

Title: Navigating Tariff Turbulence: Projecting the Canadian Dollar under U.S. Trade Pressures

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Abstract

Fluctuations in the Canadian dollar (CAD) have significant implications for large organizations that rely on stable prices throughout their supply chains. Ongoing geopolitical uncertainties manifested through trade disputes, tariff announcements, and changing energy markets amplify currency volatility. This paper addresses the need for proactive strategies to counter sudden shifts in CAD value, drawing on historical precedents (e.g., NAFTA renegotiations) and the potential for renewed tariff tensions. We propose a forecasting tool that integrates real-time economic indicators, market sentiment, oil price elasticity, and tariff severity metrics to predict short-term CAD movements. By simulating multiple geopolitical scenarios—ranging from moderate to severe tariff implementations organizations can better hedge currency risks, optimize pricing contracts, and maintain stable supply chain operations. This approach provides a straightforward framework for decision makers to swiftly adapt to currency shocks, enabling rapid scenario modeling and informed strategic responses.

I. Introduction

The ongoing economic discourse surrounding trade tariffs between the United States and Canada has brought to light their potential impacts on the Canadian economy and currency. Trade disputes, tariff implementations, and geopolitical uncertainties have historically played a pivotal role in shaping currency valuation and trade balances. As observed during the 2018 North American Free Trade Agreement (NAFTA) renegotiations, the Canadian dollar (CAD) experienced fluctuations due to market sentiment and economic pressures. This analysis seeks to project the

probable impact of a similar scenario in 2025, considering increased severity, using historical trends and sensitivity analyses to

estimate changes in CAD/USD exchange rates under varying scenarios.

II. Background

In 2018, the Canadian dollar's value reflected heightened market sentiment amid trade negotiations with the United States. Historical Exchange Rate Data from the Bank of Canada indicates that during this period of uncertainty, the CAD depreciated, reaching a low of approximately 0.7707 CAD/USD [1]. However, following the resolution and agreement, it strengthened by approximately 1.27%, rebounding to around 0.7805 CAD/USD. This historical precedent, documented by both the Bank of Canada [1] and Reuters [2], provides a benchmark to model the CAD's behavior in response to new tariff threats in 2025.

Tariffs can significantly alter trade flows and economic growth, eventually impacting currency valuations. As discussed by Amiti, Redding, and Weinstein [2], tariffs can increase costs for producers and consumers, leading to downstream effects on trade balances and currency volatility. Meanwhile, fluctuations in crude oil prices remain a major driver of the Canadian dollar's value due to Canada's status as a net exporter of oil. Studies by Chen and Chen [3] underscore that a decline in crude oil prices can lead to higher CAD volatility and depreciation. Additionally, the IMF's Economic Outlook highlights that persistent trade tensions or a "trade war" scenario could impose lasting pressures on Canada's external sector [4].

Tariff Scenarios

1. Moderate tariffs (10–15% on key sectors)

Historically, such tariffs have resulted in CAD depreciation of 2–5%.

2. Severe tariffs (25% or more)

These could lead to a 5–10% depreciation, depending on the scope and duration.

Key Influencing Factors

- **Oil Prices:** Canada's economy is significantly influenced by crude oil prices. A 10% drop in oil prices could further weaken the CAD [5].
- **Trade Balance:** Tariffs that reduce export revenue would pressure the CAD, particularly in key sectors like energy and automotive.
- **Market Sentiment:** Higher investor risk aversion could drive capital away from the CAD toward safe-haven currencies like the USD [3], [6].

Projected Impact (Similar Reaction to 2018)

Uncertainty Impact (Initial Drop)

A tariff announcement could result in a depreciation of 1–3%.

- 1% Drop:
- 3% Drop:

Relief Impact (Trade Agreement or Resolution)

Assuming a recovery of ~1.27% post-agreement, the CAD could rebound:

- Post-Relief Rate:

Example Projection: Severe Tariff Scenario

In a severe tariff scenario, compounded effects from trade revenue shocks, oil price declines, and market sentiment could exacerbate CAD depreciation:

- Trade Revenue Shock (-3%):
- Oil Price Shock (-2%):
- Market Sentiment Shock (-2%):
- Projected Rate: USD/CAD under severe tariff conditions.

Best-Case Scenario

In the event of a trade resolution, the CAD could strengthen by 1–2%, potentially reaching:

- *(Exact figures or range would be added here once calculations are done.)*

Steps to Calculate the Potential Impact

1. Define the tariff severity and likely economic impacts (e.g., trade losses, oil price effects).
2. Apply historical sensitivities or elasticity values (e.g., % change in CAD for % change in trade balance).
3. Combine the effects into a weighted model to estimate the new CAD value under various scenarios.

III. Tool Description

To further illustrate the range of potential currency outcomes, we have developed a Python-based simulation tool that generates a distribution of possible CAD/USD exchange rates after an initial tariff-driven drop and a subsequent partial or full recovery. The tool:

- Samples possible percentage changes in the exchange rate from distributions centered on an assumed initial drop and a presumed recovery.
- Applies a severity factor to scale how drastic each scenario's drop and rebound might be.
- Aggregates the final simulated exchange rates into a histogram, highlighting the potential breadth of outcomes.

This simulation does not represent a definitive forecast but serves as a modular framework to test various assumptions (e.g., changes in tariff severity, oil price shocks, etc.) quickly.

IV. How to Use

Install the Dependencies:

- Ensure you have Python 3 (3.7 or higher) and packages like NumPy and Matplotlib installed.

Obtain the Code:

- The Python script is available in `currency.py`. For a more interactive approach, a corresponding Jupyter Notebook (`.ipynb`, shown as a `.txt` as GitHub does not accept `.ipynb` files and mistakes them as `.json`) file is also provided.
- Visit the <https://github.com/ShaneSCalder/tariff-cad-volatility-model> for download instructions and version updates.

Adjust Parameters:

- Open `currency.py` and modify `current_rate`, `initial_drop_mean`, `recovery_mean`, `severity_factor`, and `iterations` according to your scenario requirements.
- For instance, if you believe the initial drop will be smaller or the recovery is more robust, reduce or increase the respective mean percentages.

Run the Simulation:

- Execute `currency.py` in a terminal or run the Notebook cells in your environment.
- The script will output a histogram (`simulated_cad_rates.png`) and print a message upon completion.

Interpret the Results:

- The resulting histogram shows the distribution of “post-recovery” CAD rates from the simulation.
- A vertical red line indicates the current CAD/USD rate, providing a visual reference point for comparison.

Example of output:

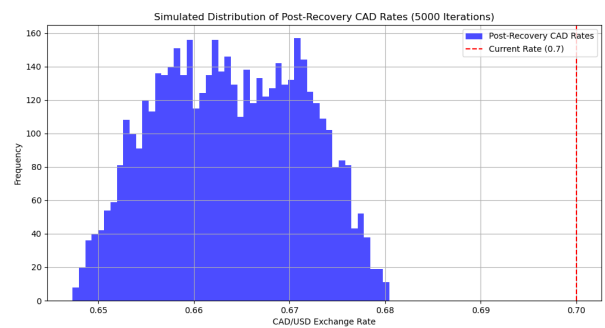


Figure 1.0 – 5000 simulations with 25% more volatility than 2018 impact And Starting currency of 0.7000 USD per 1 CAD dollar.

V. Future Research

While this tool provides a **basic scenario-based** exploration of potential CAD/USD trajectories in the face of trade tensions, there are several limitations and opportunities for further development:

Data Updates

- Currently, the tool operates on user-defined parameters (initial drop and recovery means). Incorporating **real-time** economic data (e.g., from APIs or updated datasets) could improve accuracy.

Multi-Variable Dependencies

- The model is simplified, treating tariff effects, oil prices, and market sentiment separately. In reality, these factors can interact in complex ways. Future work might explore **multivariate methods** or more sophisticated econometric models.

Granular Time Horizons

- The current approach offers a single “initial drop” and “recovery” scenario. Real-world currency movements may evolve over multiple phases. Expanding to multi-phase or time-series simulations could better capture intermediate fluctuations.

Interpretation of Results

- The simulation yields probabilistic outcomes, not certainties. Users should combine these outputs with expert judgment and other analytical frameworks. As with any predictive tool, misalignment between assumptions and real-world conditions may result in over- or underestimation of actual impacts.

Risk Management Integration

- Organizations wanting to hedge against these currency fluctuations could integrate the simulation with financial risk management frameworks. Providing value-at-risk (VaR) metrics or comparing outcomes under different hedging strategies could be a valuable extension.

Ultimately, this simulation is best viewed as a supporting tool one that must be updated and refined as situations change, new trade policies emerge, or market sentiment shifts. Like any predictive software, it cannot account for unforeseen real-world variables and should be used cautiously alongside other analytical methods.

VI. Conclusion

The potential impacts of U.S. tariffs on the Canadian economy and the CAD can be projected by leveraging historical data, economic indicators, and sensitivity analysis. Severe tariffs could weaken the CAD significantly, while trade resolutions may strengthen it. Policymakers and businesses must prepare for such eventualities, balancing risks

and exploring strategies to mitigate adverse effects. The Python simulation tool described here provides a straightforward means to visualize a range of possible outcomes, serving as a **supplement** to more detailed economic models and expert evaluation.

[6] D. Trefler, “The Long and Short of the Canada–U.S. Free Trade Agreement,” *American Economic Review*, vol. 94, no. 4, 2004, pp. 870–895, doi:
<https://www.aeaweb.org/articles?id=10.1257/0002828042002633>

References

[1] Bank of Canada, “Historical Exchange Rate Data,” 2018. [Online]. Available:
<https://www.bankofcanada.ca/rates/exchange/>

[2] F. Smith, Reuters, “C\$ notches 4-month high on NAFTA trade deal, soaring oil prices,” Oct. 01, 2018. [Online]. Available:
<https://www.reuters.com/article/canada-forex/canada-fx-debt-c-notches-4-month-high-on-nafta-trade-deal-soaring-oil-prices-idUSL2N1WH1U0/>

[3] M. Amiti, S. J. Redding, and D. E. Weinstein, “The Impact of the 2018 Tariffs on Prices and Welfare,” *Journal of Economic Perspectives*, vol. 33, no. 4, 2019, pp. 187–210, doi:
<https://www.aeaweb.org/articles?id=10.1257/jep.33.4.187>

[4] International Monetary Fund, “Canada: 2021 Article IV Consultation—Press Release; Staff Report; and Statement by the Executive Director for Canada,” IMF Country Report No. 21/27, 2021. [Online]. Available:
<https://www.imf.org/en/Publications/CR/Issues/2021/03/17/Canada-2021-Article-IV-Consultation-Press-Release-and-Staff-Report-50273>

[5] S.-S. Chen and H. Chen, “Oil Prices and Real Exchange Rates,” *Energy Economics*, vol. 29, no. 3, 2007, pp. 390–404, doi:
<https://www.sciencedirect.com/science/article/abs/pii/S014098830600096X>