



September 2018

Disclosure Statement for Daily Mark Methodologies and Assumptions

General

BNP Paribas (“BNPP”) as a registered swap dealer, is required to provide you a daily mid-market mark (the “**Daily Mark**”) for each uncleared swap transaction BNPP enters into with you (each, a “**Transaction**”) and to disclose to you the methodology and assumptions used to prepare the Daily Mark. This document describes the methodologies and assumptions used to prepare the Daily Mark for Transactions. The delivery of the Daily Mark and the disclosure of the methodologies and assumptions described below are for the sole purpose of satisfying BNPP’s obligations to you under 17 CFR § 23.431(d) with respect to Transactions. The delivery of the Daily Mark is not intended to meet BNPP’s obligations to disclose pre-trade mid-market marks under 17 CFR §23.431(a). You should not construe the content of this disclosure statement as legal, financial, tax, accounting or other advice. More generally, unless expressly agreed in writing, we are not providing you with legal, financial, tax, accounting, or other advice in connection with any Transactions, and you should consult your own attorney, financial advisor, tax advisor or accountant as to legal, financial, tax, accounting and related matters concerning any Transactions, including the impact on your business and the requirements and results of conducting Transactions.

NOTHING IN THIS DISCLOSURE STATEMENT AMENDS OR SUPERSEDES THE EXPRESS TERMS OF ANY TRANSACTION BETWEEN YOU AND US OR ANY RELATED GOVERNING DOCUMENTATION.

A Daily Mark will not reflect the actual market price at which an offer would be made to purchase, sell, enter into, exercise, novate, unwind, terminate or settle a Transaction. Rather, it will represent a mathematical approximation of a market value as of a given date derived from proprietary models and methodologies based on certain assumptions regarding past, present and future market conditions or other factors, or from other sources of pricing information (e.g., third party quotes, prices on trading venues, or clearinghouse marks for comparable or interpolated Transactions). In our sole discretion, we may use a variety of models, methodologies and assumptions to prepare our Daily Mark, depending upon the type of Transaction, its characteristics, whether there is a liquid market, and other factors. BNPP reserves the right to alter, replace or vary our models, methodologies, and assumptions from time to time. As provided in 17 CFR § 23.431, BNPP will not disclose any confidential, proprietary information about any model.

Please note that any Daily Mark BNPP provides will exclude profits, hedging costs, or funding cost and may not necessarily:

- be a price at which either BNPP or you would agree to replace or terminate the Transaction;
- include adjustments you may need to make on your books and records or financial statements to account for your profits, credit reserves, hedging, funding, liquidity or other costs in connection with the Transaction;



- unless otherwise expressly agreed, be the basis for margin calls and maintenance of collateral;
- Valuations and other price information on products or transactions (“Valuations”) provided by BNP Paribas are indicative and for information purposes only, and may differ from valuations provided by BNP Paribas for other purposes, such as valuations in collateral statements. Any indicative Valuations are confidential, and must be treated by you as such.
- be the value of the Transaction that is marked on our books and records; and
- agree with the pre-trade mark provided prior to or at time of execution.

We make no representations or warranties that the Daily Mark is suitable for complying with any financial or tax reporting obligation, determining net asset value, computing any tax liability or any other purpose, matters which you should discuss with your own financial, legal, tax, accounting and other professional advisors and, except as otherwise agreed, we disclaim any liability for any such use or reliance thereon, whether losses or damages are direct, indirect, incidental or consequential, even if we are advised of their possibility. We make no representations or warranties to you that the Daily Mark is the best prices available in the marketplace. You may wish to seek representative quotations from other participants in the relevant market to compare prices or to determine the intrinsic or current market value of a particular Transaction.

You should also read this document together with the confirmation and/or other formal documentation setting forth the terms of each Transaction we have entered into with you. The Daily Mark is prepared for each Transaction based on the specific terms of that Transaction, with assumed amounts or values for currently unknown variables determined pursuant to the methodologies described below.

For many types of Transactions, the Daily Mark is a theoretical calculation of the net present value of future payments and deliveries under the Transaction. For future payments or deliveries the amounts or values of which are currently known, BNPP uses the actual amounts or values of such payments or deliveries in calculating the Daily Mark. For future payments or deliveries the amounts or values of which are not currently known, or are not currently known in the relevant currency, or that are not certain to be required to be made, BNPP calculates assumed amounts or values according to the methodologies described below. These methodologies vary by Transaction type and generally include:

1. Forward Price Method

Calculating a forward price, level, rate or value of each relevant Underlier (as hereinafter defined) based on the current market price, level or value of the Underlier and an appropriate rate curve¹. “Underlier” means any rate (including interest and foreign exchange rates), currency, commodity, security, instrument of indebtedness, index, quantitative measure, occurrence or nonoccurrence of an event, or other financial or economic interest, or property of any kind, or any interest therein or based on the value Disclosure Statement for Daily Mark Methodologies and Assumptions



thereof, in or by reference to which any payment or delivery under a Transaction is to be made or determined. For a Foreign Exchange Transaction, the relevant forward exchange rate will be calculated based on the current exchange rate and an appropriate rate curve for each of the Underliers.

¹The forward rate for a floating interest rate is based solely on an appropriate rate curve, from which a forward curve is derived (except with respect to Treasury Lock Swaps as described below).



2. Proprietary Model Method

Estimating future payments or deliveries under the Transaction based on a proprietary model, which may be based on, or derived from, methodologies such as the Black-Scholes option pricing model, a Monte Carlo simulation, a SABR volatility model or other multi-factor methodologies, which in each case may be subject to proprietary modifications by BNPP (generally, the “**Proprietary Model Method**”).

- a. For Transactions that have option-related elements, including swaptions and Transactions with a cap, collar, floor, knock-in, knock-out or range accrual feature, the model may incorporate, among other things, observable market inputs such as (A) the current market price, level, rate or value of each applicable Underlier (and where the Underlier is a swap, the factors that are relevant to the calculation of the Daily Mark for a Transaction of that type, as described below), (B) an implied or historical volatility of each applicable Underlier derived from the observed price of market-traded instruments (given the application of an appropriate model and certain assumptions about the other inputs to that model and subject to the application of an interpolation methodology) and (C) an implied or historical correlation among Underliers, between each applicable Underlier and another relevant price, level or value or among the volatilities of any of the foregoing derived from the observed price of market-traded instruments (given the application of an appropriate model and certain assumptions about the other inputs to that model and subject to the application of an interpolation methodology). For certain Transactions described below, although a methodology other than Proprietary Model Method is specified as the applicable methodology for calculating the Daily Mark, a Proprietary Model Method may be applied if the Transaction contains an option-related element.
- b. For certain Transactions, BNPP assumes that the future price, level, rate or value of each applicable Underlier will be equal to the price, level, rate or value that is implied in the observed price of market-traded instruments given the application of an appropriate model and certain assumptions about the other inputs to that model (the “**Implied Value Method**”). Where the exercise prices and maturities of the relevant instruments do not match the exercise price of the Transaction or the date of the applicable future payment or delivery, BNPP will apply an interpolation methodology.
- c. For certain Credit Transactions, BNPP will calculate a probability-weighted amount or value for unknown future payments or deliveries by estimating (A) the likelihood that the future payment or delivery will be required to be made based on the probability of default implied in the market price of comparable swaps on the applicable index² (given the assumption about recovery described in clause (B)) and (B) the recovery amount upon a default based on the average of the recovery rates for each Reference Entity underlying the applicable index, as estimated by BNPP (the “**CDS Method**”).

² Each reference to an “index” of securities in this document means any index or basket of securities that is not a “narrow-based security index” as defined under the Securities Exchange Act of 1934, as amended, and each reference to an “index” of loans in this document means any index or basket of two or more loans.



In the calculation of the Daily Mark, the assumed future payment amounts or delivery values, along with future payment amounts and delivery values that are known with certainty, are discounted to their present value using discount rates derived from a proprietary discount curve constructed by BNPP (unless otherwise indicated). The discount curve is constructed based on (i) interest rates published for specified periods by information vendors, (ii) implied interest rates derived from the published settlement prices of futures or other market-traded instruments and (iii) the mean of bid and offer quotes for interest rate swaps (or cross-currency basis swaps) available in the market for available maturities, in each case subject to adjustment and interpolation by BNPP. The interest rates underlying the BNPP proprietary discount curve will be based on the Overnight Indexed Swap rate (or a comparable rate in an applicable non-U.S. currency), and foreign exchange swaps/forwards or cross currency swaps (in case of foreign currency collateral). For some Transactions, the BNPP proprietary discount curve may reference the currency or currencies of eligible collateral and/or the currency of the Transaction. For information about the interest rate(s) underlying the discount curve for a specific Transaction, please contact BNPP at the contact information given below. The rate curves used to determine forward prices under the Forward Price Method are constructed in a manner similar to that in which the discount curve is constructed. For a given Transaction, the rate curve used to determine forward prices may or may not be the same curve as the discount curve used for discounting purposes.³ If the Daily Mark is calculated based on the Proprietary Model Method, the discount curve and/or rate curve may be incorporated into the applicable model.

Certain Transactions that are not primarily foreign exchange Transactions may have a foreign exchange component because the price, level or value of any Underlier in the Transaction may be denominated in a currency other than the settlement currency for the Transaction. For such Transactions (except as otherwise described below), the assumed amount or value for unknown future payments or deliveries will be determined according to the applicable methodology identified below, but adjusted according to a proprietary model that accounts for the uncertainty of the foreign exchange component of the payment based on a number of inputs, which may include the current forward exchange rate for the relevant currencies, a volatility of each applicable Underlier, a volatility of the forward exchange rate for the relevant currencies and a correlation between each applicable Underlier and the forward exchange rate for the relevant currencies. Generally, any forward contracts on a given Underlier that are settled in a denomination other than the market standard denomination may require an additional “convexity” adjustment to the Forward Price Method, which accounts for the volatile co-movement of the Underlier and the (hedge) ratio between the non-standard and standard settlement denominations.

Where BNPP determines that a sufficiently liquid market exists, the Daily Mark may be based on observed market prices for instruments that are comparable to the Transaction rather than on the discounted present value of future payments.

³ In the case of a Foreign Exchange Transaction, for which two rate curves (one for each applicable currency) are used to determine the forward exchange rate, at least one rate curve will differ from the discount curve.



Unless otherwise specified, the Daily Mark provided on a given day will be calculated by BNPP as of the close of business on the prior business day in the BNPP office in which the Transaction is booked (the “**Calculation Date**”).

The methodologies used to calculate the Daily Mark may be based on simplified models that may not reflect all potentially significant factors that could affect a Transaction’s value, such as market risk, liquidity risk and credit risk as well as hedging and other costs. BNPP may use different methodologies or make valuation adjustments when determining prices at which BNPP is willing to trade, enter into, replace or terminate a Transaction, or when valuing its own inventory positions for its books and records. There will likely be a difference, which could be significant, between the Daily Mark for a Transaction and the level at which BNPP, any of its affiliates or any other market participant may agree to value, enter into, replace or terminate the Transaction. Certain features of the methodologies we use to prepare the Daily Mark are proprietary and confidential, and we are not required to disclose such proprietary or confidential information to you. The methodologies described below may not be appropriate for any particular purpose for which you may use the Daily Mark, including your internal financial or accounting determinations.

Methodologies will change over time and, as they do, this document will be updated accordingly. If you have any questions, please contact Regulatory Reform Client Contact at RegReform.Contact@US.BNPParibas.com.



Methodology By Underlier Asset Class

For each Underlier asset class identified below, the following sections describe the methodology and inputs BNPP uses to prepare the Daily Mark. If the applicable methodology is Forward Price Method or Proprietary Model Method (including Implied Value Method and CDS Method): (i) the description below identifies the relevant methodology and the key inputs that BNPP uses (together with the specific terms of the Transaction) to calculate assumed amounts or values for unknown future payments or deliveries under the Transaction, which amounts are discounted to present value as described above unless otherwise indicated; (ii) for any Transaction with two floating legs, one of which is based on a floating interest rate (the “**financing leg**”) and one of which is based on a non-interest rate Underlier, the methodology identified below is the methodology used to calculate assumed amounts or values for future payments or deliveries under the non-financing leg; and (iii) assumed amounts for unknown future payments under the financing leg of any Transaction are determined by calculating the forward rate for the relevant interest rate based on an appropriate rate curve.

1. **Equity**

The methodology for equity products, including but not limited to dividend swaps, is the “Proprietary Model Method” for dividend generation, which is based on the forward level of the underlying and prices of market-traded instruments that depend on dividend levels.

The methodology for equity products that depend on the forward, including but not limited to the equity swap, is the “Forward Price Method,” using interest rate curve modeling (provided by BNP Paribas Fixed Income (“FI”) methodologies), on a repo curve that is calibrated on market prices, and on dividends previously mentioned. (For more information about the FI methodologies, please see below).

The methodology for equity products that depend on the volatility of the underlying is the “Proprietary Model Method,” including various other models:

- The first model is an analytic formulae (e.g., Black-Scholes) that uses parameters based on implicit or historical values.
- The second model is the local volatility model, that uses the Dupire inversion formula to have a diffusion model that will replicate a given set of options prices (mostly implicit prices but otherwise historical).
- The third model is a stochastic volatility model that is calibrated on historical or implicit data, and allows a diffusion of the underlying. Each diffusion is then implemented in a Monte Carlo or Partial Differential Equation (“PDE”) numerical scheme.

For products based on more than one underlying, a correlation will be used, built with a proprietary model and based on historical data, and/or implicit prices when available.



If more than one currency is involved in the product definition, then FX spot and volatility levels and representations based on proprietary models provided by FI are used. (For more information about the FI methodologies, please see below).

All future flows will be discounted based on interest rate data and models provided by FI, collateral information specific to the client, and BNPP's internal funding.

For the purposes of the preceding paragraphs:

The "Forward Price Method" means calculating a forward price, level, rate or value of each relevant Underlier (as hereinafter defined) based on the current market price, level or value of the Underlier and an appropriate rate curve. The forward rate for a floating interest rate is based solely on an appropriate rate curve, from which a forward curve is derived (except with respect to treasury lock swaps).

"Underlier" means any rate (including interest and foreign exchange rates), currency, commodity, security, instrument of indebtedness, index, quantitative measure, occurrence or nonoccurrence of an event, or other financial or economic interest, or property of any kind, or any interest therein or based on the value thereof, in or by reference to which any payment or delivery under a transaction is to be made or determined.

For a foreign exchange transaction, the relevant forward exchange rate will be calculated based on the current exchange rate and an appropriate rate curve for each of the Underliers.

"Proprietary Model Method" means estimating future payments or deliveries under the Transaction based on a proprietary model, which may be based on, or derived from, methodologies such as the Black-Scholes option pricing model, a Sigma Alpha Beta Rho volatility model or other multi-factor or parametric Methodologies and numerical schemes like a Monte Carlo or PDE simulation, which in each case may be subject to proprietary modifications by BNP Paribas.

2. Commodity

General information about commodity forward curves and volatilities:

- For an Underlier that is a commodity futures contract, the most recent settlement price of that commodity futures contract as of the Calculation Date is deemed to be the forward price (except that, for a "constant-maturity" commodity futures contract - such as a base metals transaction on the London Metals Exchange – (respectively for "day-ahead" contract), the forward price is determined by interpolating the futures prices of the equivalent "constant expiry" commodity futures contracts (respectively the forward price can be obtained by proprietary algorithm to create a continuum in the maturities)).



- For precious metals, the forward price is determined using the spot price, the lease rate and the underlying discount curve.
 - For an Underlier that is the spot price of a physical commodity, the forward price is determined based on over-the-counter swap market observations or based on another commodity using the “differential contracts” traded between commodities.
 - For any Transaction involving optionality, BNPP constructs an “implied volatility surface” representing the implied volatility of the relevant Underlier given a specific option expiry and a specific strike, observed as of the Calculation Date. The model also derives the “forward volatility” (i.e., implied volatility observed as of a future date, which is necessary for pricing certain options). The model is calibrated based on observations of market-traded option products. Different models can be used to model different underliers, their consistency being ensured by the fact that they are all calibrated to observable market prices.
 - For commodity indices, the implied volatility surface can either be calibrated to observable options or be calculated using underlying futures implied volatility surfaces and the correlation between them.
 - If more than one currency is involved in the product definition, then FX spot and FX volatility issues, based on proprietary models provided by BNPP Fixed Income, are used. All future flows will be discounted based on interest rate data and models provided by BNPP Fixed Income, collateral information specific to the client, and BNPP funding.
- a. *Swap or Forward Referencing Physical Commodity or Commodity Futures Contract*
The Daily Mark is calculated based on the Forward Price Method, subject to the specific descriptions of the determination of forward prices for commodity Underliers set forth above.
- b. *Swap Referencing Commodity Index*
The Daily Mark is calculated based on the Forward Price Method. The forward level is based on the most recent closing level of each applicable Underlier as of the Calculation Date and an appropriate rate curve, if applicable. The Daily Mark may or may not be discounted to present value based on an appropriate discount curve.

The commodity reference price for a commodity index generally includes price indexes compiled and published by market data providers and prices used to settle exchange-traded or cleared futures or other contracts related to an Underlier. Prices of exchange-traded contracts may be affected by the method used for determining the official settlement price, including discretionary determinations of an exchange or clearinghouse settlement committee (on which we or an affiliate may participate), and by market disruption events such as failure of a price source to publish a price or discontinuance of the price source, inability of the calculation agent to obtain quotations from the requisite number of reference dealers or changes in the method for determining a commodity reference price or in the composition of an Underlier or related instruments. Commodity Transactions with more than one Underlier, including for example basket transactions, disruption fallbacks may result in the use of different pricing dates for different Underliers.



- c. *European or Asian Option Referencing Physical Commodity, Commodity Futures Contract, Commodity Index or Commodity Swap (Swaption)*

The Daily Mark is calculated based on the Proprietary Model Method. The model is based on an option pricing model that uses as inputs (in addition to an appropriate rate curve) the most recent spot price, settlement price, closing level or value, as applicable, of each Underlier, forward curves and implied volatilities determined as described above for commodity Underliers.

3. Foreign Exchange

- a. *Foreign Exchange Swap or Foreign Exchange Forward (including non-deliverable)*

The Daily Mark is calculated based on the Forward Price Method. The forward exchange rate is determined based on the most recent exchange rate ("Spot") for the Underliers published by the applicable source as of the Calculation Date and spread between Forward and Spot exchange rate (for short maturities) and cross currency swaps (for long maturities). Suitable interpolation applies to maturities between market quoted tenors. If the Transaction is contingent on the occurrence of a specified transaction, the calculation of the Daily Mark also incorporates a factor reflecting the likelihood that the specified transaction will be consummated, as estimated by BNPP.

- b. *Foreign Exchange Option (including non-deliverable)*

The Daily Mark is calculated based on the Proprietary Model Method. The model is based on an option pricing model that uses as inputs, among other things: the most recent exchange rate for the Underliers published by the applicable source as of the Calculation Date; an implied volatility of the relevant exchange rate derived from recent prices of market-traded instruments referencing the relevant exchange rate as of the Calculation Date; and an appropriate rate curve for each relevant currency.

- c. *Other Swap or Option Referencing Foreign Exchange Index*

The Daily Mark is calculated based on the Proprietary Model Method. The type of model used varies depending on the underlying foreign exchange index and may be based on Monte Carlo simulation, an analytical model or another methodology. The volatility of the underlying index will be an input to the model and will be determined by BNPP based on historical realized volatility and the target volatility of the applicable index.

- d. *Foreign Exchange Variance Swap, Volatility Swap, Variance Dispersion Swap or Correlation Swap*

The Daily Mark is calculated based on the Proprietary Model Method – Implied Value Method. Assumed values for variance, volatility or correlation, as applicable, over the applicable period are calculated based on actual realized variance, volatility or correlation, as applicable, on and prior to the Calculation Date and, for the remainder of the applicable period, an implied variance, implied volatility or implied correlation, as applicable, is derived from recent prices of market-traded instruments referencing each relevant Underlier as of the Calculation Date.



4. Credit

a. Credit Default Swap Referencing Corporate, Sovereign or Municipal Index

The Daily Mark is calculated based on the Proprietary Model Method – CDS Method. For the purpose of determining the implied probability of default (given BNPP's estimated recovery amount), the market prices of the relevant comparable swaps are observed by BNPP on the Calculation Date. For tranches or "nth-to-default" Transactions, the assumed future payment determined by the CDS Method is adjusted pursuant to a proprietary copula model, a probabilistic model that takes into account an estimated correlation of defaults among the underlying Reference Entities, which is determined by BNPP.

b. Credit Default Swaption Referencing Corporate, Sovereign or Municipal Index

The Daily Mark is calculated based on the Proprietary Model Method. The model is a proprietary probabilistic European option pricing model that incorporates an implied volatility derived from recent or historical prices of market-traded instruments referencing each applicable Underlier as of the Calculation Date, as well as the inputs that are relevant for calculating the Daily Mark with respect to each applicable Underlier.

c. Total Return Swap Referencing Corporate, Sovereign or Municipal Bond Index

The Daily Mark is calculated based on the Forward Price Method. The forward level is based on the most recent closing level of each applicable Underlier as of the Calculation Date and an appropriate rate curve.

5. Securitized Products

a. Credit Default Swap Referencing Asset-Backed Security Index or Loan Index

The Daily Mark reflects the mid-point of the most recent closing bid and offer price for comparable swaps, or estimates of the closing bid and offer price for comparable swaps based on observations of the closing bid and offer price for correlated products, in each case as of the Calculation Date. For some Transactions, the publisher of an Underlier may collect indicative mid-market prices from participating dealers and publish a resulting amount, which may also be incorporated into the Daily Mark. There are also adjustments for accrued interest and pending cash flows due to pay-downs and associated payments.

b. Total Return Swap Referencing Asset-Backed Security Index

The Daily Mark is calculated based on the Forward Price Method. The forward level is based on the most recent closing level of each applicable Underlier as of the Calculation Date and an appropriate rate curve.

c. Balance Guaranteed Swap

The Daily Mark is calculated based on the Proprietary Model Method. For purposes of determining an assumed value for the foreign exchange rate (if applicable), a forward exchange rate is calculated in the manner described above under "2. Foreign Exchange – a. Foreign Exchange Swap or Foreign Exchange Forward



(including non-deliverable)”. The relevant model incorporates (in addition to the forward exchange rate and other factors) estimates of amortization rates, the volatility of amortization rates, the volatility of the applicable interest rate on the Underlier and the correlation between amortization rates and such interest rate, in each case as determined by BNPP as of the Calculation Date.

6. Interest Rate

a. Interest Rate Swap or Forward Rate Agreement

The Daily Mark is calculated based on the Forward Price Method. In the case of a cross-currency swap, the Daily Mark reflects a conversion of the net present value of the assumed future payment in the currency of the net present value of the assumed future payment in each currency into the currency of the net present value calculation at the most recent relevant exchange rate as of the Calculation Date. In the case of a mark-to-market cross-currency swap, an assumed value for the floating notional amount is determined based on a forward exchange rate, which is calculated in the manner described above under “2. Foreign Exchange – a. Foreign Exchange Swap or Foreign Exchange Forward (including non-deliverable)”.

b. Interest Rate Swaption, Swaption Straddle, Cap, Floor or Collar

The Daily Mark is calculated based on the Proprietary Model Method. A Black-Scholes interest rate option model is used in conjunction with a SABR-based volatility model calibrated to recent prices of market-traded interest rate options.

c. Inflation Swaps

The Daily Mark is calculated based on an assumed value for the relevant inflation measure in the future, which is determined by reference to an inflation forward curve constructed by BNPP based on recent prices of market-traded instruments referencing the Underlier as of the Calculation Date, with seasonality adjustments based on historical trends.

d. Treasury Lock Swaps

The Daily Mark is calculated based on the Forward Price Method. The relevant forward Treasury rate is calculated based on the most recently available spot price of the relevant Treasury rate and an appropriate rate curve, in each case as of the Calculation Date.

e. Structured Interest Rate Swaps

The Daily Mark is calculated based on the Proprietary Model Method. Assumed future payments are derived from a probabilistic model using a probability distribution implied from recent prices of market-traded interest rate options. In some cases, the model may take into account estimated correlation between interest rates of different terms, which is determined by BNPP.