Exchange Rate Narratives

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Introduction

• Text analysis is not new (eg Friedman & Schwartz 63. Romer & Romer 04)

• Text algorithms are, especially to economists

• Offer a procedure to explain macro indicators info from news media

• Target dollar exchange rate
Why the exchange rate?

- Analyses from standard time series are inconclusive:
  
  - Low $R^2$ (Fama 84), “wrong” correlations (Backus and Smith 93), poor forecasts (Meese and Rogoff 84)

- Some recent progress: Stavrakeva and Tang 23, Chahrour et al 24, Engel and Wu 24

$\Rightarrow$ News might help!

- Reflect innovations/updates in the mkt info set

- Are salient/relevant to mkt participants
Preview of the findings

1. News contains useful info about the exchange rate
   • Outperform predictions of standard macro indicators

2. Topic model favors an epidemic-like decomposition of the exchange rate
   • Distinct diseases (topics) explain the dollar exchange rate
   • Nonlinear relation between exchange rate and fundamentals

3. Informative for exchange rate theories
   • Scapegoat theory (Bacchetta & van Wincoop 13, Fratzscher et al 15)
Related Literature


- Business Cycles: Bybee Kelly Manela Xiu 2021


Intro to sLDA

Latent Dirichlet Allocation (LDA) is a dimension-reduction technique

- Convert $V$ words into $K$ topics where $K << V$

- Let $x_a$ include the number of occurrences of each word in article $a$

\[
\min(x_a - \sum_k \theta_{a,k} \beta_k)^2
\]

topic $\beta_k \in \Delta^{V-1}$ is a distribution over $V - 1$ words

$\theta_{a,k}$ is the loading of article $a$ on topic $k$

Supervised LDA (sLDA)

- Pair each (meta) article with a response variable

- Max predictive power
Estimation Procedure

• Input text data: 564 monthly pooled article titles from Jan 1975 to Jan 2022 (707,984 individual WSJ articles).

• Response variable: monthly real exchange rate \( q_t \) of the U.S. vs G6

• Hyperparameter selection via grid search by semantic coherence and exclusivity.
  
  • Number of topics and parameters → 180 topics

• Estimate word assignments via Gibbs Sampling
Estimation Output

• sLDA produces 180 topics time series. Next:

  • Select a subset of topics with highest predictive power
  
  • Use topic word distributions $\beta$ to cluster topics in a few metatopics
  
  • Examine the relation between metatopics and macro indicators
Random Forest results

1. Estimate each tree on a random subsample.

2. Compute prediction and $R^2$ on the remaining sample.

<table>
<thead>
<tr>
<th>Dep. variable</th>
<th>Out-Of-Bag $R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(i) All topics</td>
</tr>
<tr>
<td>$q_t$</td>
<td>0.88</td>
</tr>
<tr>
<td>$q_{t+12} - q_t$</td>
<td>0.61</td>
</tr>
<tr>
<td>$q_{t+24} - q_t$</td>
<td>0.80</td>
</tr>
<tr>
<td>$q_{t+36} - q_t$</td>
<td>0.80</td>
</tr>
<tr>
<td>$q_{t+60} - q_t$</td>
<td>0.87</td>
</tr>
</tbody>
</table>

- Topics are highly informative and preferred to time series
- Focusing on six metatopics reduces $R^2$ only slightly
Figure: Dendrogram

Note: Titles are constructed using ChatGPT4.
Metatopic Prevalence

Exchange rate and metatopics

![Graph showing exchange rate predictions and true values over time, with metatopics such as Global Finance and Monetary Policies, Historical Economic Policies and Energy Markets, International Business and Financial News, Corporate Transactions and Stock Market, Economic Trends and Corporate Strategy, and Technological Advancements and Financial Reporting.]

Other Models

1: Global Finance and Monetary Policies
2: Historical Economic Policies and Energy Markets
3: International Business and Financial News
4: Corporate Transactions and Stock Market
5: Economic Trends and Corporate Strategy
6: Technological Advancements and Financial Reporting

Exchange Rate Narratives
Metatopic contributions by decade


Fed Funds Rate

Gvmt Debt

S&P 500

Trade Balance

Unemployment rate

VIX

MSE Loss

Date

1: Global Finance and Monetary Policies
2: Historical Economic Policies and Energy Markets
3: International Business and Financial News
4: Corporate Transactions and Stock Market
5: Economic Trends and Corporate Strategy
6: Technological Advancements and Financial Reporting
Quarterly Fernald TFP and metatopics

($R^2 = 28\%$)
In Sum

• Exchange rate changes can be explained by metatopics or narratives

• Narratives are differently related to fundamentals

  • Each validates theories of exchange rate fluctuations

  • If so, we should observe *something* in standard macro regressions
Rolling Window Regressions
Dep. var: $q_t - q_{t-12}$

- Larger subsample R-squared
- Coefficients consistent with metatopic analysis
Conclusion

• Novel procedure to extract news media info on a time series of interest

• Anatomy of the exchange rate sheds light on long-standing puzzles
  
  1. Sources of exchange rate fluctuations varied over time

  2. Consistent with scapegoat theory
Figure: Importance ranking computed in a model with FRED and all topics. AAAFFM is the spread between Moody's Aaa Corporate Bond Minus Federal Funds Rate; PERMIT is the number of new housing permits in the U.S., and PERMITNE, PERMITS, and PERMITW are the number of new housing permits in the northeast, in the south, and in the west of the U.S.; T5YFFM is the spread between the 5-year Treasury and the Federal Funds Rate, TB6SMFFM is the spread between 6-month Treasury and the Federal Funds Rate.
Wordclouds

(a) MT1: Global Finance and Monetary Policies
(b) MT2: Historical Economic Policies and Energy Markets
(c) MT3: International Business and Financial News
(d) MT4: Corporate Transactions and Stock Market
(e) MT5: Economic Trends and Corporate Strategy
(f) MT6: Technological Advancements and Financial Reporting
Exchange rate and metatopic

![Graphs showing feature contributions and date predictions.]

1: Global Finance and Monetary Policies
2: Historical Economic Policies and Energy Markets
3: International Business and Financial News
4: Corporate Transactions and Market Dynamics
5: Economic Trends and Corporate Strategy
6: Technological Advancements and Financial Reporting
Exchange rate and metatopic

![Graph showing exchange rate and metatopic over time with dates from 1980 to 2020.]

- Prediction
- True value

- 1: Global Finance and Monetary Policies
- 2: Historical Economic Policies and Energy Markets
- 3: International Business and Financial News
- 4: Corporate Transactions and Stock Market
- 5: Economic Trends and Corporate Strategy
- 6: Technological Advancements and Financial Reporting
Rolling Window Regressions
Dep. Var: $q_t - q_{t-12}$
Rolling Window Regressions
Dep. Var: $q_t - q_{t-12}$
Rolling Window Regressions
Dep. var: $q_t$
Rolling Window Regressions
Dep. var: $q_t$

- SP500
- Fed Funds rate
- VIX
- Government Debt
- Trade Balance
- Adjusted R-squared

Exchange Rate Narratives
Rolling Window Regressions
Dep. var: $q_t$
Rolling Window Regressions
Dep. var: $q_t - q_{t-1}$