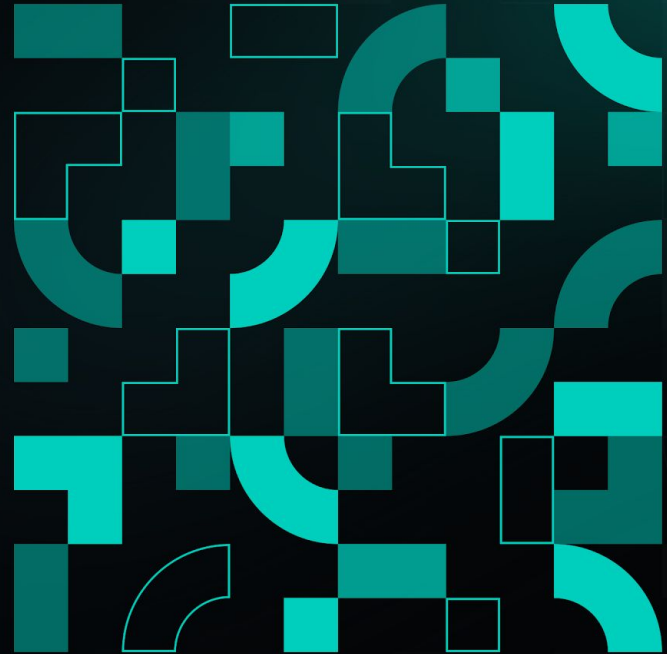# Portfolio Margin (PM)

## Transition from Legacy PM
## to New Segregated PM (S:PM)

Client Presentation, February 2024

**Deribit**

# Portfolio Margin (PM)

## Transition from Legacy PM to New Segregated PM

### Definition: Legacy PM vs Segregated PM

- Although both Models are segregated, we want to make a clear distinction between the two to avoid any confusion.

- Legacy PM (L:PM) is our current Portfolio Margin Model, Segregated PM (S:PM) will be the new Portfolio Margin Model going forward.

  - USDC/USDT related products are only SM (standard margin) when the Account is on L:PM

### Transition from Legacy PM to Segregated PM

- The Segregated PM Model (S:PM) will gradually replace the current Legacy PM Model throughout 2024

- You would get the choice to switch to S:PM for now but would no longer be able to switch Legacy PM

- Segregated PM introduces several new features, solving inefficiencies of the current model. These features include:

  - Inclusion of USDC/USDT related products

  - Replacement of Contingency margin by Delta and Roll Shocks

  - Margin charge for far OTM net short options positions (Extended Table)

  - Change in IM - MM relationship

# Portfolio Margin (PM)
## Legacy PM vs Segregated PM (1/5)

### Legacy PM (1/2)

- Portfolio Margin uses a risk-based model that determines margin requirements by valuing a portfolio over a range of underlying price and volatility moves.
- The model nets positions in futures and options within a currency
- PM **Maintenance Margin** is determined by calculating the maximum loss that can occur in a portfolio with the following components:

### Legacy PM Components:

- Maximum Underlying Price Move ie +/-15% (BTC and ETH)
- Volatility Stress Scenarios (Volatility Range Up and Down)

- Options Sum Contingency

- Futures Contingency

- Initial Margin: Maintenance Margin * Initial Margin Factor (1.20)

### Segregated PM (1/2)

- The Segregated PM model builds on the existing Legacy PM

- The model nets positions in futures, options within a currency
- PM **Initial Margin** is determined by calculating the maximum loss that can occur in a portfolio with the following components:

### Segregated PM Components:

- Maximum Underlying Price Move ie +/-16% (BTC and ETH)
- Volatility Stress Scenarios (Volatility Range Up and Down + Minimum for Range Up)
- Extended Table - this is primarily meant to localise large open short options positions
- Delta Shock and Roll Shock

- Maintenance Margin: Initial Margin * Maintenance Margin Factor (0.80)

# Portfolio Margin (PM)

## Legacy PM vs Segregated PM (2/5)

### Legacy PM (2/2)

- PM Matrix: 11 buckets

- Volatility Stress Scenarios
    - Volatility Range Up
    - Volatility Range Down
    - Short term vega power
    - Long term vega power

- Options Sum Contingency

- Futures Contingency

- Maintenance Margin = Worst case loss scenario of Risk Matrix + Futures Contingency + Option Contingency
- Position Initial Margin: Maintenance Margin * Initial Margin Factor (default = 1.20)
- Position Initial Margin is added with the Initial Margin for open orders and Initial Margin for MMP Settings to give the final Initial Margin

### Segregated PM (2/2)

- S:PM Matrix: 9 buckets in Main Table and 8 buckets in Extended Table

- Volatility Stress Scenarios
    - Same Parameters
    - Addition of Minimum Volatility for Volatility Range Up

- Extended Table
    - Calculations of price moves of -66%, -33%, +50%, +100%, +200%, +300%, +400%, +500%
    - Only on Volatility Range Up
    - Only a fraction of simulated P&L
    - Application of a dampener
    - Worst case scenario is then taken for each base currency and summed to give the Risk Matrix Output

- Position Initial Margin = Worst case loss scenario of Risk Matrix (including Extended Table) per Base Currency + Delta Shock + Roll Shock
- Maintenance Margin: Position Initial Margin * Maintenance Margin Factor (default = 0.80)
- Position Initial Margin is added with the Initial Margin for open orders and Initial Margin for MMP Settings to give the final Initial Margin

# Segregated PM (S:PM)
## Delta and Roll Shocks (1/2)

### Delta Shock

- Delta shock is calculated per currency pair for large delta positions
- We look at the net delta on long option positions separately to futures+short option positions
- The net deltas on long options are not taken into account unless they help offset the net deltas from futures + short options
- The deltas for the shock (DeltasToShock) are the net delta of futures + short options that are not offset by the net delta from long options
- We then convert these to dollar deltas by multiplying by the index and the amount in excess of the Delta Total Liquidity Shock Threshold are multiplied by the increment used in standard margin for the perpetual, and if no perpetual, for the dated future.
- A cap is applied to this charge: the Max Delta Shock

### Delta Shock Formulas

$$DeltaForShock = \begin{cases} \left| min\Big(max(Delta1 + Delta2, Delta2), 0\Big) \right|, & \text{if } Delta2 < 0, \\ \left| max\Big(min(Delta1 + Delta2, Delta2), 0\Big) \right|, & \text{if } Delta2 \geq 0 \end{cases}$$

where Delta1 = net delta of long options and Delta2 = net delta of short options + delta of futures

$$DeltaShock = \sum_{}^{eachCurrencyPair} \frac{min\Big[ max(DeltaForShock \times Index - DeltaTotalLiquidityShockThreshold, 0) \times DeltaForShock \times Increment, MaxDeltaShock \times Index \times DeltaForShock \Big]}{Index}$$

## Delta and Roll Shocks (1/2)

### Roll Shock

- Roll Shock is calculated per base currency in each settlement currency
- Roll Shock replaces Futures Contingency from the Legacy Portfolio Margin
- We first calculate a Minimum Roll Shock as shown in formula on right using the Net Delta per Expiry
- We then calculate an Annualised Roll Shock as shown in formula on right
- The Roll Shock per base currency in each settlement currency = max(Minimum Roll Shock, abs(Annualised Roll Shock)). Sum this across all the base currencies to give a Final Roll Shock in each settlement currency
- Note that in API, the Min Expiry Delta Shock is shown as min_annualised_move

### Roll Shock Formulas

$$Minimum\ Roll\ Shock = \sum_{Expiry} Min\ Expiry\ Delta\ Shock * \left| Net\ \Delta_{Expiry} \right|$$

$$Annualised\ Roll\ Shock = \sum_{Expiry} \max(e^{Annualised\ Move\ Risk * Years\ to\ Expiry} - 1, Min\ Expiry\ Delta\ Shock) * Net\ \Delta_{Expiry})$$

$$Final\ Roll\ Shock = \sum_{Base\ Currency} \max(Minimum\ Roll\ Shock, \left| Annualised\ Roll\ Shock_{Base\ Currency} \right|)$$
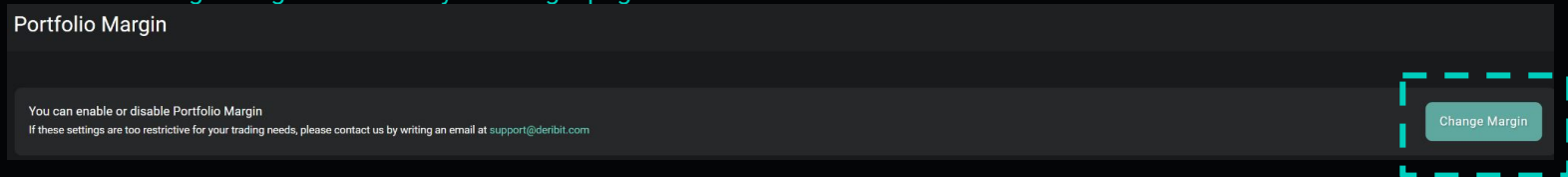
# Segregated PM (S:PM)

## Switching Margin Model 1/2

- You can change your Margin Model by going to the Margin page and clicking on Change Margin. Or go directly to this link (https://www.deribit.com/account/BTC/change-margin-model). Here will you will see the different margin types and if permissible without breaching margin requirements, you will be able to switch your Margin Model

1. Go to the main or subaccount you would like to switch to a different Margin Model. Click your current Margin model type in the header to go to Margin page

| IM | 0.94% | PM | UTC: 08:20:29 | 👤 S2000 |
| MM | 0.78% | | | |
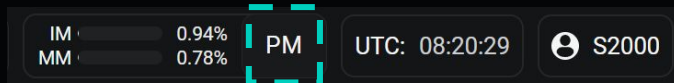
2. Click the "Change Margin" button on your Margin page

**Portfolio Margin**

You can enable or disable Portfolio Margin
If these settings are too restrictive for your trading needs, please contact us by writing an email at support@deribit.com

Change Margin

# Segregated PM (S:PM)
## Switching Margin Model 2/2

3. Select the Margin Model you would like from the drop down and then Accept Terms of Service and click "Change Margin Model" button

# Segregated PM (S:PM)
## Model Parameters

- Parameters for the model can be found on the PM page (https://www..deribit.com/account/BTC/portfolio-margin). This shows parameters based on the instruments you have in your position. To see all parameters, you can use the API call public/pme/get_params

### Parameters per Currency

For Roll Shock

| Base currency | N/A<br>PNL Offset | N/A<br>Max PNL Offset | Extended Dampener | N/A<br>Correlation Set | Min Expiry Delta Shock | Annualised % move risk | N/A<br>Include in USD Equity | N/A<br>Haircut | N/A<br>Equity Impact |
|---|---|---|---|---|---|---|---|---|---|
| USD | 0 % | 0 | 25,000 | NO | 1 % | 10 % | NO | 0 % | none |
| XRP | 0 % | 0 | 25,000 | NO | 2 % | 10 % | NO | 0 % | upside |
| SOL | 0 % | 0 | 25,000 | NO | 2 % | 10 % | NO | 0 % | upside |
| USDC | 0 % | 0 | 25,000 | NO | 1 % | 10 % | NO | 2 % | none |

### Parameters per Currency Pair

For Volatility Shocks                                                    For Delta Shock

| Currency Pair | Price Range | Volatility Range Up | Volatility Range Down | Min Volatility For Shock Up | Short Term Vega Power | Long Term Vega Power | Extended Table Factor | Delta Total Liquid. Shock Threshold | Max Delta Shock |
|---|---|---|---|---|---|---|---|---|---|
| XRP_USDC | 24 % | 60 % | 30 % | 60 % | 0.30 | 0.13 | 1.00 | 2,000,000 | 20 % |
| SOL_USDC | 24 % | 60 % | 30 % | 60 % | 0.30 | 0.13 | 1.00 | 5,000,000 | 20 % |

# Segregated PM (S:PM)
## Model Parameters (2/2)

- Default parameters for BTC and ETH

### Parameters per Currency

| Base currency | PNL Offset | Max PNL Offset | Extended Dampener | Correlation Set | Min Expiry Delta Shock | Annualised % move risk | Include in USD Equity | Haircut | Equity Impact |
|---|---|---|---|---|---|---|---|---|---|
| BTC | 0 % | 0 | 100,000 | NO | 1 % | 8 % | NO | 0 % | both |
| ETH | 0 % | 0 | 100,000 | NO | 1 % | 8 % | NO | 0 % | both |

### Parameters per Currency Pair

| Currency Pair | Price Range | Volatility Range Up | Volatility Range Down | Min Volatility For Shock Up | Short Term Vega Power | Long Term Vega Power | Extended Table Factor | Delta Total Liquid. Shock Threshold | Max Delta Shock |
|---|---|---|---|---|---|---|---|---|---|
| BTC_USD | 16 % | 50 % | 25 % | 50 % | 0.30 | 0.13 | 1.00 | 20,000,000 | 10 % |
| ETH_USD | 16 % | 50 % | 25 % | 50 % | 0.30 | 0.13 | 1.00 | 20,000,000 | 10 % |

# Segregated PM (S:PM)
## Risk Matrix Structure (1/2)

- Each calculated value in the table represents a Simulated PNL for that instrument for a particular Underlying Move and volatility shock

Extended Table (downside)

Main Table (downside)

Main Table (no underlying price move)

☑ Show All   ☐ Auto Refresh   ⟳ Refresh

| Instrument | Amount | Base Amount | -66% | -33% | ↓ | -4 | ↑ | ↓ | -3 | ↑ | ↓ | -2 | ↑ | ↓ | -1 | ↑ | ↓ | 0 | ↑ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ⌄ Total | | | -49,280.5342 | -40,745.1953 | -39,667.5609 | -39,675.6816 | -40,312.5240 | -25,085.9466 | -25,315.8164 | -27,544.2703 | -10,708.0272 | -12,519.9790 | -17,020.9138 | -456.1001 | -3,867.8620 | -9,271.4566 | 1,380.5582 | 1.4718 | -4,108.6110 |
| ⌄ Futures | | | 4,835.4176 | 4,835.4176 | 4,835.4176 | 4,835.4176 | 4,835.4176 | 3,626.5632 | 3,626.5632 | 3,626.5632 | 2,417.7088 | 2,417.7088 | 2,417.7088 | 1,208.8544 | 1,208.8544 | 1,208.8544 | 0.0000 | 0.0000 | 0.0000 |
| XRP_USDC-PERPETUAL ($0.52) | ✕ -10,000 | - | 1,674.8800 | 1,674.8800 | 1,674.8800 | 1,674.8800 | 1,674.8800 | 1,256.1600 | 1,256.1600 | 1,256.1600 | 837.4400 | 837.4400 | 837.4400 | 418.7200 | 418.7200 | 418.7200 | 0.0000 | 0.0000 | 0.0000 |
| SOL_USDC-PERPETUAL ($98.77) | ≦ -100.0 | - | 3,160.5376 | 3,160.5376 | 3,160.5376 | 3,160.5376 | 3,160.5376 | 2,370.4032 | 2,370.4032 | 2,370.4032 | 1,580.2688 | 1,580.2688 | 1,580.2688 | 790.1344 | 790.1344 | 790.1344 | 0.0000 | 0.0000 | 0.0000 |
| ⌄ Options | | | -54,115.9518 | -45,580.6129 | -44,502.9785 | -44,511.0992 | -45,147.9416 | -28,712.5098 | -28,942.3796 | -31,170.8335 | -13,125.7360 | -14,937.6878 | -19,438.6226 | -1,664.9554 | -5,076.7164 | -10,480.3110 | 1,380.5582 | 1.4718 | -4,108.6110 |
| ⌄ SOL_USDC-9FEB24 ($98.69) | -170 | ≦ -1,700 | -54,115.9518 | -45,580.6129 | -44,502.9785 | -44,511.0992 | -45,147.9416 | -28,712.5098 | -28,942.3796 | -31,170.8335 | -13,125.7360 | -14,937.6878 | -19,438.6226 | -1,664.9554 | -5,076.7164 | -10,480.3110 | 1,380.5582 | 1.4718 | -4,108.6110 |
| 98-C | 10 | ≦ 100 | -208.8213 | -409.5301 | -430.6938 | -430.6771 | -420.1536 | -430.6938 | -429.6284 | -380.2654 | -430.6264 | -412.4133 | -268.9897 | -416.1704 | -307.6810 | -42.7054 | -193.0484 | 0.1630 | 322.7022 |
| 90-P | -200 | ≦ -2,000 | -53,834.0153 | -45,027.3412 | -43,921.4845 | -43,929.6220 | -44,580.3644 | -28,131.0158 | -28,361.9823 | -30,661.9116 | -12,544.3094 | -14,375.9073 | -19,111.5475 | -1,098.0070 | -4,640.2741 | -10,565.2057 | 1,717.7967 | 1.2258 | -4,932.1193 |
| 110-C | 20 | ≦ 200 | -73.1152 | -143.7416 | -150.8002 | -150.8000 | -147.4236 | -150.8002 | -150.7690 | -128.6564 | -150.8240 | -149.3673 | -58.0855 | -150.7780 | -128.7613 | 127.6002 | -144.1901 | 0.0829 | 500.8060 |

# Segregated PM (S:PM)

## Risk Matrix Structure (2/2)

- Each calculated value in the table represent a Simulated PNL for that instrument for a particular Underlying Move and volatility shock
- Equity can't be used to offset positions in S:PM. For example SOL equity can NOT offset short SOL calls but that feature is planned when we launch Cross Collateral
- Haircuts are not applicable under S:PM

Main Table  (upside)

Extended Table (upside)

| Instrument | ↓ | 1 | ↑ | ↓ | 2 | ↑ | ↓ | 3 | ↑ | ↓ | 4 | ↑ | 50% | 100% | 200% | 300% | 400% | 500% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ˅ Total | 1,117.2947 | 1,232.6565 | -866.2146 | 1,545.6538 | 1,896.4327 | 1,200.9503 | 2,569.9941 | 2,734.4781 | 2,666.0832 | 3,721.8045 | 3,768.2501 | 3,876.2474 | 4,096.7840 | 4,345.8300 | 4,492.3084 | 4,541.2392 | 4,565.7046 | 4,580.3838 |
| ˅ Futures | -1,208.8544 | -1,208.8544 | -1,208.8544 | -2,417.7088 | -2,417.7088 | -2,417.7088 | -3,626.5632 | -3,626.5632 | -3,626.5632 | -4,835.4176 | -4,835.4176 | -4,835.4176 | -4,835.4176 | -4,835.4176 | -4,835.4176 | -4,835.4176 | -4,835.4176 | -4,835.4176 |
| XRP_USDC-PERPETUAL ($0.52) | -418.7200 | -418.7200 | -418.7200 | -837.4400 | -837.4400 | -837.4400 | -1,256.1600 | -1,256.1600 | -1,256.1600 | -1,674.8800 | -1,674.8800 | -1,674.8800 | -1,674.8800 | -1,674.8800 | -1,674.8800 | -1,674.8800 | -1,674.8800 | -1,674.8800 |
| SOL_USDC-PERPETUAL ($98.77) | -790.1344 | -790.1344 | -790.1344 | -1,580.2688 | -1,580.2688 | -1,580.2688 | -2,370.4032 | -2,370.4032 | -2,370.4032 | -3,160.5376 | -3,160.5376 | -3,160.5376 | -3,160.5376 | -3,160.5376 | -3,160.5376 | -3,160.5376 | -3,160.5376 | -3,160.5376 |
| ˅ Options | 2,326.1491 | 2,441.5109 | 342.6398 | 3,963.3626 | 4,314.1415 | 3,618.6591 | 6,196.5573 | 6,361.0413 | 6,292.6464 | 8,557.2221 | 8,603.6677 | 8,711.6650 | 8,932.2016 | 9,181.2476 | 9,327.7260 | 9,376.6568 | 9,401.1222 | 9,415.8014 |
| ˅ SOL_USDC-9FEB24 ($98.69) | 2,326.1491 | 2,441.5109 | 342.6398 | 3,963.3626 | 4,314.1415 | 3,618.6591 | 6,196.5573 | 6,361.0413 | 6,292.6464 | 8,557.2221 | 8,603.6677 | 8,711.6650 | 8,932.2016 | 9,181.2476 | 9,327.7260 | 9,376.6568 | 9,401.1222 | 9,415.8014 |
| 98-C | 439.2439 | 544.7145 | 822.6011 | 1,217.8673 | 1,246.0268 | 1,431.4128 | 2,007.2266 | 2,012.5481 | 2,116.8237 | 2,796.7690 | 2,797.5657 | 2,850.3474 | 2,932.8331 | 3,042.5363 | 3,100.3482 | 3,119.6231 | 3,129.2605 | 3,135.0430 |
| 90-P | 1,854.8937 | 1,476.1591 | -1,592.9713 | 1,856.1688 | 1,798.4488 | 211.6021 | 1,856.1716 | 1,849.3942 | 1,113.4120 | 1,856.1716 | 1,855.5307 | 1,535.6304 | 1,160.6965 | 593.9445 | 296.9874 | 197.9916 | 148.4937 | 118.7950 |
| 110-C | 32.0115 | 420.6373 | 1,113.0100 | 889.3265 | 1,269.6659 | 1,975.6442 | 2,333.1591 | 2,499.0991 | 3,062.4107 | 3,904.2816 | 3,950.5714 | 4,325.6873 | 4,838.6720 | 5,544.7669 | 5,930.3904 | 6,059.0421 | 6,123.3680 | 6,161.9635 |

# Segregated PM (S:PM)

## Risk Matrix Calculations (1/5)

This represents an underling move % of (PriceRange /4) * -3. So a PriceRange of 32% for XRP_USDC would mean an underlying move of -24% whilst a PriceRange of 16% for BTC_USDC would mean an underlying move simulation  of -12% in this bucket

The red arrow represents where liquidation would first check to then see the biggest contributor

| Instrument | ↓ | -4 | ↑ | ↓ | -3 | ↑ |
|---|---|---|---|---|---|---|
| Total | -40,585.0651 | -40,589.5914 | -41,112.5093 | -26,127.4931 | -26,287.3461 | -28,254.7116 |
| Futures | 4,801.0432 | 4,801.0432 | 4,801.0432 | 3,600.7824 | 3,600.7824 | 3,600.7824 |
| XRP_USDC-PERPETUAL ($0.52) | 1,667.8400 | 1,667.8400 | 1,667.8400 | 1,250.8800 | 1,250.8800 | 1,250.8800 |
| SOL_USDC-PERPETUAL ($97.91) | 3,133.2032 | 3,133.2032 | 3,133.2032 | 2,349.9024 | 2,349.9024 | 2,349.9024 |
| Options | -45,386.1083 | -45,390.6346 | -45,913.5525 | -29,728.2755 | -29,888.1285 | -31,855.4940 |
| SOL_USDC-9FEB24 ($97.86) | -45,386.1083 | -45,390.6346 | -45,913.5525 | -29,728.2755 | -29,888.1285 | -31,855.4940 |
| 98-C | -378.0867 | -378.0792 | -369.9141 | -378.0867 | -377.4582 | -336.3147 |
| 90-P | -44,890.5444 | -44,895.0783 | -45,428.5715 | -29,232.7116 | -29,393.2071 | -31,418.8236 |

In the Main Table, the Underlying Price Move buckets are [-4, -3, -2, -1, 0, 1, 2, 3, 4]. For a PriceRange = 16% for BTC_USD, this corresponds with underlying price move simulations (PriceMove%) of [-16%, -12%, -8%, -4%, 0%, +4%, +8%, +12%, -16%]

For each underlying price move simulation, there are 3 volatility simulations, Volatility Shock Down (ie 25%), Volatility Unchanged, Volatility Shock Up(ie 50%). The Volatility used is the current Volatility (Mark IV) of the instrument

# Segregated PM (S:PM)
## Risk Matrix Calculations (2/5)

| Instrument | ↓ | -4 | ↑ | ↓ | -3 | ↑ |
|---|---|---|---|---|---|---|
| ∨ Total | -40,585.0651 | -40,589.5914 | -41,112.5093 | -26,127.4931 | -26,287.3461 | -28,254.7116 |
| ∨ Futures | 4,801.0432 | 4,801.0432 | 4,801.0432 | 3,600.7824 | 3,600.7824 | 3,600.7824 |
| XRP_USDC-PERPETUAL ($0.52) | 1,667.8400 | 1,667.8400 | 1,667.8400 | 1,250.8800 | 1,250.8800 | 1,250.8800 |
| SOL_USDC-PERPETUAL ($97.91) | 3,133.2032 | 3,133.2032 | 3,133.2032 | 2,349.9024 | 2,349.9024 | 2,349.9024 |
| ∨ Options | -45,386.1083 | -45,390.6346 | -45,913.5525 | -29,728.2755 | -29,888.1285 | -31,855.4940 |
| ∨ SOL_USDC-9FEB24 ($97.86) | -45,386.1083 | -45,390.6346 | -45,913.5525 | -29,728.2755 | -29,888.1285 | -31,855.4940 |
| 98-C | -378.0867 | -378.0792 | -369.9141 | -378.0867 | -377.4582 | -336.3147 |
| 90-P | -44,890.5444 | -44,895.0783 | -45,428.5715 | -29,232.7116 | -29,393.2071 | -31,418.8236 |

Vol Shock Down in this Underlying Price Move bucket.

Vol Shock Up in this Underlying Price Move bucket

$$simVolatility = max\left( StrikeVolatility \times \left[ 1 + \left( \frac{30}{DaysToExpiry} \right)^{vegaPower} \times volatilityRangeUp \right], minVolatilityForShockUp \right)$$

$$simVolatility = max\left( StrikeVolatility \times \left[ 1 - \left( \frac{30}{DaysToExpiry} \right)^{vegaPower} \times volatilityRangeDown \right], 0 \right)$$

$$vegaPower = \begin{cases} vegaPower_{ST}, & \text{Short Term Vega Power for when } DaysToExpiry < 30, \\ vegaPower_{LT}, & \text{Long Term Vega Power for when } DaysToExpiry \geq 30 \end{cases}$$

# Segregated PM (S:PM)

## Risk Matrix Calculations (3/5)

- The Extended Table are underlying price move simulations (PriceMove%) of [-66%, -33%, +50%, +100%, +200%, +300%, +400%, +500%]. These price moves are the same for all currency pairs and are always with just the Volatility Shock Up simulation

| Instrument | Amount | Base Amount | -66% | -33% | 50% | 100% | 200% | 300% | 400% | 500% |
|---|---|---|---|---|---|---|---|---|---|---|
| ∨ Total | | | -49,599.5554 | -41,477.3788 | 3,878.1780 | 4,241.6589 | 4,442.5767 | 4,509.5941 | 4,543.1027 | 4,563.2080 |
| ∨ Futures | | | 4,779.4816 | 4,779.4816 | -4,779.4816 | -4,779.4816 | -4,779.4816 | -4,779.4816 | -4,779.4816 | -4,779.4816 |
| XRP_USDC-PERPETUAL ($0.51) | ✕ -10,000 | - | 1,640.3200 | 1,640.3200 | -1,640.3200 | -1,640.3200 | -1,640.3200 | -1,640.3200 | -1,640.3200 | -1,640.3200 |
| SOL_USDC-PERPETUAL ($98.10) | ⊴ -100.0 | - | 3,139.1616 | 3,139.1616 | -3,139.1616 | -3,139.1616 | -3,139.1616 | -3,139.1616 | -3,139.1616 | -3,139.1616 |
| ∨ Options | | | -54,379.0370 | -46,256.8604 | 8,657.6596 | 9,021.1405 | 9,222.0583 | 9,289.0757 | 9,322.5843 | 9,342.6896 |
| ∨ SOL_USDC-9FEB24 ($98.16) | -170 | ⊴ -1,700 | -54,379.0370 | -46,256.8604 | 8,657.6596 | 9,021.1405 | 9,222.0583 | 9,289.0757 | 9,322.5843 | 9,342.6896 |
| 98-C | 10 | ⊴100 | -176.5341 | -348.7997 | 2,921.7364 | 3,029.5649 | 3,085.2990 | 3,103.8782 | 3,113.1679 | 3,118.7417 |
| 90-P | -200 | ⊴ -2,000 | -54,156.2406 | -45,816.5295 | 981.6813 | 497.8242 | 248.9155 | 165.9437 | 124.4577 | 99.5662 |
| 110-C | 20 | ⊴200 | -46.2623 | -91.5312 | 4,754.2420 | 5,493.7514 | 5,887.8438 | 6,019.2538 | 6,084.9587 | 6,124.3817 |

# Segregated PM (S:PM)
## Risk Matrix Calculations (4/5)

- For the final risk matrix calculations, only a fraction of the SimulaterPNL is used from the Extended Table and a dampener is also used in this section. The fraction for each bucket in the Extended Table are calculated as below.

$$MarginMultiplier = extendedFactor \times \frac{priceRange}{|PriceMove\%|}$$

Linear instruments (USDC, USDT): $AdjustedSimulatedPNL = SimulatedPNL \times MarginMultiplier$

Inverse instruments (BTC, ETH): $AdjustedSimulatedPNL = \dfrac{MarginMultiplier(1 + m\%)}{(1 + \frac{m\%}{|m\%|} priceRange\%)}$

# Segregated PM (S:PM)
## Risk Matrix Calculations (5/5)

- For the Main Table and Extended Table, we sum the rows on each base currency to gat a matrix output grouped by base currency. In this step, BTCDVOL is grouped with BTC. For the Extended Table, we then apply a dampener to reduce it's impact. It means that only very large option positions will cause an impact in the Extended Table.

Linear instruments (USDC, USDT):

$$AmountToBeDampened = min\left[\left(max\left(\frac{|PriceMove|)}{PriceRange}\right) - 1\right) \times ExtendedDampener, |AdjustedSimulatedPNL|\right]$$

Inverse instruments (BTC, ETH):

$$AmountToBeDampened = min\left[\left(max\left(\frac{|PriceMove|)}{PriceRange}\right) - 1\right) \times \frac{ExtendedDampener}{(1 + sign(PriceMove) * PriceRange) * Index}, |AdjustedSimulatedPNL|\right]$$

# Thank you
# for your attention!

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**Deribit**