

|  |  |
| --- | --- |
| Assignment Cover Sheet | |
| Candidate Number | 018874 |
| Module Code | BEMM466 |
| Module Name | Business Project |
| Assignment Title | Impacts of US Tariffs and the India–UK FTA on UK Whisky and Gin Export |

*Within the Business School we support the responsible and ethical use of GenAI tools, and we seek to develop your ability to use these tools to help you study and learn. An important part of this process is being transparent about how you have used GenAI tools during the preparation of your assignments.*

*The below declaration is intended to guide transparency in the use of GenAI tools, and to assist you in ensuring appropriate referencing of those tools within your work.*

*The following GenAI tools have been used in the production of this work:*

*[please specify]* ………ChatGPT, Gemini, Grok…………..

  *I have used GenAI tools for brainstorming ideas.*

*I have used GenAI tools to assist with research or gathering information.*

*I have used GenAI tools to help me understand key theories and concepts.*

*I have used GenAI tools to identify trends and themes as part of my data analysis.*

  *I have used GenAI tools to suggest a plan or structure of my assessment.*

*I have used AI tools to give me feedback on a draft.*

*I have used GenAI tool to generate images, figures or diagrams.*

*I have used AI tools to proofread and correct grammar or spelling errors.*

*I have used AI tools to generate citations or references.*

  *Other [please specify] …………………………………………………………………………………………………………………*

  *I declare that I have referenced use of GenAI tools and outputs within my assessment in line with the* [*University referencing guidelines*](https://eur03.safelinks.protection.outlook.com/?url=https%3A%2F%2Flibguides.exeter.ac.uk%2Freferencing&data=05%7C02%7Cesm.buildingone%40exeter.ac.uk%7Cf648da2e0e514f17ff0808dcef4ae06d%7C912a5d77fb984eeeaf321334d8f04a53%7C0%7C0%7C638648352064065071%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C0%7C%7C%7C&sdata=XtT64F9dPrvOQT2VctmEQFhuY7otvEvyQ8PLT5lzbus%3D&reserved=0)*.*

**Forecasting the Impact of Trade Policy on UK Whisky and Gin Exports: A Comparative Analysis of US Tariffs and the India–UK FTA (2015–2036)**

The UK’s spirit export sector is being shaped by two contrasting trade policies. The 25 percent US tariff on Scotch whisky (2019–2021) disrupted a key market through protectionist measures, while the 2025 India–UK Free Trade Agreement aims to expand access through tariff reductions. This study examines how these opposing policies have affected, and may continue to influence, UK whisky and gin exports, using segmented trade data and forecasting to evaluate market outcomes.

**Aims & Objectives**

The overarching aim of this research is to evaluate the economic impact of international trade policies, specifically US-imposed tariffs and the UK-India FTA, on UK whisky and gin exports. To achieve this aim, the following SMART (Specific, Measurable, Achievable, Relevant, Time-bound) objectives have been defined:

1. To measure the export disruption caused by the 25% US tariffs on Scotch whisky from October 2019 to March 2021 through volume, price, and product segmentation.
2. To simulate and assess the benefits of phased tariff reductions under the India–UK FTA (from 150% to 75%, then to 40%) on export volumes of both whisky and gin.
3. To compare export elasticity between premium (e.g., single malt) and lower-grade spirits (e.g., grain whisky) under both trade events.
4. To test the predictive accuracy of various forecasting models and identify the most robust for long-term export forecasting up to 2036.

**Research Questions:**

* How significantly did the US-imposed tariffs affect UK whisky export volumes across product grades?
* What is the forecasted growth in UK whisky and gin exports under the India–UK FTA’s phased tariff reductions?
* Which product segments (high- vs. low-quality spirits) show the highest sensitivity to trade policy changes?
* Which forecasting model offers the highest accuracy for trade intervention effects?

**Problem Context and Scope of Study**

Recent shifts in global trade policy have significantly influenced UK spirit exports. Two key developments frame this study: the 25 percent retaliatory tariffs imposed by the United States on Scotch whisky between 2019 and 2021, and the 2025 United Kingdom–India Free Trade Agreement, which reduces longstanding import duties on alcoholic beverages. Together, these events present a contrasting policy landscape, ideal for examining how external interventions shape export performance across product categories.

Scotch whisky, a Geographical Indication–protected product, holds substantial economic and cultural importance (Ichijo, 2024). Empirical studies (Muhammad & Thompson, 2022; Kim, 2023; Ichijo, 2019) show that price-sensitive, lower-grade whiskies were more adversely affected by the US tariffs and Brexit-related trade disruptions, while premium single malts demonstrated resilience. Conversely, the Indian market, historically protected by tariffs as high as 150 percent, is expected to become increasingly accessible and profitable due to gradual reductions to 75 percent and eventually 40 percent (Department for International Trade, 2025).

The United States is included in this study due to its economic importance and the contrasting nature of its trade intervention. As the largest export market for Scotch whisky, the US imposed a 25 percent tariff between 2019 and 2021, creating a well-defined case of protectionism. Analysing this event enables a retrospective comparison against the liberalising effects of the India–UK FTA. Including both markets enhances the study’s analytical depth and improves the reliability of forecast models through access to robust, high-frequency export data.

Gin is included in this analysis due to its growing relevance in emerging markets and complementary export trends. As illustrated in Figure 1, the interactive dashboard Spirit in a Glass demonstrates that whisky and gin jointly account for the majority of EU spirit export value between 2021 and 2025. Developed using Plotly and Dash, and hosted on GitHub (Nandy, 2025), the dashboard serves as both an exploratory visualisation and a real-time data validation tool.

This research uses Combined Nomenclature (CN8)–level monthly export data from 2015 to 2025 to segment products by quality and format. Forecasts are extended to 2036 to capture long-term export trends and to align with the phased structure of the UK–India Free Trade Agreement, which outlines tariff reductions over a 10-year period, ultimately lowering import duties on spirits to 40 percent (Department for International Trade, 2025).

A brown rectangle with white text

AI-generated content may be incorrect.

Figure : EU Spirit Exports (2021 to 2025): 'Spirit in a Glass' Visualisation.

**Literature & Data**

This study examines the effects of international trade policies on UK whisky and gin exports, focusing on the 25% US tariffs (2019–2021) and the UK–India Free Trade Agreement (FTA) starting in 2025. The US tariffs disrupted Scotch whisky exports, with lower-quality variants facing sharper declines due to higher demand elasticity (Muhammad & Thompson, 2022; Kim, 2023). These effects persisted beyond the tariff period, necessitating long-term analysis (Fajgelbaum et al., 2020). Conversely, the India–UK FTA, which reduces tariffs from 150% to 75% and gradually to 40% by next 10 years, offers growth potential for premium spirits (Department for International Trade, 2025; Scotch Whisky Association, 2023). Phased tariff reductions facilitate market adaptation through supply chain and demand adjustments (Kohl et al., 2016; Handley & Limão, 2017).

The analysis uses monthly export data (2015–2025) from HM Revenue and Customs (HMRC) and the Office for National Statistics (ONS) at the Combined Nomenclature eight-digit level (HM Revenue & Customs, n.d.). This granularity supports segmentation by product type (e.g., single malt, blended grain) and quality, critical for assessing policy impacts (Kim, 2023). Qualitative insights from trade reports and policy documents complement the data (Scotch Whisky Association, 2023). The time-series structure is ideal for forecasting models like SARIMAX, which handle seasonality and policy shocks (Box et al., 2015). This multimethod approach ensures robust evaluation of trade policy effects across product segments.  
  
**Methodology**

This study adopts a quantitative research design, grounded in the positivist paradigm, to systematically evaluate the effects of international trade interventions on UK spirit exports. It follows the Cross-Industry Standard Process for Data Mining (CRISP-DM), a widely recognised framework for structuring predictive modelling workflows. The research process begins with business and data understanding, followed by data preparation, modelling, evaluation, and deployment of insights in the form of scenario-based forecasts.

The modelling approach centres on the Seasonal Auto-Regressive Integrated Moving Average with exogenous regressors (SARIMAX), chosen for its robustness in capturing seasonality and policy shocks. Inspired by Almuhaini and Sultana (2023), who modelled structural policy changes using SARIMAX, this study employs a dual-exogenous framework. The first variable captures the assumed immediate reduction in Indian import duties on whisky and gin from 150% to 75%, implemented as a binary shock from January 2026 based on ratification timelines. The second models the gradual reduction to 40% over the following nine years using a linearly scaled continuous variable, a common proxy in studies lacking published tariff schedules (Kohl et al., 2016).

An additional binary variable (us\_tariff) accounts for the 25% US tariff period from October 2019 to March 2021, reflecting a policy shock to Scotch whisky exports. Comparative models—ARIMA, Vector Autoregression (VAR), and Artificial Neural Networks (ANN)—will be evaluated alongside SARIMAX using accuracy metrics such as Mean Absolute Error (MAE), Root Mean Squared Error (RMSE) and Mean Absolute Percentage Error (MAPE) (Hyndman & Athanasopoulos, 2018).

Model diagnostics, like the Ljung–Box Q-test and the Akaike Information Criterion (AIC), will ensure residual quality and parameter fit (Box et al., 2015). Scenario-based forecasting may also be employed to simulate alternative implementation timelines and macroeconomic shocks. Together, these techniques aim to produce policy-relevant insights into the future trajectory of UK spirit exports.

**Analytical Approach**

The analytical process will consist of two main stages: data transformation and model application. In the first stage, export data will be cleaned, adjusted for seasonality, and decomposed into trend and residual components to identify structural shifts potentially linked to policy interventions. Time-series visualisations will be generated to assess variation across whisky and gin segments, with particular attention to inflection points associated with the US tariff episode and the anticipated India–UK FTA implementation (Kim, 2023; Muhammad & Thompson, 2022).

In the second stage, the SARIMAX model will be applied to estimate segment-specific export responses using binary and continuous exogenous variables. These will represent both the immediate and gradual tariff changes outlined in the trade agreement. Scenario-based forecasting will be used to simulate outcomes under varying implementation timelines and tariff paths, helping to evaluate the sensitivity of export trends to external trade policies. Comparative model testing—possibly including ARIMA, Vector Autoregression, Artificial Neural Networks, or other relevant approaches—will be conducted to benchmark performance and assess forecasting robustness. The results will inform strategic insights for UK exporters and policymakers navigating evolving international trade dynamics.

### Limitations

The proposed methodology provides a structured and empirically supported framework, but several limitations must be acknowledged. First, the analysis relies on secondary data from HM Revenue and Customs, which may include reporting errors, reclassification issues, or inconsistencies in export declarations (HM Revenue & Customs, n.d.). These data imperfections could affect the reliability of model estimates.

Second, time-series forecasting to 2036 introduces uncertainty, as predictive accuracy decreases over longer horizons. Even with ARIMA models accounting for seasonality and policy interventions, structural shifts, behavioral changes, or unforeseen global shocks may not be fully captured (Box et al., 2015; Hyndman & Athanasopoulos, 2018).

Third, isolating the causal impact of trade interventions is challenging due to overlapping global events, such as the COVID-19 pandemic and macroeconomic disruptions. These confounders may obscure the effects of the 25% US tariffs on UK spirits (2019–2021) and the phased implementation of the India–UK Free Trade Agreement (Fajgelbaum et al., 2020).

A further limitation concerns the modeling of the India–UK Free Trade Agreement. Although concluded, its ratification is pending, and the specific tariff reduction schedule from 75% to 40% over ten years remains unpublished. This study assumes a January 2026 start date and linear phasing, which may differ from the final implementation (Department for International Trade, 2025). Such trade-policy uncertainty can influence exporter behavior and market investment (Carballo, Handley & Limão, 2022; Limão & Maggi, 2015).

Finally, the product-specific focus on whisky and gin, while justified by data availability and market relevance, may limit the generalisability of findings to other export categories. Additionally, adjustment costs may delay market responses to tariff reductions (Alessandria & Choi, 2021).

### Ethical Considerations

This study involves the analysis of publicly available secondary data and thus presents minimal ethical risk. Nevertheless, ethical integrity is upheld through adherence to best practices in data handling, transparency, and responsible interpretation. All datasets used—primarily sourced from HM Revenue and Customs (HMRC), the Office for National Statistics (ONS), and other government publications—are anonymised and non-personal in nature. No confidential, commercially sensitive, or identifiable information is included.

In line with established ethical research frameworks (Bell, Harley, & Bryman, 2022), the study will ensure informed methodological transparency, reproducibility, and accountability throughout the research process. Forecasts and analytical insights will be presented with appropriate caveats regarding model uncertainty and data limitations, avoiding overstatement of conclusions.

Data will be stored securely using institutional cloud platforms or encrypted devices, complying with GDPR and University of Exeter data policies. Potential biases arising from model design, variable selection, or interpretation will be critically examined and disclosed. Ongoing communication with academic supervisors and full adherence to the University’s ethical review processes will further uphold the credibility and social responsibility of the research.

### Risks

The research timeline has been structured to allow for staged progression across literature review, data processing, model development, and final analysis. However, several risks could affect this timeline. One key risk lies in the data collection and preparation phase (Weeks 3–6), where issues such as inconsistent formatting, gaps in HMRC records, or challenges in mapping CN8 classifications to quality tiers could cause delays. To mitigate this, preliminary data exploration is scheduled early in the project (Weeks 1–2), enabling early detection of such issues.

Another potential risk arises during the modelling and forecasting phases (Weeks 7–10). If the SARIMAX framework fails to provide stable or interpretable results—especially in the context of overlapping economic disruptions—alternative models such as ARIMA, VAR, or ANN may need to be trialled, adding time pressure.

To manage these risks, the Gantt chart incorporates overlapping phases and buffer weeks, ensuring that the final drafting and review period (Weeks 10–12) remains protected for synthesis and refinement.

### Executive Summary Plan

The executive summary will be delivered either as a two-page written briefing or a one-page visual presentation, similar to formats used in academic or industry conferences. It will summarise key insights from the forecasting analysis, supported by export trends, intervention effects, and model accuracy metrics. Visuals such as annotated charts and forecast scenarios will aid accessibility. The goal is to communicate actionable findings clearly and concisely to a diverse audience, including policymakers, industry professionals, and academic reviewers.

**Timeline**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Phase** | **Weeks 1-2 (June 17-30)** | **Weeks 3-6 (July 1-28)** | **Weeks 7-9 (July 29-Aug 18)** | **Weeks 10-12 (Aug 19-Sept 3)** |
| Literature Review & Finalizing Proposal | X |  |  |  |
| Data Collection & Preparation | X | X |  |  |
| Model Development & Testing |  | X | X |  |
| Analysis, Forecasting & Scenario Modelling |  |  | X | X |
| Drafting Final Report & Visualizations |  |  | X | X |
| Final Report Submission |  |  |  | X |

**A graph with different colored rectangles

AI-generated content may be incorrect.**

Figure : Dissertation Gantt Chart Timeline

A time-based view of research tasks across a 12-week dissertation period. Color-coded by phase, it includes live progress percentages and editable notes for supervisor feedback.

**References**

Alessandria, G., & Choi, H. (2021). *The dynamics of the U.S. trade balance and real exchange rate: The J curve and trade costs?* Journal of International Economics, 132, 103511. <https://doi.org/10.1016/j.jinteco.2021.103511>

Almuhaini, S., & Sultana, N. (2023). *Forecasting long-term electricity consumption in Saudi Arabia based on statistical and machine learning algorithms to enhance electric power supply management.* Energies, 16(4), Article 2035. <https://doi.org/10.3390/en16042035>

Bell, E., Harley, B., & Bryman, A. (2022). *Business research methods* (6th ed.). Oxford University Press. <https://read.kortext.com/reader/epub/1929994>

Box, G. E. P., Jenkins, G. M., Reinsel, G. C., & Ljung, G. M. (2015). *Time series analysis: Forecasting and control* (5th ed.). Wiley.

Carballo, J., Handley, K., & Limão, N. (2022). *Economic and policy uncertainty: Aggregate export dynamics and the value of agreements*. Journal of International Economics, 139, Article 103661. <https://doi.org/10.1016/j.jinteco.2022.103661>

Department for International Trade. (2025). *UK-India trade deal conclusion summary*. <https://www.gov.uk/government/publications/uk-india-trade-deal-conclusion-summary>

Fajgelbaum, P. D., Goldberg, P. K., Kennedy, P. J., & Khandelwal, A. K. (2020). *The return to protectionism.* Quarterly Journal of Economics, 135(1), 1–55. <https://doi.org/10.1093/qje/qjz036>

Handley, K., & Limão, N. (2017). *Policy uncertainty, trade, and welfare: Theory and evidence for China and the United States.* American Economic Review, 107(9), 2731–2783. <https://doi.org/10.1257/aer.20141419>

HM Revenue & Customs. (n.d.). *Overseas Trade Statistics (OTS) interactive custom table* [Dataset]. UK Trade Info. Retrieved June 15, 2025, from <https://www.uktradeinfo.com/trade-data/ots-custom-table/>

Hyndman, R. J., & Athanasopoulos, G. (2018). *Forecasting: Principles and practice* (2nd ed.). OTexts. <https://otexts.com/fpp2/>

Ichijo, A. (2019). *What has the Brexit process done to Scotch Whisky?* *The Political Quarterly, 90*(4), 588–595. <https://doi.org/10.1111/1467-923X.12777>

Ichijo, A. (2024). *Defending the Scottishness of Scotch Whisky.* In *Place-branding experiences*. Edward Elgar Publishing. <https://doi.org/10.4337/9781035311071.00016>

Kim, M. (2023). *The differential effect of tariffs by quality: Estimates from Scotch.* SSRN. <https://doi.org/10.2139/ssrn.4719016>

Kohl, T., Brakman, S., & Garretsen, H. (2016). *Do trade agreements stimulate international trade differently? Evidence from 296 trade agreements.* The World Economy, 39(1), 97–131. <https://doi.org/10.1111/twec.12272>

Limão, N., & Maggi, G. (2015). *Uncertainty and Trade Agreements.* American Economic Journal: Microeconomics, 7(4), 1–42. <http://www.jstor.org/stable/43949030>

Muhammad, A., & Thompson, J. (2022). *Whiskey, Brexit, and the trade war.* Journal of Global Marketing, *35*(4), 370–386. <https://doi.org/10.1p080/08853908.2022.2111006>

Nandy, P. (2025). *Dissertation* [Unpublished manuscript]. GitHub. <https://github.com/NandyPritid/Dissertation.git>

Scotch Whisky Association. (2023). *Scotch whisky exports 2023*. <https://www.scotch-whisky.org.uk/newsroom/scotch-whisky-exports-2023>