Assessing Navigating Currency Fluctuations on Sustainable Agricultural Trade Balance: Insights From Iran's Economic Sanctions

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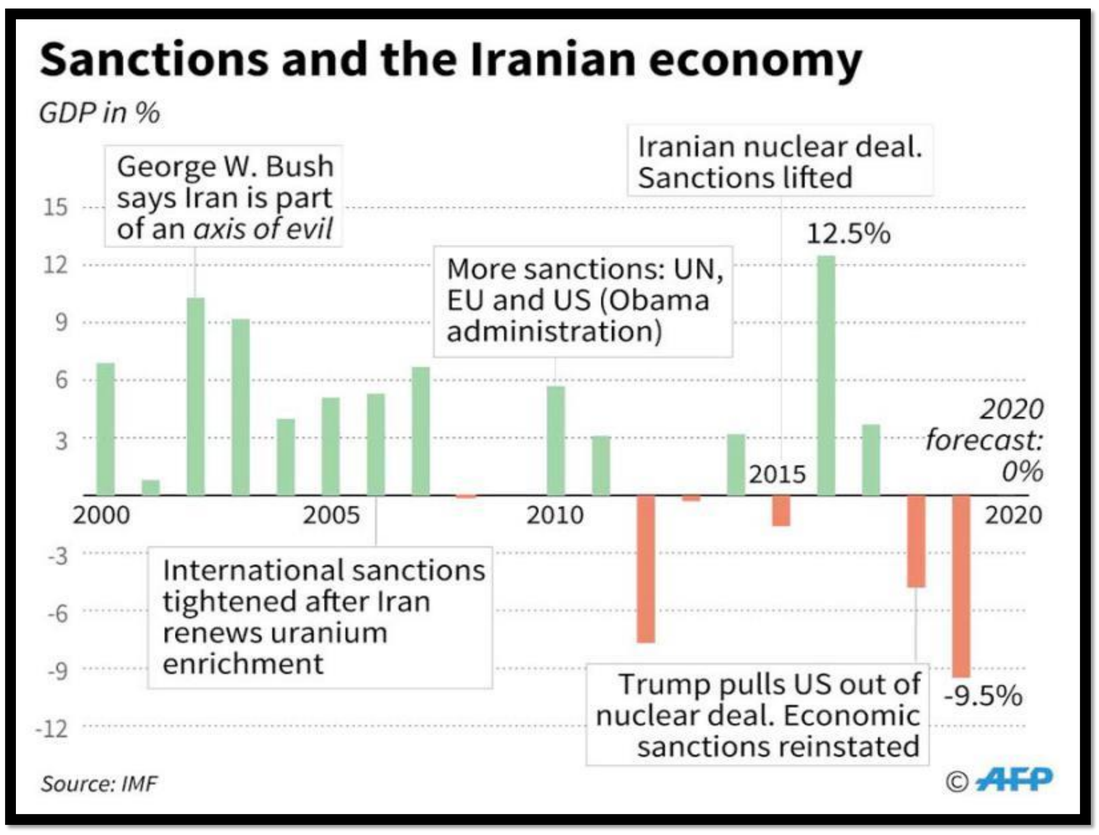
Introduction

- The dispersion of resources and differences in production factors across countries underscore the importance of international trade in fostering economic development, especially for developing nations. Without such trade, many countries struggle to achieve sustainable growth due to their limited domestic resources (Krugman, 1986).
- On the other hand, Economic sanctions have long been considered a common and peaceful tool in the interaction between governments, so since the 90s, economic sanctions have become a common political confrontation between countries and a tool to achieve goals and promote foreign political interests.
- The U.S. sanctions against Iran, ongoing since 1979, have significantly impacted Iran's economy, including its vital agricultural sector (Hufbauer et al., 2007). This sector, crucial for economic stability, is highly sensitive to external shocks like currency fluctuations and trade tensions, which have been exacerbated by sanctions (Pesaran, 2015).
- Therefore, in this study, the effect of currency Fluctuations on the trade balance of the agricultural sector was investigated, emphasizing the economic sanctions of Iran from 1980 to 2022.

Keywords:
currency fluctuations, agricultural trade balance, economic sanctions, Iran.



Materials and Methods

I. We applied a gravity model to assess trade flows between countries, where trade is positively related to GDP and negatively related to geographical distance. The model is expressed as:

$$\text{Trade}_{ij} = \frac{G \cdot GDP_i \cdot GDP_j}{D_{ij}^{\beta}}$$

II. Conditional variance models, such as GARCH, were used to analyze exchange rate fluctuations (Engle, 1982; Bollerslev, 1986).

III. Unit root tests (e.g., ADF test; Dickey & Fuller, 1979) were employed to check time series stationarity. Co-integration was tested using the Johansen procedure (Johansen, 1988), and the VECM was used to model long-term relationships among variables.

Finally, the vector error correction model (VECM) is employed to estimate the dynamic relationships among the co-integrated variables. The VECM is specified as:

$$\Delta y_t = \alpha + \Gamma_1 \Delta y_{t-1} + \cdots + \Gamma_{p-1} \Delta y_{t-p+1} + \Pi y_{t-1} + \epsilon_t$$

where Δ represents the difference operator, Γ_i are matrices of coefficients, Π is the matrix of co-integrating vectors, and ϵ_t is the error term.

Results

- The ARMA(1,1) model was identified and estimated as the optimal model for the mean equation. Tests confirmed the presence of ARCH effects, indicating heteroskedasticity in the disturbance terms. The symmetry test, which examined whether positive and negative exchange rate shocks had similar impacts, rejected the null hypothesis, suggesting asymmetric effects on the agricultural sector's balance.
- Both TGARCH and EGARCH models fit the data well. However, TGARCH was preferred due to its higher coefficient significance, making it more suitable for explaining exchange rate uncertainty.
- The Johansen-Juselius co-integration test results (case 4) revealed both short-term and long-term relationships, confirming the existence of a long-term equilibrium in the model. The vector error correction model (VECM) was used to determine the impact of each variable.

Shock symmetry test results

Test	Statistics Value	Probability
χ^2	21/63	0/000
F	35/12	0/000

Results of vector error correction model (VECM) of trade balance of Iran's agricultural sector

variable	coefficient	Statistical t
Long-term coefficients		
Iran's GDP per Capita	-0/49	-3/750
GDP per Capita of Trading Partners	0/303	2/812
Iran's Oil and Gas Income	-0/812	-4/66
Liquidity Ratio to Iran's GDP	-0/234	-0/835
Real Exchange Rate of Iran	0/462	4/421
Real Exchange Rate Fluctuations (calculated by the GARCH model)	-0/124	-3/589
Geographical Distance (distance between Tehran and each business partner's center)	-0/354	-3/493
Total Factor Productivity in Iran's Agricultural Sector	0/239	2/149
C	15/910	-
Short-term coefficients		
Shock adjustment coefficient	-0/376	-4/459
Dummy Variable for Economic Sanctions against the Islamic Republic of Iran	-0/046	-3/226

Highlights

Economic sanctions negatively impact Iran's agricultural trade balance.

Exchange rate fluctuations significantly worsen Iran's agricultural trade balance.

Rising oil revenues contribute to a decline in Iran's agricultural trade balance.

Higher GDP per capita in Iran correlates with a weaker agricultural trade balance.

Increased GDP per capita of trading partners enhances Iran's agricultural trade balance.

Conclusion

- ✓ *The analysis reveals a significant negative impact of exchange rate fluctuations on the trade balance of agricultural products.*
- ✓ *To mitigate these effects, it is crucial to develop and implement effective policies and strategies targeting exchange rate stability and trade dynamics within the agricultural sector. Such measures can enhance production, boost exports, and improve the trade balance, aligning with broader macroeconomic objectives.*
- ✓ *Additionally, further research into the sources and factors contributing to currency risk can aid in better managing and reducing currency uncertainties.*