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The Impact Of The Bab Al-Mandeb Strait Crisis On The European Economy

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Abstract

This study examines the impact of the Bab al-Mandeb Strait crisis on the European economy, focusing on two key dependent variables: inflation and the Euro Stoxx 50 index. By examining these variables, this research seeks to elucidate the broader economic ramifications of geopolitical instability in maritime chokepoints. Given the integral role of the Bab al-Mandab Strait in global trade, disruptions here could precipitate significant economic consequences for Europe, a major hub of global commerce and industry. The findings of this study are expected to provide valuable insights into the interplay between maritime security and economic stability, informing policy decisions and strategic responses to future crises. In a global economy increasingly susceptible to regional conflicts, understanding the economic impact of such disruptions is paramount for fostering resilience and ensuring sustained economic growth. .

Keywords: *European Economy , Bab al –Mandeb Strait , Geopolitical Instability, Inflation, Maritime Security .*

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Introduction

Maritime transport serves as the backbone of global trade and economic interconnectivity, with approximately 85% of international trade conducted via sea routes (UNCTAD, 2021). Among the myriad of crucial maritime passages, the Bab al-Mandab Strait stands out due to its strategic geopolitical and economic significance. This narrow chokepoint, connecting the Red Sea to the Gulf of Aden, is a critical conduit for oil shipments and global commerce. However, the protracted conflict in Yemen poses a significant threat to the stability and security of this vital artery, potentially disrupting global supply chains and economic stability.

The importance of maritime transport to economic variables such as inflation and stock market indices has been extensively documented. For instance, Michail and Melas (2022) elucidate the sensitivity of inflation in the Eurozone to fluctuations in shipping freight rates, highlighting the direct link between transportation costs and macroeconomic stability. Similarly, the comparative analysis by Park, Seo, and Ha (2019) underscores the superior role of maritime transport in fostering economic growth compared to air and land transport, reinforcing the critical impact of sea routes on national and international economic health.

Previous studies have further highlighted the multifaceted impacts of maritime disruptions. According to Notteboom and Vernimmen (2009), fluctuations in bunker fuel prices, often influenced by geopolitical tensions, significantly affect maritime freight rates and, consequently, global trade costs. Another study by Fan et al. (2016) demonstrated the vulnerability of global supply chains to piracy and maritime terrorism, particularly in strategically important regions like the Bab al-Mandab Strait.

This study aims to investigate the specific repercussions of the Bab al-Mandab Strait crisis on the European economy, focusing on two key dependent variables: inflation and the Euro Stoxx 50 index. By examining these variables, this research seeks to elucidate the broader economic ramifications of geopolitical instability in maritime chokepoints. Given the integral role of the Bab al-Mandab Strait in global trade, disruptions

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The findings of this study are expected to provide valuable insights into the interplay between maritime security and economic stability, informing policy decisions and strategic responses to future crises. In a global economy increasingly susceptible to regional conflicts, understanding the economic impact of such disruptions is paramount for fostering resilience and ensuring sustained economic growth.

Methodology

The Autoregressive Distributed Lag (ARDL) model, introduced by Pesaran et al. (2001), is a flexible econometric approach used to analyze the dynamic relationship between a dependent variable and one or more explanatory variables, both in the short and long run. The ARDL model is particularly advantageous in handling variables that are integrated of different orders, i.e., I(0) and I(1).

The general form of an ARDL(p, q) model, where p is the number of lags for the dependent variable and q is the number of lags for the explanatory variables, is given by:

$$y_t = a_0 + \sum_{i=1}^{p} a_i y_{t-i} + \sum_{j=0}^{q} \beta_j X_{t-j} + \varepsilon_t$$

where:

- y_t is the dependent variable at time t.
- X_{t-j} represents the explanatory variables at time t – j .
- a_0 is the intercept.
- $a_i$and β_j are the coefficients of the lagged dependent and explanatory variables, respectively.
- ε_t is the error term.

Unit root tests (such as augmented Dickey-Fuller (ADF) or Phillips-Pyron (PP) tests) are performed to determine the order of integration of variables. The ARDL model can be applied regardless of whether the regressors are I(0), I(1), or a mixture of both, The optimal lag length for the ARDL model is determined using criteria such as the Akaike Information Criterion (AIC) or the Schwarz Bayesian Criterion (SBC).

A bounds test must be performed to examine the existence of a long-run relationship between the dependent variable and the explanatory variables. The null hypothesis (no long-run relationship exists) is tested against the alternative hypothesis (there is a long-run relationship).

If cointegration is confirmed, estimate the long-run relationship and the Error Correction Model (ECM) to capture the short-run dynamics. The long-run model is derived from the ARDL model, and the ECM can be represented as:

$$\Delta y_t = \lambda \left(y_{t-1} - \sum_{j=0}^{q} \delta_j X_{t-j} \right) + \sum_{i=0}^{p-1} a_i \Delta y_{t-i} + \sum_{j=0}^{q-1} \beta_j \Delta X_{t-j} + \varepsilon_t$$

where λ is the speed of adjustment parameter.

1- Descriptive Statistics

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Descriptive statistics provide a summary of the central tendency, dispersion, and shape of the distribution of the dataset. Below are the descriptive statistics for each variable used in this study, covering the period from January 2021 to December 2023.

Variable	Mean	Median	Standard Deviation	Minimum	Maximum
CPI	**118.99**	**119.81**	**6.47**	**106.72**	**128.27**
S&P 500 Index	**3487.02**	**3466.93**	**325.73**	**3019.99**	**3979.59**
Cargo Ships	**44.26**	**13.55**	**13.55**	**20**	**76**
Tanker Ships	**24.74**	**6.32**	**6.32**	**10.77**	**36**
Average Oil Price	**76.63**	**17.63**	**17.63**	**51.01**	**98.93**
Passenger Ships	**21.26**	**9.55**	**9.55**	**5**	**42.53**

The descriptive statistics reveal key insights into the data's characteristics:

- The CPI and S&P 500 Index show moderate to significant variability, reflecting economic fluctuations over the study period.

- The number of cargo and tanker ships exhibits notable dispersion, indicating variability in maritime traffic, which may be influenced by geopolitical and economic factors.

- The average oil price shows considerable variability, reflecting changes in global oil markets.

- The number of passenger ships also shows substantial variation, likely influenced by seasonal factors and travel restrictions due to the COVID-19 pandemic.

These descriptive statistics provide a foundational understanding of the data, which is crucial for further analysis using the ARDL model to explore the impact of the Bab al-Mandab Strait crisis on the European economy.

Model Specification

To evaluate the impact of ship movement in the Bab al-Mandab Strait on inflation in Europe (cpi) and on the Euro Stoxx 50 index,We will use the Lagged Autoregressive Model (ARDL) This dynamic model enables us to Considering the effect of time and the ability to explain changes that contribute to solving the research problem, two models were adopted as follows:

$$EURO\ STOXX\ 50\ INDEX_t = C + CARGO\ SHIPS_t + TRANK\ SHIPS_t + AVG\ OIL\ PRICE_t + \varepsilon_t$$

$$CPI_t = C + CARGO\ SHIPS_t + TRANK\ SHIPS_t + PASSENGER\ SHIPS_t + AVG\ OIL\ PRICE_t + \varepsilon_t$$

The ships passing through the Bab al-Mandab Strait were adopted as a percentage of the total number of ships' trips. Hence, this percentage can express the transport movement in the Bab al-Mandab Strait. Two models were also adopted: the first model was adopted to study the impact of ship movement through the Bab al-Mandab Strait on Euro Stoxx 50 index, and the second model was based on The movement of ships through the Bab al-Mandab Strait affects inflation in the European region.

Results

Stationarity

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To test the stability of the model variables, we used Choose the augmented Dickey-Fuller/ADF test and the Phillips–Perron test. These two tests Effective in the presence of automatic error correlation. results The unit root test is shown in Table 1 below.

Table 1 :

Variables	At level		1st difference		Order of integration
	ADF	PP	ADF	PP	
Euro stoxx 50 index	-6.2855 ***	-6.2458 ***	-9.2370 ***	-17.7462 ***	(0)/(I)
cpi	-0.1450	-0.5426	-3.8414 **	-3.8276 **	(I)
Cargo ships	-3.7214 **	-3.6392 **	-9.1697 ***	-10.9796 ***	(0)/(I)
Tanker ships	-4.2987 ***	-5.3597 ***	-7.3809 ***	-27.0505 ***	(0)/(I)
Passenger ships	-5.2514 ***	-5.2514 ***	-10.4878 ***	-13.1821 ***	(0)/(I)
Avg oil	-5.8972 ***	-5.8972 ***	-9.8749 ***	-17.2296 ***	(0)/(I)

Source: produced by the authors using Eviews 12 software

Note: *** significant at 0.01, ** significant at 0.05, * significant at 0.1

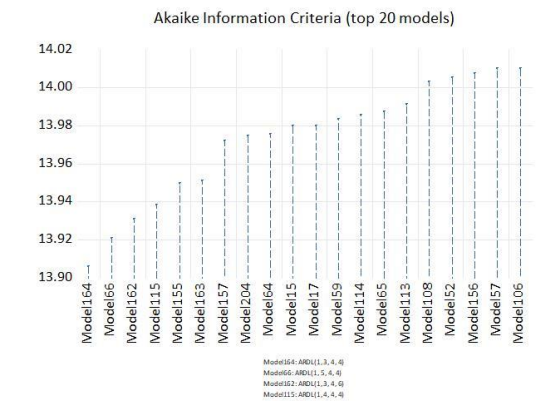
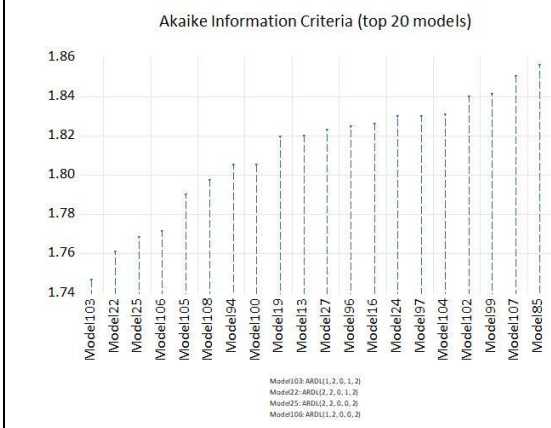
Based on the results of the ADF test and the test, we observe that all series are level stationary With the exception of the CPI variable, where the significance was greater than 5%,On the other hand, after converting the series to first difference, a technique was proposed inIn the econometric literature, we note that all variables become constant and therefore they are integrated of order (1).

Optimal delay of AIC information criterion

First we have to conclude ARDL model that provides statistically significant results with

Optimization of parameters. For our case, we will use AIC (Akaike Information Criterion) criteria for determining this model. The results are shown in Figure 1

Figure 1 :

Optimal delay of AIC information criterion of a model Euro stoxx 50 index	Optimal delay of AIC information criterion of a model copy
	

Source: produced by the authors using Eviews 12 software

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Figure 1 shows that The optimal delay for the AIC for the Euro Stoxx 50 index model is ardl(1.3.4.4), while the optimal delay for the AIC for the CPI model is ardl(1.2.0.1.2).

Bound test

Test to determine if there is a long-term relationship It is a bound test, and in this case, if this F.stata value is greater than I(1) at 5%, we do not reject the null hypothesis and There is a long-term relationship.

Tabel 2 :

Test Statistic	Value	Significant level	I(0)	I(1)
Bound test for a model Euro stoxx 50 index				
F-statistic	**11.64272**	**10%**	**2.2**	**3.09**
K	**4**	**5%**	**2.56**	**3.49**
		2.5%	**2.88**	**3.87**
		1%	**3.29**	**4.37**
Bound test for a model cpi				
F-statisric	**11.64272**	**10%**	**2.2**	**3.09**
K	**4**	**5%**	**2.56**	**3.49**
		2.5%	**2.88**	**3.87**
		1%	**3.29**	**4.37**

Source: produced by the authors using Eviews 12 software

The results of the cointegration test confirm the existence of cointegration and that the relationship between the variables studied in the model, as indicated by Fisher's statistic, is greater than the upper limits I (1) for the two models.

Long and Short Term Coefficients

Tabel 3: The results of ARDL (1.3.4.4) for Euro stoxx 50 index model and ARDL (1.2.0.1.2) for cpi model

Variable	Euro stoxx 50 index model	cpi model
Conditional Error Correction Regression		
C	**2511.599*** **	**3.4355** **
EURO STOXX 50 INDEX (-1)*	**-0.6012*** **	
CPI (-1)*		**-0.0331** **
CARGO SHIPS	**8.5700**	**-0.0378*** **
TANKER SHIPS	**64.8171*** **	**0.0061**
PASSENGER SHIPS		**0.0490*** **
AVG OIL PRACE	**-29.4461*** **	**0.0207**
D(CARGO SHIPS)	**3.2790**	**0.0207**
D(CARGO SHIPS (-1))	**-10.7606** **	**-0.0073**
D(CARGO SHIPS (-2))	**8.4128** **	**0.0224** **
D(TANKER SHIPS)	**23.7417** **	
D(TANKER SHIPS (-1))	**-42.3304*** **	
D(TANKER SHIPS (-2))	**-18.1547**	
D(TANKER SHIPS (-3))	**-19.5229** **	
D(PASSENGER SHIPS)		**0.0343** **
D(AVG OIL PRACE)	**-2.1903**	**0.0044**

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D(AVG OIL PRACE (-1))	**14.5642****	**-0.0108***
D(AVG OIL PRACE (-2))	**19.2014*****	
D(AVG OIL PRACE (-3))	**8.4214****	
Estimating a long-run model		
CARGO SHIPS	**14.2526**	**-1.1422****
TANKER SHIPS	**107.7956*****	**0.01855**
PASSENGER SHIPS		**1.4799****
AVG OIL PRACE	**-48.9711*****	**0.6246***
C	**4176.973*****	**103.5961*****

Source: produced by the authors using Eviews 12 software

Note: *** significant at 0.01, ** significant at 0.05, * significant at 0.1

In this section, we present the results and interpretation of the estimated ARDL models for the Euro Stoxx 50 index and the Consumer Price Index (CPI) in relation to maritime transport through the Bab al-Mandab Strait.

Error Correction Term (ECT)

The Error Correction Term (ECT) in our models is negative and significant, indicating convergence towards equilibrium. The magnitude of the ECT reveals the speed of adjustment from short-term disequilibrium to long-term equilibrium:

- For the Euro Stoxx 50 index model, approximately 60% of the adjustment is completed every two months.

- For the CPI model, approximately 3% of the adjustment occurs over a period of nearly three years.

Euro Stoxx 50 Index Model

Short-Term Impact:

o The proportion of sea freight ships passing through the Bab al-Mandab Strait has a positive and significant impact on the Euro Stoxx 50 index in the short term. This suggests that the European companies' economy is influenced by fluctuations in the shipping line, possibly due to the direct relationship between sea freight and industrial inputs and exports.

2. **Long-Term Impact:**

The long-term impact of sea freight ships is not significant. This implies that while maritime transport has a notable short-term effect, it does not constitute a primary driver of the European economy in the long run. This can be attributed to the diversification of trade sources and less dependency on goods from East Asian countries transported via this route.

3. **Tanker Ships:**

The effect of tanker ships is positive and significant in both the short and long term. This underscores the importance of energy transportation through the Bab al-Mandab Strait for European companies. A decline in tanker ship traffic could adversely affect European economic performance, highlighting the critical role of energy supplies in the region's economy.

4. **Oil Prices:**

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Higher oil prices are associated with a decline in the performance of European companies, indicating the negative impact of increased energy costs on the Euro Stoxx 50 index. This relationship emphasizes the vulnerability of the European economy to fluctuations in oil prices.

Consumer Price Index (CPI) Model

1. **Cargo Ships:**

The proportion of cargo ships passing through the Bab al-Mandab Strait negatively impacts the CPI, suggesting that disruptions in this shipping route can lead to significant increases in consumer prices. This is due to the reliance on low-cost goods from East Asian countries, which help maintain lower consumer prices in Europe.

2. **Tanker Ships:**

The impact of tanker ships on the CPI is not significant. This indicates that fluctuations in tanker ship traffic do not majorly influence consumer prices, likely because energy supplies are managed through various channels and not solely dependent on the Bab al-Mandab Strait.

3. **Passenger Ships:**

Passenger ships have a direct and significant impact on the CPI. This suggests that a decrease in passenger ship traffic can reduce consumer prices, which may be due to reduced congestion and more efficient transportation of goods.

Oil Prices:

Oil prices have a positive and significant impact on the CPI, reinforcing the notion that higher energy costs lead to higher consumer prices in Europe. This relationship highlights the sensitivity of the European economy to changes in oil prices, reflecting their pervasive influence on transportation and production costs.

Diagnostics Tests

Checking normality serial correlation and Heteroscedasticity

The Jarque-Bera test will be relied upon for the Normatiy study of the residuals and To check the serial correlation of the residuals the LM test is used and it is Confirm that there is no longer a serial connection between the residues, The ARCH test is also used to study the non-stationarity of homoscedasticity of the residuals.

Tabel 4 :

Test	**for a model Euro stoxx 50 index**		**for a model cpi**	
	Test value	**P-value**	**Test value**	**P-value**
Jarque-Bera test for Normatiy	0.973698	0.614560	0.097266	0.952531
Lagrange Mulriplier test for Serial Corrlation	0.525592	0.6024	0.5698	0.4120
ARCH test for Heyeroskedasticity	2.883934	0.1002	0.159459	0.6924

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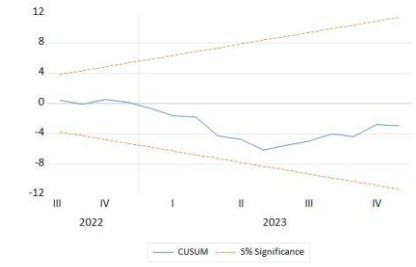
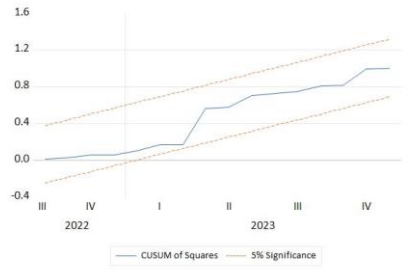
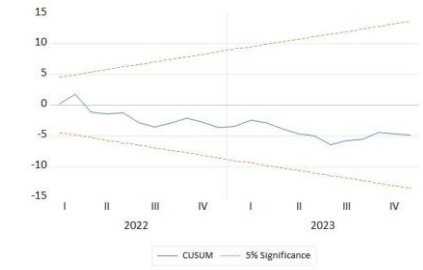
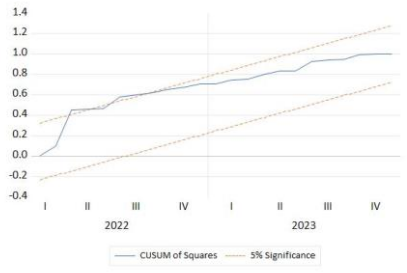
The above results of the Jarque-Bera test confirm that the residual is Gaussian white noise (following a normal law) because the Jarque-Bera probability is greater than 5% , From these program outputs, we note that the probability of the LM test is greater than 5% (the critical threshold) and therefore the residuals do not autocorrelate.

It can be seen from the above table 7 that the residuals are not heteroscedastic, because the probability of the F statistic for the ARCH test is greater than 5%. Hence, the variance of the residuals of the two models is constant.

Checking stability

In order to test the stability of the model, the CUSUM of Squares test which is based on the cumulative sum of the square of the recursive residuals is the most relevant to the null hypothesis of the stability of the relationship, the latter gave us the following result:

Figure 2 :

Stability for a model Euro stoxx 50 index	
CUSUM test	**CUSUM of Squares**
	
Stability for a model cpi	
CUSUM test	**CUSUM of Squares**
	

Source: produced by the authors using Eviews 12 software
Based on the graph above the CUSUM and CUSUM of Squares test results, we can say that the estimated model is stable. Then the coefficients are stable over time.

Conclusion

Our analysis using the ARDL model reveals that maritime transport through the Bab al-Mandab Strait significantly affects the European economy, particularly through its impact on the Euro Stoxx 50 index and the Consumer Price Index. While the short-term effects of freight ships are evident, the long-term significance is more nuanced, highlighting the complex nature of international trade dependencies. The findings underscore the critical importance of tanker ships and oil prices in shaping economic outcomes

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in Europe.

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