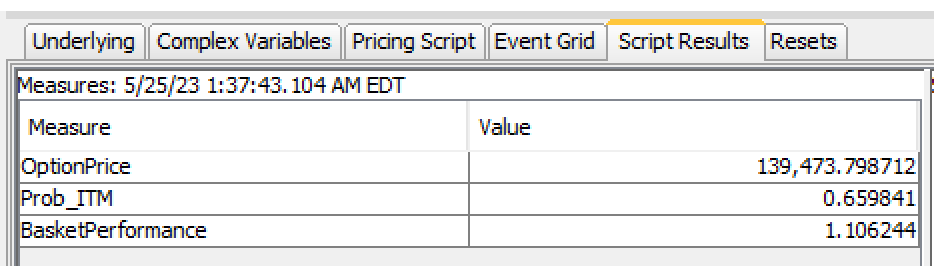
Product.Maturity

| Last Reset | Reference Date | Payment Date |
|---|---|---|
| 05/26/2023 | 05/26/2023 | 05/30/2023 |

Product.StartDate

| Last Reset | Reference Date |
|---|---|
| 04/10/2023 | 04/10/2023 |

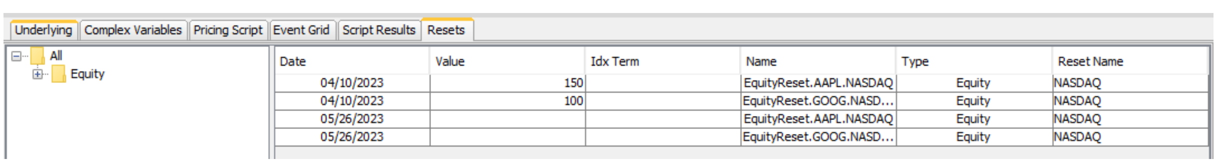
## Script Results




Measures: 5/25/23 1:37:43.104 AM EDT

| Measure | Value |
|---|---|
| OptionPrice | 139,473.798712 |
| Prob_ITM | 0.659841 |
| BasketPerformance | 1.106244 |

## Resets




| Date | Value | Idx Term | Name | Type | Reset Name |
|---|---|---|---|---|---|
| 04/10/2023 | 150 | | EquityReset.AAPL.NASDAQ | Equity | NASDAQ |
| 04/10/2023 | 100 | | EquityReset.GOOG.NASD... | Equity | NASDAQ |
| 05/26/2023 | | | EquityReset.AAPL.NASDAQ | Equity | NASDAQ |
| 05/26/2023 | | | EquityReset.GOOG.NASD... | Equity | NASDAQ |

# Example 2 – Altiplano - Basket Digital Option

### *Description*

Digital (Cash or nothing) option on basket of stocks: If the barrier doesn’t hit for any of the basket components, the holder receives a coupon on the payment dates. If the barrier hits, the holder receives nothing.

### *Termsheet*

| | |
|---|---|
| Option Buyer | Bank XXX |
| Option Seller | Bank YYY |
| Start Date | 10-04-2023 |
| Maturity Date | 26-05-2023 |
| Notional | USD 1,000,000 |
| Coupon Rate | 5% |
| Relative Barrier Level | 90% |

| Payout on Payment Date | |
|---|---|
| If barrier level hits for any of the basket component | Coupon Rate * Notional |
| Otherwise, | 0% |

## *Code*

Variables

Underlying | Complex Variables | Pricing Script | Event Grid | Script Results | Resets

```
Constant Start As ReferenceDate From Product.StartDate
Constant Observation As ReferenceDate[]
Constant Payment As PaymentDate[]
Constant Basket As Quotable[] From Product.Basket
Constant BuySell As Integer From Product.BuySell
Constant PaymentCcy As Currency From Product.Currency
Constant Notional As Double From Product.Notional
Constant RelativeBarrierLevel As Double From 0.90
Constant CouponRate As Double From 0.05
Constant BasketWts As Double[] From Product.BasketWeights
Constant N As Integer From Product.BasketSize
i As Integer
StrikePrice As Double[] From Basket
BarrierBreakCount As Integer
OptionPrice As Measure To NPV
Prob_ITM As ScheduleMeasure From Payment
```

| Variable Name | Type | Description |
|---|---|---|
| Start | Reference Date | Trade Start Date |
| Observation | Reference Date Array | Observation Dates |
| Payment | Payment Date Array | Coupon Payment Dates |
| Basket | Quotable Array | Underlying Basket |
| BuySell | Integer | Multiplier to all flows to determine direction |
| PaymentCcy | Currency | Payment Currency |
| Notional | Double | Trade Notional |
| RelativeBarrierLevel | Double | Percentage barrier level applied to basket component to get strike price |
| CouponRate | Double | Coupon Rate |
| BasketWts | Double Array | Weight of each component of basket |
| N | Integer | Basket size |

| Variable Name | Type | Description |
|---|---|---|
| i | Integer | Internal counter for basket components |
| StrikePrice | Double Array | Strike Price of each basket component |
| BarrierBreakCount | Integer | Internal counter to check if barrier hit for any of the basket components |
| OptionPrice | Measure | This measure calculates the total price and is mapped to the NPV pricer measure |
| Prob_ITM | Schedule Measure | This measure shows the probability of in the money of option |

MetaData

Product Types: ScriptableOTCProduct Calculator: ForwardPayoff Payoff Name: Example1-Bas

Script: Variables Swap

| Name | Type | Display Name | Format | Decimals |
|---|---|---|---|---|
| Basket | QuotableArray | Basket | DEFAULT | 2 |
| BasketWts | DoubleArray | BasketWts | DEFAULT | 2 |
| BuySell | Integer | BuySell | DEFAULT | 2 |
| CouponRate | Double | CouponRate | RATE | 2 |
| N | Integer | N | DEFAULT | 2 |
| Notional | Double | Notional | DEFAULT | 2 |
| Observation | ReferenceDateArray | Observation | DEFAULT | 2 |
| Payment | PaymentDateArray | Payment | DEFAULT | 2 |
| PaymentCcy | Currency | PaymentCcy | DEFAULT | 2 |
| RelativeBarrierLevel | Double | RelativeBarrierLevel | RATE | 2 |
| Start | ReferenceDate | Start | DEFAULT | 2 |

CouponRate and RelativeBarrierLevel variables are defined as RATE.

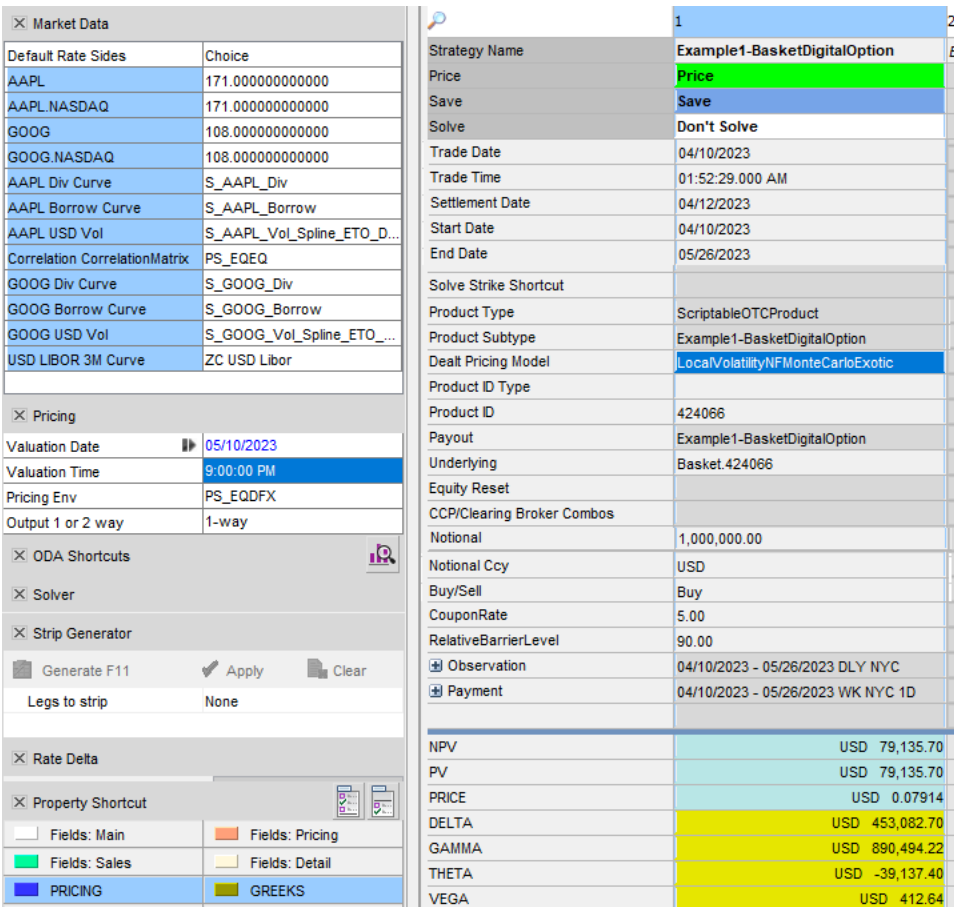
Forward Script

```

Start:
  For i = 1 To N
    StrikePrice[i] = Basket[i] * RelativeBarrierLevel
  Next
Observation:
  For i = 1 To N
    If (BasketWts[i] > 0) Then
      BarrierBreakCount += If(Basket[i] <= StrikePrice[i], 1, 0)
    EndIf
  Next
Payment:
  If (BarrierBreakCount == 0) Then
    OptionPrice += Cash((BuySell * Notional * CouponRate), PaymentCcy, 1, 'EXERCISE')
    Prob_ITM = 1.0
  EndIf
  BarrierBreakCount = 0
```

| | |
|---|---|
| Start | Strike price is calculated using Relative Barrier Level and initial fixing for each component of basket |
| Observation | Barrier hits are counted on observation dates only if weight of basket component is positive |
| Payment | Payment of coupon, if no barrier hits have been recorded |

## *Trade Example*

Trade Entry




Trade Booked in Pricing Sheet

Notional 1M USD

Barrier Level set to 90% of Initial Fixing

Coupon rate set to 5%

Payment Dates with 1Day lag

## Underlying Basket

Underlying | Complex Variables | Pricing Script | Event Grid | Script Results | Resets

Weight Type: Weight | Apply equal weights

| Asset | Quotable | Asset Ccy | Size/Weight(%) | FX Pair | Quanto/Compo | FX Reset | Fixed FX Rate |
|---|---|---|---|---|---|---|---|
| Equity.GOOG | GOOG.NASDAQ | USD | 60.00 | USD/USD | NONE | | |
| Equity.AAPL | AAPL.NASDAQ | USD | 40.00 | USD/USD | NONE | | |

## Cashflows

Edit

| Leg | Event Date | Event | Start Date | End Date | Legal Entity | Underlying | Type | Quantity | Currency | Notional | Index Factor | Rate | Spread | Reset Date | Amount |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 04/17/2023 | Cash Flow | 04/14/2023 | 04/14/2023 | NONE | | PAYOUT | | USD | | | | | 04/14/2023 | 50,000.00 |
| 1 | 05/01/2023 | Cash Flow | 04/28/2023 | 04/28/2023 | NONE | | PAYOUT | | USD | | | | | 04/28/2023 | 50,000.00 |
| 1 | 05/08/2023 | Cash Flow | 05/05/2023 | 05/05/2023 | NONE | | PAYOUT | | USD | | | | | 05/05/2023 | 50,000.00 |
| 1 | 04/12/2023 | Fee | 04/12/2023 | 04/12/2023 | NONE | | PREMIUM | | USD | | | | | | -56,628.98 |

## Event Grid

Underlying | Complex Variables | Pricing Script | Event Grid | Script Results | Resets

| Date | Events |
|---|---|
| 04/10/2023 | [Start] |
| 04/11/2023 | [Observation] |
| 04/12/2023 | [Observation] |
| 04/13/2023 | [Observation] |
| 04/14/2023 | [Observation, Payment] |
| 04/17/2023 | [Observation] |
| 04/18/2023 | [Observation] |
| 04/19/2023 | [Observation] |
| 04/20/2023 | [Observation] |
| 04/21/2023 | [Observation, Payment] |
| 04/24/2023 | [Observation] |
| 04/25/2023 | [Observation] |
| 04/26/2023 | [Observation] |
| 04/27/2023 | [Observation] |
| 04/28/2023 | [Observation, Payment] |
| 05/01/2023 | [Observation] |
| 05/02/2023 | [Observation] |
| 05/03/2023 | [Observation] |
| 05/04/2023 | [Observation] |
| 05/05/2023 | [Observation, Payment] |
| 05/08/2023 | [Observation] |
| 05/09/2023 | [Observation] |
| 05/10/2023 | [Observation] |
| 05/11/2023 | [Observation] |
| 05/12/2023 | [Observation, Payment] |
| 05/15/2023 | [Observation] |
| 05/16/2023 | [Observation] |
| 05/17/2023 | [Observation] |
| 05/18/2023 | [Observation] |
| 05/19/2023 | [Observation, Payment] |
| 05/22/2023 | [Observation] |
| 05/23/2023 | [Observation] |
| 05/24/2023 | [Observation] |
| 05/25/2023 | [Observation] |
| 05/26/2023 | [Observation, Payment] |

Payment — 04/10/2023 - 05/26/2023 WK NYC 1D

| Last Reset | Reference Date | Payment Date |
|---|---|---|
| | 04/14/2023 | 04/17/2023 |
| | 04/21/2023 | 04/24/2023 |
| | 04/28/2023 | 05/01/2023 |
| | 05/05/2023 | 05/08/2023 |
| | 05/12/2023 | 05/15/2023 |
| | 05/19/2023 | 05/22/2023 |
| | 05/26/2023 | 05/30/2023 |

Product.StartDate

| Last Reset | Reference Date |
|---|---|
| 04/10/2023 | 04/10/2023 |

Observation — 04/10/2023 - 05/26/2023 DLY NYC

| Last Reset | Reference Date |
|---|---|
| 04/11/2023 | 04/11/2023 |
| 04/12/2023 | 04/12/2023 |
| 04/13/2023 | 04/13/2023 |
| 04/14/2023 | 04/14/2023 |
| 04/17/2023 | 04/17/2023 |
| 04/18/2023 | 04/18/2023 |
| 04/19/2023 | 04/19/2023 |
| 04/20/2023 | 04/20/2023 |
| 04/21/2023 | 04/21/2023 |
| 04/24/2023 | 04/24/2023 |

## Script Results

Underlying | Complex Variables | Pricing Script | Event Grid | Script Results | Resets

Measures: 5/29/23 3:43:13.926 AM EDT

| Measure | Value |
|---|---|
| OptionPrice | 79,135.701119 |

Schedule Measures: 5/29/23 3:43:13.926 AM EDT

Payment

| Event | Prob_ITM |
|---|---|
| 04/14/2023 | 1.000000 |
| 04/21/2023 | 0.000000 |
| 04/28/2023 | 1.000000 |
| 05/05/2023 | 1.000000 |
| 05/12/2023 | 0.809412 |
| 05/19/2023 | 0.360881 |
| 05/26/2023 | 0.414655 |

## Resets

Underlying | Complex Variables | Pricing Script | Event Grid | Script Results | Resets

All
- Equity
  - GOOG
  - AAPL

| Date | Value | Idx Term | Name | Type | Reset Name |
|---|---|---|---|---|---|
| 04/10/2023 | 100 | | EquityReset.GOOG.NA... | Equity | NASDAQ |
| 04/11/2023 | 99 | | EquityReset.GOOG.NA... | Equity | NASDAQ |
| 04/12/2023 | 98 | | EquityReset.GOOG.NA... | Equity | NASDAQ |
| 04/13/2023 | 97 | | EquityReset.GOOG.NA... | Equity | NASDAQ |
| 04/14/2023 | 96 | | EquityReset.GOOG.NA... | Equity | NASDAQ |
| 04/17/2023 | 90 | | EquityReset.GOOG.NA... | Equity | NASDAQ |
| 04/18/2023 | 86 | | EquityReset.GOOG.NA... | Equity | NASDAQ |
| 04/19/2023 | 88 | | EquityReset.GOOG.NA... | Equity | NASDAQ |
| 04/20/2023 | 91 | | EquityReset.GOOG.NA... | Equity | NASDAQ |
| 04/21/2023 | 95 | | EquityReset.GOOG.NA... | Equity | NASDAQ |
| 04/24/2023 | 98 | | EquityReset.GOOG.NA... | Equity | NASDAQ |
| 04/25/2023 | 100 | | EquityReset.GOOG.NA... | Equity | NASDAQ |
| 04/26/2023 | 104 | | EquityReset.GOOG.NA... | Equity | NASDAQ |
| 04/27/2023 | 100 | | EquityReset.GOOG.NA... | Equity | NASDAQ |
| 04/28/2023 | 105 | | EquityReset.GOOG.NA... | Equity | NASDAQ |
| 05/01/2023 | 103 | | EquityReset.GOOG.NA... | Equity | NASDAQ |
| 05/02/2023 | 101 | | EquityReset.GOOG.NA... | Equity | NASDAQ |
| 05/03/2023 | 103 | | EquityReset.GOOG.NA... | Equity | NASDAQ |
| 05/04/2023 | 103 | | EquityReset.GOOG.NA... | Equity | NASDAQ |
| 05/05/2023 | 105 | | EquityReset.GOOG.NA... | Equity | NASDAQ |
| 05/08/2023 | 107 | | EquityReset.GOOG.NA... | Equity | NASDAQ |
| 05/09/2023 | 110 | | EquityReset.GOOG.NA... | Equity | NASDAQ |
| 05/10/2023 | 108 | | EquityReset.GOOG.NA... | Equity | NASDAQ |
| 05/11/2023 | | | EquityReset.GOOG.NA... | Equity | NASDAQ |
| 05/12/2023 | | | EquityReset.GOOG.NA... | Equity | NASDAQ |

Underlying | Complex Variables | Pricing Script | Event Grid | Script Results | Resets

All
- Equity
  - GOOG
  - AAPL

| Date | Value | Idx Term | Name | Type | Reset Name |
|---|---|---|---|---|---|
| 04/10/2023 | 150 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 04/11/2023 | 151 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 04/12/2023 | 152 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 04/13/2023 | 153 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 04/14/2023 | 154 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 04/17/2023 | 155 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 04/18/2023 | 156 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 04/19/2023 | 157 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 04/20/2023 | 158 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 04/21/2023 | 159 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 04/24/2023 | 160 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 04/25/2023 | 161 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 04/26/2023 | 163 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 04/27/2023 | 150 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 04/28/2023 | 160 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 05/01/2023 | 158 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 05/02/2023 | 162 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 05/03/2023 | 165 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 05/04/2023 | 163 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 05/05/2023 | 168 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 05/08/2023 | 170 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 05/09/2023 | 172 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 05/10/2023 | 171 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 05/11/2023 | | | EquityReset.AAPL.NAS... | Equity | NASDAQ |

# Example 3 - FXTARF

### *Description*

A target redemption forward (TARF) is a structured forward contract that allows you to trade at a better rate than a standard forward contract by integrating leverage and a profit cap level.

### *Termsheet - EURUSD Target Redemption Forward*

| | |
|---|---|
| Buyer | Bank XXX |
| Seller | Bank YYY |
| Underlying Currency Pair | EURUSD |
| Call/Put on Underlying | Call (Buy EURUSD) |
| Notional Amount | EUR 1,000,000 per fixing date |
| Enhanced Notional Amount | EUR 2,000,000 per fixing date |
| Spot Rate | 1.0650 |
| Strike | 1.0700 |
| Payout Cap | 0.0900 EUR/USD |
| Trade Date | 03-Apr-23 |
| Fixing/Settlement Schedule | See Appendix A |
| Fixing Reference | The EURUSD rate published by the ECB on each Fixing Date |
| Period Accrued Intrinsic Value | Max (Fixing Reference - Strike, 0) |
| Total Accrued Intrinsic Value | Sum (Period Accrued Intrinsic Value) |
| Payout Cap Event | The Payout Cap Event occurs when the Total Accrued Intrinsic Value, including the current fixing, is greater than or equal to the Payout Cap |
| Fixing Amount | Notional Amount if Fixing Rate > Strike<br>Enhanced Notional Amount if Fixing Rate <= Strike |

| | |
|---|---|
| Final Fixing Amount | Same as Fixing Amount |
| Final Fixing Strike | Fixing Rate - (Payout Cap - Previous Fixing Total Accrued Intrinsic Value) |
| Premium | Bank YYY pays EUR 10,000 |
| Premium Value Date | 06-Apr-23 |
| Settlement | Physical/Cash |

Appendix A: Fixing and Settlement Schedule

| Fixing Date | Settlement Date |
|---|---|
| 05-10-2023 | 05-12-2023 |
| 06-12-2023 | 06-14-2023 |
| 07-10-2023 | 07-12-2023 |
| 08-10-2023 | 08-14-2023 |
| 09-11-2023 | 09-13-2023 |
| 10-10-2023 | 10-12-2023 |
| 11-10-2023 | 11-14-2023 |

### *Code*

Variables

Script: Variables | Keywords | Types | Product Properties | Reserved

```
Constant StartDate As ReferenceDate From Product.StartDate
Constant AccrualSchedule As PaymentDate[]
Constant BuySell As Integer From Product.BuySell
Constant FxQuotable As Quotable From Product.Underlying
Constant Notional As Double From Product.Notional
Constant NotionalCcy As Currency From Product.Currency
Constant SettleCcy As Currency
Constant LeverageRatio As Double
Constant CallPut As Enum 'Call', 'Put'
Constant FinalPaymentType As Enum 'Full', 'ExactStrike', 'ExactNotional', 'None'
Constant Strike As Double
Constant KOLevel As Double
Constant SettlementType As Enum 'Cash','Physical'
CallPutSign As Double
KnockedOut As Boolean
AccrueAbove As Double
AccrueBelow As Double
PeriodStrike As Double
PeriodAccruedNotional As Double
TotalAccruedNotional As Double
PeriodAccruedIntrinsicValue As Double
TotalAccruedIntrinsicValue As Double
AdjustedStrike As Double
AdjustedNotional As Double
OptionNPV As Measure To NPV
m_ProbKo As Measure
m_PayoutCap As Measure
m_KOLevel As Measure
A1_Fixing As ScheduleMeasure From AccrualSchedule
A2_PerStrike As ScheduleMeasure From AccrualSchedule
A3_PerNotional As ScheduleMeasure From AccrualSchedule
A4_PerProfit As ScheduleMeasure From AccrualSchedule
A5_AccProfit As ScheduleMeasure From AccrualSchedule
```

| Variable Name | Type | Description |
|---|---|---|
| StartDate | ReferenceDate | Trade Start Date |
| AccrualSchedule | PaymentDate[] | Schedule of Fixing and Payment Dates |
| BuySell | Integer | Buy or Sell |

| Variable Name | Type | Description |
|---|---|---|
| FxQuotable | Quotable | Underlying CCY pair |
| Notional | Double | Unleveraged Notional |
| NotionalCcy | Currency | Notional Currency |
| SettleCcy | Currency | Settlement Currency |
| LeverageRatio | Double | Leverage Ratio for OTM fixings |
| CallPut | Enum | Call or Put |
| FinalPaymentType | Enum | Full Final Payment, Exact Final Payment with Strike Adjustment, Exact Final Payment with Notional Adjustment or No Final Payment |
| Strike | Double | Strike |
| KOLevel | Double | Profit cap level in points |
| SettlementType | Enum | Physical / Cash Settlement |
| CallPutSign | Double | Call or Put |
| KnockedOut | Boolean | Indicator of Payout Cap Event |
| AccrueAbove | Double | Leveraged Notional |
| AccrueBelow | Double | Leveraged Notional |
| PeriodAccruedNotional | Double | Amount to settle for the period |
| TotalAccruedNotional | Double | Total amount to settle (not really used) |
| PeriodAccruedIntrinsicValue | Double | Accrued ITM intrinsic value for the period |
| TotalAccruedIntrinsicValue | Double | Total accrued ITM intrinsic value |
| AdjustedStrike | Double | Adjusted Strike for settling Final Exact fixings |
| AdjustedNotional | Double | Adjusted Notional for settling Final Exact fixings |
| OptionNPV | Measure | NPV |
| m_ProbKo | Measure | Probability of hitting the payout cap |
| m_PayoutCap | Measure | Profit cap level |

## MetaData

Script: Variables | Swap

| Name | Type | Display Name | Format | Decimals | Default Value |
|---|---|---|---|---|---|
| AccrualSchedule | PaymentDateArray | AccrualSchedule | DEFAULT | 2 | |
| BuySell | Integer | BuySell | DEFAULT | 2 | |
| CallPut | Enum | CallPut | DEFAULT | 2 | |
| FinalPaymentType | Enum | FinalPaymentType | DEFAULT | 2 | |
| FxQuotable | Quotable | FxQuotable | DEFAULT | 2 | |
| KOLevel | Double | KOLevel | DEFAULT | 4 | |
| LeverageRatio | Double | LeverageRatio | DEFAULT | 2 | |
| Notional | Double | Notional | DEFAULT | 2 | |
| NotionalCcy | Currency | NotionalCcy | DEFAULT | 2 | |
| SettleCcy | Currency | SettleCcy | DEFAULT | 2 | |
| SettlementType | Enum | SettlementType | DEFAULT | 2 | |
| StartDate | ReferenceDate | StartDate | DEFAULT | 2 | |
| Strike | Double | Strike | DEFAULT | 4 | |

Note: KOLevel and Strike variables are defined with 4 Decimals so that user can enter till 4 decimal places.

## Forward Script

Script: Forward | Keywords | Functions | Operators | Reserved

```

StartDate:
  Select Case CallPut
    Case 'Call'
      CallPutSign = 1.0
      AccrueAbove = Notional
      AccrueBelow = (Notional * LeverageRatio)
    Case 'Put'
      CallPutSign = -1.0
      AccrueAbove = (Notional * LeverageRatio)
      AccrueBelow = Notional

  EndSelect
  m_KOLevel = KOLevel
  m_PayoutCap = (Notional * KOLevel)
AccrualSchedule:
  Al_Fixing = FxQuotable
  If Not(KnockedOut) Then
    PeriodAccruedNotional = If((FxQuotable > Strike), AccrueAbove, AccrueBelow)
    PeriodStrike = Strike
    Select Case CallPut
      Case 'Call'
        PeriodAccruedIntrinsicValue = Max(0, (FxQuotable - PeriodStrike))
      Case 'Put'
        PeriodAccruedIntrinsicValue = Max(0, (PeriodStrike - FxQuotable))

    EndSelect
    If ((TotalAccruedIntrinsicValue + PeriodAccruedIntrinsicValue) >= KOLevel) Then
      KnockedOut = True
      m_ProbKo = 1.0
      Select Case FinalPaymentType
        Case 'Full'
          Select Case SettlementType
            Case 'Physical'
              OptionNPV += PhysicalFx(NotionalCcy, ((BuySell * CallPutSign) * PeriodAccruedNotional), FxQuotable, PeriodStrike, 1, 'KNOCK_OUT', 1)
            Case 'Cash'
              OptionNPV += CashFx(SettleCcy, NotionalCcy, ((BuySell * CallPutSign) * PeriodAccruedNotional), FxQuotable, PeriodStrike, 1, 'KNOCK_OUT', 1)

          EndSelect
        Case 'ExactStrike'
          AdjustedStrike = (FxQuotable - (CallPutSign * (KOLevel - TotalAccruedIntrinsicValue)))
          PeriodStrike = AdjustedStrike
          Select Case SettlementType
            Case 'Physical'
              OptionNPV += PhysicalFx(NotionalCcy, ((BuySell * CallPutSign) * PeriodAccruedNotional), FxQuotable, PeriodStrike, 1, 'KNOCK_OUT', 1)
            Case 'Cash'
              OptionNPV += CashFx(SettleCcy, NotionalCcy, ((BuySell * CallPutSign) * PeriodAccruedNotional), FxQuotable, PeriodStrike, 1, 'KNOCK_OUT', 1)

          EndSelect
        Case 'ExactNotional'
```

Barrier Descriptors

Script: BarrierDescriptors

```
AccrualSchedule|KOLevel|TotalAccruedIntrinsicValue|Up|Out|Closing|False
```

Note: Barrier Descriptors section in script provides information necessary for Barrier Monitoring.

BO Events

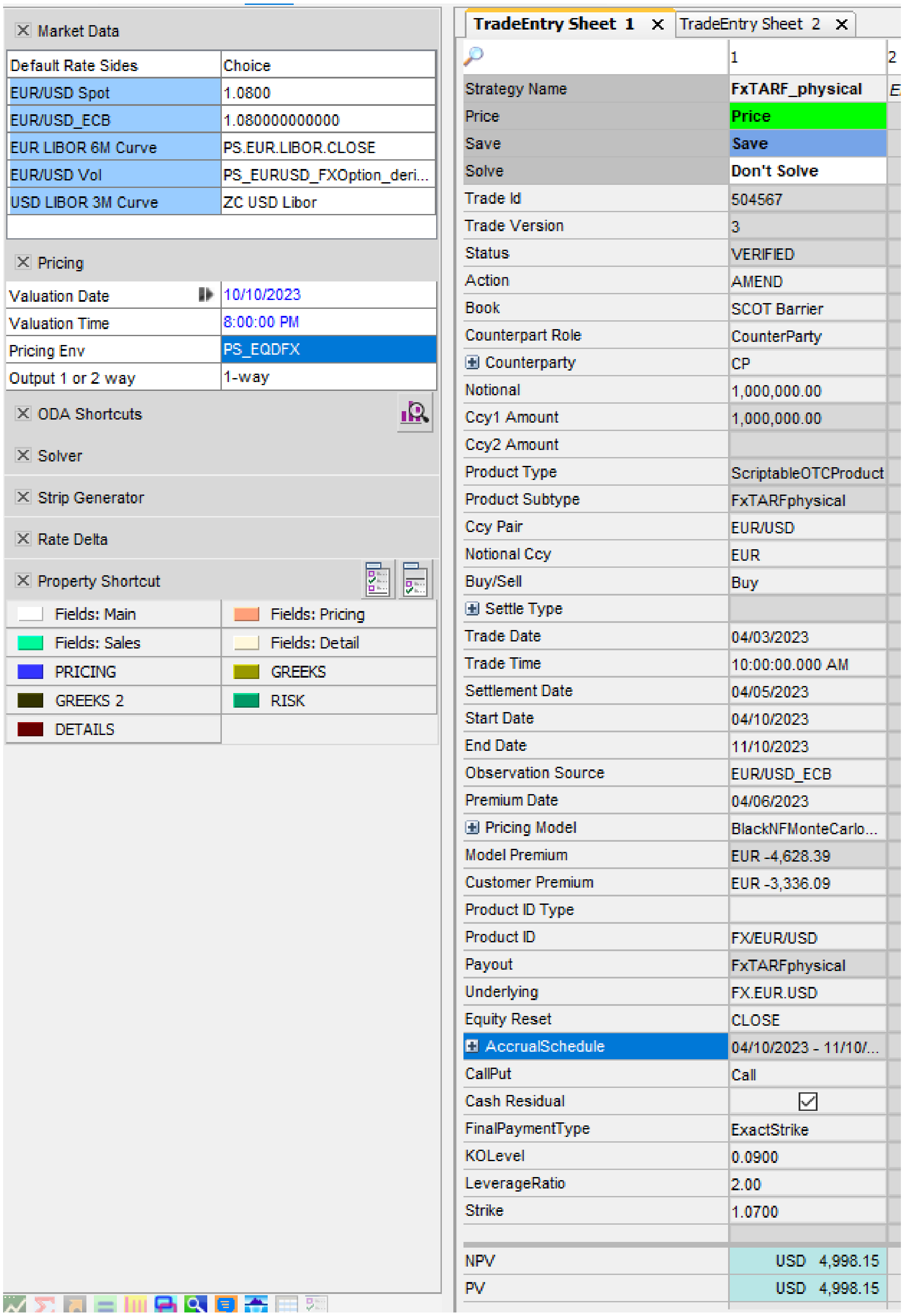
Script: BOEvents

```
KNOCK_OUT|KnockedOut
```

Note: BO Events is used to monitor if an event has occurred or not using a Boolean variable, without the need to tie the event to a cash flow.

### *Trade Example – FXTARF Physical Settlement*

Trade Entry


Market Data
Default Rate Sides
Choice
EUR/USD Spot
1.0800
EUR/USD_ECB
1.080000000000
EUR LIBOR 6M Curve
PS.EUR.LIBOR.CLOSE
EUR/USD Vol
PS_EURUSD_FXOption_deri...
USD LIBOR 3M Curve
ZC USD Libor
Pricing
Valuation Date
10/10/2023
Valuation Time
8:00:00 PM
Pricing Env
PS_EQDFX
Output 1 or 2 way
1-way
ODA Shortcuts
Solver
Strip Generator
Rate Delta
Property Shortcut
Fields: Main
Fields: Pricing
Fields: Sales
Fields: Detail
PRICING
GREEKS
GREEKS 2
RISK
DETAILS
TradeEntry Sheet 1
TradeEntry Sheet 2
1
2
Strategy Name
FxTARF_physical
Price
Price
Save
Save
Solve
Don't Solve
Trade Id
504567
Trade Version
3
Status
VERIFIED
Action
AMEND
Book
SCOT Barrier
Counterpart Role
CounterParty
Counterparty
CP
Notional
1,000,000.00
Ccy1 Amount
1,000,000.00
Ccy2 Amount
Product Type
ScriptableOTCProduct
Product Subtype
FxTARFphysical
Ccy Pair
EUR/USD
Notional Ccy
EUR
Buy/Sell
Buy
Settle Type
Trade Date
04/03/2023
Trade Time
10:00:00.000 AM
Settlement Date
04/05/2023
Start Date
04/10/2023
End Date
11/10/2023
Observation Source
EUR/USD_ECB
Premium Date
04/06/2023
Pricing Model
BlackNFMonteCarlo...
Model Premium
EUR -4,628.39
Customer Premium
EUR -3,336.09
Product ID Type
Product ID
FX/EUR/USD
Payout
FxTARFphysical
Underlying
FX.EUR.USD
Equity Reset
CLOSE
AccrualSchedule
04/10/2023 - 11/10/...
CallPut
Call
Cash Residual
FinalPaymentType
ExactStrike
KOLevel
0.0900
LeverageRatio
2.00
Strike
1.0700
NPV
USD 4,998.15
PV
USD 4,998.15

| | |
|---|---|
| AccrualSchedule | 04/10/2023 - 11/10/... |
| Start Date | 04/10/2023 |
| End Date | 11/10/2023 |
| Frequency | MTH |
| Payment Holidays | NYC |
| Date Roll | FOLLOWING |
| Period Rule | ADJUSTED |
| Date Rule | |
| Specify Roll | ☐ |
| Roll Day | 0 |
| Payment Lag | 2 |
| Reset Lag | 0 |
| Reset Holidays | NYC |
| Bus. Day Lag | ☑ |
| Stub Rule | NONE |
| Rounding | |
| Include Start | ☐ |
| Quote Usage | |
| Manual Schedule | ☐ |
| Generation Base Date | RESET |

Trade Booked in Pricing Sheet

Ccy Pair → EURUSD

Notional → 1M EUR

Final Payment Type → Exact Final Payment with Strike Adjustment

KOLevel → 0.09

Strike → 1.07 EURUSD

Leverage Ratio → 2

Payment Pag → 2 Day

Cashflows

| Leg | Event Date | Event | Start Date | End Date | Legal Entity | Underlying | Type | Quantity | Currency | Notional | Index Factor | Rate | Spread | Reset Date | Amount | No. of Days | df |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 05/12/2023 | Cash Flow | 05/10/2023 | 05/10/2023 | CP | FX/EUR/USD | SECURITY | 1,000,000 | EUR | 1,000,000.00 | 1 | 1.070000 | 0.000000 | 05/10/2023 | | 0 | 0.00000000 |
| 1 | 06/14/2023 | Cash Flow | 06/12/2023 | 06/12/2023 | CP | FX/EUR/USD | SECURITY | 2,000,000 | EUR | 2,000,000.00 | 1 | 1.070000 | 0.000000 | 06/12/2023 | | 0 | 0.00000000 |
| 1 | 07/12/2023 | Cash Flow | 07/10/2023 | 07/10/2023 | CP | FX/EUR/USD | SECURITY | 1,000,000 | EUR | 1,000,000.00 | 1 | 1.070000 | 0.000000 | 07/10/2023 | | 0 | 0.00000000 |
| 1 | 08/14/2023 | Cash Flow | 08/10/2023 | 08/10/2023 | CP | FX/EUR/USD | SECURITY | 1,000,000 | EUR | 1,000,000.00 | 1 | 1.070000 | 0.000000 | 08/10/2023 | | 0 | 0.00000000 |
| 1 | 09/13/2023 | Cash Flow | 09/11/2023 | 09/11/2023 | CP | FX/EUR/USD | SECURITY | 1,000,000 | EUR | 1,000,000.00 | 1 | 1.070000 | 0.000000 | 09/11/2023 | | 0 | 0.00000000 |
| 1 | 04/06/2023 | Fee | 04/06/2023 | 04/06/2023 | CP | | PREMIUM | | EUR | | | | | | -3,336.09 | | |

Security Flow for past Physical Delivery event has been created.

## Event Grid

Complex Variables | Pricing Script | Event Grid | Script Results | Resets

| Date | Events |
|---|---|
| 04/10/2023 | [StartDate] |
| 05/10/2023 | [AccrualSchedule] |
| 06/12/2023 | [AccrualSchedule] |
| 07/10/2023 | [AccrualSchedule] |
| 08/10/2023 | [AccrualSchedule] |
| 09/11/2023 | [AccrualSchedule] |
| 10/10/2023 | [AccrualSchedule] |
| 11/10/2023 | [AccrualSchedule] |

| | |
|---|---|
| | Product.StartDate |
| AccrualSchedule | 04/10/2023 - 11/10/2023 MTH NYC 2D |

| Last Reset | Reference Date | Payment Date |
|---|---|---|
| 05/10/2023 | 05/10/2023 | 05/12/2023 |
| 06/12/2023 | 06/12/2023 | 06/14/2023 |
| 07/10/2023 | 07/10/2023 | 07/12/2023 |
| 08/10/2023 | 08/10/2023 | 08/14/2023 |
| 09/11/2023 | 09/11/2023 | 09/13/2023 |
| 10/10/2023 | 10/10/2023 | 10/12/2023 |
| 11/10/2023 | 11/10/2023 | 11/14/2023 |

## Script Results

Complex Variables | Pricing Script | Event Grid | Script Results | Resets

Measures: 10/10/23 5:29:45.546 AM EDT

| Measure | Value |
|---|---|
| ProbabilityOfTARNTrigger | 1.000000 |
| PayoutCap | 90,000.000000 |
| OptionNPV | 4,628.387412 |

Schedule Measures: 10/10/23 5:29:45.546 AM EDT

AccrualSchedule

| Event | m_PeriodAccrue... | m_PeriodAccrue... | m_Quotable | m_accPL |
|---|---|---|---|---|
| 05/10/2023 | 0.030000 | 1,000,000.000000 | 1.100000 | 0.030000 |
| 06/12/2023 | 0.000000 | 2,000,000.000000 | 1.065000 | 0.030000 |
| 07/10/2023 | 0.020000 | 1,000,000.000000 | 1.090000 | 0.050000 |
| 08/10/2023 | 0.030000 | 1,000,000.000000 | 1.100000 | 0.080000 |
| 09/11/2023 | 0.005000 | 1,000,000.000000 | 1.075000 | 0.085000 |
| 10/10/2023 | 0.010000 | 1,000,000.000000 | 1.080000 | 0.095000 |
| 11/10/2023 | 0.010000 | 1,000,000.000000 | 1.082477 | 0.095000 |

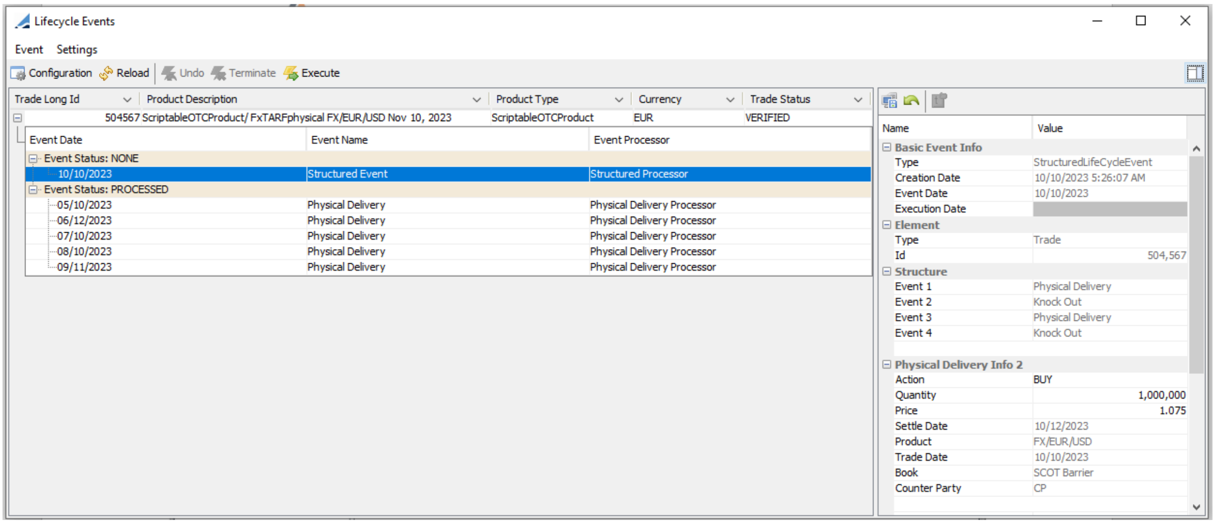
## Resets

Complex Variables | Pricing Script | Event Grid | Script Results | Resets

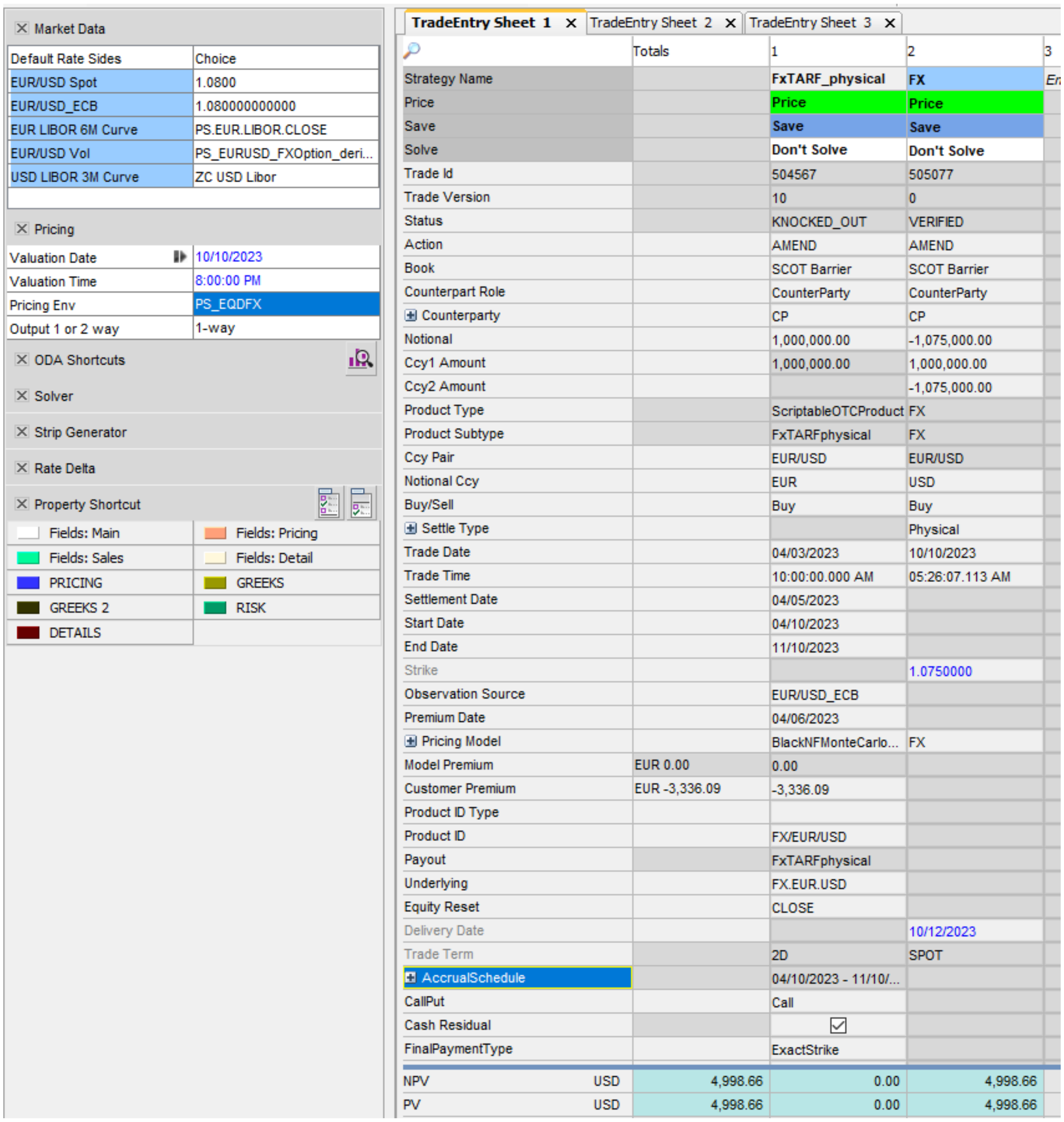
All
FX

| Date | Value | Idx Term | Name | Type | Reset Name |
|---|---|---|---|---|---|
| 05/10/2023 | 1.1 | | FX.EUR.USD.EUR/USD... | FX | CLOSE |
| 06/12/2023 | 1.065 | | FX.EUR.USD.EUR/USD... | FX | CLOSE |
| 07/10/2023 | 1.09 | | FX.EUR.USD.EUR/USD... | FX | CLOSE |
| 08/10/2023 | 1.1 | | FX.EUR.USD.EUR/USD... | FX | CLOSE |
| 09/11/2023 | 1.075 | | FX.EUR.USD.EUR/USD... | FX | CLOSE |
| 10/10/2023 | 1.08 | | FX.EUR.USD.EUR/USD... | FX | CLOSE |
| 11/10/2023 | | | FX.EUR.USD.EUR/USD... | FX | CLOSE |

Lifecycle Events Window




After executing Structured Event (Knock Out Event and Physical Delivery Event)



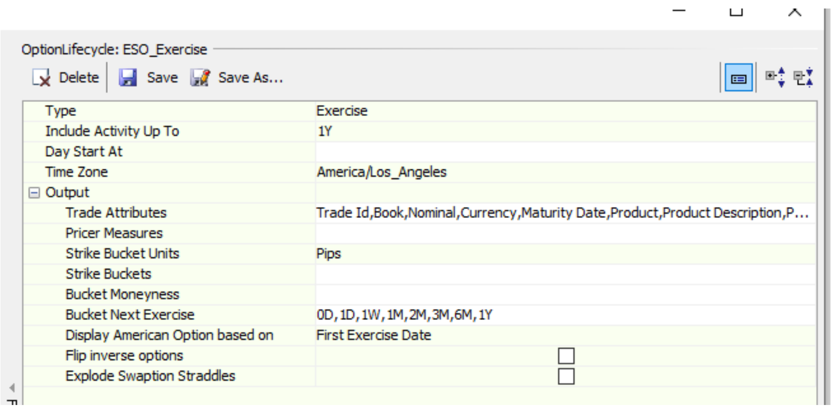

Parent Trade is Knocked Out and NPV is Zero.

New FX Trade is created out of Physical Delivery Event with Adjusted Strike.

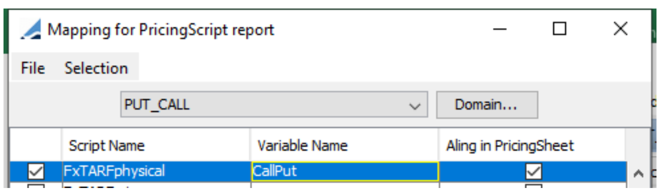
Adjusted Strike = Fixing Rate - (Payout Cap - Previous Fixing Total Accrued Intrinsic Value) = 1.08 – (0.090 – 0.085) = 1.075

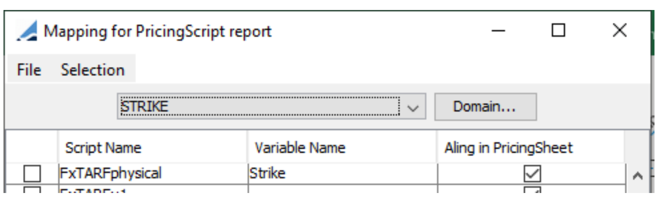
## *Option Lifecycle Analysis - Exercise*

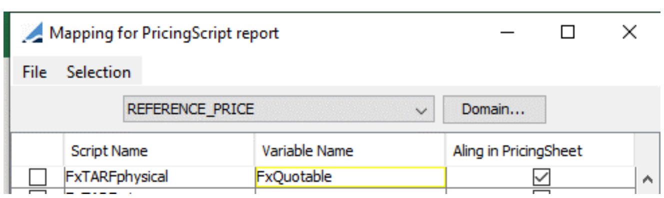
OLA Analysis



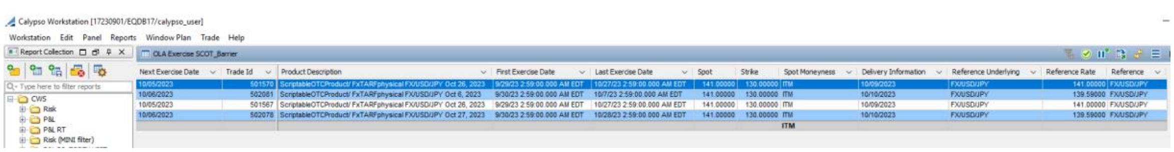

Variable Mapping



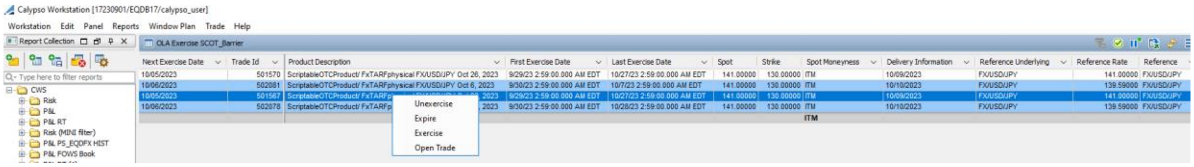



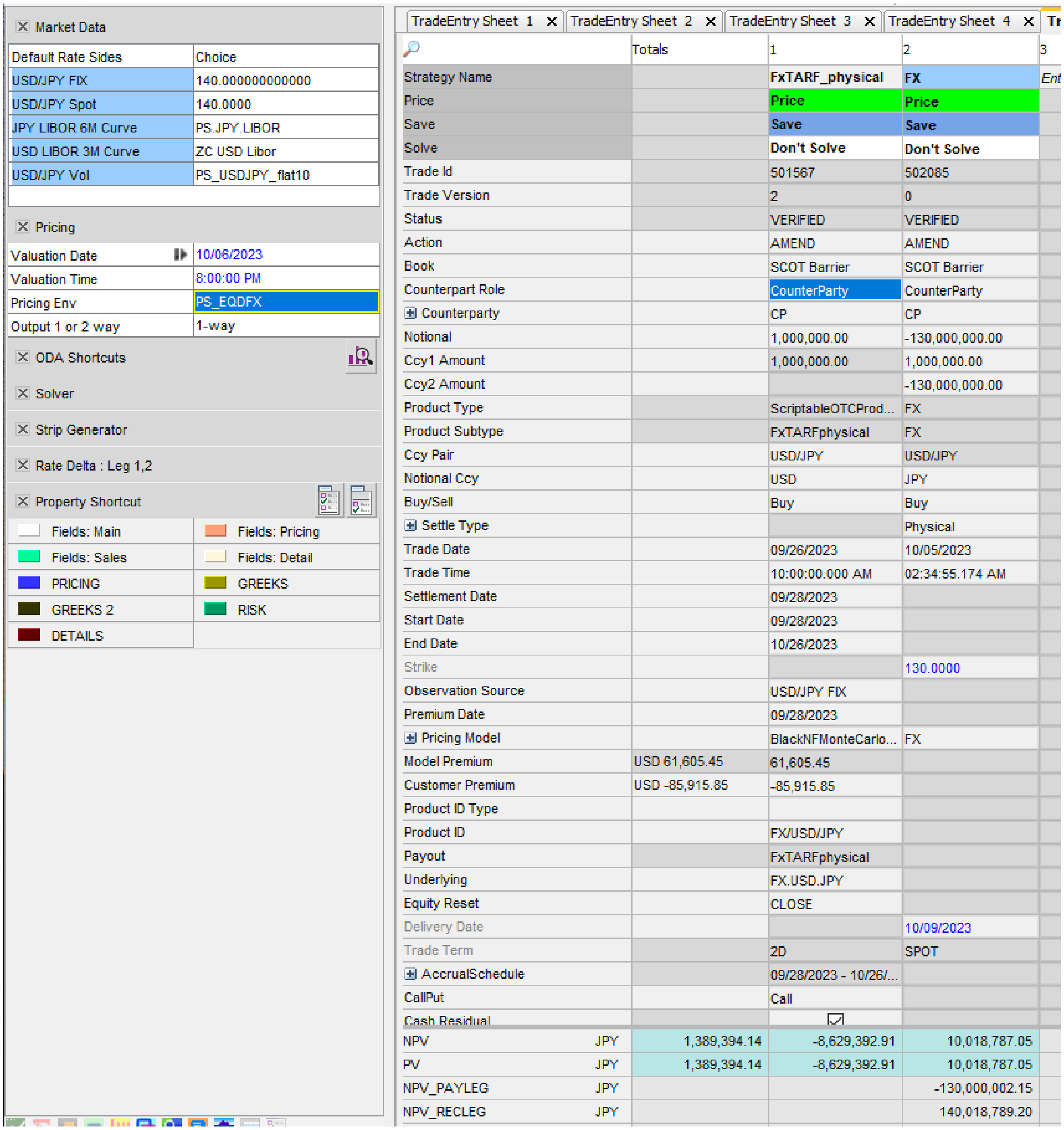

CWS OLA Exercise



Exercise Trade using Exercise Option



Resulting Trades - New Fx Trade is created out of Physical Exercise



Market Data

| Default Rate Sides | Choice |
|---|---|
| USD/JPY FIX | 140.000000000000 |
| USD/JPY Spot | 140.0000 |
| JPY LIBOR 6M Curve | PS.JPY.LIBOR |
| USD LIBOR 3M Curve | ZC USD Libor |
| USD/JPY Vol | PS_USDJPY_flat10 |

Pricing

| | |
|---|---|
| Valuation Date | 10/06/2023 |
| Valuation Time | 8:00:00 PM |
| Pricing Env | PS_EQDFX |
| Output 1 or 2 way | 1-way |

ODA Shortcuts

Solver

Strip Generator

Rate Delta : Leg 1,2

Property Shortcut

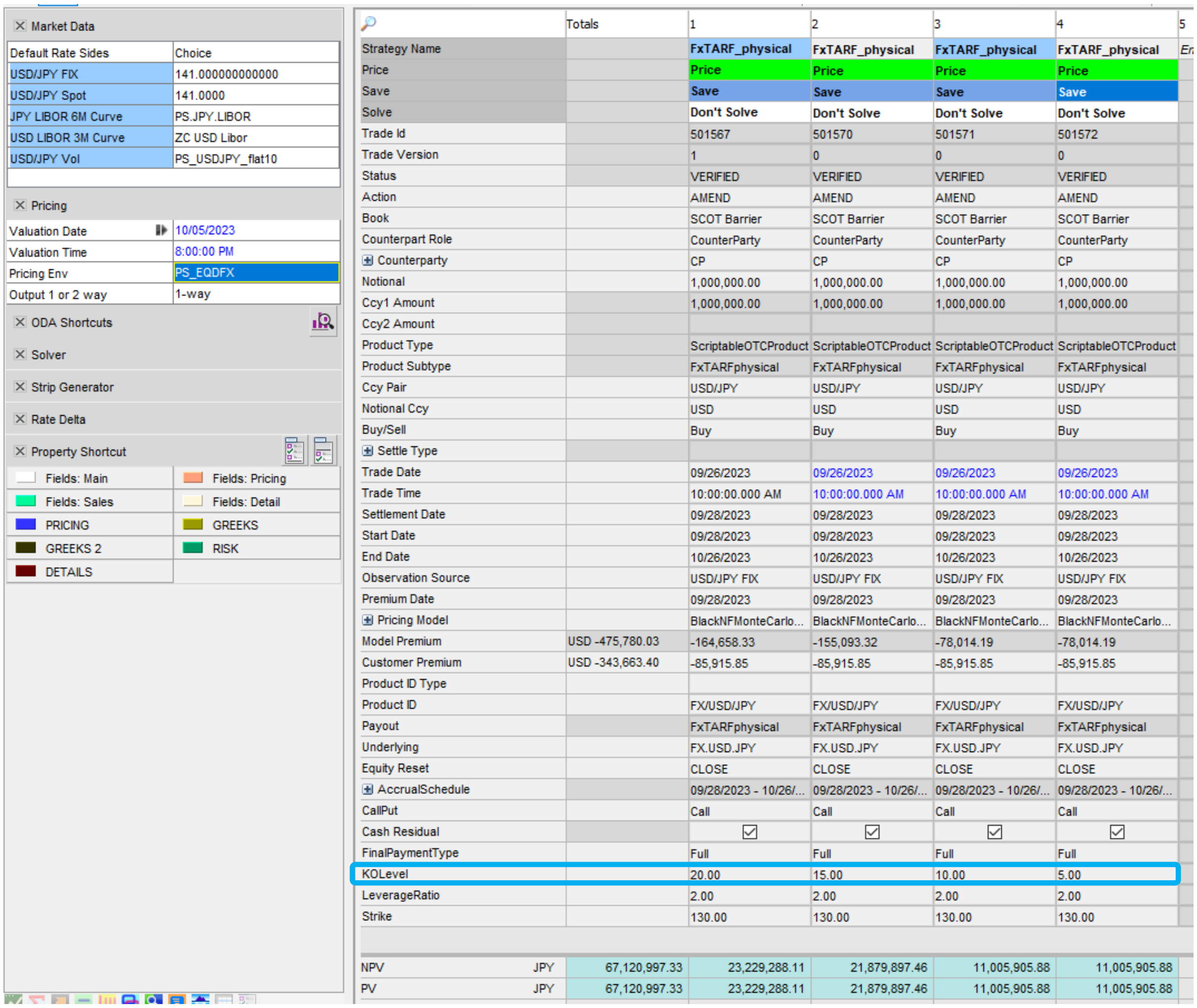
| | |
|---|---|
| Fields: Main | Fields: Pricing |
| Fields: Sales | Fields: Detail |
| PRICING | GREEKS |
| GREEKS 2 | RISK |
| DETAILS | |

TradeEntry Sheet 1 | TradeEntry Sheet 2 | TradeEntry Sheet 3 | TradeEntry Sheet 4 | Tr

| | | Totals | 1 | 2 | 3 |
|---|---|---|---|---|---|
| Strategy Name | | | FxTARF_physical | FX | Ent |
| Price | | | Price | Price | |
| Save | | | Save | Save | |
| Solve | | | Don't Solve | Don't Solve | |
| Trade Id | | | 501567 | 502085 | |
| Trade Version | | | 2 | 0 | |
| Status | | | VERIFIED | VERIFIED | |
| Action | | | AMEND | AMEND | |
| Book | | | SCOT Barrier | SCOT Barrier | |
| Counterpart Role | | | CounterParty | CounterParty | |
| Counterparty | | | CP | CP | |
| Notional | | | 1,000,000.00 | -130,000,000.00 | |
| Ccy1 Amount | | | 1,000,000.00 | 1,000,000.00 | |
| Ccy2 Amount | | | | -130,000,000.00 | |
| Product Type | | | ScriptableOTCProd... | FX | |
| Product Subtype | | | FxTARFphysical | FX | |
| Ccy Pair | | | USD/JPY | USD/JPY | |
| Notional Ccy | | | USD | JPY | |
| Buy/Sell | | | Buy | Buy | |
| Settle Type | | | | Physical | |
| Trade Date | | | 09/26/2023 | 10/05/2023 | |
| Trade Time | | | 10:00:00.000 AM | 02:34:55.174 AM | |
| Settlement Date | | | 09/28/2023 | | |
| Start Date | | | 09/28/2023 | | |
| End Date | | | 10/26/2023 | | |
| Strike | | | | 130.0000 | |
| Observation Source | | | USD/JPY FIX | | |
| Premium Date | | | 09/28/2023 | | |
| Pricing Model | | | BlackNFMonteCarlo... | FX | |
| Model Premium | | USD 61,605.45 | 61,605.45 | | |
| Customer Premium | | USD -85,915.85 | -85,915.85 | | |
| Product ID Type | | | | | |
| Product ID | | | FX/USD/JPY | | |
| Payout | | | FxTARFphysical | | |
| Underlying | | | FX.USD.JPY | | |
| Equity Reset | | | CLOSE | | |
| Delivery Date | | | | 10/09/2023 | |
| Trade Term | | | 2D | SPOT | |
| AccrualSchedule | | | 09/28/2023 - 10/26/... | | |
| CallPut | | | Call | | |
| Cash Residual | | | ☑ | | |
| NPV | JPY | 1,389,394.14 | -8,629,392.91 | 10,018,787.05 | |
| PV | JPY | 1,389,394.14 | -8,629,392.91 | 10,018,787.05 | |
| NPV_PAYLEG | JPY | | | -130,000,002.15 | |
| NPV_RECLEG | JPY | | | 140,018,789.20 | |

## *Barrier Monitoring*

### Sample Trades with Barrier Levels



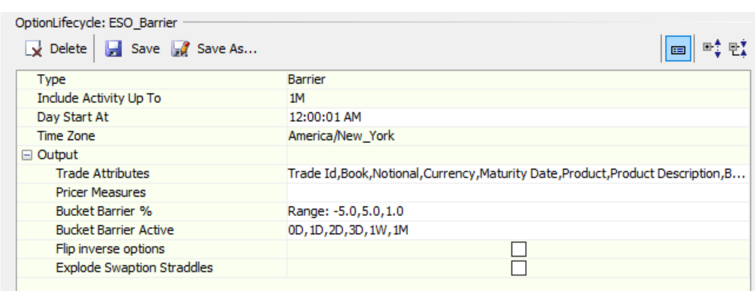
| Market Data | |
|---|---|
| Default Rate Sides | Choice |
| USD/JPY FIX | 141.000000000000 |
| USD/JPY Spot | 141.0000 |
| JPY LIBOR 6M Curve | PS.JPY.LIBOR |
| USD LIBOR 3M Curve | ZC USD Libor |
| USD/JPY Vol | PS_USDJPY_flat10 |

| Pricing | |
|---|---|
| Valuation Date | 10/05/2023 |
| Valuation Time | 8:00:00 PM |
| Pricing Env | PS_EQDFX |
| Output 1 or 2 way | 1-way |



| | Totals | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| Strategy Name | | FxTARF_physical | FxTARF_physical | FxTARF_physical | FxTARF_physical | |
| Price | | Price | Price | Price | Price | |
| Save | | Save | Save | Save | Save | |
| Solve | | Don't Solve | Don't Solve | Don't Solve | Don't Solve | |
| Trade Id | | 501567 | 501570 | 501571 | 501572 | |
| Trade Version | | 1 | 0 | 0 | 0 | |
| Status | | VERIFIED | VERIFIED | VERIFIED | VERIFIED | |
| Action | | AMEND | AMEND | AMEND | AMEND | |
| Book | | SCOT Barrier | SCOT Barrier | SCOT Barrier | SCOT Barrier | |
| Counterpart Role | | CounterParty | CounterParty | CounterParty | CounterParty | |
| Counterparty | | CP | CP | CP | CP | |
| Notional | | 1,000,000.00 | 1,000,000.00 | 1,000,000.00 | 1,000,000.00 | |
| Ccy1 Amount | | 1,000,000.00 | 1,000,000.00 | 1,000,000.00 | 1,000,000.00 | |
| Ccy2 Amount | | | | | | |
| Product Type | | ScriptableOTCProduct | ScriptableOTCProduct | ScriptableOTCProduct | ScriptableOTCProduct | |
| Product Subtype | | FxTARFphysical | FxTARFphysical | FxTARFphysical | FxTARFphysical | |
| Ccy Pair | | USD/JPY | USD/JPY | USD/JPY | USD/JPY | |
| Notional Ccy | | USD | USD | USD | USD | |
| Buy/Sell | | Buy | Buy | Buy | Buy | |
| Settle Type | | | | | | |
| Trade Date | | 09/26/2023 | 09/26/2023 | 09/26/2023 | 09/26/2023 | |
| Trade Time | | 10:00:00.000 AM | 10:00:00.000 AM | 10:00:00.000 AM | 10:00:00.000 AM | |
| Settlement Date | | 09/28/2023 | 09/28/2023 | 09/28/2023 | 09/28/2023 | |
| Start Date | | 09/28/2023 | 09/28/2023 | 09/28/2023 | 09/28/2023 | |
| End Date | | 10/26/2023 | 10/26/2023 | 10/26/2023 | 10/26/2023 | |
| Observation Source | | USD/JPY FIX | USD/JPY FIX | USD/JPY FIX | USD/JPY FIX | |
| Premium Date | | 09/28/2023 | 09/28/2023 | 09/28/2023 | 09/28/2023 | |
| Pricing Model | | BlackNFMonteCarlo... | BlackNFMonteCarlo... | BlackNFMonteCarlo... | BlackNFMonteCarlo... | |
| Model Premium | USD -475,780.03 | -164,658.33 | -155,093.32 | -78,014.19 | -78,014.19 | |
| Customer Premium | USD -343,663.40 | -85,915.85 | -85,915.85 | -85,915.85 | -85,915.85 | |
| Product ID Type | | | | | | |
| Product ID | | FX/USD/JPY | FX/USD/JPY | FX/USD/JPY | FX/USD/JPY | |
| Payout | | FxTARFphysical | FxTARFphysical | FxTARFphysical | FxTARFphysical | |
| Underlying | | FX.USD.JPY | FX.USD.JPY | FX.USD.JPY | FX.USD.JPY | |
| Equity Reset | | CLOSE | CLOSE | CLOSE | CLOSE | |
| AccrualSchedule | | 09/28/2023 - 10/26/... | 09/28/2023 - 10/26/... | 09/28/2023 - 10/26/... | 09/28/2023 - 10/26/... | |
| CallPut | | Call | Call | Call | Call | |
| Cash Residual | | ☑ | ☑ | ☑ | ☑ | |
| FinalPaymentType | | Full | Full | Full | Full | |
| KOLevel | | 20.00 | 15.00 | 10.00 | 5.00 | |
| LeverageRatio | | 2.00 | 2.00 | 2.00 | 2.00 | |
| Strike | | 130.00 | 130.00 | 130.00 | 130.00 | |
| NPV JPY | 67,120,997.33 | 23,229,288.11 | 21,879,897.46 | 11,005,905.88 | 11,005,905.88 | |
| PV JPY | 67,120,997.33 | 23,229,288.11 | 21,879,897.46 | 11,005,905.88 | 11,005,905.88 | |

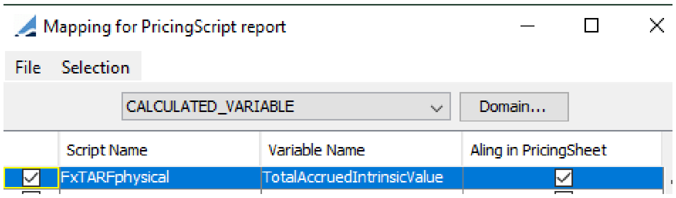
### Option Lifecycle Analysis: Type- Barrier

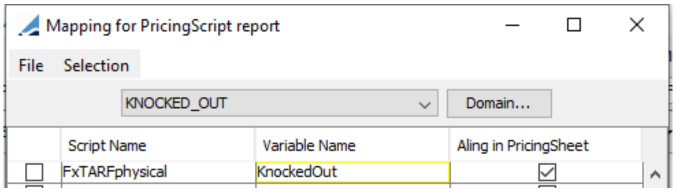


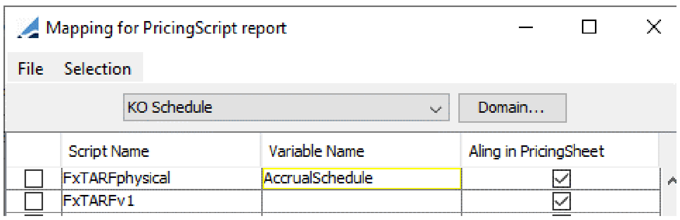


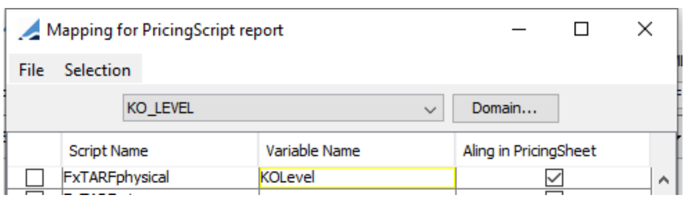
| | |
|---|---|
| Type | Barrier |
| Include Activity Up To | 1M |
| Day Start At | 12:00:01 AM |
| Time Zone | America/New_York |
| Output | |
| Trade Attributes | Trade Id,Book,Notional,Currency,Maturity Date,Product,Product Description,B... |
| Pricer Measures | |
| Bucket Barrier % | Range: -5.0,5.0,1.0 |
| Bucket Barrier Active | 0D,1D,2D,3D,1W,1M |
| Flip inverse options | ☐ |
| Explode Swaption Straddles | ☐ |

### Variable Mapping

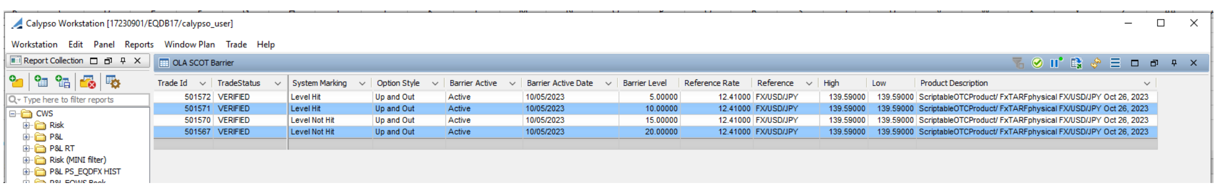


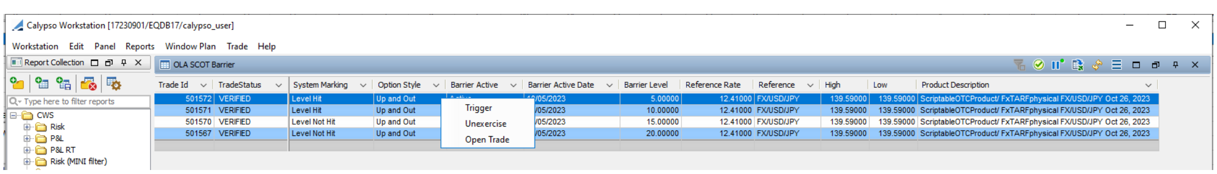



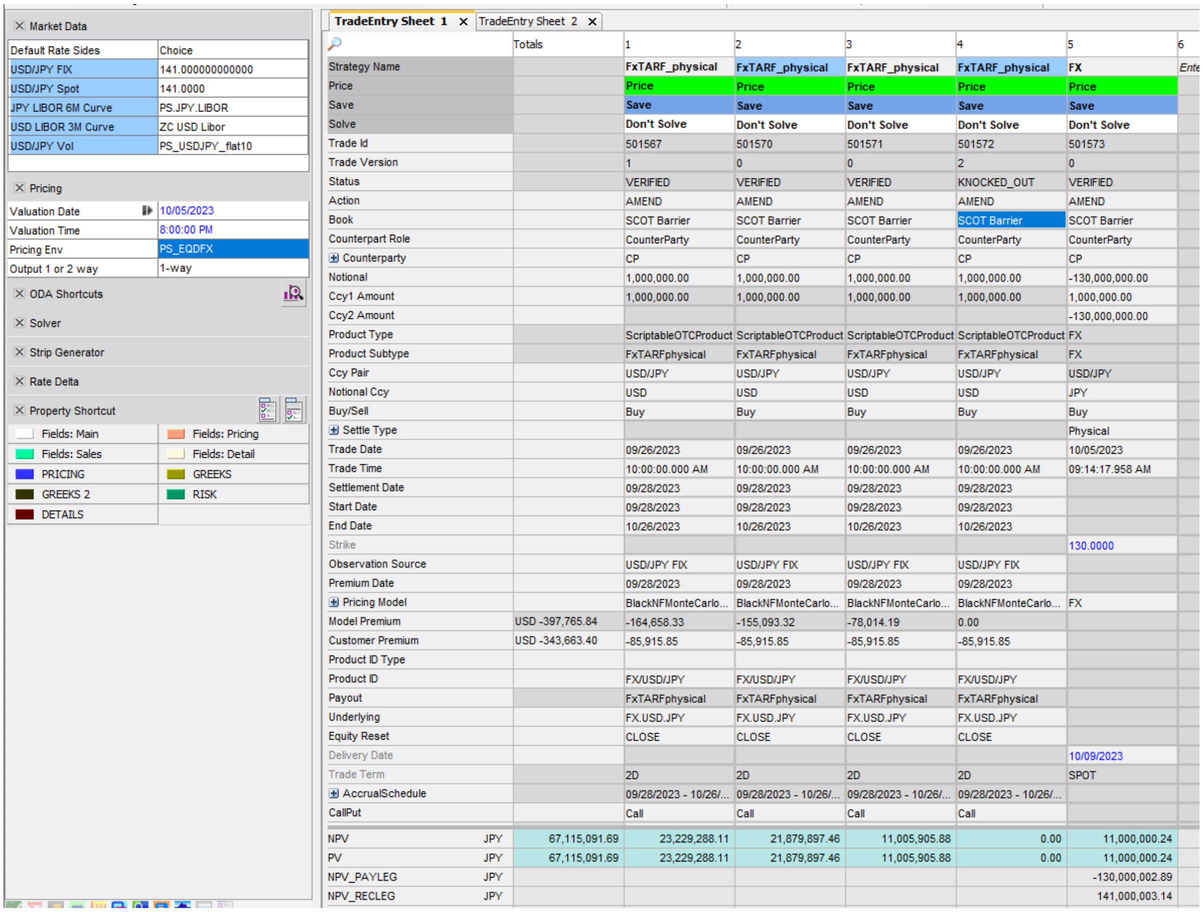

## CWS - OLA Barrie



## Trigger Barrier



## Resulting Trades

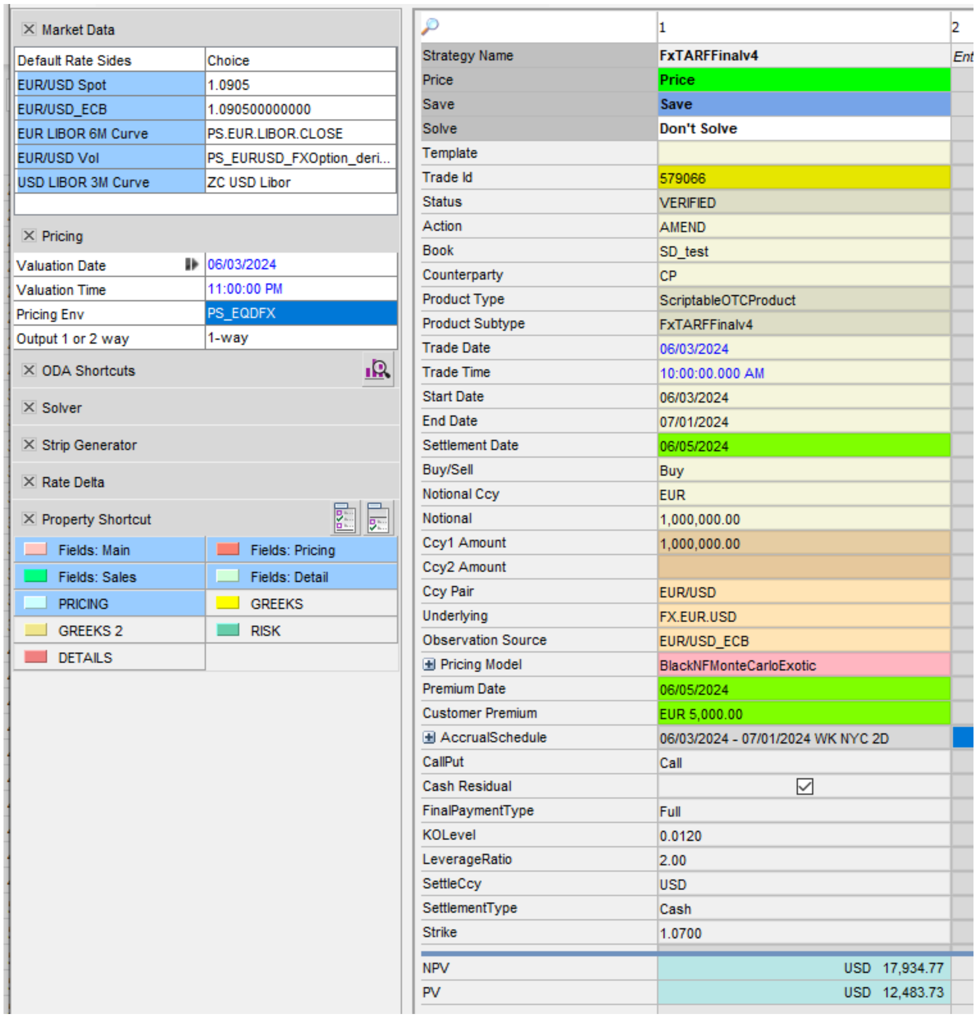



Parent Trade is Knocked Out and NPV is Zero - New FX Trade is created out of Physical Delivery Event.

New FX Trade is created out of Physical Delivery Event.

## *Trade Example - FXTARF Cash Settlement*

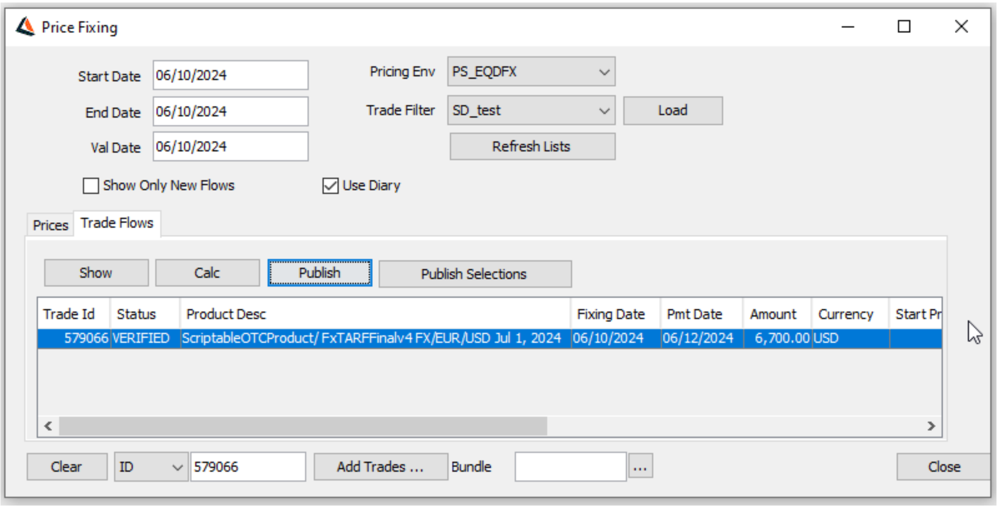
### Trade Entry



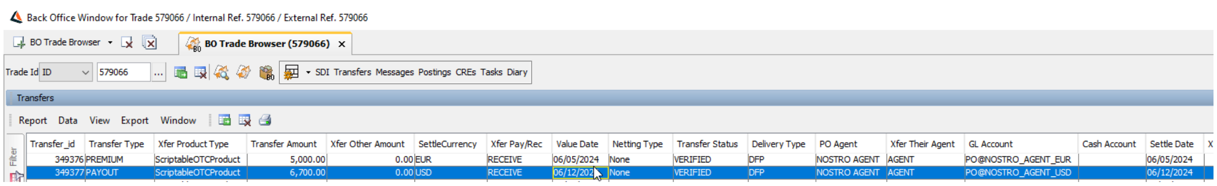

### Cashflows

| Leg | Even Date | Event | Start Date | End Date | Legal Entity | Underlying | Type | Quantity | Currency | Notional | Index Factor | Rate | Spread | Reset Date | Amount |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 06/05/2024 | Fee | 06/05/2024 | 06/05/2024 | CP | | PREMIUM | | EUR | | | | | | 5,000.00 |
| 1 | 06/12/2024 | Cash Flow | 06/10/2024 | 06/10/2024 | CP | | PAYOUT | | USD | | | | | 06/10/2024 | 6,700.00 |
| 1 | 06/19/2024 | Cash Flow | 06/17/2024 | 06/17/2024 | CP | | PAYOUT | | USD | | | | | 06/17/2024 | 3,500.00 |
| 1 | 06/26/2024 | KNOCK_OUT | 06/24/2024 | 06/24/2024 | CP | | PAYOUT | | USD | | | | | 06/24/2024 | 3,600.00 |

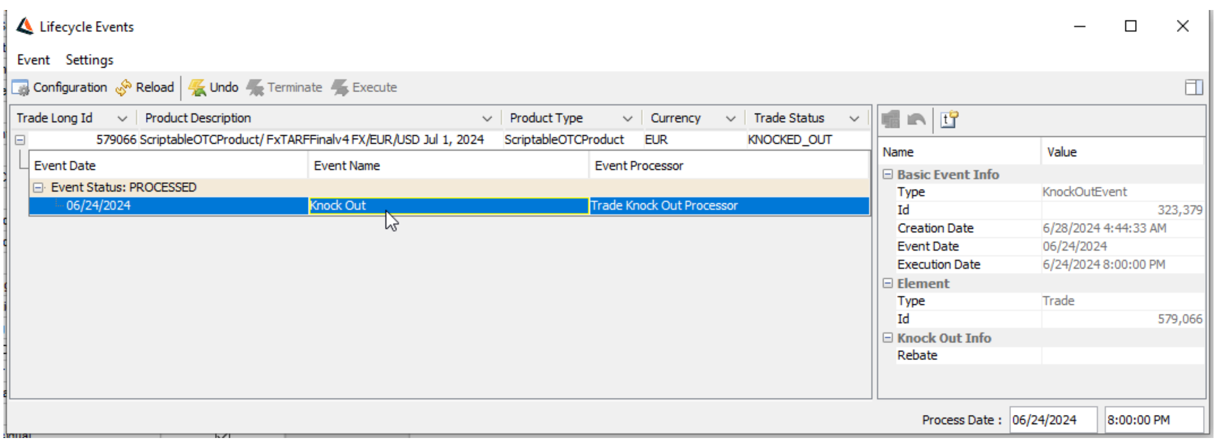
### Price Fixing



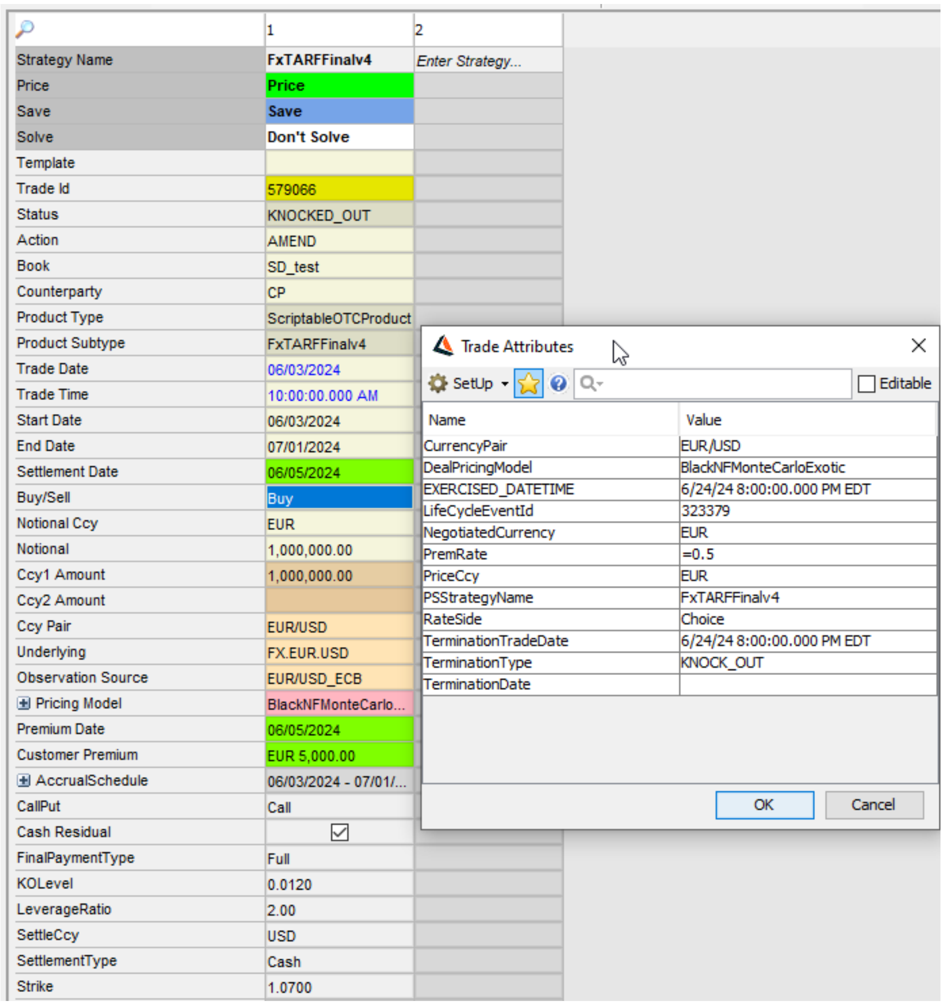

Transfer is generated after Price Fixing




Lifecyle Event – KnockOut




Resulting Trade after Knock Out


1
2
Strategy Name
FxTARFFinalv4
Enter Strategy...
Price
Price
Save
Save
Solve
Don't Solve
Template
Trade Id
579066
Status
KNOCKED_OUT
Action
AMEND
Book
SD_test
Counterparty
CP
Product Type
ScriptableOTCProduct
Product Subtype
FxTARFFinalv4
Trade Date
06/03/2024
Trade Time
10:00:00.000 AM
Start Date
06/03/2024
End Date
07/01/2024
Settlement Date
06/05/2024
Buy/Sell
Buy
Notional Ccy
EUR
Notional
1,000,000.00
Ccy1 Amount
1,000,000.00
Ccy2 Amount
Ccy Pair
EUR/USD
Underlying
FX.EUR.USD
Observation Source
EUR/USD_ECB
Pricing Model
BlackNFMonteCarlo...
Premium Date
06/05/2024
Customer Premium
EUR 5,000.00
AccrualSchedule
06/03/2024 - 07/01/...
CallPut
Call
Cash Residual
FinalPaymentType
Full
KOLevel
0.0120
LeverageRatio
2.00
SettleCcy
USD
SettlementType
Cash
Strike
1.0700
Trade Attributes
SetUp
Editable
Name
Value
CurrencyPair
EUR/USD
DealPricingModel
BlackNFMonteCarloExotic
EXERCISED_DATETIME
6/24/24 8:00:00.000 PM EDT
LifeCycleEventId
323379
NegotiatedCurrency
EUR
PremRate
=0.5
PriceCcy
EUR
PSStrategyName
FxTARFFinalv4
RateSide
Choice
TerminationTradeDate
6/24/24 8:00:00.000 PM EDT
TerminationType
KNOCK_OUT
TerminationDate
OK
Cancel

# Example 4 - Basket Worst M

### *Description*

Payment of worst performance of Equity Basket

### *Code*

Variables

```
Constant Strike As ReferenceDate From Product.StartDate
Constant Exercise As PaymentDate From Product.Maturity
Constant Basket As Quotable[] From Product.Basket
Constant N As Integer From Product.BasketSize
Constant Weight As Double[] From Product.Basket
Constant PayRec As Integer From Product.BuySell
Constant Notional As Double From Product.Notional
Constant PaymentCurrency As Currency From Product.Currency
Constant M As Integer
StrikePrice As Double[] From N
Return As Double[] From N
ReturnRank As Integer[] From N
BasketReturn As Measure
TotalWeight As Double
i As Integer
Option As Measure To NPV
```

| Variable Name | Type | Description |
|---|---|---|
| M | Integer | M worst performance from all constituents of Basket |
| Weight | Double Array | weight of each constituent of basket |

Forward Script

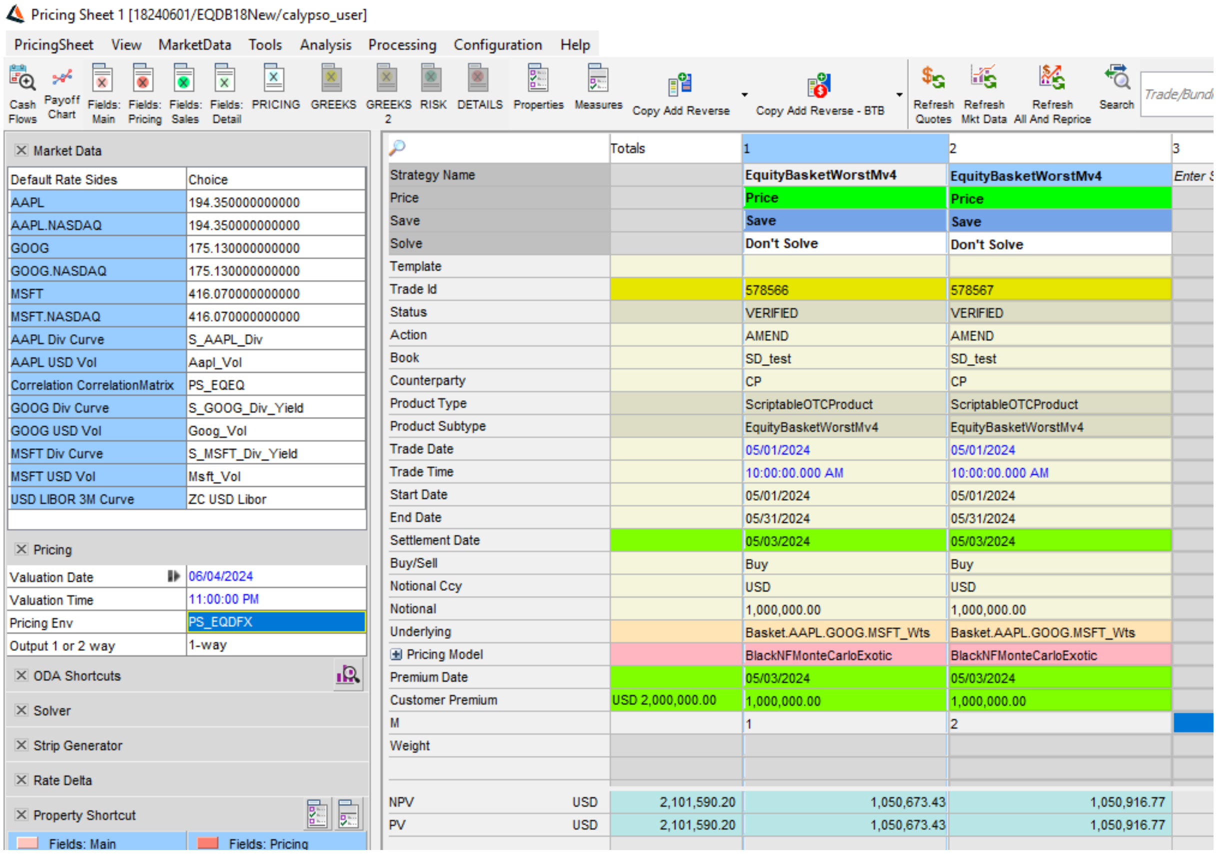
Script: Forward | Keywords | Functions | Operators | Reserved

```

Strike:
  For i = 1 To N
    StrikePrice[i] = Basket[i]
  Next
Exercise:
  For i = 1 To N
    Return[i] = (Basket[i] / StrikePrice[i])
  Next
  Rank(Return, ReturnRank)
  For i = 1 To N
    If (ReturnRank[i] > (N - M)) Then
      BasketReturn += (Weight[i] * Return[i])
      TotalWeight += Weight[i]
    EndIf
  Next
  BasketReturn = (BasketReturn / TotalWeight)
  Option = Cash((PayRec * (Notional * BasketReturn)), PaymentCurrency)
```

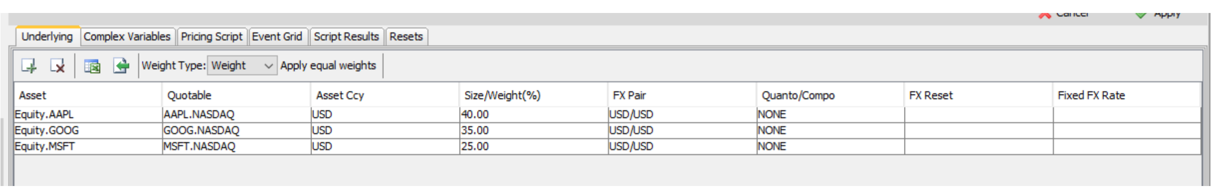
| | |
|---|---|
| Strike | Sample the underlying basket quotes |
| Exercise | 1. Sample the underlying performances<br>2. Rank the performances and store the results in ReturnRank<br>3. For all performances that rank among the M worst, calculate the weighted average.<br>4. Pay out the weighted average performance multiplied by notional |

## Trade Example

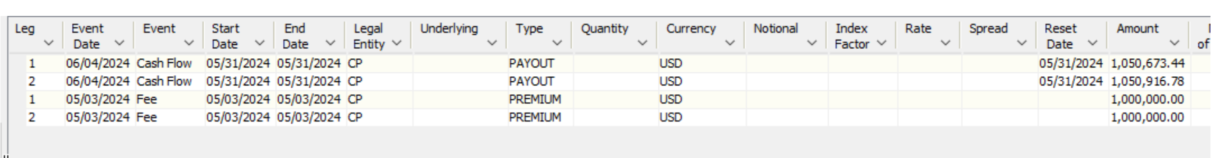
## Trade Entry



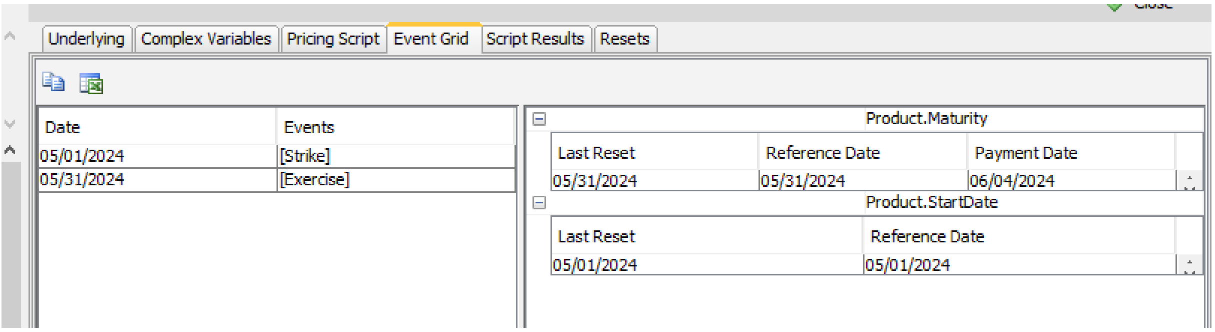

## Underlying Basket



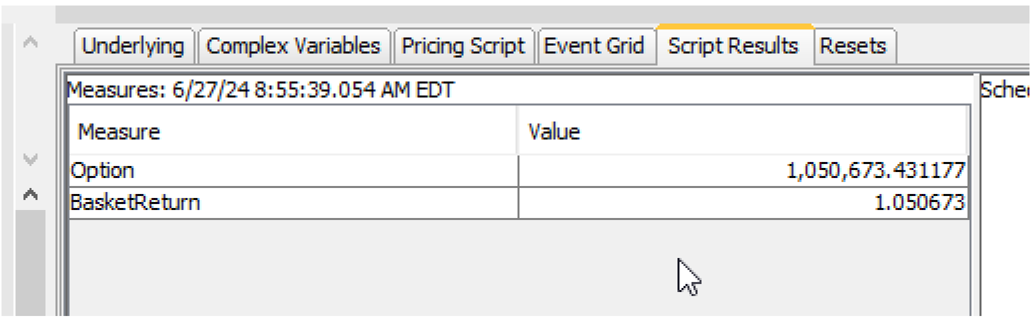

## Cashflows



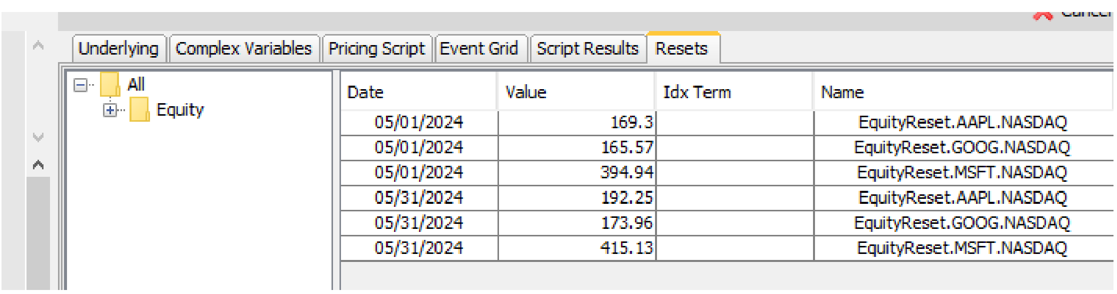

## Event Grid




## Script Results




## Resets



# Example 5 - Hybrid Dual Digital

### *Description*

Payment of Coupon if Equity/Index performance is above a certain strike level and FX performance is below a certain strike level.

### *Code*

Variables

Script: Variables Keywords Types Product Properties

```
Constant Start As ReferenceDate From Product.StartDate
Constant Exercise As PaymentDate From Product.Maturity
Constant BuySell As Integer From Product.BuySell
Constant PaymentCcy As Currency From Product.Currency
Constant Notional As Double From Product.Notional
Constant Index As Quotable From Product.Underlying
Constant IndexStrike As Double From 1
IndexInitialLevel As Double
IndexPerf As Double
mIndexPerf As Measure
Constant FX As Quotable
Constant FXStrike As Double From 1
FXInitialLevel As Double
FXPerf As Double
mFXPerf As Measure
Payoff As Double
mPayoff As Measure
Constant CouponRate As Double From 0.05
Option As Measure To NPV
```

| Variable Name | Type | Description |
|---|---|---|
| IndexStrike | Double | Index Strike above which coupon should be paid |
| FXStrike | Double | FX Strike above which coupon should be paid |
| CouponRate | Double | Coupon that should be paid |

Forward Script

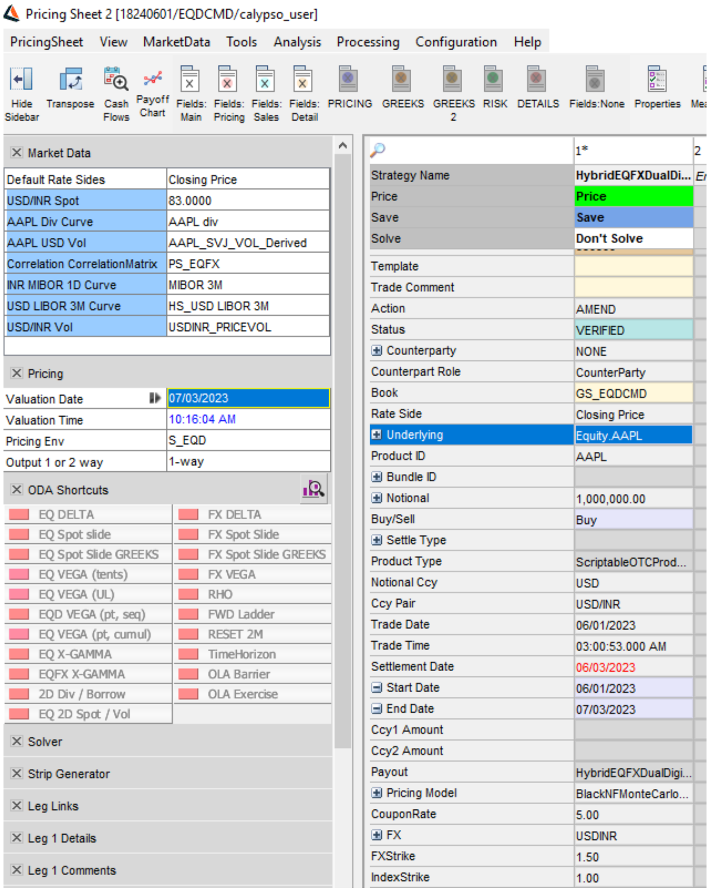
Script: Forward | Keywords | Functions | Operators | Reserved

```

Start:
  IndexInitialLevel = Index
  FXInitialLevel = FX
Exercise:
  IndexPerf = (Index / IndexInitialLevel)
  FXPerf = (FX / FXInitialLevel)
  If ((IndexPerf > IndexStrike) AND (FXPerf < FXStrike)) Then
    Payoff = (CouponRate * Notional)
  Else
    Payoff = 0
  EndIf
  Option += Cash((BuySell * Payoff), PaymentCcy, 'EXERCISE')
  mIndexPerf = IndexPerf
  mFXPerf = FXPerf
  mPayoff = Payoff
```

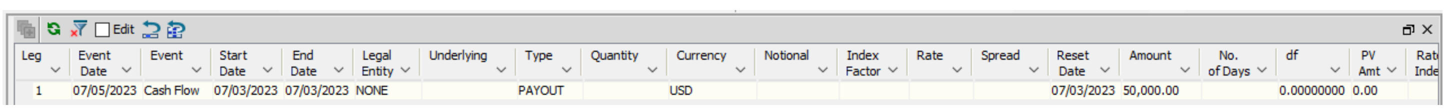
| | |
|---|---|
| Start | Calculate the initial index level and FX level |
| Exercise | 1. Calculate the index performance |
| | 2. Calculate the FX performance |
| | 3. Check if Index performance is greater than index Strike and FX Performance is lower than FX Strike |
| | 4. Pay an amount equivalent to Coupon * Notional if the above is true or else 0. |

## *Trade Example*

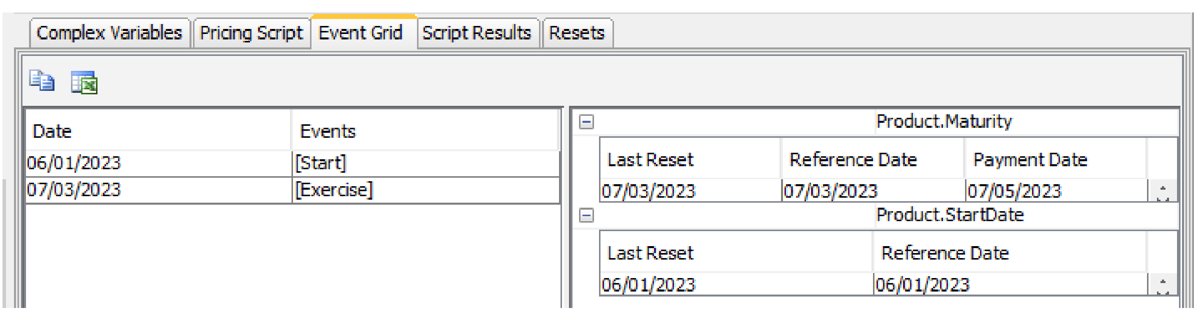
### Trade Entry



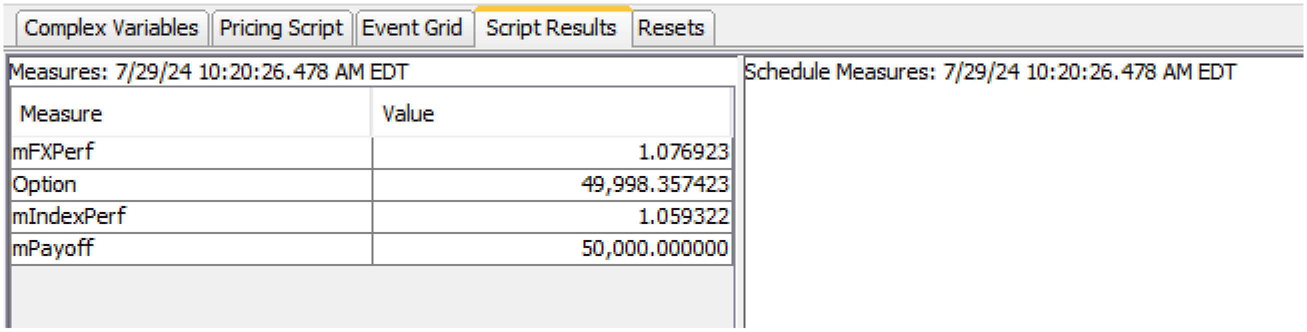

### Cashflows




### Event Grid

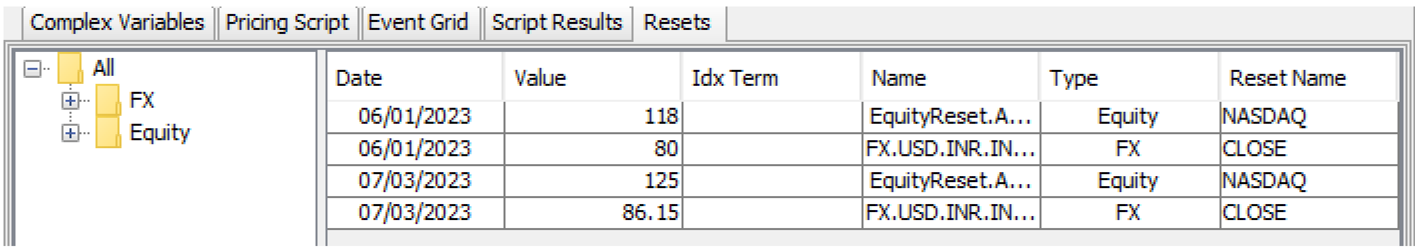


Script Results




| Measure | Value |
| --- | --- |
| mFXPerf | 1.076923 |
| Option | 49,998.357423 |
| mIndexPerf | 1.059322 |
| mPayoff | 50,000.000000 |

Resets




| Date | Value | Idx Term | Name | Type | Reset Name |
| --- | --- | --- | --- | --- | --- |
| 06/01/2023 | 118 | | EquityReset.A... | Equity | NASDAQ |
| 06/01/2023 | 80 | | FX.USD.INR.IN... | FX | CLOSE |
| 07/03/2023 | 125 | | EquityReset.A... | Equity | NASDAQ |
| 07/03/2023 | 86.15 | | FX.USD.INR.IN... | FX | CLOSE |

# Example 6 - Basket Reverse Convertible

***This example shows Worst of Basket Barrier Monitoring and Bond Exotic Note features.***

### *Description*

- At Final Redemption Date, the payment amount is determined based on three scenarios.
    1. In the money- if all the basket components trade above strike price on final valuation date, then Note is redeemed at Notional Amount.
    2. Out of the money- if one or more basket components trade below strike price.
        a) If KI event occurred, Note is redeemed physical delivery, paying out Notional/Strike shares. Any residual is paid in cash.
        b) If KI event did not occur, Note is redeemed at Notional Amount.
- Knock In Event→ KnockIn event is monitored daily. Any basket component trades below the KI level then KI event has occurred.
- Digital Coupon → Coupons paid monthly, if any basket component trades below the coupon strike level, the lower coupon amount is paid. Otherwise, a higher coupon amount is paid.
- Knock Out Event→ If on any coupon reset date, all basket component trade above the KO barrier, the note is redeemed at notional, and the period coupon is still paid.

### *Code*

Variables

Script: Variables | Keywords | Types | Product Properties | Reserved

```
Constant Start As ReferenceDate From Product.StartDate
Constant CouponPeriod As AccrualPeriod[]
Constant Maturity As PaymentDate From Product.Maturity
Constant Settlement As Enum 'Physical', 'Cash'
Constant KI As ReferenceDate[]
Constant KO As AccrualPeriod[]
Constant PrincipalProtection As Double From 1
Constant ITMParticipation As Double From 1
Constant StrikePct As Double From 1
Constant KI_BarrierPct As Double From 0.5
Constant KO_BarrierPct As Double From 1.5
Constant KO_Curr As Currency
Constant KO_FX As Double From 1
Constant KO_Rebate As Double From 0.1
Constant KO_PeriodDivisor As Double From 4
Constant KO_RebateType As Enum 'Absolute', 'Period'
Constant CouponRateStrikePct As Double From 1
Constant FinalCouponRate As Double From 0.0
Constant PayRec As Integer From Product.BuySell
Constant Curr As Currency From Product.Currency
Constant Notional As Double From Product.Notional
Constant Basket As Quotable[] From Product.Basket
Constant N As Integer From Product.BasketSize
Constant CouponRateHigh As Double From 0.1
Constant CouponRateLow As Double From 0
ValuationDate As ReferenceDate From Context.ValuationDate
KO_RebateAccrued As Double
AboveKO  As Boolean
AboveCP  As Boolean
DelivQty  As Double
RealizedCoupon  As Double
FlowValue  As Double
i  As Integer
KNOCKED_IN  As Boolean
KNOCKED_OUT  As Boolean
WorstLevel  As Double
WorstLevelIndex  As Integer
WorstLevelBarrierKO As Double
WorstLevelBarrierKI As Double
Strike  As Double[] From Basket
CouponRateStrike As Double[] From Basket
KI_Barrier  As Double[] From Basket
KO_Barrier  As Double[] From Basket
Performance  As Double[] From Basket
Option As Measure to NPV
Prob_KO As Measure
Prob_KI As Measure
```

| Variable Name | Type | Description |
| --- | --- | --- |
| CouponRate_High | Double | digital coupon amount |
| CouponRate_Low | Double | digital coupon amount |
| CouponStrikePct | Double | digital coupon strike |
| KI_BarrierPct | Double | KI level, as % of initial fixing |
| KO_BarrierPct | Double | KO level, as % of initial fixing |
| ValuationDate | ReferenceDate | This date is used by the barrier monitoring feature |
| WorstLevel | Double | internal variable |
| WorstLevelIndex | Integer | this is used for barrier monitoring as well as an internal variable |
| WorstLevelBarrierKO | Double | barrier monitoring |
| WorstLevelBarrierKI | Double | barrier monitoring |

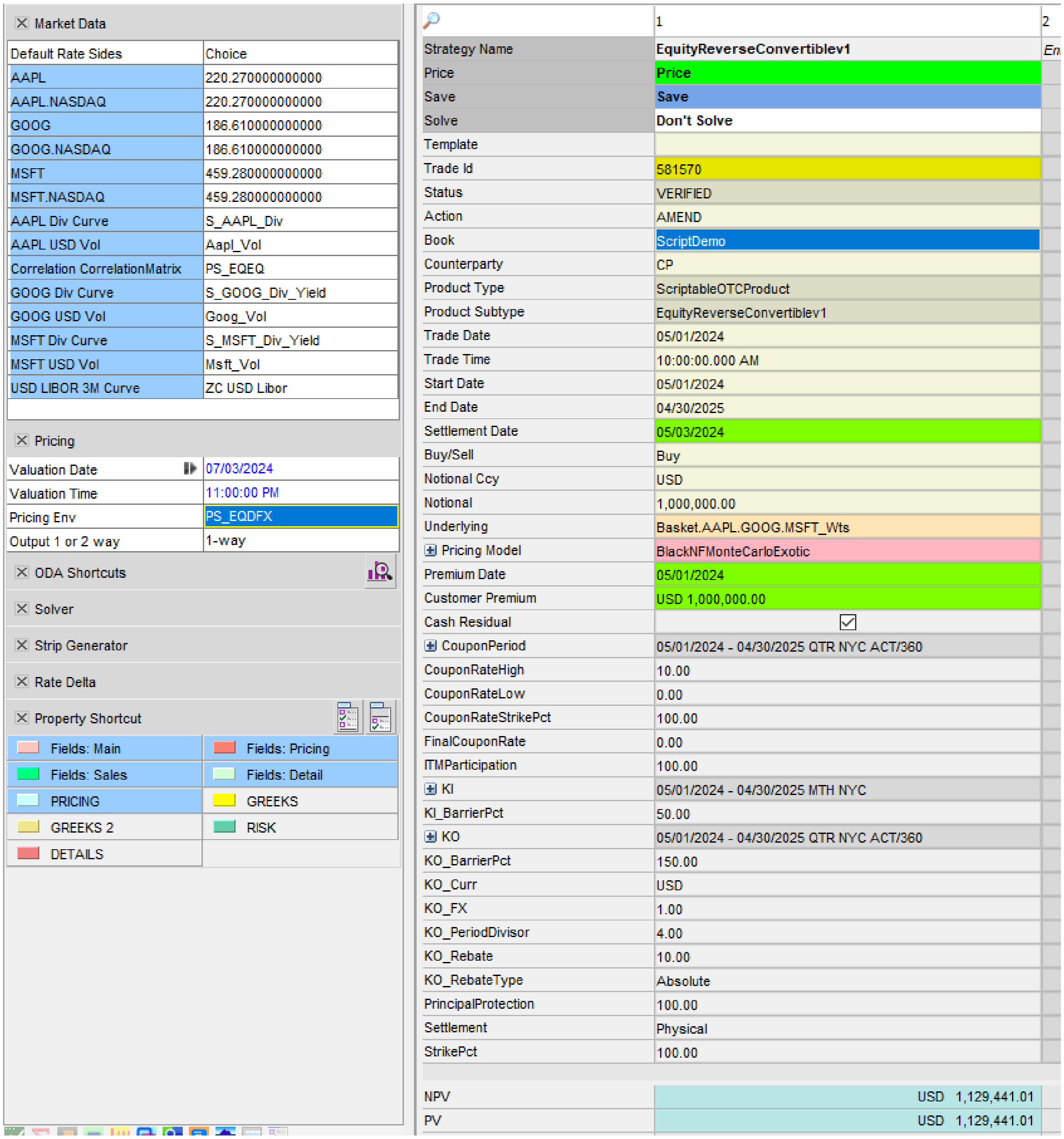
## Forward Script

Script: Forward Keywords Functions Operators Reserved

```

Start:
  For i = 1 To N
    Strike[i] = (StrikePct * Basket[i])
    KO_Barrier[i] = (KO_BarrierPct * Basket[i])
    KI_Barrier[i] = (KI_BarrierPct * Basket[i])
    CouponRateStrike[i] = (CouponRateStrikePct * Basket[i])
  Next
ValuationDate:
  WorstLevel = Infinity
  WorstLevelIndex = 1
  For i = 1 To N
    Performance[i] = (Basket[i] / Strike[i])
    If (Performance[i] < WorstLevel) Then
      WorstLevelIndex = i
      WorstLevel = Performance[i]
      WorstLevelBarrierKO = KO_Barrier[i]
      WorstLevelBarrierKI = KI_Barrier[i]
    EndIf
  Next
KI:
  m_Prob_KI = 0
  If Not(KNOCKED_IN) Then
    For i = 1 To N
      If (Basket[i] <= KI_Barrier[i]) Then
        m_Prob_KI = 1
        KNOCKED_IN = True
      EndIf
    Next
  EndIf
CouponPeriod:
  If Not(KNOCKED_OUT) Then
    AboveCP = True
    For i = 1 To N
      If (Basket[i] < CouponRateStrike[i]) Then
        AboveCP = False
      EndIf
    Next
    RealizedCoupon = If(AboveCP, CouponRateHigh, CouponRateLow)
    FlowValue = Interest(Notional, (PayRec * RealizedCoupon), Curr, 'DGT_COUPON')
    Option += FlowValue
  EndIf
KO:
  KO_RebateAccrued += (KO_Rebate / KO_PeriodDivisor)
  If Not(KNOCKED_OUT) Then
    AboveKO = True
    For i = 1 To N
      If (Basket[i] < KO_Barrier[i]) Then
        AboveKO = False
      EndIf
    Next
    If AboveKO Then
      KNOCKED_OUT = True
      Prob_KO = 1
      Select Case KO_RebateType
        Case 'Absolute'
          FlowValue = Principal((((PayRec * Notional) * KO_FX) * (PrincipalProtection + KO_Rebate)), KO_Curr, 'KNOCK_OUT')
        Case 'Period'
          FlowValue = Principal((((PayRec * Notional) * KO_FX) * (PrincipalProtection + KO_RebateAccrued)), KO_Curr, 'KNOCK_OUT')

      EndSelect
      Option += FlowValue
    EndIf
  EndIf
Maturity:
  If Not(KNOCKED_OUT) Then
    WorstLevel = Infinity
    WorstLevelIndex = 1
    For i = 1 To N
      Performance[i] = (Basket[i] / Strike[i])
      If (Performance[i] < WorstLevel) Then
        WorstLevelIndex = i
        WorstLevel = Performance[i]
      EndIf
    Next
    If Not(KNOCKED_IN) Then
      FlowValue = Principal(((PayRec * Notional) * ((PrincipalProtection + (ITMParticipation * Max((Performance[WorstLevelIndex] - 1), 0))) + FinalCouponRate)), Curr, 'REDEMPTION')
      Option += FlowValue
    Else
      Prob_KI = 1.0
      If (Basket[WorstLevelIndex] >= Strike[WorstLevelIndex]) Then
        FlowValue = Principal(((PayRec * Notional) * PrincipalProtection), Curr, 'REDEMPTION')
        Option += FlowValue
      Else
        Select Case Settlement
          Case 'Physical'
            DelivQty = (Notional / Strike[WorstLevelIndex])
            FlowValue = Physical((PayRec * DelivQty), Basket[WorstLevelIndex], 0.0, 1, 'REDEMPTION', 1)
            Option += FlowValue
          Case 'Cash'
            FlowValue = Principal(((PayRec * Notional) * Performance[WorstLevelIndex]), Curr, 'REDEMPTION')
            Option += FlowValue

        EndSelect
      EndIf
    EndIf
  EndIf
```

## *Trade Example – Scriptable OTC Product*

Trade Entry



Market Data

| Default Rate Sides | Choice |
|---|---|
| AAPL | 220.270000000000 |
| AAPL.NASDAQ | 220.270000000000 |
| GOOG | 186.610000000000 |
| GOOG.NASDAQ | 186.610000000000 |
| MSFT | 459.280000000000 |
| MSFT.NASDAQ | 459.280000000000 |
| AAPL Div Curve | S_AAPL_Div |
| AAPL USD Vol | Aapl_Vol |
| Correlation CorrelationMatrix | PS_EQEQ |
| GOOG Div Curve | S_GOOG_Div_Yield |
| GOOG USD Vol | Goog_Vol |
| MSFT Div Curve | S_MSFT_Div_Yield |
| MSFT USD Vol | Msft_Vol |
| USD LIBOR 3M Curve | ZC USD Libor |

Pricing

| | |
|---|---|
| Valuation Date | 07/03/2024 |
| Valuation Time | 11:00:00 PM |
| Pricing Env | PS_EQDFX |
| Output 1 or 2 way | 1-way |

ODA Shortcuts

Solver

Strip Generator

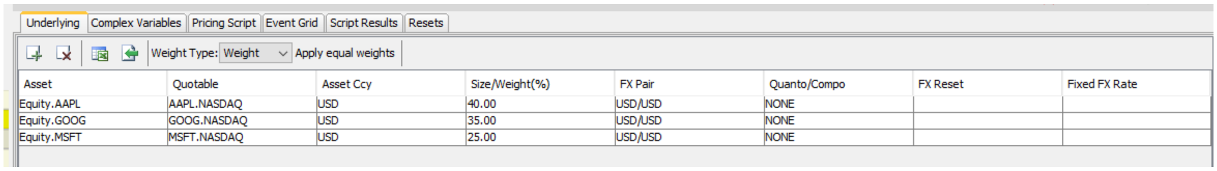
Rate Delta

Property Shortcut

| | |
|---|---|
| Fields: Main | Fields: Pricing |
| Fields: Sales | Fields: Detail |
| PRICING | GREEKS |
| GREEKS 2 | RISK |
| DETAILS | |

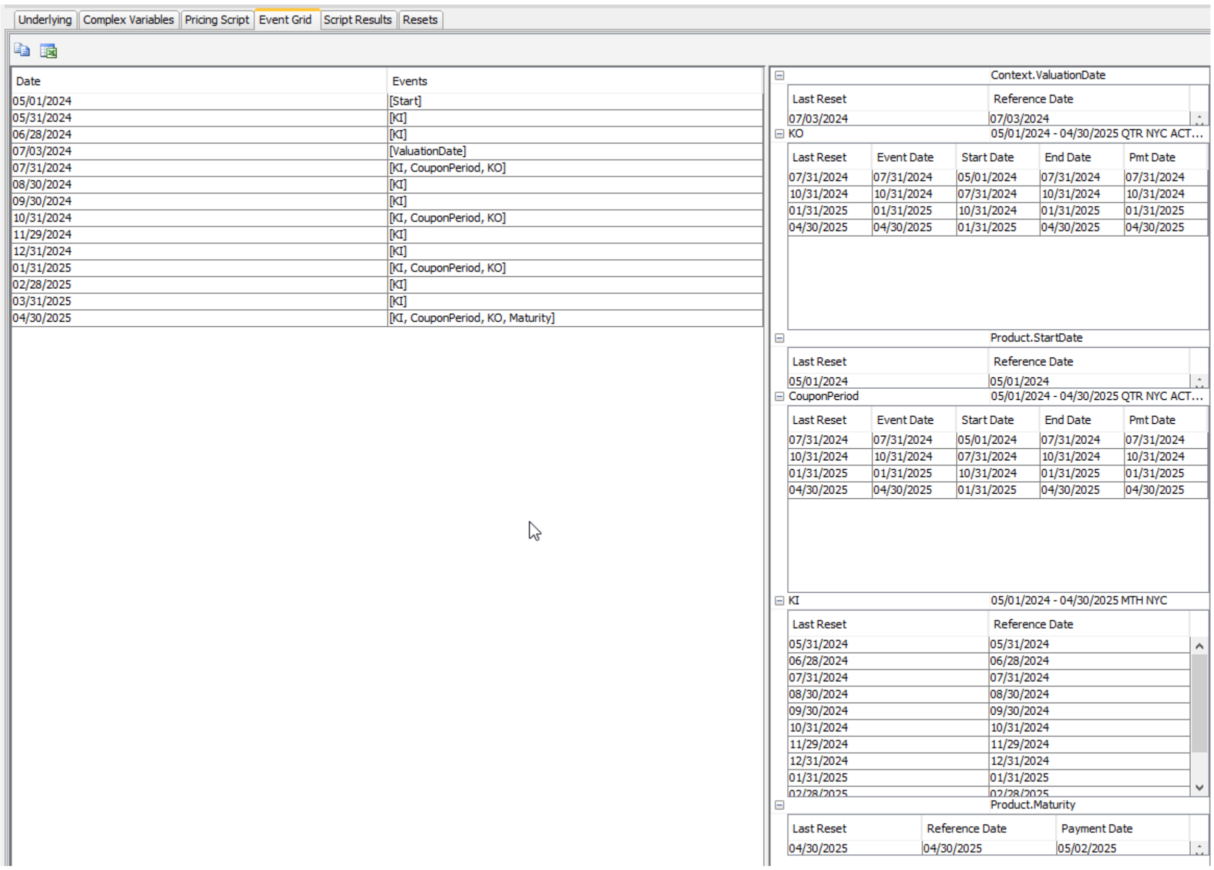
| | 1 | 2 |
|---|---|---|
| Strategy Name | EquityReverseConvertiblev1 | En |
| Price | Price | |
| Save | Save | |
| Solve | Don't Solve | |
| Template | | |
| Trade Id | 581570 | |
| Status | VERIFIED | |
| Action | AMEND | |
| Book | ScriptDemo | |
| Counterparty | CP | |
| Product Type | ScriptableOTCProduct | |
| Product Subtype | EquityReverseConvertiblev1 | |
| Trade Date | 05/01/2024 | |
| Trade Time | 10:00:00.000 AM | |
| Start Date | 05/01/2024 | |
| End Date | 04/30/2025 | |
| Settlement Date | 05/03/2024 | |
| Buy/Sell | Buy | |
| Notional Ccy | USD | |
| Notional | 1,000,000.00 | |
| Underlying | Basket.AAPL.GOOG.MSFT_Wts | |
| Pricing Model | BlackNFMonteCarloExotic | |
| Premium Date | 05/01/2024 | |
| Customer Premium | USD 1,000,000.00 | |
| Cash Residual | ☑ | |
| CouponPeriod | 05/01/2024 - 04/30/2025 QTR NYC ACT/360 | |
| CouponRateHigh | 10.00 | |
| CouponRateLow | 0.00 | |
| CouponRateStrikePct | 100.00 | |
| FinalCouponRate | 0.00 | |
| ITMParticipation | 100.00 | |
| KI | 05/01/2024 - 04/30/2025 MTH NYC | |
| KI_BarrierPct | 50.00 | |
| KO | 05/01/2024 - 04/30/2025 QTR NYC ACT/360 | |
| KO_BarrierPct | 150.00 | |
| KO_Curr | USD | |
| KO_FX | 1.00 | |
| KO_PeriodDivisor | 4.00 | |
| KO_Rebate | 10.00 | |
| KO_RebateType | Absolute | |
| PrincipalProtection | 100.00 | |
| Settlement | Physical | |
| StrikePct | 100.00 | |
| NPV | USD 1,129,441.01 | |
| PV | USD 1,129,441.01 | |

## Underlying Basket




| Asset | Quotable | Asset Ccy | Size/Weight(%) | FX Pair | Quanto/Compo | FX Reset | Fixed FX Rate |
|---|---|---|---|---|---|---|---|
| Equity.AAPL | AAPL.NASDAQ | USD | 40.00 | USD/USD | NONE | | |
| Equity.GOOG | GOOG.NASDAQ | USD | 35.00 | USD/USD | NONE | | |
| Equity.MSFT | MSFT.NASDAQ | USD | 25.00 | USD/USD | NONE | | |

## Event Grid




| Date | Events |
|---|---|
| 05/01/2024 | [Start] |
| 05/31/2024 | [KI] |
| 06/28/2024 | [KI] |
| 07/03/2024 | [ValuationDate] |
| 07/31/2024 | [KI, CouponPeriod, KO] |
| 08/30/2024 | [KI] |
| 09/30/2024 | [KI] |
| 10/31/2024 | [KI, CouponPeriod, KO] |
| 11/29/2024 | [KI] |
| 12/31/2024 | [KI] |
| 01/31/2025 | [KI, CouponPeriod, KO] |
| 02/28/2025 | [KI] |
| 03/31/2025 | [KI] |
| 04/30/2025 | [KI, CouponPeriod, KO, Maturity] |

Context.ValuationDate

| Last Reset | Reference Date |
|---|---|
| 07/03/2024 | 07/03/2024 |

KO — 05/01/2024 - 04/30/2025 QTR NYC ACT...

| Last Reset | Event Date | Start Date | End Date | Pmt Date |
|---|---|---|---|---|
| 07/31/2024 | 07/31/2024 | 05/01/2024 | 07/31/2024 | 07/31/2024 |
| 10/31/2024 | 10/31/2024 | 07/31/2024 | 10/31/2024 | 10/31/2024 |
| 01/31/2025 | 01/31/2025 | 10/31/2024 | 01/31/2025 | 01/31/2025 |
| 04/30/2025 | 04/30/2025 | 01/31/2025 | 04/30/2025 | 04/30/2025 |

Product.StartDate

| Last Reset | Reference Date |
|---|---|
| 05/01/2024 | 05/01/2024 |

CouponPeriod — 05/01/2024 - 04/30/2025 QTR NYC ACT...

| Last Reset | Event Date | Start Date | End Date | Pmt Date |
|---|---|---|---|---|
| 07/31/2024 | 07/31/2024 | 05/01/2024 | 07/31/2024 | 07/31/2024 |
| 10/31/2024 | 10/31/2024 | 07/31/2024 | 10/31/2024 | 10/31/2024 |
| 01/31/2025 | 01/31/2025 | 10/31/2024 | 01/31/2025 | 01/31/2025 |
| 04/30/2025 | 04/30/2025 | 01/31/2025 | 04/30/2025 | 04/30/2025 |

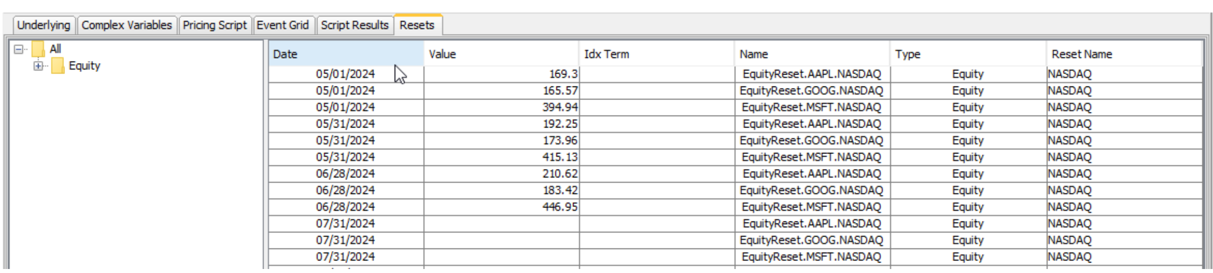
KI — 05/01/2024 - 04/30/2025 MTH NYC

| Last Reset | Reference Date |
|---|---|
| 05/31/2024 | 05/31/2024 |
| 06/28/2024 | 06/28/2024 |
| 07/31/2024 | 07/31/2024 |
| 08/30/2024 | 08/30/2024 |
| 09/30/2024 | 09/30/2024 |
| 10/31/2024 | 10/31/2024 |
| 11/29/2024 | 11/29/2024 |
| 12/31/2024 | 12/31/2024 |
| 01/31/2025 | 01/31/2025 |
| 02/28/2025 | 02/28/2025 |

Product.Maturity

| Last Reset | Reference Date | Payment Date |
|---|---|---|
| 04/30/2025 | 04/30/2025 | 05/02/2025 |

## Resets




| Date | Value | Idx Term | Name | Type | Reset Name |
|---|---|---|---|---|---|
| 05/01/2024 | 169.3 | | EquityReset.AAPL.NASDAQ | Equity | NASDAQ |
| 05/01/2024 | 165.57 | | EquityReset.GOOG.NASDAQ | Equity | NASDAQ |
| 05/01/2024 | 394.94 | | EquityReset.MSFT.NASDAQ | Equity | NASDAQ |
| 05/31/2024 | 192.25 | | EquityReset.AAPL.NASDAQ | Equity | NASDAQ |
| 05/31/2024 | 173.96 | | EquityReset.GOOG.NASDAQ | Equity | NASDAQ |
| 05/31/2024 | 415.13 | | EquityReset.MSFT.NASDAQ | Equity | NASDAQ |
| 06/28/2024 | 210.62 | | EquityReset.AAPL.NASDAQ | Equity | NASDAQ |
| 06/28/2024 | 183.42 | | EquityReset.GOOG.NASDAQ | Equity | NASDAQ |
| 06/28/2024 | 446.95 | | EquityReset.MSFT.NASDAQ | Equity | NASDAQ |
| 07/31/2024 | | | EquityReset.AAPL.NASDAQ | Equity | NASDAQ |
| 07/31/2024 | | | EquityReset.GOOG.NASDAQ | Equity | NASDAQ |
| 07/31/2024 | | | EquityReset.MSFT.NASDAQ | Equity | NASDAQ |

## *Worst of Basket Barrier Monitoring*

- Context.ValuationDate is used for getting the valuation date from the product at the time of pricing.
- The block ‘ValuationDate’ needs to be in the script for worst-of basket.
- The barrier levels for the worst performer are computed as per valuation date. This is needed for both KI and KO and the levels are stored in variables WorstLevelBarrierKO and WorstLevelBarrierKI.
- The index for the worst performer is stored in the variable WorstLevelIndex.

Script Variables

```
ValuationDate As ReferenceDate From Context.ValuationDate
```

Script Forward

```
ValuationDate:
  WorstLevel = Infinity
  WorstLevelIndex = 1
  For i = 1 To N
    Performance[i] = (Basket[i] / Strike[i])
    If (Performance[i] < WorstLevel) Then
      WorstLevelIndex = i
      WorstLevel = Performance[i]
      WorstLevelBarrierKO = KO_Barrier[i]
      WorstLevelBarrierKI = KI_Barrier[i]
    EndIf
  Next
```

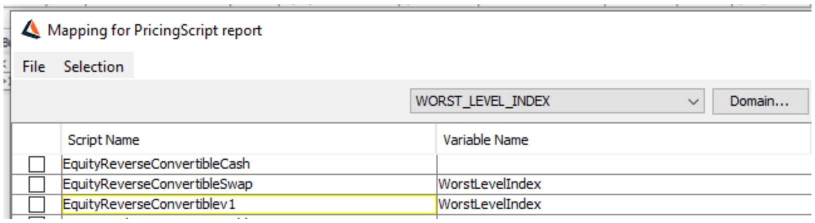
Barrier Descriptor

In the case of worst-of basket we can monitor the worst of component and tell the barrier monitoring the index of the same.

Script: BarrierDescriptors

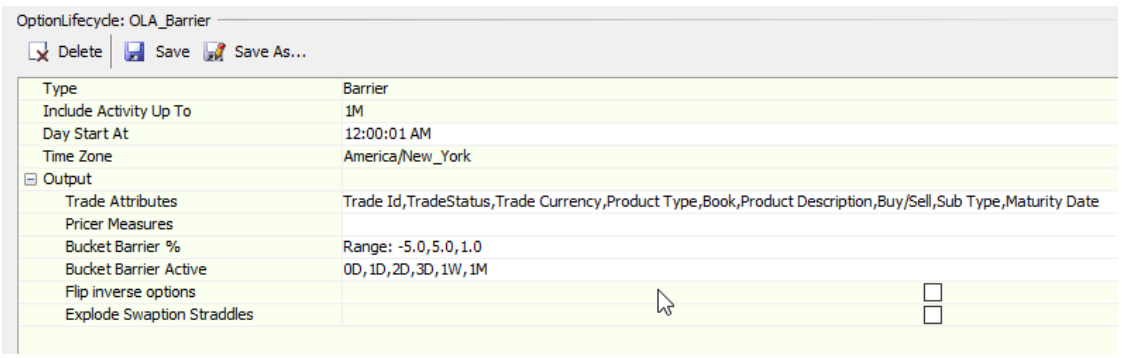
```
KO|WorstLevelBarrierKO|Basket|Up|Out|Closing|False
KI|WorstLevelBarrierKI|Basket|Down|In|Closing|False
```

Variable Mapping


Mapping for PricingScript report
File Selection
WORST_LEVEL_INDEX Domain...

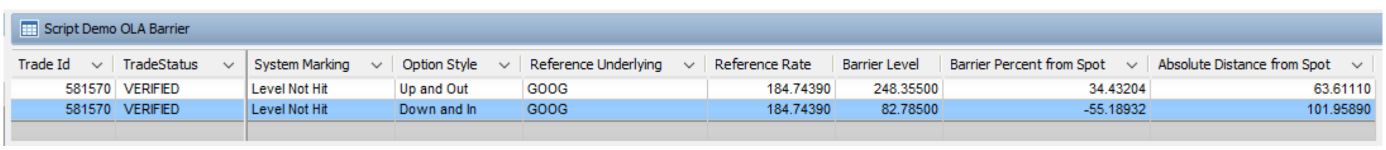
| | Script Name | Variable Name |
|---|---|---|
| ☐ | EquityReverseConvertibleCash | |
| ☐ | EquityReverseConvertibleSwap | WorstLevelIndex |
| ☐ | EquityReverseConvertiblev1 | WorstLevelIndex |

Option Lifecycle Analysis


OptionLifecycle: OLA_Barrier
Delete Save Save As...

| | |
|---|---|
| Type | Barrier |
| Include Activity Up To | 1M |
| Day Start At | 12:00:01 AM |
| Time Zone | America/New_York |
| Output | |
| Trade Attributes | Trade Id,TradeStatus,Trade Currency,Product Type,Book,Product Description,Buy/Sell,Sub Type,Maturity Date |
| Pricer Measures | |
| Bucket Barrier % | Range: -5.0,5.0,1.0 |
| Bucket Barrier Active | 0D,1D,2D,3D,1W,1M |
| Flip inverse options | ☐ |
| Explode Swaption Straddles | ☐ |

CWS - OLA Barrier (Live Report)


Script Demo OLA Barrier

| Trade Id | TradeStatus | System Marking | Option Style | Reference Underlying | Reference Rate | Barrier Level | Barrier Percent from Spot | Absolute Distance from Spot |
|---|---|---|---|---|---|---|---|---|
| 581570 | VERIFIED | Level Not Hit | Up and Out | GOOG | 184.74390 | 248.35500 | 34.43204 | 63.61110 |
| 581570 | VERIFIED | Level Not Hit | Down and In | GOOG | 184.74390 | 82.78500 | -55.18932 | 101.95890 |

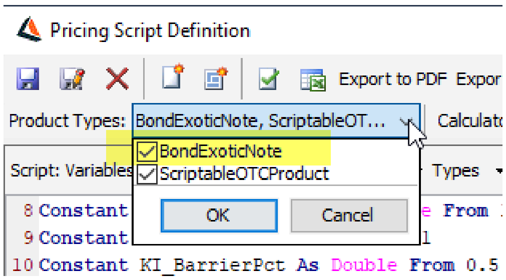
| Basket Constituent | 05-01-2024 | 07-03-2024 | Performance | Up Barrier (150%) | Down Barrier (50%) |
|---|---|---|---|---|---|
| Equity.AAPL | 169.3 | 220.27 | 30.11% | 253.95 | 84.65 |
| Equity.GOOG | 165.57 | 186.61 | 12.71% | 248.355 | 82.785 |
| Equity.MSFT | 394.94 | 459.28 | 16.29% | 592.41 | 197.47 |

Google has worst performance as of valuation date hence showing GooG as reference underlying.

## *Trade Example – Bond Exotic Note*

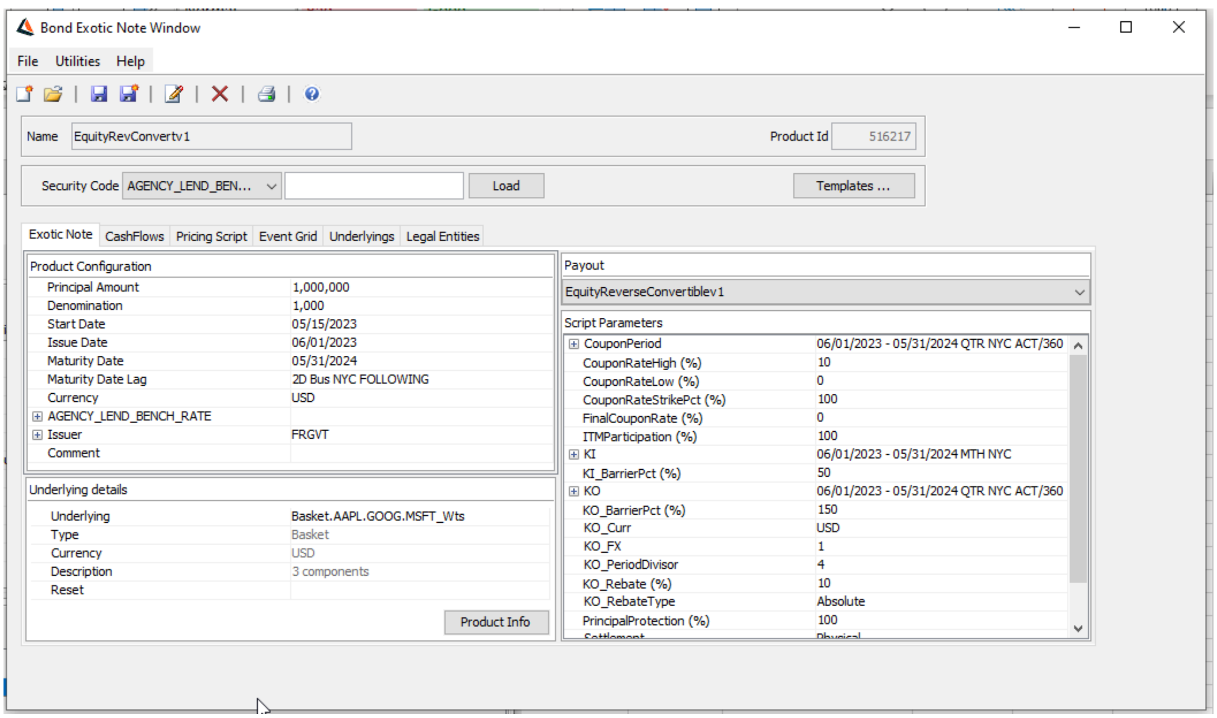
The Bond Exotic Note or BEN is a Bond product that uses Pricing Script in its product definition. It is like a standard Bond, position based.

Script can be configured as Bond Exotic Note if BondExoticNote Product Types is selected.

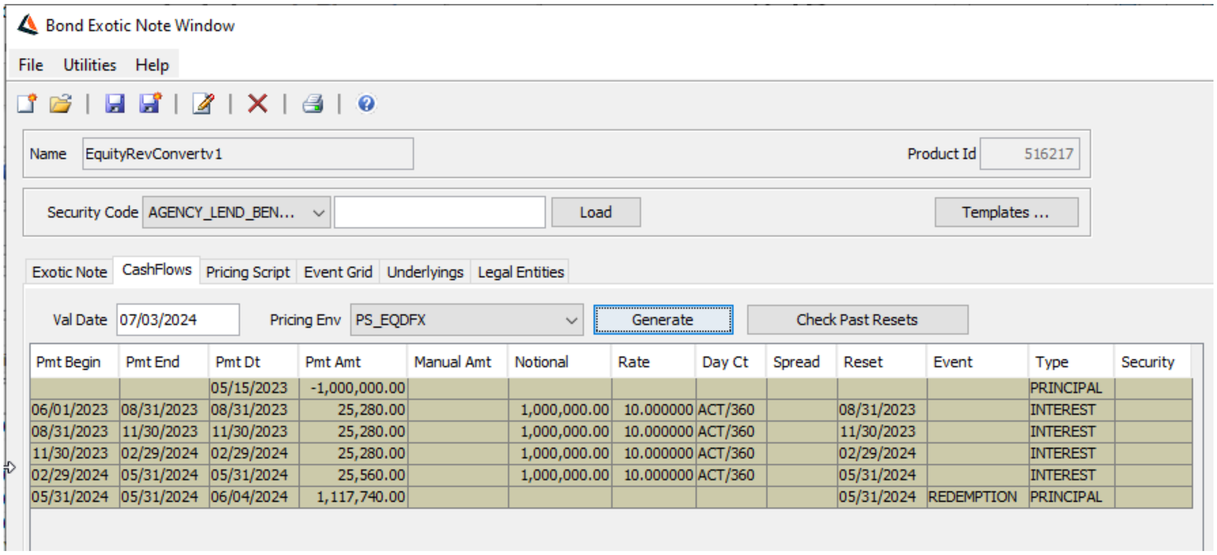



## *Product Definition*

Exotic Note

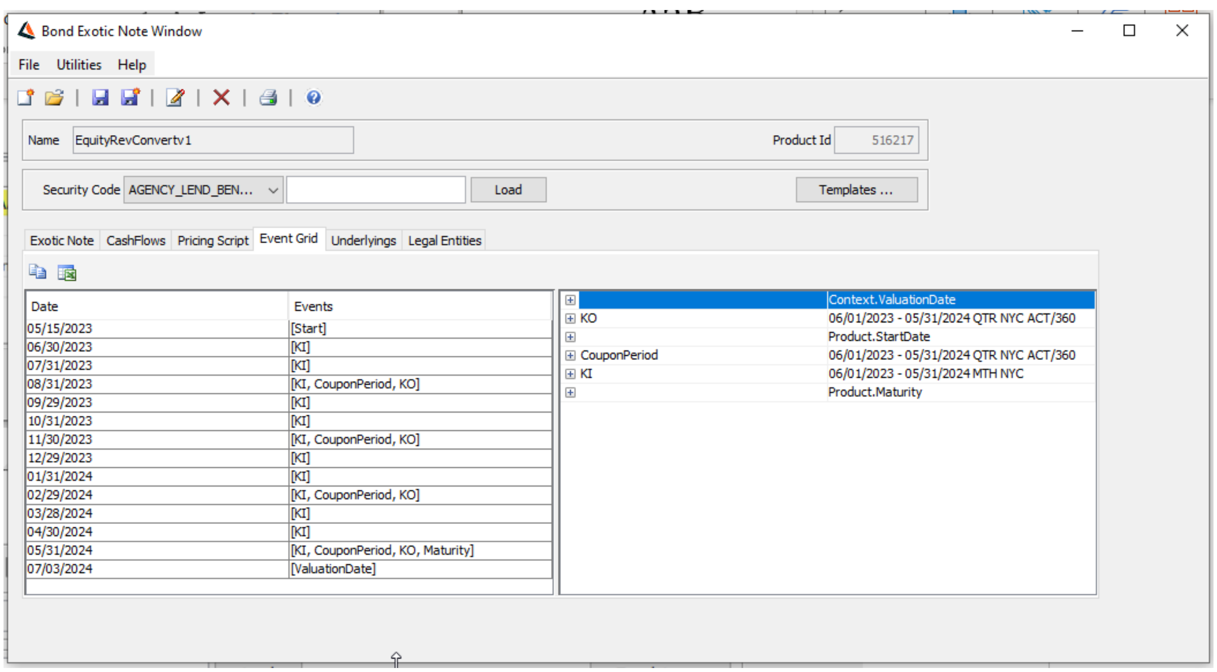


## Cashflows




| Pmt Begin | Pmt End | Pmt Dt | Pmt Amt | Manual Amt | Notional | Rate | Day Ct | Spread | Reset | Event | Type | Security |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 05/15/2023 | -1,000,000.00 | | | | | | | | PRINCIPAL | |
| 06/01/2023 | 08/31/2023 | 08/31/2023 | 25,280.00 | | 1,000,000.00 | 10.000000 | ACT/360 | | 08/31/2023 | | INTEREST | |
| 08/31/2023 | 11/30/2023 | 11/30/2023 | 25,280.00 | | 1,000,000.00 | 10.000000 | ACT/360 | | 11/30/2023 | | INTEREST | |
| 11/30/2023 | 02/29/2024 | 02/29/2024 | 25,280.00 | | 1,000,000.00 | 10.000000 | ACT/360 | | 02/29/2024 | | INTEREST | |
| 02/29/2024 | 05/31/2024 | 05/31/2024 | 25,560.00 | | 1,000,000.00 | 10.000000 | ACT/360 | | 05/31/2024 | | INTEREST | |
| 05/31/2024 | 05/31/2024 | 06/04/2024 | 1,117,740.00 | | | | | | 05/31/2024 | REDEMPTION | PRINCIPAL | |

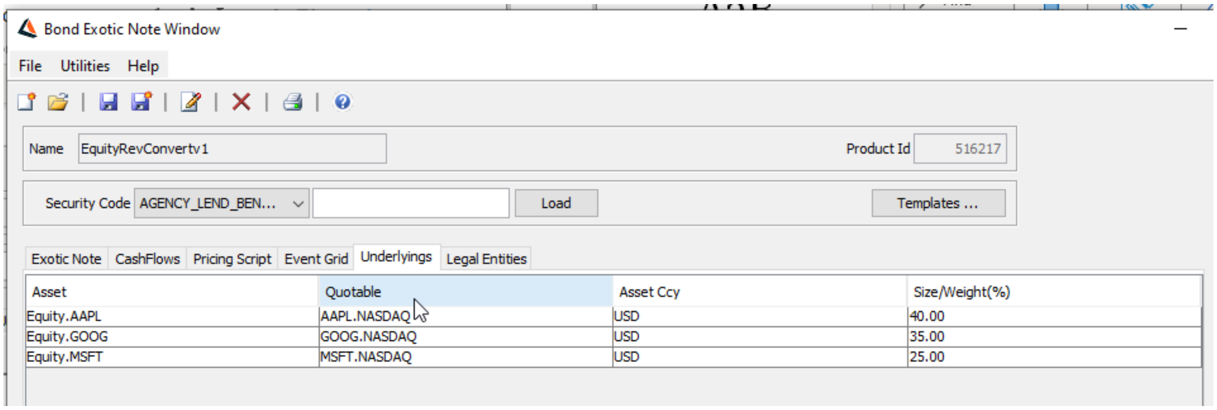
## Event Grid




| Date | Events |
|---|---|
| 05/15/2023 | [Start] |
| 06/30/2023 | [KI] |
| 07/31/2023 | [KI] |
| 08/31/2023 | [KI, CouponPeriod, KO] |
| 09/29/2023 | [KI] |
| 10/31/2023 | [KI] |
| 11/30/2023 | [KI, CouponPeriod, KO] |
| 12/29/2023 | [KI] |
| 01/31/2024 | [KI] |
| 02/29/2024 | [KI, CouponPeriod, KO] |
| 03/28/2024 | [KI] |
| 04/30/2024 | [KI] |
| 05/31/2024 | [KI, CouponPeriod, KO, Maturity] |
| 07/03/2024 | [ValuationDate] |

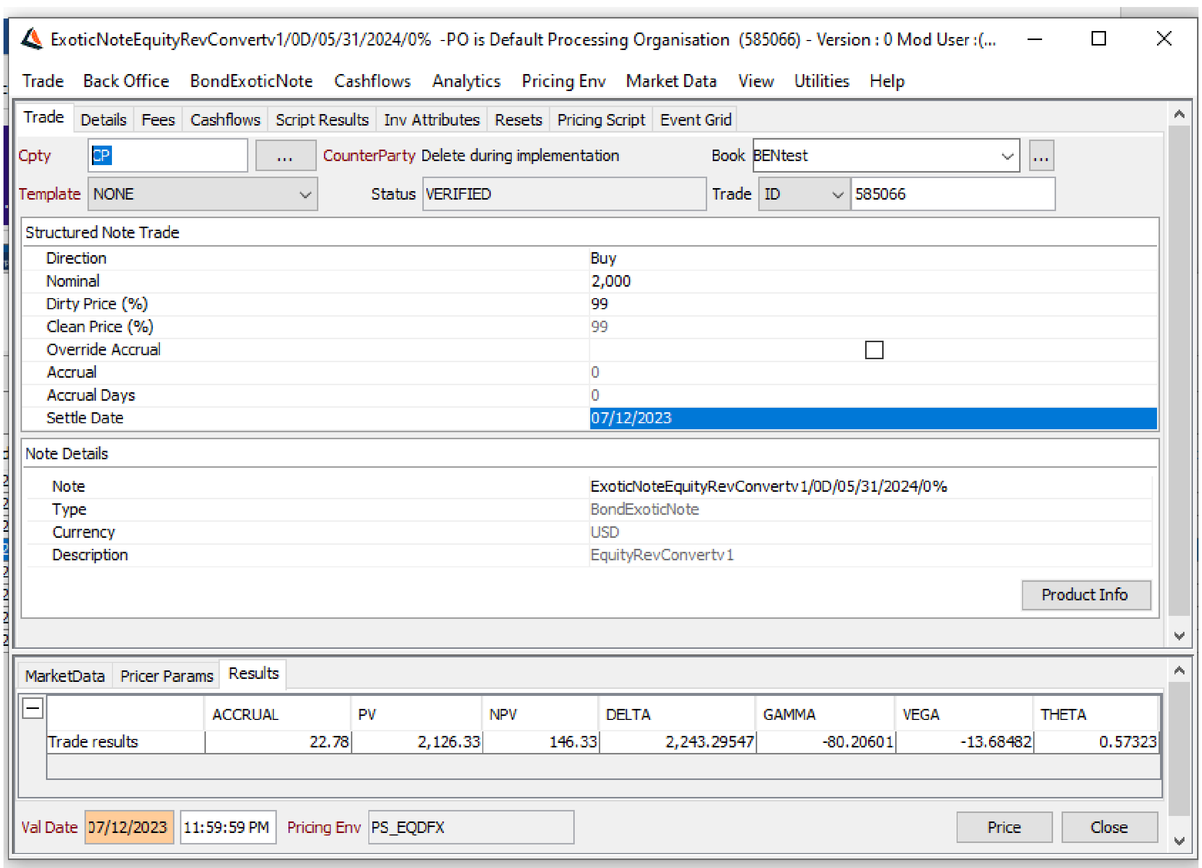
| | |
|---|---|
| | Context.ValuationDate |
| KO | 06/01/2023 - 05/31/2024 QTR NYC ACT/360 |
| | Product.StartDate |
| CouponPeriod | 06/01/2023 - 05/31/2024 QTR NYC ACT/360 |
| KI | 06/01/2023 - 05/31/2024 MTH NYC |
| | Product.Maturity |

Underlying

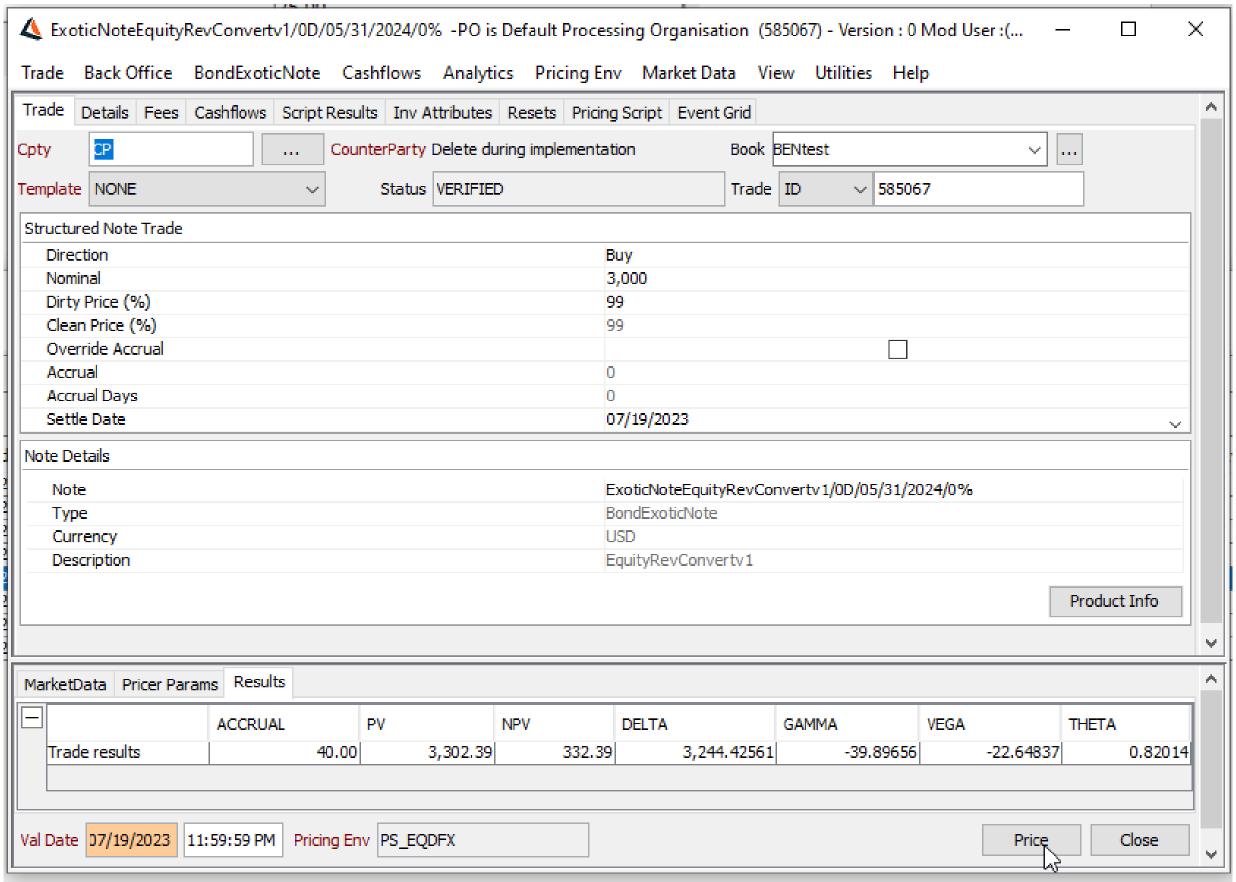



## *Trade Entry*

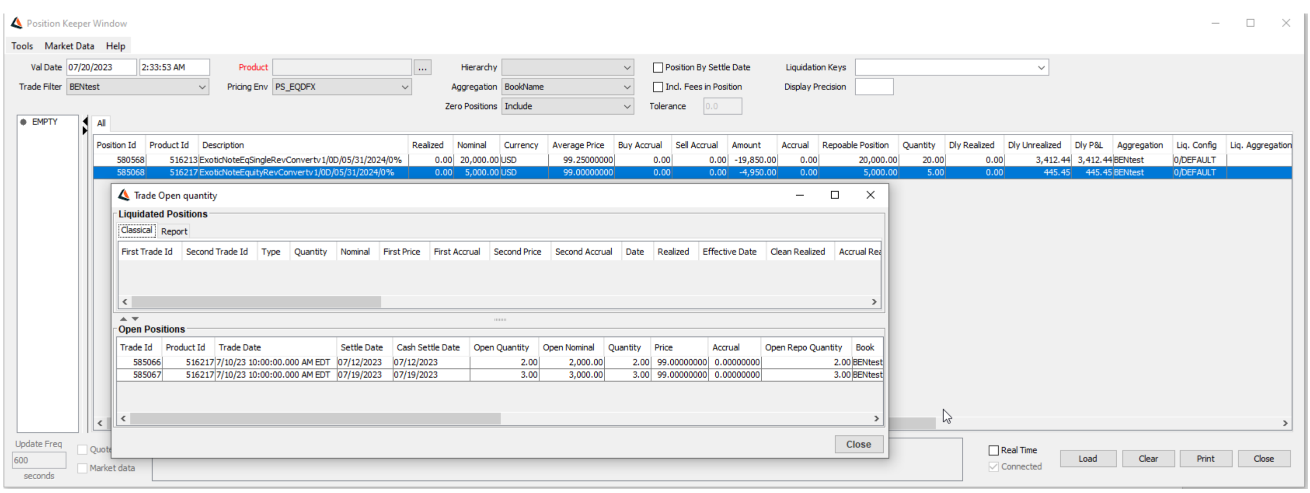
Trade 1



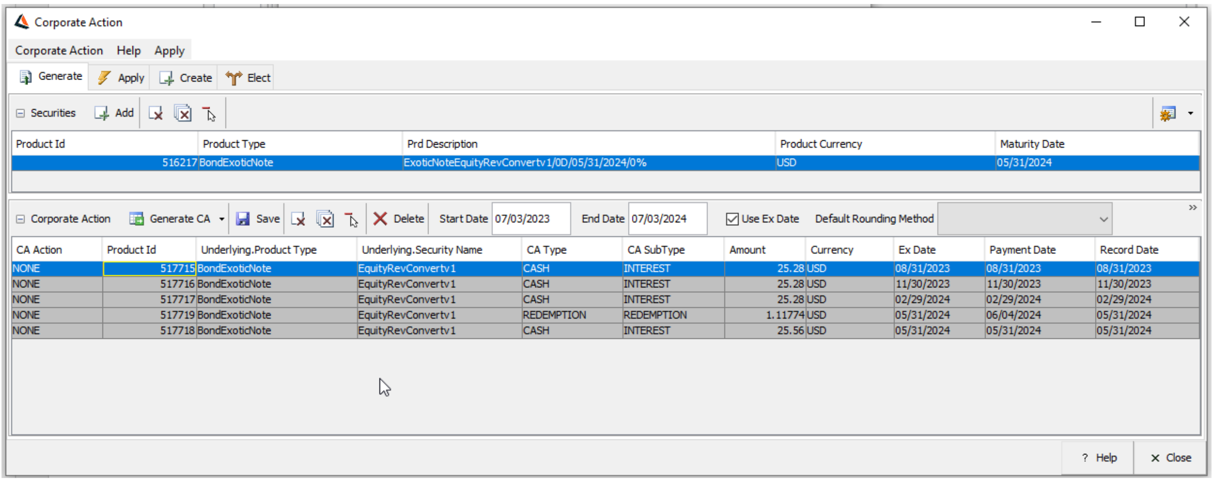
Trade 2



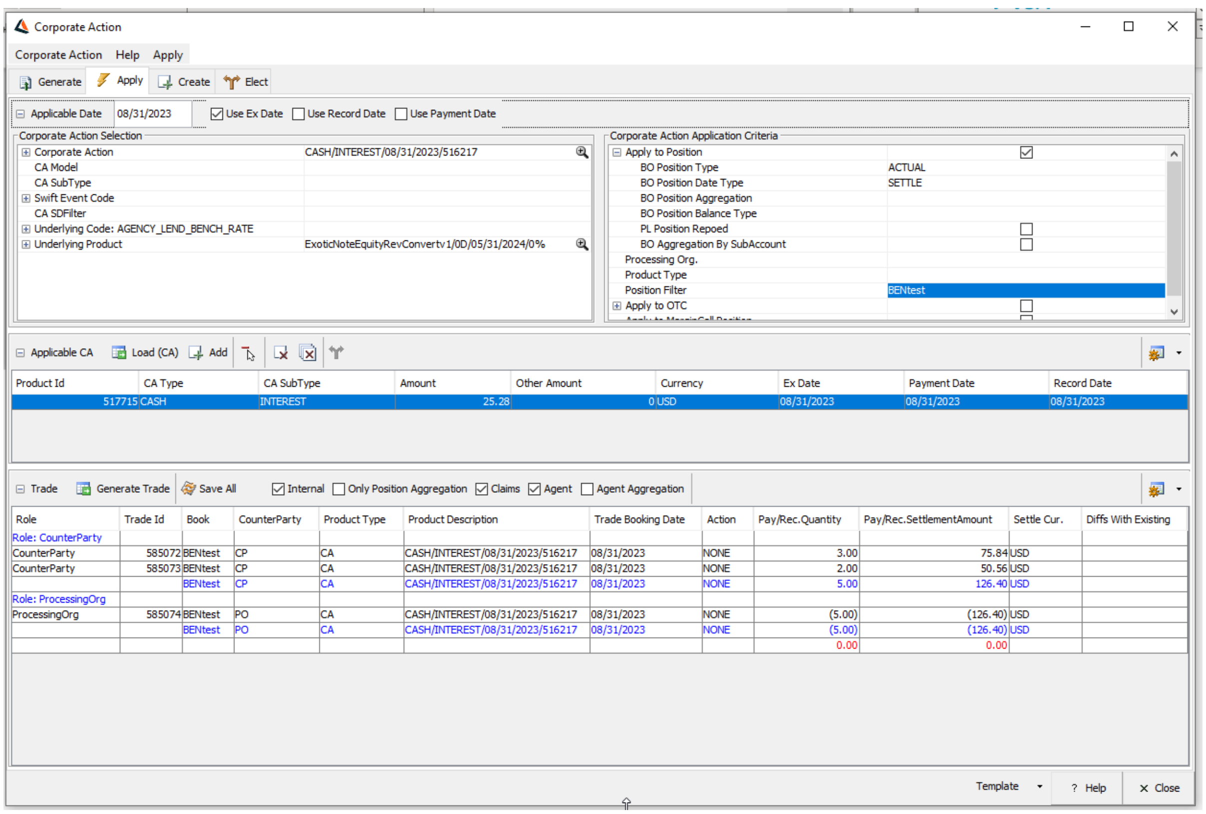

Position



## Corporate Action




## Apply Interest CA




- 2 Cash Interest CA Trades created to generate transfer
- 1 Internal Cash Interest CA Trade created to update P&L. Internal Trade is CA Trade between the book and the processing org to update P&L.

# Example 7 - Single Equity Reverse Convertible

***This example is the same as Basket Reverse Convertible but with Single Equity Underlying instead of Basket.***

***Description***

- At Final Redemption Date, the payment amount is determined based on three scenarios.
    1. In the money→ If the single underlying trades above strike price on final valuation date, Note is redeemed at Notional Amount.
    2. Out of the money→ If the single underlying trades below strike price.
        a) If KI event occurred, Note is redeemed physical delivery, paying out Notional/Strike shares. Any residual is paid in cash.
        b) If KI event did not occur, Note is redeemed at Notional Amount.
- Knock In Event→ KnockIn event is monitored daily. If the single underlying trades below the KI level then KI event has occurred.
- Digital Coupon → Coupons paid monthly, If the single underlying trades below the coupon strike level, the lower coupon amount is paid. Otherwise, a higher coupon amount is paid.
- Knock Out Event→ If on any coupon reset date, the single underlying trades above the KO barrier, the note is redeemed at notional, and the period coupon is still paid.

### *Code*

Variables

Script: Variables | Keywords | Types | Product Properties

```
Constant Start As ReferenceDate From Product.StartDate
Constant CouponPeriod As AccrualPeriod[]
Constant Maturity As PaymentDate From Product.Maturity
Constant Settlement As Enum 'Physical', 'Cash'
Constant KI As ReferenceDate[]
Constant KO As AccrualPeriod[]
Constant PrincipalProtection As Double From 1
Constant ITMParticipation As Double From 1
Constant StrikePct As Double From 1
Constant KI_BarrierPct As Double From 0.5
Constant KO_BarrierPct As Double From 1.5
Constant KO_Curr As Currency
Constant KO_FX As Double From 1
Constant KO_Rebate As Double From 0.1
Constant CouponRateStrikePct As Double From 1
Constant FinalCouponRate As Double From 0.0
Constant CouponRateHigh As Double From 0.1
Constant CouponRateLow As Double From 0
Constant Notional As Double From Product.Notional
Constant PayRec As Integer From Product.BuySell
Constant Curr As Currency From Product.Currency
Constant Index As Quotable From Product.Underlying
AboveKO  As Boolean
AboveCP  As Boolean
DelivQty  As Double
RealizedCoupon  As Double
FlowValue  As Double
KNOCKED_IN  As Boolean
KNOCKED_OUT  As Boolean
Strike  As Double
CouponRateStrike As Double
KI_Barrier  As Double
KO_Barrier  As Double
Performance  As Double
Prob_KI As Measure
Prob_KO As Measure
Option As Measure to NPV
```

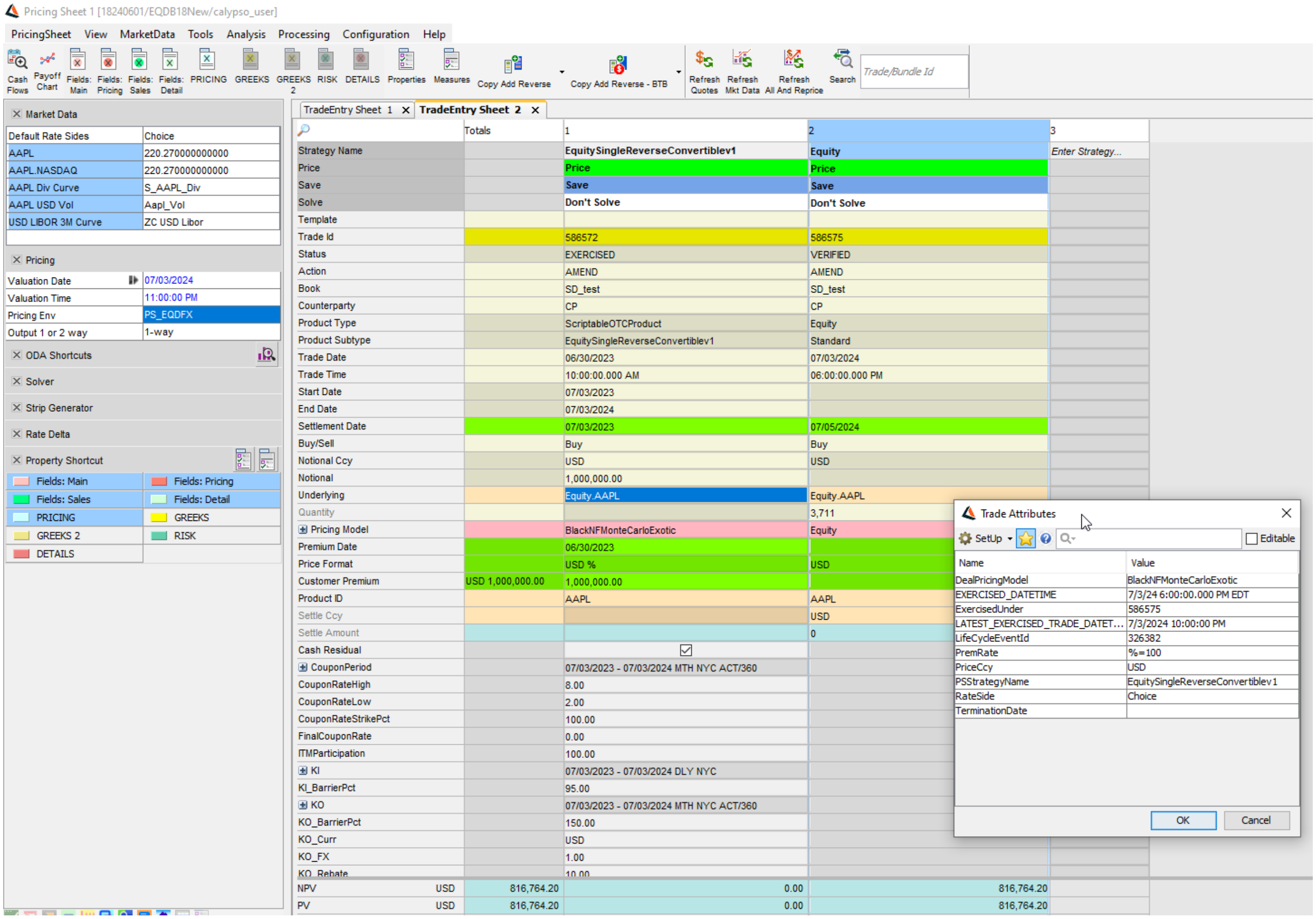
## Forward Script

Script: Forward | Keywords | Functions | Operators | Reserved

```
Start:
  Strike = (StrikePct * Index)
  KO_Barrier = (KO_BarrierPct * Index)
  KI_Barrier = (KI_BarrierPct * Index)
  CouponRateStrike = (CouponRateStrikePct * Index)
KI:
  If Not(KNOCKED_IN) Then
    If (Index <= KI_Barrier) Then
      KNOCKED_IN = True
    EndIf
  EndIf
CouponPeriod:
  If Not(KNOCKED_OUT) Then
    AboveCP = True
    If (Index < CouponRateStrike) Then
      AboveCP = False
    EndIf
    RealizedCoupon = If(AboveCP, CouponRateHigh, CouponRateLow)
    FlowValue = Interest(Notional, (PayRec * RealizedCoupon), Curr, 'DGT_COUPON')
    Option += FlowValue
  EndIf
KO:
  If Not(KNOCKED_OUT) Then
    If (Index >= KO_Barrier) Then
      KNOCKED_OUT = True
      Prob_KO = 1
      FlowValue = Principal((((PayRec * Notional) * KO_FX) * (PrincipalProtection + KO_Rebate)), KO_Curr, 'KNOCK_OUT')
      Option += FlowValue
    EndIf
  EndIf
Maturity:
  If Not(KNOCKED_OUT) Then
    Performance = (Index / Strike)
    If Not(KNOCKED_IN) Then
      FlowValue = Principal(((PayRec * Notional) * ((PrincipalProtection + (ITMParticipation * Max((Performance - 1), 0))) + FinalCouponRate)), Curr, 'REDEMPTION')
      Option += FlowValue
    Else
      Prob_KI = 1.0
      If (Index >= Strike) Then
        FlowValue = Principal(((PayRec * Notional) * PrincipalProtection), Curr, 'REDEMPTION')
        Option += FlowValue
      Else
        Select Case Settlement
          Case 'Physical'
            DelivQty = (Notional / Strike)
            FlowValue = Physical((PayRec * DelivQty), Index, 0.0, 1, 'REDEMPTION', 1)
            Option += FlowValue
          Case 'Cash'
            FlowValue = Principal(((PayRec * Notional) * Performance), Curr, 'REDEMPTION')
            Option += FlowValue

        EndSelect
      EndIf
```

## *Trade Example*

Trade Entry – Physical Delivery




Parent Trade and Equity Trade created through Physical Delivery with quantity 3711 and remaining residual amount 76.29 paid in cash.

| | |
|---|---|
| Notional | 1000000 |
| Initial Fixing | 192.46 |
| StrikePct | 140% |
| Strike | 269.444 |
| Qty | 3711.346 |
| Qty Rounded | 3711 |
| Cash Residual | 0.346328 |
| Spot price | 220.27 |

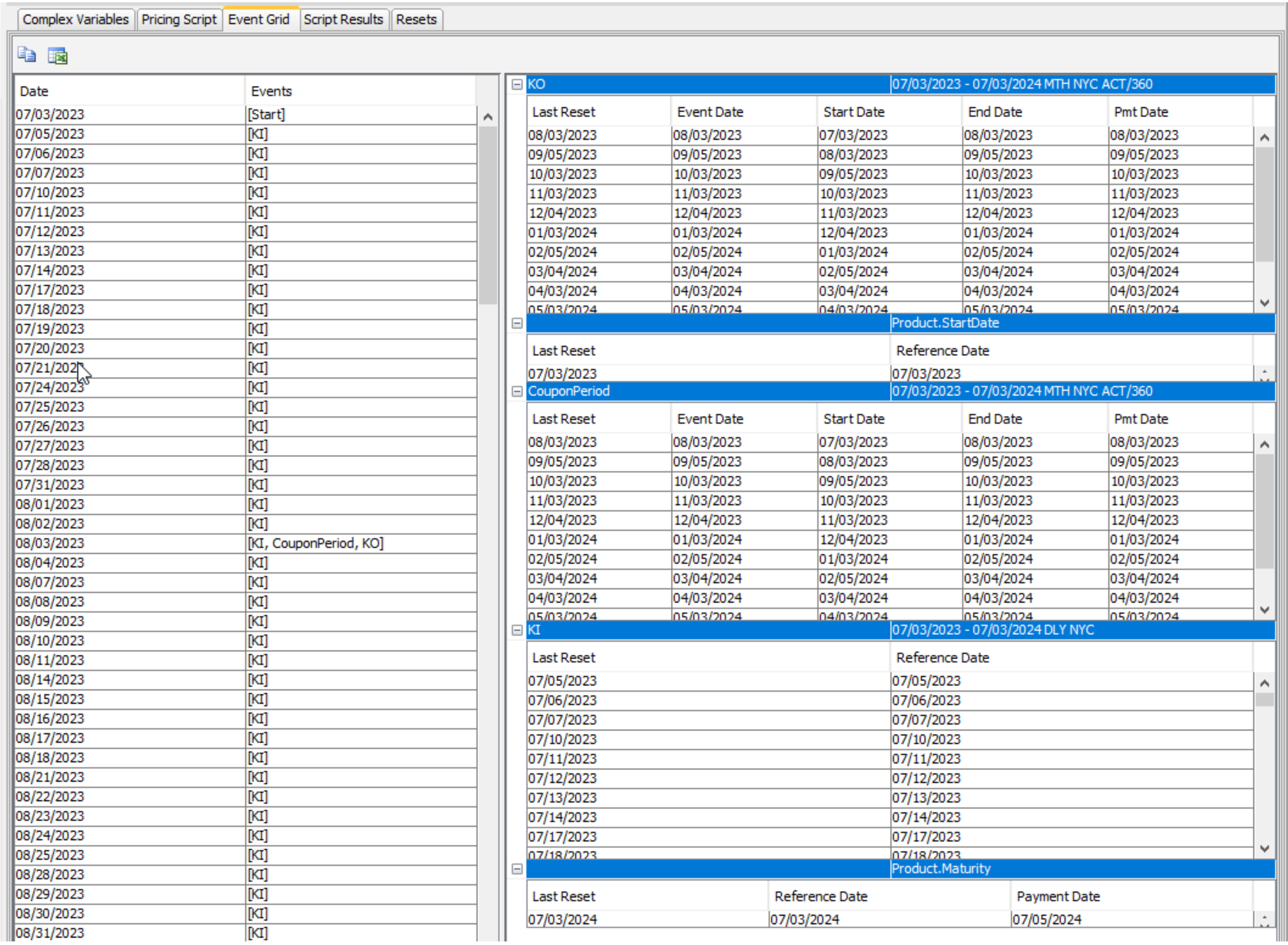
| | |
|---|---|
| Cash Residual | 76.29 |

## Cashflows

Edit

| Leg | Even Date | Event | Start Date | End Date | Legal Entity | Underlying | Type | Quantity | Currency | Notional | Index Factor | Rate | Spread | Reset Date | Amount |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 06/30/2023 | Fee | 06/30/2023 | 06/30/2023 | CP | | PREMIUM | | USD | | | | | | 1,000,000.00 |
| 1 | 08/03/2023 | Cash Flow | 07/03/2023 | 08/03/2023 | CP | | INTEREST | | USD | 1,000,000.00 | | 2.000000 | | 08/03/2023 | 1,722.23 |
| 1 | 09/05/2023 | Cash Flow | 08/03/2023 | 09/05/2023 | CP | | INTEREST | | USD | 1,000,000.00 | | 2.000000 | | 09/05/2023 | 1,833.34 |
| 1 | 10/03/2023 | Cash Flow | 09/05/2023 | 10/03/2023 | CP | | INTEREST | | USD | 1,000,000.00 | | 2.000000 | | 10/03/2023 | 1,555.56 |
| 1 | 11/03/2023 | Cash Flow | 10/03/2023 | 11/03/2023 | CP | | INTEREST | | USD | 1,000,000.00 | | 2.000000 | | 11/03/2023 | 1,722.23 |
| 1 | 12/04/2023 | Cash Flow | 11/03/2023 | 12/04/2023 | CP | | INTEREST | | USD | 1,000,000.00 | | 2.000000 | | 12/04/2023 | 1,722.23 |
| 1 | 01/03/2024 | Cash Flow | 12/04/2023 | 01/03/2024 | CP | | INTEREST | | USD | 1,000,000.00 | | 2.000000 | | 01/03/2024 | 1,666.67 |
| 1 | 02/05/2024 | Cash Flow | 01/03/2024 | 02/05/2024 | CP | | INTEREST | | USD | 1,000,000.00 | | 2.000000 | | 02/05/2024 | 1,833.34 |
| 1 | 03/04/2024 | Cash Flow | 02/05/2024 | 03/04/2024 | CP | | INTEREST | | USD | 1,000,000.00 | | 2.000000 | | 03/04/2024 | 1,555.56 |
| 1 | 04/03/2024 | Cash Flow | 03/04/2024 | 04/03/2024 | CP | | INTEREST | | USD | 1,000,000.00 | | 2.000000 | | 04/03/2024 | 1,666.67 |
| 1 | 05/03/2024 | Cash Flow | 04/03/2024 | 05/03/2024 | CP | | INTEREST | | USD | 1,000,000.00 | | 2.000000 | | 05/03/2024 | 1,666.67 |
| 1 | 06/03/2024 | Cash Flow | 05/03/2024 | 06/03/2024 | CP | | INTEREST | | USD | 1,000,000.00 | | 8.000000 | | 06/03/2024 | 6,888.89 |
| 1 | 07/03/2024 | Cash Flow | 06/03/2024 | 07/03/2024 | CP | | INTEREST | | USD | 1,000,000.00 | | 8.000000 | | 07/03/2024 | 6,666.67 |
| 1 | 07/05/2024 | REDEMPTION | 07/03/2024 | 07/03/2024 | CP | | PAYOUT | | USD | | | | | 07/03/2024 | 76.29 |
| 1 | 07/05/2024 | REDEMPTION | 07/03/2024 | 07/03/2024 | CP | Equity.AAPL | SECURITY | 3,711 | USD | 0.00 | 1 | 0.000000 | | 07/03/2024 | |

## Event Grid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Pricing Script
Event Grid
Script Results
Resets
Date
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08/31/2023 [KI]
KO
07/03/2023 - 07/03/2024 MTH NYC ACT/360
Last Reset Event Date Start Date End Date Pmt Date
08/03/2023 08/03/2023 07/03/2023 08/03/2023 08/03/2023
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Product.StartDate
Last Reset Reference Date
07/03/2023 07/03/2023
CouponPeriod
07/03/2023 - 07/03/2024 MTH NYC ACT/360
Last Reset Event Date Start Date End Date Pmt Date
08/03/2023 08/03/2023 07/03/2023 08/03/2023 08/03/2023
09/05/2023 09/05/2023 08/03/2023 09/05/2023 09/05/2023
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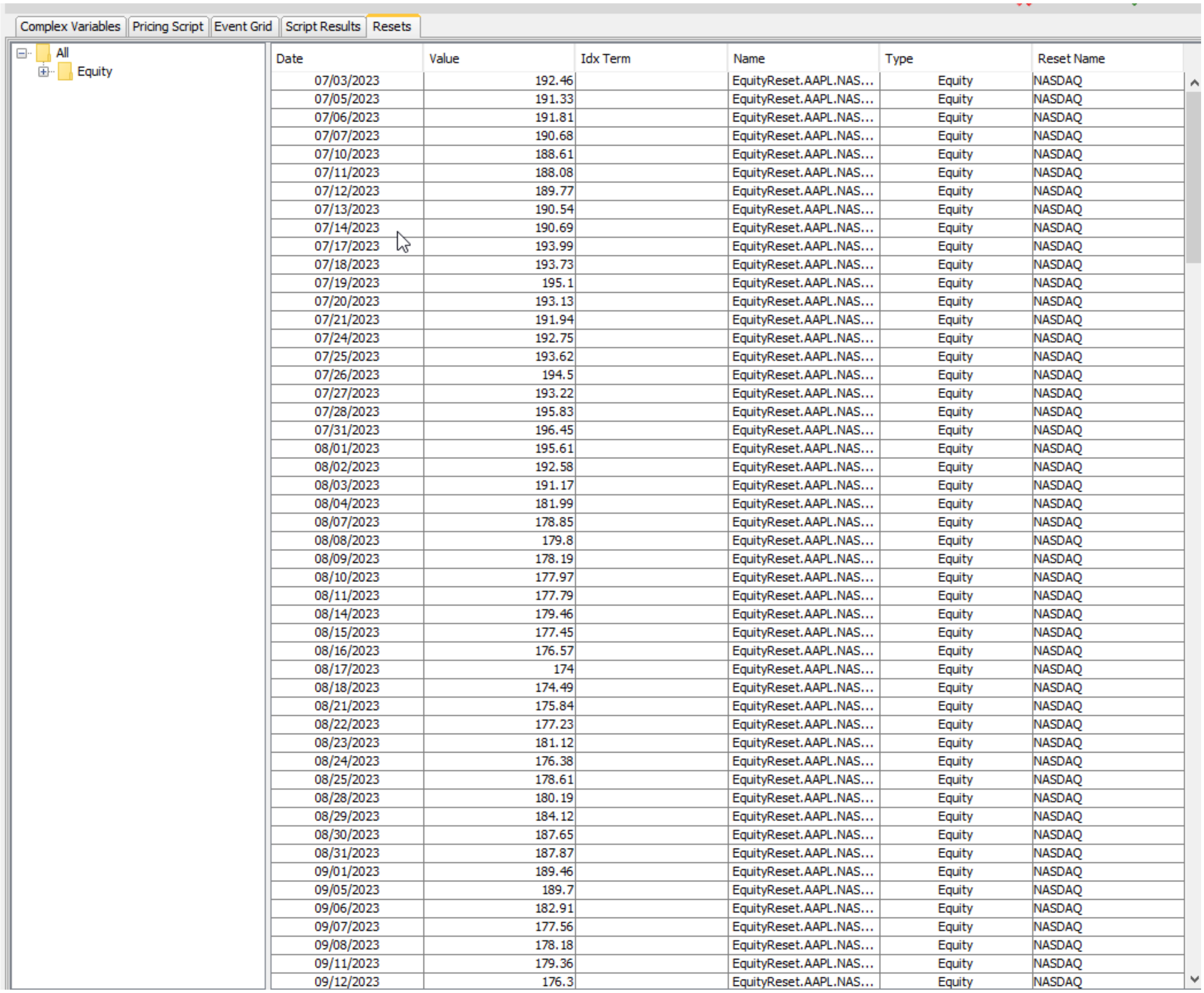
07/03/2023 - 07/03/2024 DLY NYC
Last Reset Reference Date
07/05/2023 07/05/2023
07/06/2023 07/06/2023
07/07/2023 07/07/2023
07/10/2023 07/10/2023
07/11/2023 07/11/2023
07/12/2023 07/12/2023
07/13/2023 07/13/2023
07/14/2023 07/14/2023
07/17/2023 07/17/2023
Product.Maturity
Last Reset Reference Date Payment Date
07/03/2024 07/03/2024 07/05/2024

## Resets




| Date | Value | Idx Term | Name | Type | Reset Name |
|---|---|---|---|---|---|
| 07/03/2023 | 192.46 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 07/05/2023 | 191.33 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 07/06/2023 | 191.81 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 07/07/2023 | 190.68 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 07/10/2023 | 188.61 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 07/11/2023 | 188.08 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 07/12/2023 | 189.77 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 07/13/2023 | 190.54 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 07/14/2023 | 190.69 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 07/17/2023 | 193.99 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 07/18/2023 | 193.73 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 07/19/2023 | 195.1 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 07/20/2023 | 193.13 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 07/21/2023 | 191.94 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 07/24/2023 | 192.75 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 07/25/2023 | 193.62 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 07/26/2023 | 194.5 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 07/27/2023 | 193.22 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 07/28/2023 | 195.83 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 07/31/2023 | 196.45 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 08/01/2023 | 195.61 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 08/02/2023 | 192.58 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 08/03/2023 | 191.17 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 08/04/2023 | 181.99 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 08/07/2023 | 178.85 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 08/08/2023 | 179.8 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 08/09/2023 | 178.19 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 08/10/2023 | 177.97 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 08/11/2023 | 177.79 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 08/14/2023 | 179.46 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 08/15/2023 | 177.45 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 08/16/2023 | 176.57 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 08/17/2023 | 174 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 08/18/2023 | 174.49 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 08/21/2023 | 175.84 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 08/22/2023 | 177.23 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 08/23/2023 | 181.12 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 08/24/2023 | 176.38 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 08/25/2023 | 178.61 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 08/28/2023 | 180.19 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 08/29/2023 | 184.12 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 08/30/2023 | 187.65 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 08/31/2023 | 187.87 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 09/01/2023 | 189.46 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 09/05/2023 | 189.7 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 09/06/2023 | 182.91 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 09/07/2023 | 177.56 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 09/08/2023 | 178.18 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 09/11/2023 | 179.36 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |
| 09/12/2023 | 176.3 | | EquityReset.AAPL.NAS... | Equity | NASDAQ |

# Example 8 - Single Equity Reverse Convertible Swap

***This example is the same as Single Equity Reverse Convertible but with funding leg.***

***Code***

Only code differences from 'ReverseConvertible' are explained

- Two measures - One represents the performance leg and the other the rate leg.
- For each cash flow, we assign the value to either performance leg or Rate leg.
- There is an additional event 'IR_CouponPeriod' which pays the interest. This schedule will be mapped to leg 2

Variables

```
Option As Measure to NPV
Constant IR_CouponPeriod As AccrualPeriod[]
Constant IR_CouponRate As Quotable
Constant IR_Spread As Double
EQLeg As Measure
IRLeg As Measure
```

Mata Data

Script: Variables ☑ Swap Legs: Leg 1 Leg 2

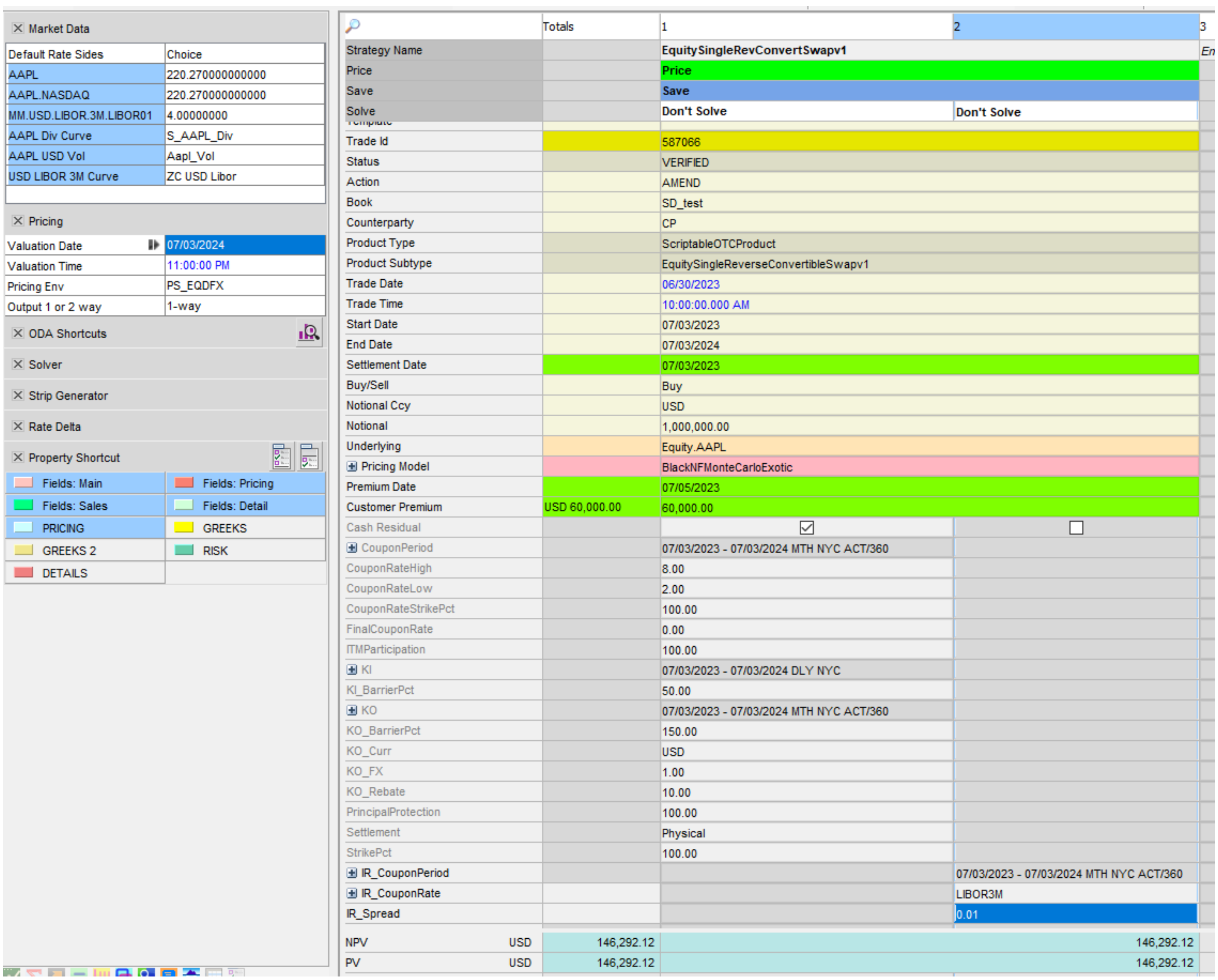
| Name | Type | Display N... | Format | Decimals | Leg | Default V... |
|---|---|---|---|---|---|---|
| CouponPeriod | AccrualPeriodA... | CouponPeriod | DEFAULT | 2 | | |
| CouponRateHigh | Double | CouponRateHigh | RATE | 2 | | |
| CouponRateLow | Double | CouponRateLow | RATE | 2 | | |
| CouponRateSt... | Double | CouponRateSt... | RATE | 2 | | |
| Curr | Currency | Curr | DEFAULT | 2 | | |
| FinalCouponRate | Double | FinalCouponRate | RATE | 2 | | |
| ITMParticipation | Double | ITMParticipation | RATE | 2 | | |
| Index | Quotable | Index | DEFAULT | 2 | | |
| KI | ReferenceDat... | KI | DEFAULT | 2 | | |
| KI_BarrierPct | Double | KI_BarrierPct | RATE | 2 | | |
| KO | AccrualPeriodA... | KO | DEFAULT | 2 | | |
| KO_BarrierPct | Double | KO_BarrierPct | RATE | 2 | | |
| KO_Curr | Currency | KO_Curr | DEFAULT | 2 | | |
| KO_FX | Double | KO_FX | DEFAULT | 2 | | |
| KO_Rebate | Double | KO_Rebate | RATE | 2 | | |
| Maturity | PaymentDate | Maturity | DEFAULT | 2 | | |
| Notional | Double | Notional | DEFAULT | 2 | | |
| PayRec | Integer | PayRec | DEFAULT | 2 | | |
| PrincipalProtec... | Double | PrincipalProtec... | RATE | 2 | | |
| Settlement | Enum | Settlement | DEFAULT | 2 | | |
| Start | ReferenceDate | Start | DEFAULT | 2 | | |
| StrikePct | Double | StrikePct | RATE | 2 | | |
| IR_CouponPeriod | AccrualPeriodA... | IR_CouponPeriod | DEFAULT | 2 | | |
| IR_CouponRate | Quotable | IR_CouponRate | DEFAULT | 2 | | |
| IR_Spread | Double | IR_Spread | DEFAULT | 2 | | |

Forward Script

```
CouponPeriod:
  If Not(KNOCKED_OUT) Then
    AboveCP = True
    If (Index < CouponRateStrike) Then
      AboveCP = False
    EndIf
    RealizedCoupon = If(AboveCP, CouponRateHigh, CouponRateLow)
    FlowValue = Interest(Notional, (PayRec * RealizedCoupon), Curr, 1, 'DGT_COUPON', 1)
    EQLeg += FlowValue
    Option += FlowValue
  EndIf
IR_CouponPeriod:
  If Not(KNOCKED_OUT) Then
    FlowValue = Interest(Notional, (-PayRec * (IR_CouponRate + IR_Spread)), Curr, 1, '', 2)
    IRLeg += FlowValue
    Option += FlowValue
  EndIf
```

## *Trade Example*

### Trade Entry



## Cashflows

| Leg | Even Date | Event | Start Date | End Date | Legal Entity | Underlying | Type | Quantity | Currency | Notional | Index Factor | Rate | Spread | Reset Date | Amount | of |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 07/05/2023 | Fee | 07/05/2023 | 07/05/2023 | CP | | PREMIUM | | USD | | | | | | -25,000.00 | |
| 1 | 08/03/2023 | Cash Flow | 07/03/2023 | 08/03/2023 | CP | | INTEREST | | USD | 1,000,000.00 | | 2.000000 | | 08/03/2023 | 1,722.23 | |
| 2 | 08/03/2023 | Cash Flow | 07/03/2023 | 08/03/2023 | CP | | INTEREST | | USD | 1,000,000.00 | | -5.000000 | | 07/03/2023 | -4,305.56 | |
| 1 | 09/05/2023 | Cash Flow | 08/03/2023 | 09/05/2023 | CP | | INTEREST | | USD | 1,000,000.00 | | 2.000000 | | 09/05/2023 | 1,833.34 | |
| 2 | 09/05/2023 | Cash Flow | 08/03/2023 | 09/05/2023 | CP | | INTEREST | | USD | 1,000,000.00 | | -5.000000 | | 08/03/2023 | -4,583.34 | |
| 1 | 10/03/2023 | Cash Flow | 09/05/2023 | 10/03/2023 | CP | | INTEREST | | USD | 1,000,000.00 | | 2.000000 | | 10/03/2023 | 1,555.56 | |
| 2 | 10/03/2023 | Cash Flow | 09/05/2023 | 10/03/2023 | CP | | INTEREST | | USD | 1,000,000.00 | | -5.200000 | | 09/05/2023 | -4,044.45 | |
| 1 | 11/03/2023 | Cash Flow | 10/03/2023 | 11/03/2023 | CP | | INTEREST | | USD | 1,000,000.00 | | 2.000000 | | 11/03/2023 | 1,722.23 | |
| 2 | 11/03/2023 | Cash Flow | 10/03/2023 | 11/03/2023 | CP | | INTEREST | | USD | 1,000,000.00 | | -6.000000 | | 10/03/2023 | -5,166.67 | |
| 1 | 12/04/2023 | Cash Flow | 11/03/2023 | 12/04/2023 | CP | | INTEREST | | USD | 1,000,000.00 | | 2.000000 | | 12/04/2023 | 1,722.23 | |
| 2 | 12/04/2023 | Cash Flow | 11/03/2023 | 12/04/2023 | CP | | INTEREST | | USD | 1,000,000.00 | | -6.195645 | | 11/03/2023 | -5,335.14 | |
| 1 | 01/03/2024 | Cash Flow | 12/04/2023 | 01/03/2024 | CP | | INTEREST | | USD | 1,000,000.00 | | 2.000000 | | 01/03/2024 | 1,666.67 | |
| 2 | 01/03/2024 | Cash Flow | 12/04/2023 | 01/03/2024 | CP | | INTEREST | | USD | 1,000,000.00 | | -5.400000 | | 12/04/2023 | -4,500.00 | |
| 1 | 02/05/2024 | Cash Flow | 01/03/2024 | 02/05/2024 | CP | | INTEREST | | USD | 1,000,000.00 | | 2.000000 | | 02/05/2024 | 1,833.34 | |
| 2 | 02/05/2024 | Cash Flow | 01/03/2024 | 02/05/2024 | CP | | INTEREST | | USD | 1,000,000.00 | | -5.500000 | | 01/03/2024 | -5,041.67 | |
| 1 | 03/04/2024 | Cash Flow | 02/05/2024 | 03/04/2024 | CP | | INTEREST | | USD | 1,000,000.00 | | 2.000000 | | 03/04/2024 | 1,555.56 | |
| 2 | 03/04/2024 | Cash Flow | 02/05/2024 | 03/04/2024 | CP | | INTEREST | | USD | 1,000,000.00 | | -5.000000 | | 02/05/2024 | -3,888.89 | |
| 1 | 04/03/2024 | Cash Flow | 03/04/2024 | 04/03/2024 | CP | | INTEREST | | USD | 1,000,000.00 | | 2.000000 | | 04/03/2024 | 1,666.67 | |
| 2 | 04/03/2024 | Cash Flow | 03/04/2024 | 04/03/2024 | CP | | INTEREST | | USD | 1,000,000.00 | | -5.300000 | | 03/04/2024 | -4,416.67 | |
| 1 | 05/03/2024 | Cash Flow | 04/03/2024 | 05/03/2024 | CP | | INTEREST | | USD | 1,000,000.00 | | 2.000000 | | 05/03/2024 | 1,666.67 | |
| 2 | 05/03/2024 | Cash Flow | 04/03/2024 | 05/03/2024 | CP | | INTEREST | | USD | 1,000,000.00 | | -5.600000 | | 04/03/2024 | -4,666.67 | |
| 1 | 06/03/2024 | Cash Flow | 05/03/2024 | 06/03/2024 | CP | | INTEREST | | USD | 1,000,000.00 | | 8.000000 | | 06/03/2024 | 6,888.89 | |
| 2 | 06/03/2024 | Cash Flow | 05/03/2024 | 06/03/2024 | CP | | INTEREST | | USD | 1,000,000.00 | | -5.700000 | | 05/03/2024 | -4,908.34 | |
| 1 | 07/03/2024 | Cash Flow | 06/03/2024 | 07/03/2024 | CP | | INTEREST | | USD | 1,000,000.00 | | 8.000000 | | 07/03/2024 | 6,666.67 | |
| 2 | 07/03/2024 | Cash Flow | 06/03/2024 | 07/03/2024 | CP | | INTEREST | | USD | 1,000,000.00 | | -5.800000 | | 06/03/2024 | -4,833.34 | |
| 1 | 07/05/2024 | REDEMPTION | 07/03/2024 | 07/03/2024 | CP | | PRINCIPAL | | USD | | | | | 07/03/2024 | 1,144,497.56 | |
| 1 | 07/05/2024 | REDEMPTION | 07/03/2024 | 07/03/2024 | CP | | PRINCIPAL | | USD | | | | | 07/03/2024 | -1,000,000.00 | |

## Script Results

Complex Variables | Pricing Script | Event Grid | Script Results | Resets

Measures: 7/16/24 6:47:42.104 AM EDT

| Measure | Value |
|---|---|
| EQLeg | 1,150,857.154698 |
| Option | 146,292.122420 |
| Prob_KO | 0.000000 |
| Prob_KI | 0.000000 |
| IRLeg | -1,004,565.032277 |