

Brent Oil Price Change Point Analysis

Birhan Energies – Data Science Project

1 Project Overview

This project investigates how geopolitical, economic, and policy events impact Brent crude oil prices. Task 1 focuses on:

- Defining the analysis workflow
- Understanding time series properties of Brent oil prices
- Compiling a dataset of key global oil market events
- Conducting initial EDA

Outputs guide **Bayesian change point modeling** (Task 2) & **dashboard development** (Task 3).

2 Data Description

Dataset: Daily Brent oil prices (May 20, 1987 – Sep 30, 2022)

Column	Description
Date	Trading date
Price	Brent oil price (USD per barrel)

Event Dataset: 13 key events including:

- Geopolitical conflicts (Iraq War, Russia-Ukraine War)
- Economic shocks (2008 financial crisis, COVID-19)
- OPEC policy changes, sanctions

3 Initial EDA Findings



Figure 1: 365-day rolling mean of Brent oil prices

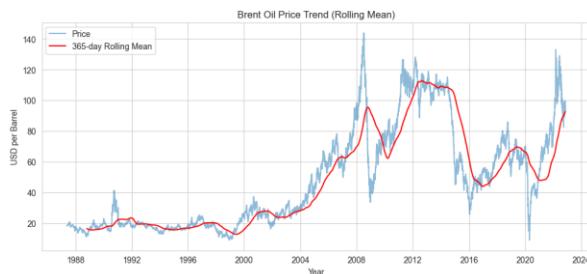


Figure 2: Daily Brent oil prices (1987–2022)

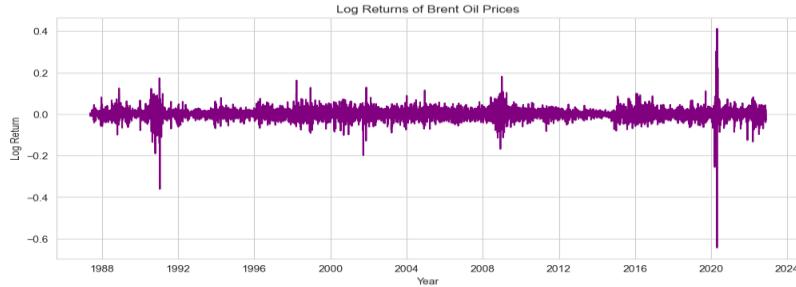


Figure 3: Log returns of Brent oil prices

4 Event Dataset (Sample)

Event Date	Event Description	Category
2003-03-20	US-led invasion of Iraq	Geopolitical Conflict
2008-09-15	Global Financial Crisis	Economic Shock
2010-12-17	Arab Spring begins	Political Instability
2014-11-27	OPEC maintains production	OPEC Policy
2020-03-11	COVID-19 pandemic	Global Crisis

Full CSV (`events.csv`) in repo.

5 Assumptions & Limitations

Assumptions: Market reacts promptly; event dates approximate impact; prices reflect aggregated expectations.

Limitations: Correlation \neq causation; overlapping events; subtle shifts may not be detected; unobserved macroeconomic factors not modeled.

6 Next Steps

Task 2: Bayesian Change Point Modeling

- Detect structural breaks in price/log returns
- Quantify impact before/after change points
- Link change points to events
- Examine trace plots and posterior distributions

Task 3: Interactive Dashboard

- **Backend (Flask):** Serve prices, change points, event correlations
- **Frontend (React):** Interactive charts, event highlights, date filters
- **Insights:** Allow stakeholders to explore event impacts and volatility