**Preliminary EDA Report: Sovereign Bonds and Macro Indicators**

**Objective**

The primary goal of this project is to examine how **10-year government bond yields** in emerging markets (Brazil, Egypt, India, South Africa, Sri Lanka, and Turkey) co-move with key **macroeconomic fundamentals**: inflation (CPI), GDP growth, external debt, oil prices (Brent), and the USD index.  
The broader objective is twofold:

1. **Empirical** – identify whether sovereign bond yields reflect macro fundamentals or are dominated by country-specific shocks.
2. **Hypothesis building** – use exploratory evidence to guide formal econometric models (time-series, panel regressions) in later stages.

**Work Completed**

1. **Data consolidation** – monthly sovereign yields were aligned with annual/quarterly macro indicators (forward-filled to match frequency).
2. **Correlation analysis** – constructed correlation matrices across countries to detect broad patterns.
3. **Scatter plots** – visualized pairwise relationships between yields and macro variables.
4. **Time-series plots** – compared the co-movement of yields with inflation, GDP growth, debt, oil, and USD index across years.

**Key Findings**

**General Insights**

* **Inflation (CPI):** Correlations with yields are moderate and vary by country. Inflation spikes tend to coincide with rising yields, consistent with the Fisher effect, but not always one-to-one due to monetary policy interventions.
* **GDP Growth:** The relationship is weak and sometimes counterintuitive. Higher growth does not always translate into lower yields, reflecting that markets often weigh fiscal sustainability and inflation expectations more than growth alone.
* **External Debt:** Large and rising debt burdens (e.g., Sri Lanka, Turkey) show associations with elevated yields, suggesting default-risk pricing. However, the effect is weaker in larger economies (Brazil, India) where domestic borrowing cushions the risk.
* **Brent Oil:** Stronger co-movements in oil-importing countries (India, Turkey, Egypt), where higher oil prices often push yields up via inflationary and balance-of-payments pressures. Exporters (Brazil to some extent) are less sensitive.
* **USD Index:** Negative co-movements appear in several cases – as the USD strengthens, local yields rise, consistent with capital outflows and higher risk premia in emerging markets.

**Country-Specific Patterns**

* **Brazil:** High but relatively stable yields, with visible sensitivity to USD movements and oil shocks. Inflation–yield link is strong in the early 2010s.
* **India:** Yields respond more to oil and inflation than to GDP growth. External debt plays a weaker role given India’s reliance on domestic borrowing.
* **South Africa:** Clear evidence of yields rising with debt and USD strength. Inflation is moderately correlated but less dominant than fiscal signals.
* **Turkey:** Bond yields highly volatile, responding strongly to debt and USD shocks. Inflation linkages are present but complicated by unorthodox monetary policy.
* **Sri Lanka:** Very high yields with spikes aligning with debt stress, underscoring sovereign risk. Clear case of macro fragility.
* **Egypt:** Mixed signals; yields track inflation episodes but also show sensitivity to global shocks (oil, USD).

**Caveats**

1. **Frequency mismatch** – annual/quarterly macro indicators forward-filled to monthly can overstate smoothness and understate volatility.
2. **Correlation ≠ causation** – scatter plots and heatmaps highlight associations, not direction of influence.
3. **Policy distortions** – central bank interventions, capital controls, and political risk blur pure macro–yield relationships.

**Treatment:**

* Forward filling was used to align frequencies, but moving forward, quarterly rolling averages or interpolation could be more realistic.
* Rolling correlations (6–12 months) will be used to assess time-varying dynamics.
* Country fixed effects and dummy adjustments in later regressions will help absorb idiosyncratic policy shocks.

**Primary Hypothesis (from EDA)**

Emerging market bond yields are not explained by growth fundamentals alone; rather, they respond more strongly to **macro stability variables** (inflation, debt, external balance) and **global shocks** (oil, USD).

* **India, Brazil, South Africa** – relatively more resilient, but still yield-sensitive to global spillovers (oil, USD).
* **Turkey, Sri Lanka, Egypt** – more fragile, with yields directly reflecting inflation–debt crises and external vulnerabilities.

**Next Steps**

1. **Country focus:** Narrow the empirical analysis to **India, Brazil, and South Africa** (representatives of relatively larger and more liquid markets). If robust, extend to Turkey, Sri Lanka, and Egypt.
2. **Rolling correlations & VARs:** Examine dynamic interlinkages over time, particularly around crises.
3. **Panel regressions:** Test pooled effects with country dummies to identify systematic vs. idiosyncratic drivers.
4. **Hypothesis testing:** Check if bond yields systematically reflect inflation, debt, oil, and USD rather than growth fundamentals.

**Revised Objective**

To test whether **emerging market bond yields are primarily priced on macro stability (inflation, debt, oil, USD) rather than growth fundamentals**, using panel and time-series methods, starting with India, Brazil, and South Africa.