Open Economy Dynamics, Exchange Rate Movements, and External Shocks

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Executive Summary

The aim of the exercise is to explore the impact of exchange rate arrangements on macroeconomic stability and enterprise risk in the context of international events and crises. The Mundell–Fleming model suggests that, in the presence of high capital mobility and sticky prices, monetary policies are relatively effective under a floating exchange rate, but fiscal policies hold more short-term momentum under a credible fixed exchange rate. Germany is part of a monetary union, however, the euro floats against the US dollar, not Germany sets the euro-area policy interest rate (European Central Bank [ECB], 2026a).

An analysis of the latest consistent German Federal Statistical Office goods-trade series and ECB annual exchange-rate observations indicates that Germany's goods surplus decreased from €175.898 billion in 2021 to €88.088 billion in 2022, but recovered to €242.887 billion by 2024, before dropping to roughly €201.638 billion in 2025. Taking into account an illustrative combined export-demand/import-price shock, the surplus would be reduced to around €86.617 billion in 2025. A separate tour-operator simulation shows that a 70% USD cost hedge will help maintain operating surplus during a depreciation of the euro. The suggested answer combines diversified markets, risk thresholds, multiple layers of treasury control and scenario-based risk management.

Introduction

Disturbances in open economies are transferred in and out via trade, prices, exchange rates and financial flows. An exchange-rate movement affects the prices of competing products and services and the prices of imported services in the local currency for inbound tourism businesses, as well as for internationally sourcing travel agencies. Variations in interest rates abroad may also affect the flows of investment, refinancing rates and the value of foreign-currency debts. These mechanisms are relevant even in the case of good management choices in operation, since these choices are made with the knowledge that external market changes cannot be controlled.

The fourfold objective of the study is to compare stabilization instruments in both fixed and floating exchange rate regimes; to understand the performance of goods trade in Germany in recent years and the impact of the energy shock in 2022; to evaluate an historical currency crash; and to develop an auditable, spreadsheet-based corporate response. The empirical part is based on the annual German goods trade data for 2021-2025 and euro-dollar reference rates. The policy multipliers deliberately used to illustrate risk management, as well as the commercial exposures and/or future shock assumptions, should not be mistaken for historical data. Completing the short-approach theoretical discussion, a long-approach discussion on adjustment and competitiveness is introduced.

Theoretical Framework & Macroeconomic Models

Mundell–Fleming equilibrium and exchange-rate regimes

The Mundell–Fleming model is the extension of the IS–LM model to a small open economy. Goods-market equilibrium (IS) is determined by the combinations of consumption, investment, government spending and net exports; money-market equilibrium (LM) is determined by the combinations of output, prices, nominal money and interest rates. Balance of payments (BP) relationship introduces trade and capital flows. Under perfect capital

mobility, a small country's domestic interest rate is determined after taking into account risk and exchange expectations by tying it to the world interest rate. The exchange-rate arrangement thus limits the choice of policy that can have a lasting effect on output (Boughton, 2002).

A credible fixed exchange rate requires fiscal expansion to initially boost demand and interest rates and attract capital. In order to protect the parity, the central bank intervenes in foreign currency transactions and increases the liquidity of the domestic market, thereby strengthening activity. The opposite - unilateral monetary expansion - functions in a different manner: capital outflows put pressure on the peg and cause sales of reserves and the removal of the additional money. Under floating rates, money expansion can cause the currency's value to drop, thereby boosting net exports and net output, while fiscal expansion can push the value of the currency up, thereby reducing some net exports. The following are textbook comparative-static results and not exact policy coefficients today (International Monetary Fund [IMF], 2018).

External shocks, competitiveness and long-run adjustment

A negative shock in foreign demand causes a contraction of export demand, which, if not compensated for by substitution or exchange adjustment or policy, will lead to a decrease in output and the trade balance. Depreciation can make energy, aircraft leases or hotel contracts more expensive in euro terms, but have a positive effect on price competitiveness in dollar terms. There are lags in trade quantities and supply chains may be import intensive. The Marshall–Lerner condition and the J-curve thus serve as reminders to not take for granted that a drop in a nominal currency automatically leads to a rise in a nominal trade surplus. A real effective exchange rate is conceptually superior for overall competitiveness than a bilateral rate like the EUR/USD would be (ECB, n.d.).

Higher foreign interest rates may pull investment out of the country and towards higher-yielding assets, potentially depressing the value of the exposed domestic currency, but with expectations, sovereign risk, hedging costs and financial conditions potentially being among the other factors. At longer horizons, the equilibrium exchange rate and output are determined by domestic wages and prices, domestic productivity, domestic supply capacity and domestic fiscal sustainability. Risk premia and capital controls or fragility are important and the high mobility textbook result is less reliable with a peg with unrestricted capital flows (IMF, 2024).

German institutional qualification

Germany is not an independent floating-currency economy in relation to the USA. The external rate of the euro of German firms is determined on currency markets, and the ECB's policy decisions are implemented in the countries involved. The fiscal decisions in Germany are made within a currency union and with potential spillover effects across the border and European fiscal constraints. As such, a comparison of fixed and float should be used primarily as a teaching counterfactual: with the exception of the monetary policy comparison, a separate German exchange rate does not exist. Official German trade and euro-dollar proof (ECB, 2026a).

Quantitative Calculations & Scenario Analysis

Official German trade and euro-dollar evidence

Nominal goods exports rose from €1,371.397 billion in 2021 to €1,594.342 billion in 2022, but imports increased more quickly, to €1,506.254 billion. This led to a surplus in goods of €88.088 billion, about half of what it was in 2021. The exports of 2024 were €1,646.152 billion and the imports €1,356.180 billion, which meant a calculated balance of €289.972 billion. A difference of €0.001 billion can be attributable to rounding of the underlying official components (Federal Statistical Office [Destatis], 2026).

The annual ECB reference rate averaged USD 1.1827 per euro in 2021, USD 1.0530 in 2022 and USD 1.1300 in 2025. The euro-dollar average came as a result to drop by approximately 11.0% in 2022. However, a move of the exchange rate and/or the trade balance does not define a causality effect: energy import prices, domestic energy demand, activity and firms' pricing in foreign markets also play a role. The unusually large current-account compression in 2022 is mainly due to the increase in prices of energy and other imported commodities, according to the analysis by the Bundesbank (Deutsche Bundesbank, 2023).

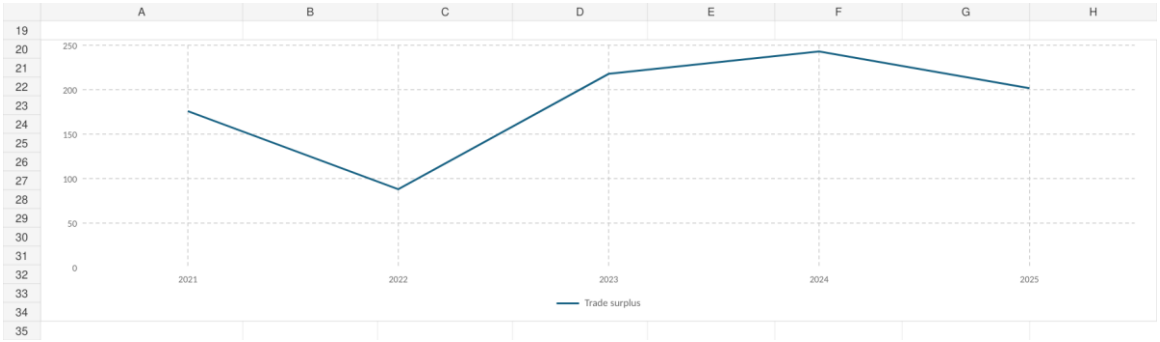


Figure 1. German nominal goods-trade surplus, 2021–2025 (€ billion). Source: spreadsheet chart generated from Destatis annual data.

Three transparent stress tests

First, a mechanical external shock is defined as a reduction in export receipts of 3%, with import prices rising by 5%, with quantities and second-round effects unchanged. In the stressed scenario, the exports sum to €1,516.874 billion, the imports to €1,430.258 billion and the remaining surplus to €86.617 billion, which represents a reduction of €115.021 billion. This indicates the extent of directions going in the opposite direction; it is not a Destatis forecast nor a broad agreement estimate. The full formula outputs and inputs are given in Appendix C.

Second, in a normalized Mundell–Fleming experiment, output is at 100 at the beginning of the exercise. If the fiscal impulse is 2%, and the multipliers are 1.2 for a peg and 0.2 for a float, then the indices are 102.4 and 100.4, respectively. Under a peg, assumed multipliers of zero and under a float, assumed multipliers of 1.0 give 100.0 and 102.0 respectively for an

identical monetary impulse. The following selected coefficients are theoretical only, and have not been estimated based on German time series data.

Third, let's say there is a hypothetical German tour operator whose revenue is €2.0 mm and costs at home is €600,000 and the expenses they incur from suppliers is USD 1.2 mm. Unhedged operating surplus is €309,091 with an initial USD 1.10 per euro. If the euro depreciates to parity, the USD exposure will become more expensive and the surplus will be reduced to €200,000. The amount of €276,364 that is preserved is approximately €76,364 less by the pre-agreed illustrative forward purchase at USD 1.10. When looking at hedging, however, the gain of appreciation is offset by the price of the hedge at USD 1.20. Not including forward points, counterparty risk and execution costs.

A USD 500,000 floating-rate debt has an interest rate of 4% and a six-month coupon of USD 10,000. If it goes up to 6%, the coupon will be USD 15,000. If the exchange rate also moves from 1.10 USD / € to 1.00 USD / €, the euro coupon cost also rises from €9,091 to €15,000 (or €5,909). The size of the principal exposure is significantly larger and warrants its own hedge/refinancing plan. Interest-rate change and exchange translation are separated in the outputs of formula linked workbooks. Germany's crisis of external shock or currency-peg.

Discussion & Managerial Implications

Germany’s external shock versus a currency-peg crisis

Germany's 2022 experience is an imported-price and terms-of-trade stress: due to the sharp increase in the price of energy imports, and the recovery of outbound travel expenditure, the Bundesbank recorded a decrease in the current-account surplus to €162 billion in 2022 (Deutsche Bundesbank, 2023). This is not the same series as the goods-trade series. The current account also includes services, primary and secondary income; it should never be referred to as merchandise exports minus imports. German companies did not transmit

through the defense of the national exchange-rate peg, but through the purchasing costs and the evaluation of the consumer purchasing power and the cash-flow forecasts.

The historical test of Thailand is a comparison. These large short-term capital inflows helped finance current-account deficits and a currency peg fostered expectations of a minimum exchange risk. On 2 July 1997, the authorities gave up the baht peg and allowed speculation to drive up the price of the baht. Later on, the depreciation further exacerbated foreign-currency liabilities and financial pressures. A severe contraction programme and subsequent stabilization programme was documented by the IMF in 1998 (IMF, 2000). It is not that all pegs break; it is that fixed rates must be based on adequate fundamentals, credible reserves, and financial control and supervision of maturity/currency mismatches.

Corporate strategy under policy uncertainty

For any tourism or export-oriented business, the business's net currency position should be determined prior to hedging, which is defined as dollar purchases minus dollar receipts, with considerations for maturity and contract timing. Natural hedging – balancing revenues and costs in the same currency – may decrease the need for derivatives. Layering with documented forwards or options to hedge remaining exposures as well as reconciling with forecast purchases. The illustrative 70% hedge may have reduced the downside, but at the cost of some positive exchange movement, which should be a balance of budget certainty and flexibility, not attempting to make a speculative profit.

On the operational side, treasury should have a 13-week running liquidity forecast, a foreign-currency commitments register integrated and a foreign-currency and other scenario library including rates, fuel volume and booking volume. Managing cash at risk levels and defining the level of risk which requires mitigation ahead of time. Examples of triggers include a EUR/USD rate that falls below 1.02, a foreign rate change of 100 basis points, or bookings exceeding 10% of plan – these are examples of internal factors, not regulations.

Diversification of source markets and suppliers also helps the company to decrease its reliance on a single outsourcing cycle.

There are three different layers in a practical dashboard. The first presents general facts that have been observed, with dates of the source, such as the destinations of exports, and the concentration of the costs of imports. The latter includes clear sensitivity assumptions that can be modified by the controllers. The third records the decisions made regarding records, confirmations of hedges, realized forecast errors, liquidity headroom. Independent review of model formulas will help stop a spreadsheet gaining too much authority for its precision in numbers. The IMF's recent study on international economic frictions also cautions that balance-sheet considerations, risk premia differentials, and sudden stops are ignored by the simple Mundell–Fleming logic (IMF, 2024).

Conclusion & Recommendations

Open-economy analysis is the main reason why there is more than one way of predicting the exchange rate, and macroeconomic risk cannot be reduced to one exchange-rate prediction. The Mundell-Fleming relationship between exchange regimes and the transmission of fiscal and monetary actions, but the similarities with Germany are modified by its common euro area monetary policy and integrated supply chains. The official account indicates that the situation of Germany's nominal goods balance was seriously challenged during the 2022 import-price shock and it partially improved thereafter, the scenario model illustrates how further marginal squeeze from cost pressures and foreign demand can arise.

Four recommendations follow. First, the decision makers need to rely on institutionally available series of trade, inflation rates, interest rates and exchange rates and not on unsourced forecasts. Second, treasury needs to overlay net forex commitments, hedge critical USD requirements with a multi-layer approach and review foreign-rate risk and FX translation risk in combination. Third, managers should conduct occurrences of combined stress scenarios as

well as realistic cash buffers, customer-market diversification and procurement. Fourth, there should be a system of economic constraints on each of the model assumptions, and the models should be checked for their errors. These steps are better defensible than just one prediction of the exchange rate or taking the textbook result about fixed versus floating rates and dogmatically applying it to this situation.

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Appendices: Excel Data Models & Graph Outputs

Appendix A. Verified German trade and EUR/USD series

	A	B	C	D	E	F	G	H
1	**GERMAN GOODS TRADE & EUR/USD AVERAGE (2021–2025)**							
2								
3	*Destatis: goods trade only, € billion, revised series. ECB: annual USD per EUR. 2025 trade provisional.*							
4								
5	**Year**	**Exports €bn**	**Imports €bn**	**Surplus €bn**	**Imports/exports**	**Surplus/exports**	**USD per EUR**	**YoY euro change**
6	2021	1,371.397	1,195.499	175.898	87.2%	12.8%	1.1827	
7	2022	1,594.342	1,506.254	88.088	94.5%	5.5%	1.0530	-11.0%
8	2023	1,575.209	1,357.465	217.744	86.2%	13.8%	1.0813	2.7%
9	2024	1,549.577	1,306.690	242.887	84.3%	15.7%	1.0824	0.1%
10	2025	1,563.788	1,362.150	201.638	87.1%	12.9%	1.1300	4.4%
11								
12								
13	2022 surplus compression reflected the energy-price shock; exchange-rate correlation is not proof of causation.							

Appendix B. Mundell–Fleming policy multipliers

	A	B	C	D	E	F	G
1	**MUNDELL–FLEMING: STYLISED POLICY COUNTERFACTUALS**						
2							
3	*Small open economy, sticky prices, high capital mobility. Index outputs are teaching assumptions, NOT estimated German effects.*						
4							
5	**Illustrative parameter**	**Value**					
6	Initial real output index	100					
7	Fiscal shock (% of output)	2.0%					
8	Monetary shock (% of money stock)	2.0%					
9	Fixed-rate fiscal multiplier	1.2					
10	Floating-rate fiscal multiplier	0.2					
11	Fixed-rate monetary multiplier	0					
12	Floating-rate monetary multiplier	1					
13							
14							
15	**Exchange-rate regime**	**Instrument**	**Shock size**	**Multiplier**	**Output index**	**Δ index points**	
16	Fixed / credible peg	Fiscal expansion	2.0%	1.20	102.40	2.40	
17	Floating	Fiscal expansion	2.0%	0.20	100.40	0.40	
18	Fixed / credible peg	Monetary expansion	2.0%	0.00	100.00	0.00	
19	Floating	Monetary expansion	2.0%	1.00	102.00	2.00	
20							
21							
22							
23	The multipliers are illustrative and embody textbook direction, not a forecasting equation. Under a peg, reserve flows neutralise autonomous money changes; under a float, exchange adjustment weakens fiscal stimulus. Germany cannot set its own policy rate: the ECB governs the euro area.						

Appendix C. Trade-balance shock computation

	A	B	C	D	E	F
1	**2025 TRADE SHOCK: MECHANICAL STRESS TEST**					
2						
3	*Counterfactual arithmetic holds volumes and all second-round responses fixed. It is not a forecast.*					
4						
5	**Variable / shock**	**Value**				
6	2025 goods exports (€bn)	1,563.788				
7	2025 goods imports (€bn)	1,362.150				
8	Export demand shock	-3%				
9	Import price shock	5%				
10	Initial nominal surplus (€bn)	201.638				
11	Shock-adjusted exports (€bn)	1,516.874				
12	Shock-adjusted imports (€bn)	1,430.258				
13	Shock-adjusted surplus (€bn)	86.617				
14	Change in surplus (€bn)	-115.021				
15						
16						
17						
18						
19	Ceteris paribus: an export-demand reduction of 3% plus a 5% import price rise shrinks the nominal trade balance. This does not account for trade elasticities, supply substitution, depreciation, domestic demand, tariffs, or delayed adjustment (J-curve).					

Appendix D. Foreign-currency expense exposures

GERMAN TOUR OPERATOR: USD EXPENSE HEDGE

All operator figures are hypothetical. USD per EUR declines when the euro depreciates (USD purchases become more expensive).

Model input	Value
Euro revenue (€)	2,000,000
Euro domestic costs (€)	600,000
USD supplier payments ($)	1,200,000
Forward rate (USD/EUR)	1.1
Hedge share	70%

Spot USD/EUR	Unhedged USD cost €	Hedged USD cost €	Unhedged operating surplus €	Hedged operating surplus €	Hedge benefit (€)	Hedged margin
1.00	1,200,000	1,123,636	200,000	276,364	76,364	13.8%
1.10	1,090,909	1,090,909	309,091	309,091	0	15.5%
1.20	1,000,000	1,063,636	400,000	336,364	-63,636	16.8%

Model holds Euro revenue and domestic costs fixed. The hedge assumes 70% of USD payment volume was contracted at an illustrative USD 1.10/EUR forward rate, excludes forward points, fees, collateral and credit risks. Hedging reduces downside but sacrifices upside if the euro appreciates.

Appendix E. Floating foreign-interest exposure

	A	B	C	D	E	F
1	**FOREIGN RATE & USD DEBT REFINANCING STRESS**					
2						
3	*A hypothetical six-month USD floating-rate obligation; higher dollar rates plus euro depreciation amplify euro cash outflow.*					
4						
5	**Debt exposure input**	**Value**				
6	USD loan principal	500,000				
7	Annual base USD interest	4.0%				
8	Annual shock USD interest	6.0%				
9	Loan tenor (years)	0.5				
10	Baseline FX USD per EUR	1.1				
11	Shock FX USD per EUR	1				
12	Base coupon USD	10,000.00				
13	Shock coupon USD	15,000.00				
14	Incremental EUR interest burden	5,909.09				
15						
16						
17						
18						
19	Rate and FX shocks are combined here for stress testing, not presented as an empirical prediction. Principal repayment FX exposure is additional and materially greater than the coupon-only burden illustrated.					

Appendix F. Risk management decision register

	A	B	C	D	E	F
1	**GLOBAL TOURISM COMPANY: FX & POLICY RISK CONTROL**					
2						
3	*Practical control triggers are illustrative thresholds. Refresh at least monthly or on material market changes.*					
4						
5	**Risk driver**	**KPI/trigger**	**Mitigation**	**Owner**	**Monitoring**	**Evidence/output**
6	USD supplier FX	EUR/USD <1.02	Hedge 60-80% of net USD needs in layers	Treasury	Weekly	Cash-at-risk / open position
7	Global rate shock	USD rates rise ≥1 pp	Reduce floating USD debt; stress debt service	CFO	Monthly	Debt repricing maturity map
8	Export/travel demand	Bookings fall >10% YoY	Scenario budgets; adjustable supplier capacity	Sales/FP&A	Weekly	Rolling 13-week forecast
9	Imported energy shock	Fuel cost +15%	Supplier diversification / index caps	Procurement	Monthly	Cost sensitivity grid
10	Liquidity drawdown	Cash buffer <€200k	Committed facility and payment waterfall	Treasury	Daily	Minimum liquidity forecast
11	Governance model risk	Assumptions not refreshed	Independent review / scenario back-test	Risk committee	Quarterly	Model validation record

Appendix G. Spreadsheet charts – comparative results

