# Currency Exposure
Methodology

## Introduction

The methodology provides information about the currency exposure of the assets and liabilities in which a portfolio is invested. The currency exposure can be used in conjunction with the knowledge about the investors' currency to assess their currency risk. Currency risk, commonly referred to as exchange-rate risk, arises from the change in the price of one currency in relation to another. Investors who have assets denominated in different currencies, with respect to their own domestic currency, are exposed to fluctuations in exchange rates that can generate unexpected losses (or gains).

## Asset Classes Covered

The methodology of currency exposure covers all asset classes, such as equity, fixed income, real estate, and commodities within the portfolio of a mutual fund, but some specific types of securities, like some types of derivatives, will not be in the scope of the calculation. We provide the full list of security types covered by the currency exposure calculation in Appendix 1. In case the methodology does not cover a specific security, or we do not have sufficient data to define the currency exposure of a security covered by our methodology, we will assign the security to an unidentified currency bucket and will provide the percentage of portfolio not covered by the calculation. Morningstar builds currency exposure using a bottom-up approach so that the currency exposure of each holding is assessed and then the exposure to each currency is aggregated at the portfolio level.

In general, the currency attributed to bonds will be the currency of denomination of the bond, while its weight will be the ratio between the accounting value (fair value) reported by the asset manager and the portfolio net asset value.[1] For stocks, within the context of this methodology,[2] Morningstar uses the currency of denomination of the security. This approach is aligned with fund manager practice and is used in EU Solvency 2 regulation for the calculation of the currency risk of insurers.[3]

Real estate will be given a currency of the country in which the asset is located if the fund company does not report any currency. Commodities will be given a currency of the derivative through which they are traded.

A replicating portfolio approach will be used to model the currency exposure of derivatives. This approach is widely used in rational pricing theory, which assumes the market prices to be arbitrage-free.

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[1] In Morningstar database the fund TNA is sourced through a specific file on a quarterly basis. This methodology uses the total market value of a portfolio, which is the sum of market values of all portfolio holdings sourced from a portfolio file.

[2] Morningstar Risk Models perform a regression analysis between the returns of a specific security in a specific currency against a defined set of exchange rates.

[3] From a pure theoretical perspective, a better approach would have consisted of breaking down the currency exposure of each individual company's revenues and costs. However, this approach is not practical, as this information, along with any hedging layer used to cover the currency risk, is hardly available in the financial reports of quoted companies.

The approach consists in identifying an equivalent portfolio that has the same cash flows of the derivative under investigation through a non-arbitrage argument. A currency exposure will be generated based on the replicating portfolio.

**Portfolio "Look Through"**

Whenever a fund invests in other funds, Morningstar will first attempt to "look through" the underlying holdings of the underlying funds. Morningstar will try to unbundle up to 10 levels of underlying funds in its look-through analysis. Then Morningstar will calculate the currency exposure of each underlying holding and will rescale the weight of the holding held in the underlying fund by multiplying it with a fraction (a rescaling factor) that is equal to the weight of the underlying fund with respect to its parent fund. For example, suppose fund A invests in fund B and that fund B invests in security C. If the currency weight of security C within the portfolio of fund B is 5%, and if the fund B represents the 4% of the portfolio of fund A, then the currency weight of the security C within the portfolio of Fund A will be equal to 5%*4%=0.2%.

**Calculation Timings**

The calculation will be performed upon the collection of the portfolio and published according to an embargo period agreed upon with the portfolio data suppliers.

**Holding-Level Weights and Currency Selection**

For any holding, Morningstar will determine a currency weight and the currency to which the holding is exposed. The weights associated to each holding will depend on the type of holding. In general, each holding can generate long and short exposures to one or multiple currencies. Therefore, for each holding we calculate the following data points:

| | | |
|---|---|---|
| Holding-level long currency exposure | = | The positive amount of money subject to currency risk expressed in portfolio base currency. |
| Holding-level long currency exposure weight | = | The weight respect to the total market value of the portfolio of the holding-level long currency exposure. |
| Holding-level long exposure currency id | = | The ISO 4217 for Currency Code associated to the holding-level long currency exposure. |
| Holding-level short currency exposure | = | The negative amount of money subject to currency risk expressed in portfolio base currency. |
| Holding-level short currency exposure weight | = | The weight respect to the total market value of the portfolio of the holding-level short currency exposure. |
| Holding-level short exposure currency id | = | The ISO 4217 for Currency Code associated to the holding-level short currency exposure. |

Whenever a security will generate long and short exposure to the same currency, we will output only the net weight of the two exposures. In case the net value will be positive, Morningstar will populate the long exposure and the related weight or the short exposure and related weight.

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**Rules to Generate Holding-Level Currency Exposure Weights and to Select the Currency of Exposure**

As stated above, for each holding we can generate up to six data points. The below rules are used to generate currency exposure weights and to identify the currency of exposure.

**Rule 1**

Cash positions, direct equity positions (including private equity as well as preferred stocks), bonds, convertible bonds, commodities, and real estate assets will have their currency exposure weight calculated using the accounting weight of the holding. A comprehensive list of security types following this rule are listed in Appendix 1. The currency in which the holding is denominated will be chosen as the exposure currency of the holding.

If the accounting value is positive, then there is a long exposure weight to the currency of denomination of the holding. If the accounting value is negative, there is a short exposure weight to the currency of denomination of the holding.

Based on that, the Currency Exposure of the holding i is defined by the below equation:

[1]
$$Currency\ Exposure\ Weight_i = Market\ Value_i / Total\ Market\ Value$$

| | | |
|---|---|---|
| $Market\ Value_i$ | = | It is the reported accounting value of holding i expressed in portfolio base currency. If the accounting value will be positive, then there will be a long currency exposure or else a short currency exposure. |
| $Total\ Market\ Value$ | = | It is the sum of all accounting values of all holdings in the portfolio provided by the asset manager. |

**Rule 2**

The second rule is applied to noncurrency derivatives such as, but not limited to: forward, futures, options on equity and fixed-income instruments as well as interest-rate swaps. It generates the currency exposure using the accounting weight of the derivative while the currency of exposure is the currency of the underlying asset, if available, otherwise the settlement currency of the derivative is used. The selection of the currency is the only difference between Rule 1 and Rule 2.

The reason why the accounting value is used rather than notional value for noncurrency derivatives can be explained through a replicating portfolio approach. Derivatives are a leveraged instrument that allows exposure to a specific asset without having the cash outflow of a direct investment in the asset. Therefore, an investor in a financial derivative implicitly borrows cash from the counterparty to invest in

the underlying asset of the derivative. A replicating portfolio can be built consisting of the underlying asset of the derivative and a liability representing the borrowed amount of cash used to buy the underlying asset. The two positions in the replicating portfolio are denominated in the same currency and offset each other, except for any unsettled profit and loss. The profit and loss may be interpreted as the difference between the present value of the underlying asset and the present value of the liability used to finance the purchase of the underlying asset.

Occasionally, the currency in which a derivative is settled differs from the currency of the underlying instrument. In this scenario, Morningstar considers any unsettled profit and loss as exposed to the currency of denomination of the underlying of the derivative, as they derive from changes in prices of the underlying holding. On the other hand, any settled profit and loss that is credited or debited in the margin account associated to the derivative will be treated as a cash deposit following the currency of denomination of the margin account associated to the derivative.

For illustration purposes, we discuss below the cases concerning some of the most used derivatives in the financial markets.

**Interest-Rate Swap**
Using a replicating portfolio method, an interest-rate swap can be modeled as a combination of a fixed-interest rate bond and a floating interest-rate bond, or as a combination of two different floating rate bonds with different reference rates. Under such models, the value of the interest-rate swap is the difference between the present values of the two underlying instruments. As the underlying instruments are denominated in the same currency, the overall exposure to the underlying currency is the value of the swap, which corresponds to the unrealized profit and loss.

**Interest-Rate Forwards and Futures**
An interest-rate forward at its inception can be modeled as a combination of a long position on a fixed-rate instrument covering the period between the inception of the derivative up to the maturity of the underlying forward rate for an amount equal to the notional of the derivative and a short position on a fixed-rate instrument covering the period between the inception of the derivative and the maturity of the derivative. Based on this modeling, both long and short exposure are denominated in the same currency. The market-forward rate will vary from the agreed forward rate, generating a profit and loss. The reported profit and loss will therefore represent the exposure to the underlying currency of the contract. Interest-rate futures can be modeled as interest-rate forwards with the difference that profits and loss are settled on a daily basis though the mark to market mechanisms. When the portfolio data is reported to Morningstar, if the future has been already marked to market, the accounting value will be zero. The daily profit and loss liquidated into the margin account will be treated as a cash account from the currency exposure perspective. If the future has not yet been settled, its accounting value will be equal to the daily unsettled profit and loss. We will use this value for the currency exposure of the future using the currency of the underlying interest rate.

**Treasury and Equity Futures**

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A long Treasury future or equity future position can be replicated through a portfolio consisting of a negative cash position, a liability, and the underlying instrument. The cash implicitly borrowed through the future is used to finance the long exposure of the underlying Treasury or equity security and therefore is denominated in the currency of the asset purchased in the replicating portfolio.[4] Profit and loss accumulated on the future are settled on a daily basis through a mark to market mechanism. Whenever the future is reported before the daily profit and loss settlement, the future will have a net exposure to the currency of denomination of the underlying security equal to the daily profit and loss of the derivative, or else the exposure will be zero.

**Equity Options**

It can be demonstrated that the value of a European equity option (its accounting value or premium) can be decomposed in two parts that represent a contingent asset and a contingent liability.[5] The contingent asset is the value of the underlying asset contingent conditional to the event that the option will finish in the money, while the contingent liability is the payment of the strike price conditional to the event that the option will finish in the money. The currency of the contingent asset and the contingent liabilities are the same as the currency of the underlying, and therefore are offsetting each other, except for the value of the option, which is the premium and corresponds to the accounting value of an option.

**Rules to Generate Holding-Level Currency Exposure Weights for Currency Derivatives**

Currency derivatives are instruments used to hedge a position or an entire portfolio. We will first present the concept of currency hedging:

**Currency Hedging**

In its essence, currency hedging is a technique to neutralize the currency exposure of an asset or a liability. To achieve that purpose a fund manager will need to create two additional positions:

1) A liability of the same size, currency of denomination, and maturity of the asset to hedge; and
2) An asset of the same size and maturity of the asset to hedge but denominated in the currency to which the fund manager wants to be exposed. The asset size will be determined based on the spot exchange rate between the currency of the asset hedged and the target currency so that when expressed in portfolio base currency, the value of the new asset will be equal to the value of the asset hedged. The liability neutralizes the currency exposure of the original asset while the new asset creates the desired currency exposure.

A currency hedging can be executed in different ways. The main strategy used by financial managers consist in financing the asset-generating future cash flows in foreign currency with borrowing cash in the same foreign currency so that the maturity and the size of the future cash flows are matched. Through this approach, the financial manager matches the asset in foreign currency with a liability in foreign currency, removing the currency risk in foreign investment. Such technique is not used by fund

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[4] https://www.cmegroup.com/trading/equity-index/intl-investing-currency-risk-in-equity-portfolios.html#

[5] Nielsen, Lars Tyge. October 1992. "Understanding N(d1) and N(d2): Risk-Adjusted Probabilities in the Black-Scholes Model." INSEAD
    https://financetrainingcourse.com/education/wp-content/uploads/2011/03/Understanding.pdf

managers because they need more flexible and liquid securities offered by the market of currency derivatives.

Among the currency derivatives, currency forwards are by far the most common instruments in mutual fund portfolios, followed by currency swap, currency futures, and currency options. Morningstar calculates currency exposure for currency forward, swap, and future but not for currency options.

**Rule 3**

The third rule is applicable to currency swaps.[6] Currency swaps can be modeled as a combination of a long bond exposure and short bond exposure denominated in different currencies. Typically, the swap notional is exchanged at maturity. Therefore, the value of the swap may be modeled as the present value of the two future cash flows of the modeled underlying bonds. The net value between a positive and negative cash flow's present value is what generates a profit and loss that is recorded as accounting value contributing to the fund TNA.

Therefore, it is possible to model the value of the swap with the below equation:

[2][7]

$$Swap\ Value^7 = fx_{inf} * \sum_{i=1}^{n} Disc_i^{inflow} * Inflow_i - fx_{outf} * \sum_{j=1}^{n} Disc_j^{outflow} * Outflow_j$$
$$= accounting\ value$$

Where:

| | |
|---|---|
| $Inflow_i$ | Is the cash inflow i of the swap |
| $Disc_i^{inflow}$ | Is the discount factor for the cash inflow i |
| $Outflow_j$ | Is the cash outflow j of the swap |
| $Disc_i^{outflow}$ | Is the discount factor for cash outflow j |
| $fx_{inf}$ | Is the spot exchange rate between the inflows currency and the portfolio base currency |
| $fx_{outf}$ | Is the spot exchange rate between the outflows currency and the portfolio base currency |

The first terms on the right of the equation is the present value of the cash receipts connected to the long leg of the swap expressed in the portfolio base currency; while the second term on the right side of the equation is the present value of the cash receipts connected to the short leg of the swap expressed in portfolio base currency.

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[6] Foreign-exchange swaps, known as FX swaps, which exchange one currency for another over a given period of time, are treated as cross-currency swaps.

[7] Tugwell, Jem. 2017. "Portfolio Representations," page 298 (Harriman House). The formula has been adjusted to consider the fact that the cash flows are discounted using different rates depending on the currency and then converted in the portfolio base currency using spot exchange rates.

Morningstar approximates the present values of the long and short legs of the swap using data reported by asset managers in the full holding portfolio template through the following equation:

[3]
$$Long\ Currency\ Exposure_i = NotionalBC_i + accounting\ value_i \approx \sum_{j=1}^{n} Disc_j^{inflow} Inflow_j$$

[4]
$$Short\ Currency\ Exposure_i = NotionalBC_i \approx \sum_{j=1}^{n} Disc_j^{outflow} Outflow_j$$

Where:

| | | |
|---|---|---|
| $NotionalBC_i$ | = | The notional of the currency swap expressed in portfolio base currency using the spot exchange rates. |
| $accounting\ value_i$ | = | Is the value of the swap reported by the asset manager that contributes to the fund TNA? |

The currency to which the swap is positively exposed will be the currency of denomination of inflows, while the currency to which the swap will be negatively exposed will be the currency of denomination of the outflows.

Based on the above exposure values, it is possible to calculate the exposure weights:

[5]
$$Long\ Currency\ Exposure\ Weight = Long\ Currency\ Exposure_i / Total\ Market\ Value$$

[6]
$$Short\ Currency\ Exposure\ Weight_i = Short\ Currency\ Exposure_i / Total\ Market\ Value$$

Where:

| | | |
|---|---|---|
| $Total\ Market\ Value$ | = | Is the sum of all accounting values of all holdings in the portfolio provided by asset manager. |

In this approximation, all the profits and losses due to changes in interest rates of the currency involved in the contract are assigned to the long leg of the swap.

This approximation is substantially using the notional exposure as proxy of currency exposure connected to currency swap, which is widely accepted by the industry.[8] We believe that this approximation is also a good compromise between complexity and quality of the result due to the following reasons:

1) It is a simple calculation.

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[8] https://www.iosco.org/library/pubdocs/pdf/IOSCOPD645.pdf

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2) It does not require the knowledge of interest-rate curves of the currencies involved in the contract as well as the knowledge of the schedule of cash payments and receipts. Therefore, the currency exposure will not be impacted by the absence of the above-mentioned information, nor will it be required to use model assumptions when this data is not available.

3) This approximation does not generate possible discrepancies with the data reported by the asset managers and the one calculated by Morningstar due to different model assumptions while reconciling the currency exposure, the economic exposure, and the total net asset of the fund.

**Rule 4**

The fourth rule is applied to foreign-exchange forwards and to foreign-exchange futures. The long and the short exposure are based on the reported amount of currency purchased and sold through the derivatives expressed in the portfolio base currency. Morningstar accepts these amounts already converted by the asset manager in the portfolio base currency. The currency conversion will be executed by Morningstar only if the amount of money purchased or sold is not provided in the portfolio base currency.

Based on that, the long and short current exposure will be calculated as follows:

[7]
$$Long\ Currency\ Exposure = \ Amount\ Purchased * Ccy_p/Ccy_{ptf}$$

[8]
$$Short\ Currency\ Exposure = \ Amount\ Sold * Ccy_s/Ccy_{ptf}$$

The currency of denomination of the purchased amount will be the long currency while the currency of denomination of the sold amount will be the short currency.

[9]
$$Long\ Currency\ Exposure\ Weight = \ Long\ Currency\ Exposure/Total\ Market\ Value$$

[10]
$$Short\ Currency\ Exposure\ Weight = \ Short\ Currency\ Exposure/Total\ Market\ Value$$

Where:

| | | |
|---|---|---|
| *Amount purchased* | = | The amount of currency purchased through the future or the forward based on the current price and notional of the contract. |
| *Amount sold* | = | The amount of currency sold through the future or the forward based on the current price and notional of the contract. |
| $Ccy_p/Ccy_{ptf}$ | = | The spot exchange rate between the currency of the long leg of the derivative and the portfolio base currency. |
| $Ccy_s/Ccy_{ptf}$ | = | The spot exchange rate between the currency of the short leg of the derivative and the portfolio base currency. |

In our representation we ignore the discounting factors of the amount sold and the amount purchased. Typically, currency forwards and futures have a very short tenure. In the context of an overall portfolio descriptive analysis, we think that this type of rounding is acceptable.[9]

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[9] For currencies where government rates are very high, this approach may not be ideal. The amount sold and purchased as defined by the contract should be discounted using the interest-rate curves of the currency in questions.

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**Portfolio Currency Exposure**

The above holding-level exposures will be grouped by currency and summed up to generate the portfolio-level currency exposure. The portfolio currency exposure will be calculated as long-only, short-only, or net. In addition, Morningstar will output a version of currency exposure without considering the hedging layer generated by the currency derivatives, as well as a version of currency exposure including the effect of currency derivatives.

The portfolio level data point will be the following:

| | | |
|---|---|---|
| Unhedged long currency exposure | = | The positive weight of a specific currency relative to the total market value of the portfolio excluding all currency derivatives. |
| Unhedged short currency exposure | = | The negative weight of a specific currency relative to the total market value of the portfolio excluding all currency derivatives. |
| Long currency exposure | = | The positive weight of a specific currency relative to the total market value of the portfolio. |
| Short currency exposure | = | The negative weight of a specific currency relative to the total market value of the portfolio. |
| Unhedged net currency exposure | = | The weight respect to the total market value of the portfolio of all the long holding-level currency exposures minus the short holding-level currency exposures of a specific currency excluding all currency derivatives. |
| Net currency exposure | = | The weight respect to the total market value of the portfolio of all the holding-level long minus short currency exposure to a specific currency. |

**Portfolio Net Currency Exposure Representation--With or Without Currency-Hedging Layer**

Some fund managers actively change the currency risk profile of their portfolios with the use of currency derivatives. The net unhedged and hedged currency exposure may be plotted in a bar chart (see Figure 1), which is a graphical view of the currency-hedging activity of the fund manager. In Figure 1, the full red lines represent the overall portfolio exposure to different currencies while the patterned lines represent the currency exposure of the portfolio without the use of currency derivatives. This representation provides an immediate understanding of how the fund manager uses currency derivatives to neutralize currency risk or gain exposure to specific currencies.

This chart could be useful when comparing different fixed-income funds. For example, two fund managers may be both exposed to U.S. dollars, though one fund manager may invest directly in USD-denominated bonds while the other may invest in bonds denominated in other currencies and then hedge out these currencies with the use of derivatives in order to get exposure to USD. The second fund manager may try to profit on interest-rate spreads between different currencies. This chart can also be used to evaluate currency exposure of funds investing in international equity or emerging markets. Some funds are offering protection to local currencies' volatility while others are not.

Figure 1



Net Currency Exposure - Impact of Hedging

■ ccy_exposure_net_with_hdg    ▨ ccy_exposure_net_without_hdg
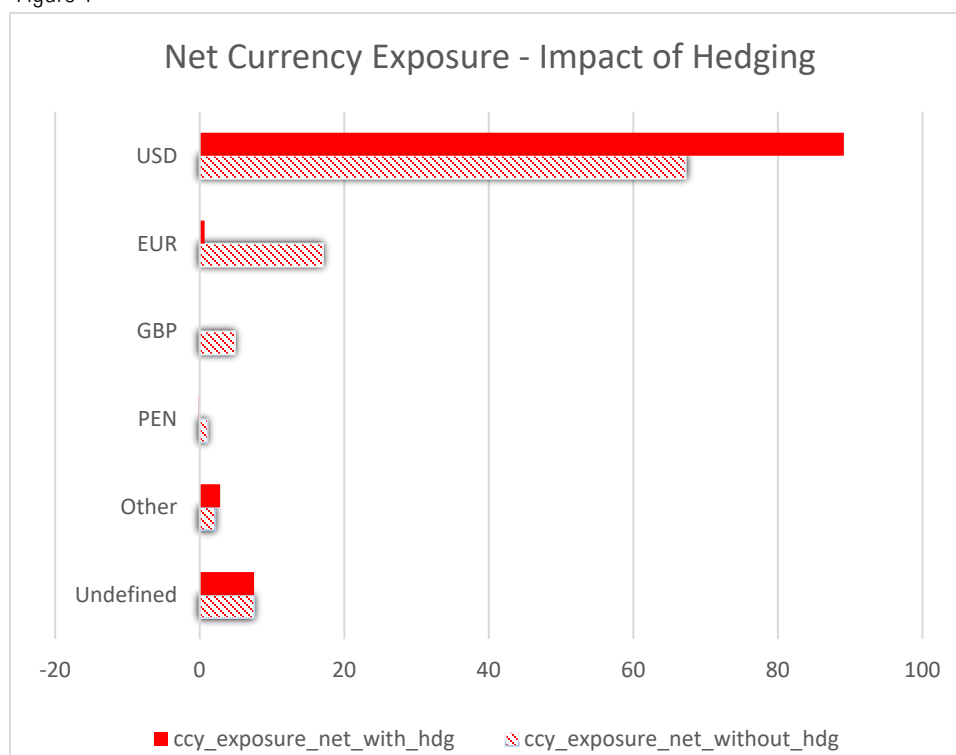
**Portfolio Long and Short Currency Exposure**

A different way to represent the currency exposure is to provide the overall long and short exposure to each currency as represented in Figure 2. In Figure 2, the yellow lines represent the long exposure to a currency while the blue lines represent the short exposure. This type of representation is unpacking the net exposure in its constituents, and it provides information on how the currency exposure is reached as a combination of both long and short positions on each currency.

**Quality Control**

Morningstar evaluates the data sufficiency for each holding within the portfolio. Any holding having sufficient data for currency calculation is flagged as "ready."[10] Morningstar will calculate the currency exposure and currency weight of any holding that is ready for the currency calculation. Morningstar will calculate the portfolio-level calculation if all of the following conditions are met:

1) The sum of absolute weight of "not ready" securities are less than 10% of the portfolio total market value.

2) All currency derivatives are flagged as "ready" and therefore have sufficient and high-quality data.

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[10] Data sufficiency criteria depends on the calculation rules and the type of security.

Morningstar collects portfolio data from multiple sources through different data templates. In order to make sure that the calculation will be qualitatively high, the portfolios that are not collected through an advanced reported template will be included in the calculation scope if, and only if, they do not invest in currency derivatives and if there will not be derivative cash offset positions.

Figure 2
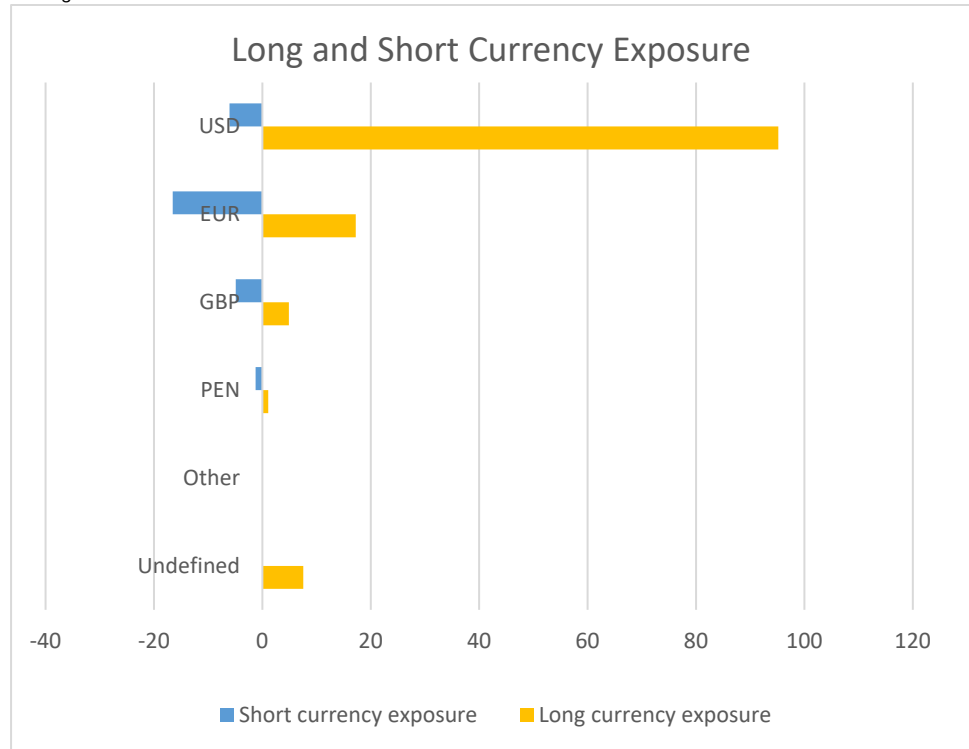
## Appendix 1

Below is the list of Morningstar Detail type ids included in the calculation of currency exposure:

| Description | Detail Holding Type Id | Scope | Applicable Rule |
|---|---|---|---|
| Interest-Rate Swap | SI | In the scope | Rule 1 |
| Muni Bond - Unspecified | 0 | In the scope | Rule 1 |
| Muni Bond - General Obligation | 1 | In the scope | Rule 1 |
| Muni Bond - Revenue | 12 | In the scope | Rule 1 |
| Bond - Corporate Bond | B | In the scope | Rule 1 |
| Bond - Gov't Agency Debt | BD | In the scope | Rule 1 |
| Bond - Gov't Agency Pass-Thru | BG | In the scope | Rule 1 |
| Bond - Non-Agency Residential MBS | BH | In the scope | Rule 1 |
| Bond - Undefined | BQ | In the scope | Rule 1 |
| Bond - Bank Loans | BR | In the scope | Rule 1 |
| Bond - Gov't/Treasury | BT | In the scope | Rule 1 |
| Bond - Units | BU | In the scope | Rule 1 |
| Bond - Asset Backed | BY | In the scope | Rule 1 |
| Bond - Supranational | BZ | In the scope | Rule 1 |
| Bond - Corp Inflation Protected | IP | In the scope | Rule 1 |
| Bond - Commercial MBS | NB | In the scope | Rule 1 |
| Bond - Gov't Agency CMO | NC | In the scope | Rule 1 |
| Bond - Covered Bond | ND | In the scope | Rule 1 |
| Bond - Gov't Agency ARM | NE | In the scope | Rule 1 |
| Bond - Gov't Inflation Protected | TP | In the scope | Rule 1 |
| Muni Bond - Cash | 13 | In the scope | Rule 1 |
| Cash | C | In the scope | Rule 1 |
| Cash - Collateral | CA | In the scope | Rule 1 |
| Cash - CD/Time Deposit | CD | In the scope | Rule 1 |
| Cash - Currency | CH | In the scope | Rule 1 |
| Cash - Commercial Paper | CP | In the scope | Rule 1 |
| Cash - Repurchase Agreement | CR | In the scope | Rule 1 |
| Bond - Convertible | BC | In the scope | Rule 1 |
| Alternatives - Private Equity | AP | In the scope | Rule 1 |
| Alternatives - Real Estate | AR | In the scope | Rule 1 |
| Bond - Warrants/Rights (Call) | BW | In the scope | Rule 1 |
| Bond - Warrants/Rights (Put) | BX | In the scope | Rule 1 |
| Commodity | DD | In the scope | Rule 1 |
| Commodity - Future | DM | In the scope | Rule 1 |
| Property | PP | In the scope | Rule 1 |

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| Description | Detail Holding Type Id | Scope | Applicable Rule |
|---|---|---|---|
| Unidentified Holding | Q | In the scope | Rule 1 |
| Other Assets and Liabilities | QQ | In the scope | Rule 1 |
| Undefined - Warrants/Rights | WR | In the scope | Rule 1 |
| Convertible Preferred | PC | In the scope | Rule 1 |
| Preferred Stock | P | In the scope | Rule 1 |
| Equity | E | In the scope | Rule 1 |
| Equity - Undefined | EQ | In the scope | Rule 1 |
| Equity - REIT | ER | In the scope | Rule 1 |
| Equity - Units | EU | In the scope | Rule 1 |
| Equity - Warrants/Rights (Put) | EV | In the scope | Rule 1 |
| Equity - Warrants/Rights (Call) | EW | In the scope | Rule 1 |
| Bond - Future | DA | In the scope | Rule 2 |
| Interest Rate Future | SJ | In the scope | Rule 2 |
| Interest Rate Forward | SK | In the scope | Rule 2 |
| Bond - Treasury Future | TF | In the scope | Rule 2 |
| Bond - Option (Call) | DB | In the scope | Rule 2 |
| Commodity - Option (Call) | DC | In the scope | Rule 2 |
| Bond - Option (Put) | DE | In the scope | Rule 2 |
| Other - Future | DJ | In the scope | Rule 2 |
| Commodity - Option (Put) | DP | In the scope | Rule 2 |
| Contract For Difference | SF | In the scope | Rule 2 |
| Equity - Future | DG | In the scope | Rule 2 |
| Equity - Option (Call) | DH | In the scope | Rule 2 |
| Equity - Option (Put) | DI | In the scope | Rule 2 |
| Currency - Swap | CS | In the scope | Rule 3 |
| Currency - Future | CL | In the scope | Rule 4 |
| Currency - Forward | CU | In the scope | Rule 4 |
| Cash - Option (Call) | CC | Out of Scope | |
| Currency - Warrants\Rights (Call) | CV | Out of Scope | |
| Cash - Option (Put) | CO | Out of Scope | |
| Currency - Warrants\Rights (Put) | CX | Out of Scope | |
| Mutual Fund - Unspecified | EX | In the scope | Look-through[11] |
| Mutual Fund - Closed End | FC | In the scope | Look-through[11] |
| Mutual Fund - ETF | FE | In the scope | Look-through[11] |
| Mutual Fund - Hedge Fund | FH | In the scope | Look-through[11] |

[11] As explained in paragraph Portfolio, "Look-Through" mutual funds are analyzed on the base of their portfolio constituents. If the portfolio of the fund is not available, then the fund will not be considered ready for the analysis and its weight will be allocated to the bucket of undefined currencies.

| Description | Detail Holding Type Id | Scope | Applicable Rule |
|---|---|---|---|
| Mutual Fund - Open End | FO | In the scope | Look-through[11] |
| Mutual Fund - Separate Account | FS | In the scope | Look-through[11] |
| Mutual Fund - Variable Annuity | FV | In the scope | Look-through[11] |
| Asset Swap[12] | SA | Out of Scope | |
| Credit Default Swap | SR | Out of Scope | |
| Debt Swap | SD | Out of Scope | |
| Equity Index Swap[12] | SQ | Out of Scope | |
| Equity Swap[1212] | SE | Out of Scope | |
| Total Return Swap[12] | ST | Out of Scope | |
| Volatility/Variance Swap | SN | Out of Scope | |
| Cash - Future Offset | CQ | Out of Scope | |
| Mutual Fund - Money Market | FM | Out of Scope | |
| Cash - Option Offset | OO | Out of Scope | |
| Cash - Swap Offset | OS | Out of Scope | |
| Cash - Forward Offset | OT | Out of Scope | |
| Cash - Stable-Value Fund | SV | Out of Scope | |
| Bond Index - Future[13] | BL | Out of Scope | |
| Bond Index - Option (Call)[13] | BO | Out of Scope | |
| Bond Index - Option (Put)[13] | BP | Out of Scope | |
| Equity Index - Option (Call)[13] | EC | Out of Scope | |
| Equity Index - Future[13] | EL | Out of Scope | |
| Equity Index - Option (Put)[13] | EP | Out of Scope | |
| Mutual Fund - CIT | SC | Out of Scope | |
| Alternatives - Farm & Timber Land | AF | Out of Scope | |
| Alternatives - Infrastructure | AI | Out of Scope | |
| Alternatives - Master Investment Trust | AM | Out of Scope | |
| Income Trust | IT | Out of Scope | |

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**Methodology History**

Version: 1.0     31 March 2022          Original publication

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[12] Complex swaps have been set out of the scope of this analysis. They may have baskets of currency forwards as underlying for which we may not have sufficient information.

[13] Derivatives with indexes as underlying are not in the scope for this methodology, as the use of the underlying index holdings may be forbidden by index providers

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