IMPACT OF SEA FREIGHT RATES ON DRY BULK CARGO IMPORT AND EXPORT ALONG THE EUROPE ROUTE

ẢNH HƯỞNG CỦA GIÁ CƯỚC VẬN TẢI HÀNG HẢI ĐẾN HOẠT ĐỘNG XUẤT NHẬP KHẨU HÀNG RỜI KHÔ TUYẾN CHÂU ÂU

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ABSTRACT

This article reports on the results of evaluating the impact of freight rates on the profitability of dry bulk cargo of VOSA Quang Ninh Company, a Vietnamese maritime enterprise operating in the dry bulk cargo transport sector on the Hai Phong - Europe route during the period 2019 - 2024. Employing descriptive statistics and both the Autoregressive Distributed Lag model (ARDL) and the Error Correction Model (ECM) on 72 monthly observations, the analysis investigates the relationships between profit, freight rates, the USD/VND exchange rate, and Brent crude oil prices. Findings reveal that freight rates exert the most substantial and direct influence on profit, while exchange rate fluctuations also play a significant role, and Brent crude prices contribute to short-term increases in operational costs. The study further proposes strategic measures, including supply-demand management, operational optimization, exchange-rate and fuel-risk mitigation, and digital transformation. These insights offer practical guidance for enhancing operational efficiency and risk management in Vietnam's logistics sector.

Keywords: *Freight rates, dry bulk, ARDL, ECM, Exchange rate, Brent oil.*

TÓM TẮT

Bài báo báo cáo kết quả đánh giá ảnh hưởng của giá cước đến lợi nhuận hàng rời khô của Công ty VOSA Quảng Ninh, một doanh nghiệp hàng hải Việt Nam hoạt động trong lĩnh vực vận tải hàng rời khô trên tuyến Hải Phòng - Châu Âu giai đoạn 2019 - 2024. Sử dụng thống kê mô tả và Mô hình phân phối trễ tự hồi quy (ARDL) và Mô hình điều chỉnh sai số (ECM) trên 72 quan sát hàng tháng, nghiên cứu đánh giá mối liên kết giữa lợi nhuận với giá cước, tỷ giá USD/VND và giá dầu Brent. Kết quả cho thấy giá cước tác động mạnh và trực tiếp nhất đến lợi nhuận, tỷ giá cũng quan trọng, trong khi giá dầu Brent làm tăng chi phí vận hành ngắn hạn. Nghiên cứu đề xuất các giải pháp chiến lược tập trung vào quản lý cung - cầu, tối ưu vận hành, quản lý rủi ro tỷ giá và nhiên liệu, đồng thời thúc đẩy chuyển đổi số. Những phát hiện này cung cấp cơ sở thực tiễn quan trọng để nâng cao hiệu quả và quản lý rủi ro cho các công ty logistics tại Việt Nam.

Từ khóa: *Giá cước vận tải, hàng rời khô, ARDL, ECM, tỷ giá hối đoái, dầu Brent.*

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1. INTRODUCTION

Fluctuations in sea freight rates have long been recognized as a key determinant of the financial performance of firms engaged in international trade and logistics. Freight rates not only reflect supply-demand conditions in the shipping market but also transmit cost pressures throughout the logistics chain, thereby affecting profit. Ahn and Ko demonstrate that changes in transport demand and fleet capacity translate directly into freight rate movements, resulting in significant cost

variations for shippers and freight forwarders [1]. Similarly, Stopford argues that freight rates serve as an early indicator of business margins on long-haul routes, where transportation accounts for a substantial share of total operating costs [2].

In Vietnam, growing attention has been paid to the impact of freight rate volatility on corporate profit. Hong et al. report that geopolitical disruptions in 2022 triggered sharp increases in freight rates, forcing domestic shipping and forwarding companies to adjust their business strategies and, in many cases, accept lower profit margins [3]. However, Nguyen found that firms with stronger bargaining power and more diversified service portfolios were able to benefit from higher freight rates, resulting in uneven financial performance across the sector [4].

Beyond freight rates, according to the IMF (2023), exchange rates and fuel prices are also widely recognised as important determinants of profit. For firms generating revenue in USD while incurring most operating costs in local currency, USD appreciation generally improves profit margins through favourable exchange-rate effects, a pattern commonly observed in emerging economies [5]. The influence of fuel prices is less consistent. Nguyen et al. find that rising marine fuel prices increase freight rates and transportation costs, potentially reducing trade competitiveness [6]. However, the extent to which these costs affect profit depends on fuel surcharge mechanisms and contractual arrangements. This finding is consistent with the results of the present study, where Brent crude oil prices have no significant long-run effect on Company VOSA Quảng Ninh's profit.

Company VOSA Quảng Ninh is a Vietnamese shipping agency engaged in dry bulk shipping operations, handling commodities such as iron ore, lime powder, agricultural products, wheat, and soda. Although legally classified as a shipping agency, the business segment examined in this study also encompasses freight contracting, voyage coordination, cargo management, and chartering. Consequently, its profit is directly influenced by freight rates, bunker fuel costs, and exchange-rate fluctuations.

Overall, the literature suggests that freight rates, exchange rates, and fuel prices significantly influence the financial performance of firms involved in international logistics. However, most existing studies focus on market-level determinants or macroeconomic transmission mechanisms, with relatively limited attention to firm-level profit. This study addresses this gap by applying an ARDL–ECM model to monthly data from 2019 to 2024 to examine how freight rates, the USD/VND exchange rate, and Brent crude oil prices affect the import and export profits of Company VOSA Quảng Ninh, which operates on the Hai Phong - Europe route.

2. RESEARCH METHODOLOGY

2.1. Research model

This study applies the ARDL/ECM approach to examine how freight rates, the USD/VND exchange rate, and Brent crude oil prices influence the monthly import-export profits of Company VOSA Quảng Ninh from January 2019 to December 2024 (72 observations). The dataset includes dry-bulk profits, average freight rates on the Hai Phong - Europe route, Brent oil prices, and the monthly exchange rate. Freight rate data were collected from the company's monthly operational reports.

The ARDL model is chosen because it performs well with small samples and allows for variables with different integration orders. In this research, ARDL is used to estimate the long-run effects of freight rates, exchange rates, and oil prices on profit, providing insight into how persistent changes in these variables shape business performance. By converting the model into its ECM form, the study also captures short-run adjustments and the speed at which profits return to long-term equilibrium following shocks. The error correction term (ECT) reflects how quickly disequilibria are corrected, which is critical in logistics and trade, where sudden spikes in oil prices or freight rate volatility can temporarily disturb profits.

2.2. Variable Selection

The selection of explanatory variables: freight rates, Brent crude oil prices, and the USD/VND exchange rate, is grounded in established maritime-economics theory and supported by recent empirical research. Freight rates on the Hai Phong - Europe route represent the core market variable because they function as the industry's price-clearing mechanism. As Stopford (2008) explains, freight rates emerge from the interaction of vessel supply and cargo demand and therefore act as the most immediate indicator of market equilibrium [7]. This view is reinforced by studies showing that freight rates internalize both demand shocks and supply-side adjustments [8, 9]. The widespread reliance on composite indices such as the BDI (Baltic Dry Index), SCFI (Shanghai Containerized Freight Index), and IACI (Intra-Asia Container Index), XSI (Xeneta Shipping Index) [10-12] further supports the use of route-

specific rates as a meaningful proxy for market conditions, particularly for firms like Company VOSA Quảng Ninh, whose margins are directly linked to transport-rate fluctuations.

According to the DHL report, Brent crude oil price is included to capture volatility in marine fuel costs, a major component of maritime operating expenses. Ederington suggested that Brent serves as the global benchmark for bunker-fuel pricing, with changes flowing through freight markets via bunker indices and BAF (Bunker Adjustment Factor) surcharges [13, 14]. Prior studies confirm that oil-price shocks propagate through shipping cost structures and influence freight-rate formation [6, 15], making Brent an essential control for exogenous cost pressures. The USD/VND exchange rate is incorporated as a macro-financial indicator reflecting broader economic and monetary dynamics. Exchange rates are widely recognized as composite signals of competitiveness and risk in open economies [16, 17]. For Vietnamese logistics firms, USD fluctuations directly affect profit because revenues are largely USD-denominated while key expenditures are in VND.

Other potential determinants, such as congestion, global demand indicators, vessel capacity measures, or geopolitical risks, were excluded because freight rates already capture these effects [7, 8] and because many alternatives lack consistent monthly data suitable for ARDL estimation [18]. A parsimonious model with three theoretically central variables avoids overparameterization in a 72-month sample while maintaining econometric robustness [6, 15]. Taken together, these variables: freight rates, fuel costs, and exchange rates, capture the main channels through which external shocks influence firm-level profit and align closely with the operational realities of Company VOSA Quảng Ninh's import and export activities.

2.3. Data Collection

2.3.1. Dry Bulk Import and Export Profit

Dry-bulk profit is used as the dependent variable and reflects the monthly financial performance of Company VOSA Quảng Ninh derived from dry-bulk import and export activities. The data come directly from the company's consolidated financial statements, ensuring consistency with reporting standards and internal accounting practices. Profit is measured in Vietnamese Dong (VND) and reflects the profit after deducting operating, administrative, and voyage-related expenses. This indicator is particularly suitable because the firm's performance on the Hai Phong - Europe trade route is highly sensitive to freight-rate fluctuations, fuel costs, and foreign-exchange movements. Using profit rather than revenue allows the analysis to capture how cost shocks translate into bottom-line outcomes.

2.3.2. Weighted Average Freight Rate

Freight rates constitute the primary explanatory variable and represent the market-clearing price in the maritime transport sector. In the short run, shipping capacity is largely fixed, so fluctuations in market demand are reflected directly in freight-rate movements. Maritime economic theory identifies freight rates as the central indicator of market equilibrium, which is shaped by the interaction of vessel supply, cargo availability, and route-level shocks, as suggested by Stopford [7].

To accurately reflect Company VOSA Quảng Ninh's operational structure, this study constructs a weighted average freight rate which is calculated by using monthly cargo volumes (MT) transported and monthly freight rate (VND) on trade lane, that incorporates both outbound and inbound flows on the Hai Phong - Europe corridor:

$$Freight_{avg_{HPH-EU}} = W_{export} * R_{HPH-EU} + W_{import} * R_{EU-HPH}$$

where R_{HPH-EU} is the export freight rate from Hai Phong to Europe, R_{EU-HPH} is the import freight rate from Europe to Hai Phong, and W_{export} and W_{import} are the monthly respective volume or value shares of exports and imports. This weighting approach is aligned with industry practice in constructing freight indices such as the Baltic Freight Index, SCFI, IACI and XSI®, all of which are based on trade-weighted averages across multiple routes [10-20]. Freight-rate data for both directions: from Hai Phong to Europe (HPH→EU) and from Europe to Hai Phong (EU→HPH) were obtained from Company VOSA Quảng Ninh's monthly commercial and operational reports, then converted into VND using the corresponding monthly average exchange rate for consistency with the profit series.

2.3.3. Brent crude oil price

Brent crude oil price is included as a proxy for marine fuel costs, which account for a substantial share of voyage expenses in seaborne transport. Brent is one of the world's most important benchmark oils and is commonly used as the reference base to calculate bunker prices and Bunker Adjustment Factor (BAF) surcharges across trade routes [13]. Shipping companies

purchase bunker fuel (heavy fuel oil or marine gas oil) and face regular adjustments in bunker indices tied to Brent. When Brent prices rise, bunker indices and BAF are revised upward; when Brent falls, fuel surcharges decline accordingly. As shown by Ederington, changes in oil prices are transmitted into freight markets through carriers' pricing strategies and directly affect logistics costs [14].

According to UNCTAD (2023), World Bank (2023), and IMF (2024), Brent prices from international energy databases are aggregated to the monthly level and converted into VND. The period 2019 - 2024 features pronounced oil-price volatility driven by demand collapses during COVID-19, OPEC+ production decisions, and geopolitical disruptions, which had a visible impact on shipping costs and, consequently, on firms [20-22].

2.3.4. Monthly average VND/USD exchange rate

According to Frieden (2014) and Maraoui (2022), the USD/VND exchange rate is used as a macro-financial variable capturing the broader economic, political, and social conditions surrounding international trade. The exchange rate is widely recognized as an aggregate indicator of competitiveness, policy stance, and risk in open economies [16, 17]. Görener suggests that from an economic perspective, exchange rates reflect trade balances, transportation costs, and relative price competitiveness [23]. According to UNCTAD (2023), exchange rates are also influenced by inflation differentials, interest-rate spreads, capital flows, and financial conditions [20]. Steinberg argued that, from a political and social perspective, exchange rates respond to political instability, policy changes, sanctions, elections, tourism flows, remittances, and other social events [17-25].

In this study, the monthly average USD/VND rate is computed from daily quotations published by the State Bank of Vietnam and major financial institutions [25]. Most bulk-freight and charter contracts are invoiced in USD, whereas many of the Company VOSA Quảng Ninh's operating expenses are denominated in VND. According to the IFRS Foundation, Vietnam's accounting standards require recording foreign-exchange gains and losses and commonly use the monthly average rate to convert revenues and expenses incurred throughout the month [26]. As a result, movements in the USD/VND rate have a direct and measurable impact on the firm's reported profits.

3. RESULTS AND DISCUSSION

3.1. The Augmented Dickey Fuller - Unit Root Test Results

Before testing the long-term relationship using the ARDL method, the stationarity test of the variables was performed using the Augmented Dickey-Fuller (ADF) with lag = 4 and trend. The main results (t-stat and p-value) are as Table 1.

Table 1. The Augmented Dickey Fuller - Unit root Test Results

Variable	Level (Z(t))	p-value (approx.)	First diff (Z(t))	p-value (approx.)	Conclude
profit_bulk	-2.488	0.3338	-5.114	0.0001	I(1)
freight_rate	-2.199	0.4905	-3.676	0.0240	I(1)
brent	-1.809	0.7006	-3.553	0.0341	I(1)
exchange_rate	-1.180	0.9146	-4.622	0.0009	I(1)

Sources: Author's estimation in Stata

The unit root test is conducted to ensure that no variables are I(2). It is shown from Table 1 that variables are a purely combination of I(1), hence the ARDL approach to cointegration is valid.

3.2. Long-term coefficients result of ARDL model

Table 2. Long-term coefficients result of ARDL model

Independent variable	Coefficient	Std. Err.	t-Statistic	p-value	Conclude
freight_rate	0.2870	0.0862	3.33	0.001	Significant (1%)
brent	0.2460	0.1413	1.74	0.087	Marginal (10%)
exchange_rate	11.0964	4.8013	2.31	0.024	Significant (5%)

Sources: Author's estimation in Stata

The ARDL approach is highly advantageous for economic data such as freight rates, exchange rates, and profits, which often exhibit mixed integration properties and short data spans. The Bounds Testing approach for cointegration enables testing for the presence of a long-term equilibrium relationship among variables regardless of their integration order, provided none are I (2). Once cointegration is detected, the estimated long-term coefficients from the ARDL model reflect the equilibrium effects of sea freight rates and control variables on Company VOSA Quảng Ninh's import and export profits.

ARDL is also known for providing unbiased long-term estimates even with small samples, which is an important feature in this study since the monthly dataset covers a limited time frame.

The optimal ARDL model based on AIC is ARDL(2,1,0,1).

The freight_rate coefficient (0.287) is positive and significant at the 1% level, indicating that a 1% rise in freight rates leads to a 0.287% increase in bulk import and export profits in the long run. This aligns with theory, as higher rates often reflect stronger transport demand or cost pass-through to prices. The Brent variable also shows a positive but weaker effect, significant only at the 10% level, suggesting it may be offset by other operational costs.

The exchange rate variable has a large positive coefficient (11.096), significant at the 5% level, indicating that VND depreciation increases profits by enhancing conversion gains from foreign currency revenues. The relatively high coefficient does not suggest bias but results from the limited fluctuation range of the exchange rate (less than 8% during 2019 - 2024) and the log-log model's elasticity effect, where small changes in exchange rates produce large coefficients to reflect proportional variation in profits.

Similar patterns are found in emerging markets, where exchange rates operate within narrow bands but still exert significant influence on trade and profit. This sensitivity stems from the heavy reliance of logistics firms on foreign currency–denominated costs.

The ARDL model, supported by Bounds testing and a negative, significant Error Correction Term (ECT), confirms a long-term equilibrium among variables. Additional robustness tests, using differenced, real, and mean-detrended exchange rates, produced consistent results, verifying model stability.

Therefore, the large coefficient simply reflects that enterprise profits are highly sensitive to small exchange rate changes, consistent with Vietnam's tightly managed currency regime and the FX exposure of logistics operations.

3.3. Bounds Test results

After determining the integration characteristics of the variables, the ARDL model selected based on the Akaike criterion (AIC) is ARDL(2,1,0,1). The results of cointegration testing by the Bounds Test method of Pesaran [27] are presented in Table 3.

Table 3. Bounds Test results

Test statistics	Value	Threshold I(0)	Threshold I(1)	Conclude
F-statistic	5.816	4.181 (5%)	5.352 (5%)	Have a long-term relationship
t-statistic	-4.693	-3.429 (5%)	-4.186 (5%)	Have a long-term relationship

Sources: Author's estimation in Stata

The above results show that the F = 5.816 and t = -4.693 values both exceed the critical threshold I(1) at the 5% significance level, implying the rejection of the hypothesis that there is no cointegration relationship between the variables. Therefore, it can be affirmed that there is a long-term relationship between the bulk cargo import and export profits and the macro variables included in the model.

3.4. Error Correction Model (ECM) results

After determining the long-term relationship, an error-corrected differential model (ECM) is estimated to assess the variables' short-term effects. A negative and statistically significant ECT implies that any short-term disequilibrium in Company VOSA Quảng Ninh's profit caused by fluctuations in freight rates or other factors will gradually return to its long-term equilibrium path. Thus, the ECM model captures the transitory effects and the rate of convergence following short-term shocks. The results of the ECM model testing are presented in Table 4.

Table 4. Error Correction Model (ECM) results

Variable	Coefficient	Std. Err.	t-Statistic	p-value	Conclude
freight_rate	-0.0018	0.1169	-0.02	0.988	Insignificant
brent	0.3069	0.1057	2.90	0.005	Significant (1%)
exchange_rate	2.7069	6.1891	0.44	0.663	Insignificant
ECT(t-1)	-0.5645	0.1167	-4.84	0.000	Significant (1%)
Constant	0.0109	0.0169	0.64	0.530	–

Sources: Author's estimation in Stata

The ECM results show that only the Brent oil price variable has a significant short-run effect, with a positive coefficient of 0.3069 ($p < 0.01$), indicating that oil price fluctuations immediately affect profits through transport and input costs. In contrast, freight rates and exchange

rates show no short-term significance, implying a lagged adjustment. The error correction term ($ECT_{(t-1)}$) is -0.5645 ($p < 0.001$), confirming that about 56% of disequilibrium is corrected each period, reflecting a fast return to long-run balance. Overall, the results demonstrate a stable long-term relationship among profits, freight rates, oil prices, and exchange rates. In the long run, freight rates and exchange rates exert the strongest influence, while oil prices dominate in the short run. The rapid ECT adjustment highlights the system's stability and resilience to short-term shocks.

3.5. Discussion

The ARDL/ECM results reflect Company VOSA Quảng Ninh's operational performance during 2019 - 2024, demonstrating how freight rates, exchange rates, and oil prices influenced profit, particularly during the post-pandemic recovery period. The model shows that higher freight rates will increase import and export profits in the long run. The positive and statistically significant coefficient indicates that the company benefits from favorable maritime transport market conditions, as higher freight-related revenue offsets the corresponding increase in operating costs. This finding underscores the central role of freight rates in shaping VOSA Quang Ninh Company's profits and reflects the company's close dependence on developments in the international maritime transport market.

Exchange-rate movements (USD/VND) also influence profit through two channels. In the short run, VND depreciation increases the cost of USD-denominated payments, creating temporary financial pressure. Over the longer term, however, a weaker VND raises converted revenue because most receipts are denominated in USD while a substantial share of operating costs is incurred in VND. Improved financial planning, reserve management, and contract diversification have also helped mitigate exchange-rate risk.

Brent crude oil prices mainly affect short-term performance by increasing bunker fuel and related operating costs, thereby reducing profit. Their long-run impact is less pronounced, reflecting the company's efforts to optimize routes, implement fuel surcharges, and strengthen cost-control practices. Nevertheless, oil price volatility remains an important source of operational risk.

Overall, the findings indicate that Company VOSA Quảng Ninh's dry bulk import–export operations are resilient but remain structurally exposed to external market conditions. Freight rates are the dominant driver of profit, while exchange-rate movements and oil prices primarily affect financial and operating costs, highlighting the company's continued dependence on international maritime market dynamics.

Beyond the Vietnamese context, similar evidence has also been reported in other emerging economies. In China, Gu and Liu show that freight rate fluctuations in the dry bulk sector are closely linked to manufacturing activity and macroeconomic uncertainty, indicating that firm-level performance is highly sensitive to demand-side industrial conditions [28]. Due to the limited number of firm-level studies specifically focusing on dry bulk shipping companies in emerging economies, this study draws on closely related evidence from shipping firms, freight forwarders, and port-based logistics systems that handle dry bulk cargo. Similarly, evidence from Indonesian dry bulk logistics firms suggests that operational performance is significantly affected by volatility in freight demand and fuel costs, which directly influence shipping margins and cost structures [29]. Therefore, the relationships identified for Company VOSA Quảng Ninh are consistent with broader evidence from comparable shipping businesses rather than being unique to a single Vietnamese case.

4. RECOMMENDATIONS AND SOLUTIONS

4.1. Improve the capacity to manage supply–demand, and freight rates

Freight rates have the strongest influence on Company VOSA Quảng Ninh's business performance. When transport demand rises while vessel capacity is constrained, freight costs increase sharply; during market downturns, revenue and profit decline. To reduce dependence on market cycles, the company should strengthen freight-rate forecasting and adopt more flexible pricing strategies. Key measures include developing an internal database on transport supply and demand, applying short-term forecasting models based on historical data, and balancing short- and long-term contracts linked to the Baltic Dry Index (BDI). The company should also implement flexible surcharge mechanisms, such as BAF and CAF, to share freight-cost risks with customers.

4.2. Fuel cost management

Fuel accounts for approximately from 30% to 40% of logistics operating costs and remains one of the largest threats to profit. Rising Brent crude oil prices increase

transportation costs, while the company's ability to pass these costs on to customers is limited. Fuel monitoring and consumption management should therefore be strengthened. Company VOSA Quảng Ninh should implement a Voyage Optimization System to improve route planning based on weather and ocean conditions, and adopt a slow steaming policy where operationally feasible. In addition, long-term fuel supply contracts with reliable suppliers, regular fuel-quality inspections, and fuel-consumption KPIs for each vessel would improve cost control.

4.3. Managing exchange rate risks and cash flow

Because most revenues are received in USD while many operating expenses are incurred in VND, Company VOSA Quảng Ninh remains exposed to exchange-rate fluctuations. Although USD appreciation increases converted revenue, it also raises foreign-currency expenses, while VND appreciation reduces converted profits. The goal of this solution is to stabilize converted profits and reduce financial risks due to exchange rate fluctuations. Company VOSA Quảng Ninh needs to issue an official exchange rate risk management policy that clearly specifies the reserve ratio and risk prevention measures. The Accounting - Finance Department will maintain a USD account at a commercial bank and apply a "natural hedge" mechanism, using USD revenue to pay for foreign currency expenses to reduce conversion costs. Enterprises also need to build a specialized financial management department to monitor exchange rate fluctuations, prepare quarterly reports and advise the Board of Directors on adjusting financial plans.

4.4. Management innovation and digital transformation in logistics operations

Currently, Company VOSA Quảng Ninh's management system is still fragmented, and much of the data has not been digitized, causing difficulties in coordination and decision-making. In the digital transformation trend of the logistics industry, modernizing information infrastructure is an inevitable requirement to increase efficiency, transparency and data analysis capabilities.

Enterprises need to deploy an integrated ERP system between the operations, accounting, and human resources departments; build a data dashboard for real-time analysis; and digitize transportation documents, contracts, and invoices. At the same time, it is necessary to organize training for personnel in using management software and in data security.

5. CONCLUSION

This study analyzed the impact of key external economic factors: freight rates, exchange rates, and oil prices on Company VOSA Quảng Ninh's import and export performance during 2019 - 2024 using the ARDL and ECM models. The results confirm that all three variables significantly affect profit in both the short and long term. Freight rates have the strongest influence, reflecting the firm's dependence on global supply and demand cycles. Exchange rate fluctuations are positively correlated with profits through foreign-currency revenues, whereas oil prices primarily affect short-term operating costs. These findings align with maritime economic theory and answer the study's research questions.

Based on the econometric evidence, the study proposed solutions focusing on freight rate management, exchange rate hedging, fuel cost control, flexible pricing, and digital forecasting. Effective implementation can improve Company VOSA Quảng Ninh's resilience, profit, and competitiveness amid market volatility. The research achieved both key objectives: determining the impact of freight rates on bulk cargo and proposing practical management solutions to mitigate risks and optimize performance.

However, limitations remain. The case-study approach restricts generalization to the broader Vietnamese maritime sector, and the short 2019 - 2024 timeframe may not capture structural market shifts. Future research should expand the dataset, apply complementary models (e.g., VAR and extended ARDL), and include broader samples of logistics firms, incorporating additional variables such as industrial production or port costs to enhance robustness and policy relevance.

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