

Stage 2 FX Hedge Model Specification

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1. Objective

This specification outlines the quantitative workflow for building the firm's FX hedge model for a €3,879,310 receivable due in one year. At the current EUR/USD spot rate of 1.16, the exposure is valued at approximately \$4.5 million. Because the firm operates in USD, a depreciation of the euro would reduce the USD value of the incoming cash flow.

This document provides a structured, reproducible plan for analyzing three hedging strategies—forward contract, money market hedge, and EUR put option—and designing the Stage 3 Excel model. The final model will quantify trade-offs in cost, protection, and upside, enabling Treasury leadership to select an optimal hedge.

2. Scope

In-Scope - Modeling FX risk for a known EUR receivable. - Valuation logic for: - Forward hedge (1-year forward at 1.0875 USD/EUR) - Money market hedge using USD and EUR interest rates - EUR put option hedge with strike 1.16 USD/EUR - Scenario analysis for EUR/USD outcomes (1.04–1.28). - Model outputs including tables, charts, and comparative metrics.

Out-of-Scope - Accounting treatment of hedges. - Automated data integrations or live market feeds. - Volatility modeling or dynamic option pricing.

3. Inputs (Known Variables)

Variable	Value	Units	Source
EUR Receivable (FC)	3,879,310	EUR	Business forecast
Spot Rate (S_0)	1.16	USD/EUR	Bloomberg
Forward Rate (F_0, T)	1.0875	USD/EUR	Bloomberg

Variable	Value	Units	Source
USD 1-Year Interest Rate (r_d)	3.42%	Annual	Federal Reserve H.15
EUR 1-Year Interest Rate (r_f)	2.15%	Annual	ECB / Trading Economics
Put Premium	\$0.015	USD per EUR	Market quote
Call Premium	\$0.018	USD per EUR	Market quote
Strike Price (K)	1.16	USD/EUR	Contract terms
Scenario Exchange Rates (S_T)	1.04–1.28	USD/EUR	Analyst-defined

4. Assumptions & Constraints

- Interest rates remain constant over the 1-year horizon.
- No credit constraints, settlement delays, or counterparty risk adjustments.
- Transaction costs are assumed negligible unless added in Stage 3.
- Options are European-style and exercised at maturity.
- All interest rates use the same compounding convention.
- Exposure is fully hedged (no partial hedging).

5. Workflow / Calculation Flow

Step 1 — Define Exposure and Timing

- Confirm receivable amount (EUR 3,879,310) and 1-year maturity.
- Establish USD as functional currency.

Step 2 — Unhedged Scenario

- For each scenario rate S_T , compute:
Unhedged USD Proceeds = $FC \times S_T$
- Use as benchmark for hedge effectiveness.

Step 3 — Forward Hedge

- Lock in rate 1.0875 USD/EUR.
- Compute:
Forward Proceeds = $FC \times \text{Forward Rate}$
- Adjust for any transaction fees.

Step 4 — Money Market Hedge

- Discount EUR receivable using r_f to compute present value:
$$PV_{EUR} = FC / (1 + r_f)$$
- Convert PV_{EUR} to USD at spot S_0 .
- Invest USD at r_d for 1 year:
$$MMH Proceeds = (PV_{EUR} \times S_0) \times (1 + r_d)$$

Step 5 — Option Hedge (EUR Put)

- Record upfront premium cost:
$$\text{Premium} = FC \times \text{Premium Rate}$$
- For each S_T :
 - If $S_T < K \rightarrow \text{Exercise put: Payoff} = (K - S_T) \times FC$
 - If $S_T \geq K \rightarrow \text{No exercise: Payoff} = 0$
- Compute total proceeds:
$$\text{Option Proceeds} = (FC \times S_T) + \text{Payoff} - \text{Premium}$$

Step 6 — Comparative Framework

- Summarize proceeds under each hedge and unhedged.
 - Calculate:
 - Downside protection
 - Opportunity cost vs. spot
 - Hedge cost (premium, lost upside)
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6. Expected Outputs

- **Tables:**
 - Hedge proceeds for forward, money market, and option strategies.
 - Scenario comparison table (1.04–1.28 EUR/USD).
 - **Charts:**
 - Payoff diagrams for each hedge.
 - Sensitivity chart showing USD proceeds across scenarios.
 - **Metrics:**
 - Minimum/maximum proceeds
 - Breakeven levels
 - Range of protection
 - Hedge effectiveness relative to unhedged variance
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7. Sensitivity Plan

- Evaluate performance under EUR/USD values from **1.04 to 1.28** ($\pm 10\%$).
 - For each point, compute proceeds under:
 - Unhedged
 - Forward
 - Money Market
 - Option
 - Visualizations:
 - Line chart comparing proceeds across all strategies.
 - Highlight regions where each hedge dominates.
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8. Limitations & Next Steps

Limitations

- Assumes static interest rates and no transaction costs.
- Does not incorporate FX volatility or stochastic modeling.
- Options pricing does not adjust for implied volatility shifts.

Next Steps (Stage 3)

1. Build Excel model using this specification.
 2. Implement scenario tables and payoff logic.
 3. Produce charts for management presentation.
 4. Prepare final recommendation based on risk tolerance and cost.
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9. Evaluation Criteria

Success will be judged according to the following dimensions:

- **Accuracy:** Logical correctness of hedge valuation steps and consistency with FX theory (interest parity, option payoff logic, forward pricing).
- **Clarity:** Professional communication, organized structure, and ease of understanding for Treasury or CFO-level readers.
- **Reproducibility:** Another analyst should be able to construct the full Excel model directly from this specification without additional clarification.
- **Completeness:** All required components—inputs, assumptions, workflow, outputs, and sensitivity methods—are included and sufficiently detailed.
- **Analytical Rigor:** Correct sequencing of calculations, explicit assumptions, and well-defined comparison metrics.

10. AI Prompt

Example 1:

“Using the specified inputs, calculate 1-year forward hedge proceeds and generate a table comparing hedged vs. unhedged outcomes across all scenario rates.”

Example 2:

“Create a payoff chart for the EUR put option ($K = 1.16$, premium = 0.015) across EUR/USD values 1.04–1.28.”