# HSBC USA Inc. Notes Linked to the AI Powered US Equity Index (USD) Excess Return

## GENERAL

HSBC USA Inc. from time to time may offer and sell certain senior unsecured debt obligations (the "Notes") linked to the AI Powered US Equity Index (USD) Excess Return (the "Index"). The applicable free writing prospectus or pricing supplement will specify the specific terms of the Notes. In this underlying supplement, "the Issuer," "we," "us" and "our" refer to HSBC USA Inc. unless the context requires otherwise.

This underlying supplement describes the Index. All disclosures contained in this document regarding the Index, including its make-up, method of calculation and changes in its components, are derived from publicly available information. This description of the Index is qualified in its entirety by the full description in its methodology, which is available at www.solactive.com/wp-content/uploads/2019/12/AI-Powered-Equity-Index-6-USD-Excess-Return.pdf. The methodology of the Index is not incorporated in, or part of, this underlying supplement.

You should read the applicable free writing prospectus or pricing supplement, this underlying supplement, the accompanying prospectus supplement for Notes, Series 1 dated February 26, 2018 (the "Prospectus Supplement") and the accompanying base prospectus for debt securities, preferred stock, depositary shares, warrants, purchase contracts and units dated February 26, 2018 (the "Base Prospectus") carefully before you invest in a particular issuance of the Notes. If the terms described in the applicable free writing prospectus or pricing supplement are different or inconsistent with those described herein, the terms described in the applicable free writing prospectus or pricing supplement will govern the applicable Notes.

## The AI Powered US Equity Index (USD) Excess Return

The Index is an excess return index which is dynamically exposed to the AI Powered US Equity Base Index (TR) (the "Base Index"). The Index is owned by EquBot Inc. and administered, calculated and published by Solactive AG. The Index follows a rules-based strategy that provides leveraged exposure (between 0-150%) to the Base Index based on a volatility control mechanism that seeks to control the volatility of the index at or near a pre-determined target of 6% (the "Target Volatility"). The level of the Index is calculated net of the Interest Component (as defined below), which is based on the USD 3-month LIBOR rate, and an index fee of 0.85% per annum (the "Index Fee"). With IBM Watson®, the Index tracks a long-only, volatility-controlled equity strategy that utilizes objective artificial intelligence techniques to dynamically select the underlying constituents.

The Index level is published on each Calculation Day at 4:50 p.m. (EST) under the Bloomberg symbol "AIPEX6 <Index>". A "Calculation Day" is any day on which the New York Stock Exchange is open for trading. A "Trading Day" is any day on which Nasdaq and the New York Stock Exchange are both open for trading. The Index was launched on November 19, 2019 and is calculated in U.S. dollars based on an initial base value of 1,000 as of April 29, 2004. Additional information about the Index and the Base Index is available from Solactive AG's website: Solactive.com. The foregoing website is not incorporated in, or part of, this underlying supplement.

### Index Calculation

The level of the Index is calculated on each Calculation Day based on the performance of the Base Index. Specifically, the Index level will be determined by multiplying the Index level as of the Trading Day immediately preceding the Calculation Day by a performance multiplier. The performance multiplier is calculated in several steps. First, the Exposure (as defined and determined as described below) is multiplied by the change in the level of the Base Index since the Trading Day immediately preceding the Calculation Day, net of the Interest Component (collectively, the "Performance Component"). The Interest Component is equal to the USD 3-month LIBOR rate as of the Trading Day immediately preceding the Calculation Day multiplied by the applicable day count fraction, which is determined based on the number of calendar days since said Trading Day divided by 360. The change in the level of the Base Index is calculated by subtracting one (in order to reflect only the percentage increase or decrease) from the quotient of the closing level of the Base Index on such Calculation Day divided by its closing level on the Trading Day immediately preceding the Calculation Day. Next, the Index Fee is calculated by multiplying the fee rate of 0.85% per annum by the day count fraction. The performance multiplier is equal to the result of one plus the Performance Component minus the Index Fee. One is added to the Performance Component net of the Index Fee in order to retain the prior level of the Index. This calculation, expressed as a formula:

$$\mathrm{IL_t} = \mathrm{IL_r} \times \left(1 + \mathrm{Exp_r} \times \left(\frac{\mathrm{BIL_t}}{\mathrm{BIL_r}} - 1 - \mathrm{r_r} \times \frac{\mathrm{DC_{r,t}}}{360}\right) - \mathrm{Fee} \times \frac{\mathrm{DC_{r,t}}}{360}\right)$$

Where:

| | |
|---|---|
| $\mathrm{IL_t}$ | = the closing level of the Index in respect of Calculation Day t |
| $\mathrm{IL_r}$ | = the closing level of the Index in respect of the Trading Day immediately preceding Calculation Day t |
| $\mathrm{BIL_t}$ | = the closing level of the Base Index in respect of Calculation Day t |
| $\mathrm{BIL_r}$ | = the closing level of the Base Index in respect of the Trading Day immediately preceding Calculation Day t |
| $\mathrm{r_r}$ | = the USD 3-Month Libor Rate in respect of the Trading Day immediately preceding Calculation Day t |
| $\mathrm{DC_{r,t}}$ | = the number of Calendar Days from (but excluding) the Trading Day immediately preceding Calculation Day t to (and including) Calculation Day t; |
| $\mathrm{Fee}$ | = 0.85% (per annum) |

$\text{Exp}_r$ = the Exposure in respect of the Trading Day immediately preceding Calculation Day t (calculated as described below)

Volatility Control

The Index includes a volatility control mechanism that seeks to maintain the volatility of the Index at or near the Target Volatility. The Index regulates its exposure to the Base Index (the "Exposure") on each Calculation Day between 0% (no exposure to the Base Index) and 150% based on two measures of realized volatility of the Base Index. The realized volatility of the base index is calculated based on the prior one month (21 Calculation Days) and prior three month time periods (63 Calculation Days) based on the below formula. The Target Volatility is then divided by the greater of these two volatility measures. If the resulting amount is less than 150%, this amount becomes the Exposure for the applicable Calculation Day. Otherwise, the Exposure will equal the maximum exposure of 150%. Expressed as a formula:

$$\text{Exp}_r = \min\left(\text{Max Exposure}, \frac{\text{Target Volatility}}{\text{RV}_{r-1}}\right)$$

Where:

$\text{Exp}_r$ = the Exposure in respect of the Trading Day immediately preceding Calculation Day t

Max Exposure = 150%

Target Volatility = 6%

$RV_{(r-1)}$ = the realized volatility in respect to of the Calculation Day immediately preceding the Trading Day immediately preceding Calculation Day t. The realized volatility with respect to each Calculation Day shall be calculated in accordance with the following formula:

$$\text{RV}_t = \max\left(\sqrt{\frac{252}{21} * \sum_{i=0}^{20}\left(\ln\left(\frac{\text{BIL}_{t-i}}{\text{BIL}_{t-i-1}}\right)\right)^2}, \sqrt{\frac{252}{63} * \sum_{i=0}^{62}\left(\ln\left(\frac{\text{BIL}_{t-i}}{\text{BIL}_{t-i-1}}\right)\right)^2}\right)$$

Where:

$\text{RV}_t$ = the realized volatility in respect of Calculation Day t;

$\text{BIL}_{t-i}$ = the closing level of the Base Index in respect of the Calculation Day falling i Calculation Days prior to Calculation Day t;

$\text{BIL}_{t-i-1}$ = the closing level of the Base Index in respect of the Calculation Day falling i+1 Calculation Days prior to Calculation Day t.

**The Base Index**

The Base Index is a total return index which provides exposure to a portfolio of U.S. large- and mid-cap equity securities chosen from the constituents of the Solactive US Large & Mid Cap Index based on artificial intelligence techniques. The Index is owned by EquBot Inc. and administered, calculated and published by Solactive AG. The Base Index follows a rules-based strategy which selects and weights the underlying constituents based on AI Scores (as defined below), subject to a weighting cap of 7.50% and the allocation constraints described in greater detail below, to calculate the level of the Base Index.

The Base Index level is calculated on each Calculation Day from 9:00 a.m. to 10:50 p.m. (CET) and published under the Bloomberg symbol "AIPEXTR <Index>". The Index was launched on November 19, 2019 and is calculated in U.S. dollars based on an initial base value of 1,000 as of January 30, 2004.

Constituent Selection

The equity constituents underlying the Base Index are selected and re-weighted monthly based on a methodology developed by Equbot Inc. Adjustments will be made starting on the last Calculation Day of each month (the "Adjustment Day") and be implemented over a 5 Trading Day Period running from and including the Adjustment Day through and including the fourth immediately following Trading Day (the "Adjustment Period"). Any Adjustments will be determined four Calculation Days prior to the scheduled Adjustment Date (the "Selection Day"). All adjustments will be made based on three scores for each potential equity constituents, the AI Financial Score, the AI Management Score and the AI News Score (each, an "AI Score"), computed as of the applicable Selection Day. If EquBot Inc. is no longer able to compute or communicate the selection of the equity constituents in accordance with the below, the Base Index will be composed of a single constituent, the SPDR® S&P 500® ETF.

*The AI Scores*

The determination of the AI Scores involves both EquBot proprietary technology and IBM Watson®. Each of the AI scores are based on signals collected since 1999, where available, and natural language processing with IBM Watson® is used to extract the relevant signals from sources. Data normalization and other techniques are applied to overcome missing and erroneous data issues. The relevant sources vary for each AI Score. AI Financial scores are sourced from financial statement date, forecasted financial data, and trading data. AI Management scores are sourced from financial statement data and company specific news articles, while AI News Scores are sourced from news articles and social media posts. Additional information regarding the signals for each AI score is available in the Base Index methodology.

For each AI Score, the signals in respect of each potential equity constituent are inserted into a deep learning model which is specific to each share. These models then generate a projected one-month future price. The raw AI scores for each potential equity constituent are then normalized in accordance with the following formula:

$$AI\ Score_{i,s} = \frac{N_{i,s} - N_{min,s}}{N_{max,s} - N_{min,s}} \times 10$$

Where:

$AI\ Score_{i,s}$ = the AI Score for each potential equity constituent *i* as of Selection Day *s*;

$N_{i,s}$ = future price of share *i*, expressed as a percentage of its current price, as estimated on Selection Day *s* by the model related to the relevant AI Score;

$N_{min,s}$ = the theoretical minimum value of $N_{i,s}$ in respect of such Selection Day across all potential equity constituents, assuming the $N_{i,s}$ in respect of such Selection Day are normally distributed;

$N_{max,s}$ = the theoretical maximum value of $N_{i,s}$ in respect of such Selection Day across all potential equity constituents, assuming the $N_{i,s}$ in respect of such Selection Day are normally distributed.

Once the raw AI Scores for each potential equity constituent are normalized, the three AI Scores are aggregated (the "Aggregated AI Score"). Each potential equity constituent's Aggregated AI Score is equal to the product of its AI Financial Score, AI Management Score and AI News Score. Then, the Aggregated AI Scores are used to create a normal distribution, and the z-score of each potential equity constituent's Aggregated AI Score is determined (with respect to each potential equity constituent, its "Opportunity Value"). Another algorithm is then employed to select the equity constituents from the potential equity constituents and assign weights to the selected equity constituents in order to form the portfolio with the highest Opportunity Value, subject to the allocation constraints described below.

*Allocation Constraints*

After equity constituents and their corresponding weights will be subject to two allocation limits. First, any equity constituent with a market capitalization as of the applicable Selection Day of less than USD 2 billion shall be excluded from the Base Index. Second, the weight of each equity constituent will be subject to a cap that is equal to the lowest of 7.50%, a threshold based on the one month average daily trading volume of such equity constituent on all exchanges, and a threshold based on the one month average daily trading volume of such equity constituent on its primary exchange (or if such amount is not available based on 10% of its average daily trading volume on all exchanges). Each of the average daily trading volume thresholds includes a multiplier by which the raw one month average is multiplied. In the case of the all exchange threshold, the multiplier is equal to the product of (i) the quotient of one divided by 2.7 billion, (ii) 15%, and 3. In the case of the primary exchange threshold, the multiplier is equal to the product of (i) the quotient of one divided by 2.7 billion, (ii) 50%, and 3. The cap, expressed as a formula:

$$Cap_{i,s} = \mathrm{Min}\left(Cap, \alpha \times ADVTC_{i,s}, \beta \times ADVTP_{i,s}\right)$$

Where:

$Cap$ = 7.50%;

$\alpha$ = [1/2,700,000,000 * 15% * 3];

$\beta$ = [1/2,700,000,000 * 50% * 3];

$ADVTC_{i,s}$ = the average over the 20 Trading Days period ending on Selection Day *s* of the daily traded volume across all exchanges on which Index Component *i* is listed;

$ADVTP_{i,s}$ = the average over the 20 Trading Days period ending on Selection Day *s* of the daily traded volume on the primary exchange on which Index Component *i* is listed on the close or, if such data is not available, the product of 10% multiplied by $ADVTC_{i,s}$.

Any excess weight that results from implementing these constraints will be allocated to the iShares® 1-3 Year Treasury Bond ETF.

*Adjustment Period Calculations*

After the new composition of the Base Index is determined on the applicable Selection Day, the Base Index is adjusted during the corresponding Adjustment Period. An equity constituent's weight in the Base Index on any Trading Day will be referred to as its "Target Weight" with respect to such Trading Day. On any Trading Day that does not fall during an Adjustment Period, the Target Weight of a share in the Base Index will be equal to its weight on the preceding Selection Day. During the 5 Trading Days during an Adjustment Period, the Target Weight will adjust, based on an equal adjustment on each such Trading Day, from its weight as set during the prior Adjustment Period to its newly selected weight. This adjustment, expressed as a formula:

$$w_{i,r} = w_{i,r_0} + \frac{m \times \left(w_{i,s} - w_{i,r_0}\right)}{5}$$

Where:

$w_{i,r}$ = the Target Weight of equity constituent *i* in respect of such Trading Day;

$w_{i,r_0}$ = the Target Weight of equity constituent *i* in respect of the Trading Day immediately preceding such Adjustment Period;

$m$ = (a) if such Trading Day is the first Trading Day of such Adjustment Period, 1, (b) if such Trading Day is the second Trading Day of such Adjustment Period, 2 or (c) if such Trading Day is the third Trading Day of

such Adjustment Period, 3 or (d) if such Trading Day is the fourth Trading Day of such Adjustment Period, 4 or (e) if such Trading Day is the fifth Trading Day of such Adjustment Period, 5;

$w_{i,s}$ = the weight of equity constituent *i* in respect of the preceding Selection Day.

Base Index Calculation

The level of the Base Index will be calculated on each Calculation Day based on the number of shares of each equity constituent included in the Base Index on such Calculation Day (with respect to each equity constituent, the "Fraction of Shares") and the published price of each equity constituent on the regulated U.S. exchange on which it has its primary listing (with respect to each equity constituent, its "Trading Price"). Solactive AG will determine the Fraction of Shares of each equity constituent by multiplying its Target Weight as of the preceding Calculation Day by a fraction, the numerator of which is the Base Index closing level on such Calculation Day and the denominator of which is the final Trading Price of such equity constituent on such Calculation Day (with respect to each equity constituent, its "Closing Price"). Each equity constituent's contribution to the Base Index level will then be determined by multiplying its Fraction of Shares by its Trading Price. The sum of each equity constituent's contribution will be equal to the level of the Base Index. The calculation of the Base Index closing level, expressed as a formula:

$$Index_t = \sum_{i=1}^{n} x_{i,t} \times p_{i,t}$$

Where:

$Index_t$ = the closing level of the Base Index in respect of Calculation Day *t*;

$n$ = the number of equity constituents included in the Base Index;

$i$ = equity constituent *i*;

$x_{i,t}$ = the Fraction of Shares in respect of equity constituent *i* and Calculation Day *t*;

$p_{i,t}$ = the Closing Price of equity constituent *i* on Calculation Day *t*.

The Base Index is calculated on a total return basis. Any dividends paid on an equity constituent will result in a positive adjustment to the Fraction of Shares for such equity constituent. The Fraction of Shares for all other equity constituents will not be adjusted as a result of such dividend.

**Adjustments to the Index and the Base Index**

Solactive AG may make adjustments to either the Base Index or the Index as a result of corporate actions that are in addition to any of the regular adjustments or rebalances that are described above. Corporate actions which may require adjustments to the Index or the Base Index include cash and/or stock distributions, share splits, reverse splits, capital increases, share repurchases, spin-offs, mergers and acquisitions, delistings, nationalization and insolvency. Such adjustments may affect the inclusion of an equity constituent in the Base Index or affect its weighting within the index. Such adjustments may have a material impact on the price and/or weighting of any equity constituents and, therefore, the overall integrity of the Index and the Base Index. The applicable adjustments are described in further detail in the Solactive Equity Index Methodology which is available from Solactive's website. Solactive reserves the right to deviate from these standard procedures in case of any unusual or complex corporate action or if such deviation is made to preserve the comparability and representativeness of the Index or the Base Index, as applicable, over time. In addition, the calculation of the Index may be affected in the event of the discontinuance of the 3-month USD LIBOR rate, as described in further detail in the Index methodology.

**License Agreement**

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