

INTRODUCTION

Inflation is defined as an overall increase in prices of goods and services in an economy. Inflation can be characterized with a broad price index representing the overall price level. Inflation has a dramatic effect on people's lives. Some of the effects are:

- Loss of purchasing power
- Higher interest rates
- Difficulty paying bills
- Effects on the housing market. For example, the recent spike in housing prices.

Leading theories of inflation:

- Classical Monetary Theory (aka quantity theory of money; Friedman, 1989): The money supply determines prices. Rapid increases in money supply cause inflation.
- Modern Monetary Theory: Productivity determines prices. Rapid increases in money supply will increase productivity by increasing demand and will not cause inflation (Mankiw, 2020; Mitchell et al., 2016)
- The Fisher effect: Expectations influence inflation. If consumers expect high inflation, they want to buy now before prices increase, causing demand (pull) inflation.
- Many other factors: Political crises, costly wars, oil prices, low Fed Funds rate (interest rate from Fed)

The purpose of this study was to determine if the current inflation rates were predictable given what was known prior to the onset of the current spike.

METHODS

- Data collected from online public repositories:
 - <https://fred.stlouisfed.org>
 - <https://www.census.gov/data>
 - <https://data.bls.gov>
- Used SAS to split the data into pre-2010 as the train data set and post-2010 as the validation data set
- The 2010 cutoff was selected to balance sufficient training data and validation data set sizes, and to challenge the model to predict events 12 years after the last training information.
- In SAS Enterprise Miner, explored the data and conducted time series pre-processing limited to specifying the time interval as monthly
- The three target variables included monthly inflation rate not seasonally adjusted (MIR_notSAD), consumer price index (CPI), and personal consumption expenditures price index (PCE).
- Tested a series of models by adding one predictor at a time to create seven models for each of the three target variables, starting with the most important predictor according to classical monetary theory
- Ran a model comparison node for the seven models, three in total, corresponding to the three target variables.

RESULTS

Indices of conceptual predictors:

Money Supply: M1 (all money) or M2 (also includes credit), Fed Funds rate (interest offered by government)

Supply: GDP (all goods/services produced), BBKM GDP Index

Demand: Per Capita Income (absolute or in constant 2022 dollars), unemployment rate

M2 turned out to have the stronger relationship to inflation, and so was used in all models.

GDP caused problems with collinearity, and so was dropped from all models.



Figure 1: Exploration of the Variables

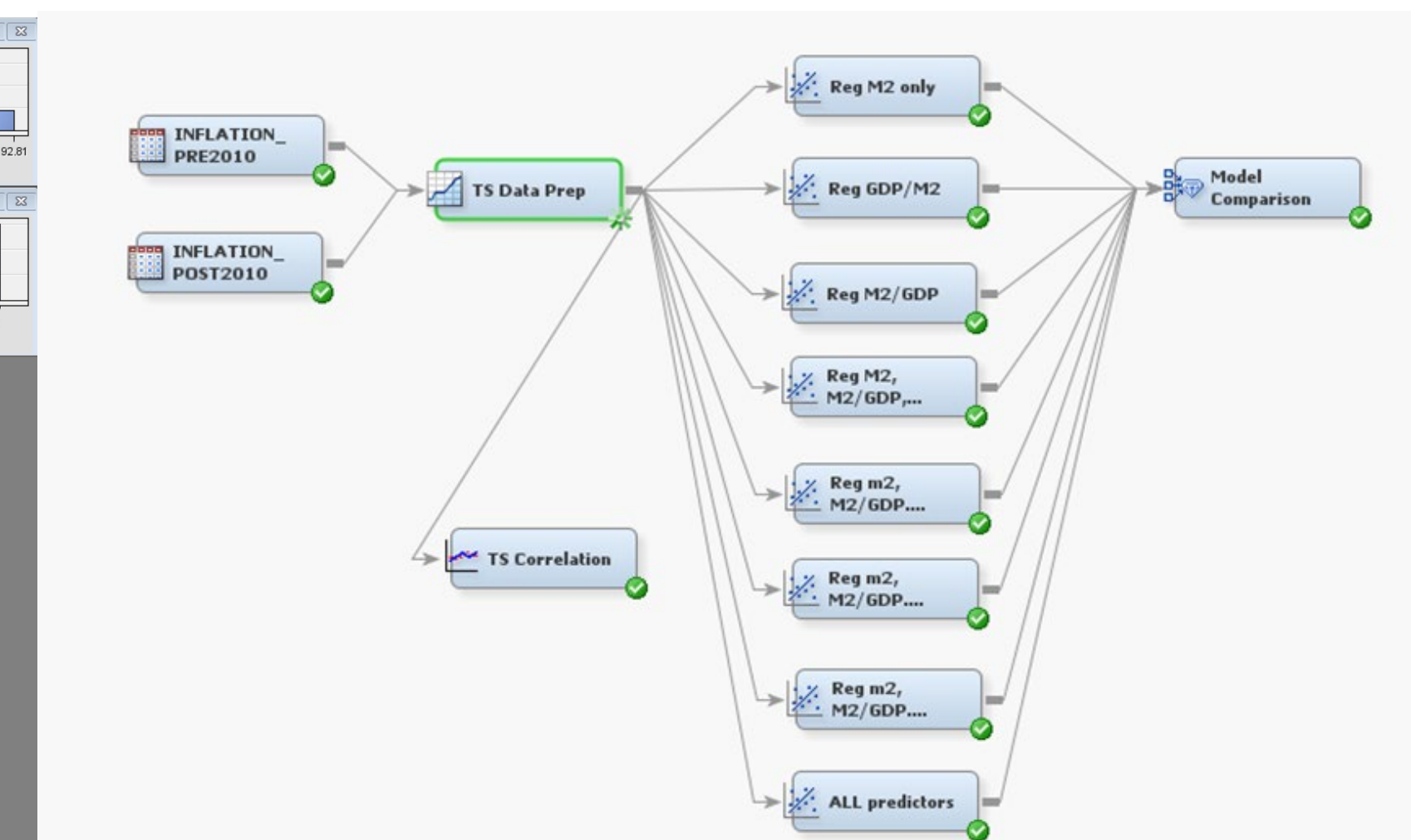


Figure 2: The SAS Enterprise Miner pipeline.

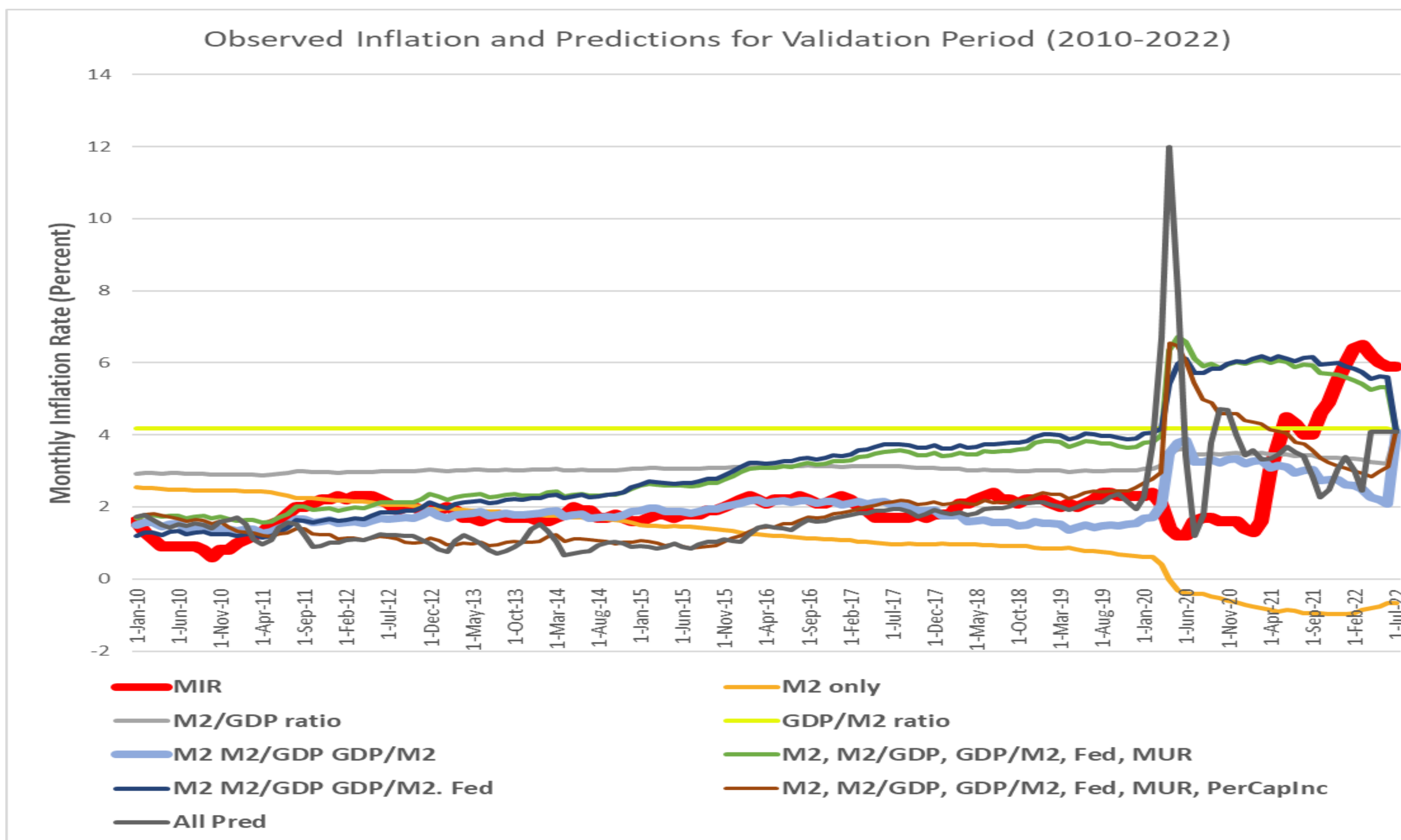


Figure 3. Predicted values for monthly inflation rate (MIR) from 2010 – 2022. The best model (average squared error selection) includes M2, M2/GDP ratio and GDP/M2 ratio. This model predicts a rise in inflation a little earlier than it actually happened, and fails to predict the continued rise in inflation from mid-2021 – mid-2022, but does feature a very late spike that comes close to matching the actual inflation rate in July 2022.

DISCUSSION

The main predictor of classical monetary theory, the money supply, failed to predict inflation. In fact, the money supply predicted a decrease in inflation.

The main predictor of modern monetary theory, productivity relative to money supply (GDP/M2), also failed, predicted a flat rate that was typically higher than the actual rate.

The money supply relative to productivity (M2/GDP) was moderately better, over-predicted for most of the period but predicting a small increase beginning in mid-2020.

The best model for all three target variables included both classical and modern monetary theory measures, and only those measures. This model predicted an earlier rise than what occurred. The model failed to predict how high inflation became but was the only model moving in the correct direction in the last month for which data were available.

Additional predictors (Fed rate, unemployment, BBKM, per capita income) caused either much earlier over-prediction starting in approximately 2016 – 2017 or a dramatic spike in mid-2020 that did not occur.

Future directions: M2 is theoretically a leading indicator and exploration of the lagged cross-correlation with MIR indicated a 12-month lead. Adding a 12-month lagged transfer function might improve the model.

Conclusions

Models based on both classical and modern monetary theory failed to predict current inflation, but a model that considered principles from both was successful. Although the chosen model predicted a spike earlier than when the true inflation occurred, it did not rise as high as current inflation.

The model was spiking as of July 2022, so it might yet come close to the actual peak of inflation.

Given that economists who do this for a living failed to predict inflation, we count this model as a success.

References

Friedman, M. (1989). Quantity theory of money. In *Money* (pp. 1-40). Palgrave Macmillan, London.
 Mankiw, N. G. (2020, May). A skeptic's guide to modern monetary theory. In *AEA Papers and Proceedings* (Vol. 110, pp. 141-44).
 Mitchell, W., Wray, L. R., & Watts, M. (2016). *Modern monetary theory and practice: an introductory text*. Newcastle, NSW: Centre of Full Employment and Equity.