

Term Spread Combinations

Its ability to span different macro variables and explain their future movements.

– Abdul Tawab Ajmal Safi-

ECON 304
Bates College
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What is the Term Spread?

$$\text{Term Spread} = \text{Long Term Interest Rate} - \text{Short Term Interest Rate}$$

- Short Term Interest Rate:

$$y_t^{1m}$$

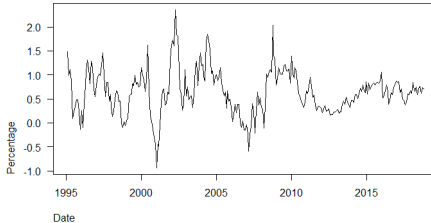
- Long Term Interest Rate:

$$y_t^{10y} = \frac{1}{10y} \sum_{i=0}^{10y-1} E \left[y_{t+i}^{1m} \right] + TP_t^{10Y}$$

Different Combinations of Long and Short Run Yield Curve result in varying Term Spreads

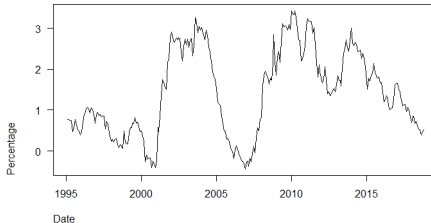
Term Spread

2.5 Year Yield Curve - 2 Month Yield Curve



Term Spread

10 Year Yield Curve - 1 Year Yield Curve



Research Questions

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2. Are Macro economic variables captured in all different combinations of term spread?
3. Can different term spread combinations be used to explain future movements in macro variables?

1st Research Question

- **Does it matter what short term and long term yield curve combinations we use to calculate the term spread?**

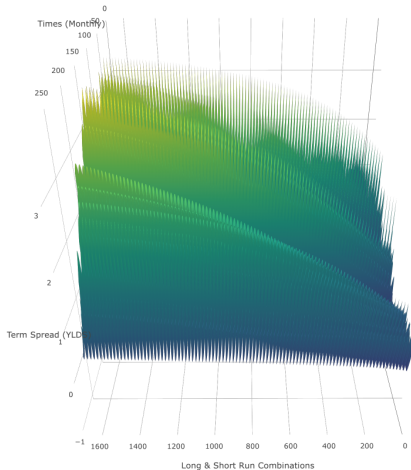
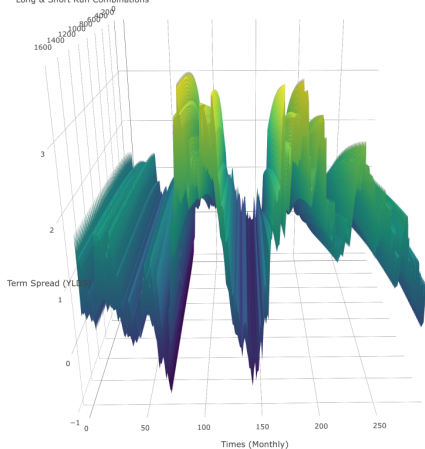
Term Spread Model Setup

$$TS_t^i = y_t^{Long\ Run} - y_t^{Short\ Run}$$

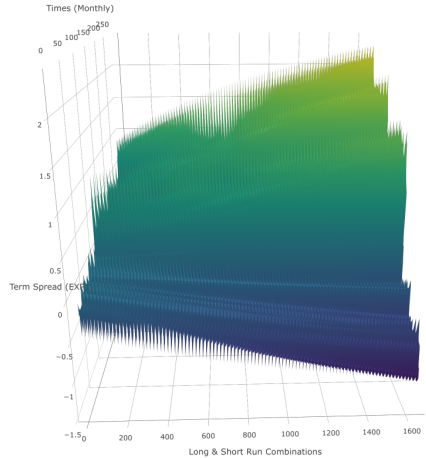
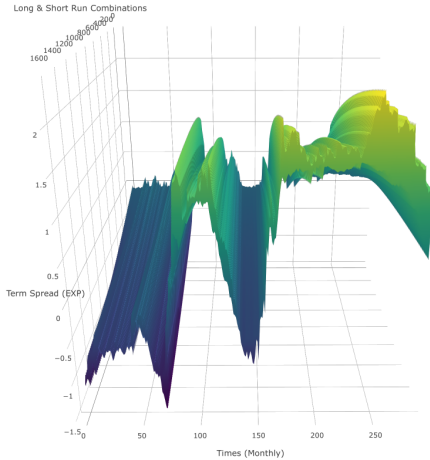
- **Long Run:** 24 months **to** 120 months = 97 Values
- **Short Run:** 2 months **to** 18 months = 17 Values
- **i** = Possible combinations of Term Spread = 1649
- **t** = monthly data = 1995-01-30 **to** 2018-10-31 = 286 observations

Term Spread [Long Run YLDS - Short Run YLDS]

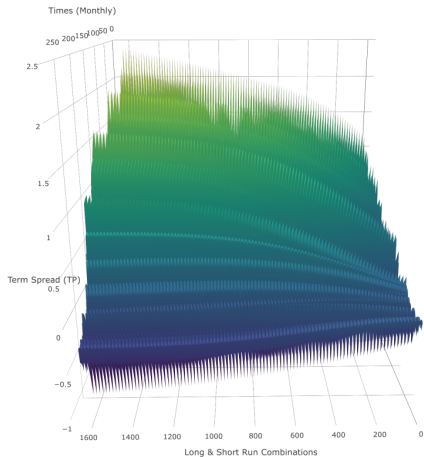
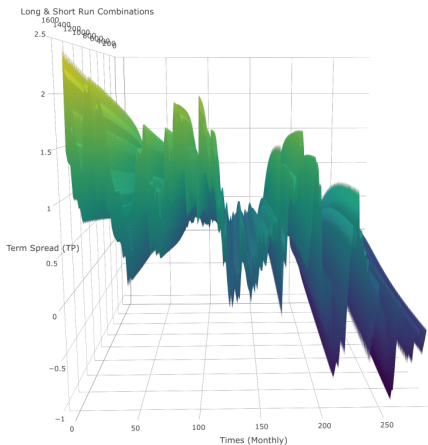
Long & Short Run Combinations



Term Spread [Long Run EXP - Short Run EXP]



Term Spread [Long Run TP - Short Run TP]



1st Research Question Takeaway

- Does it matter what short term and long term yield curve combinations we use to calculate the term spread?
- The Term Spread shapes appear to change across different combinations of short term and long term yield curves. **Hence, the combination we use does matter.**

2nd Research Question

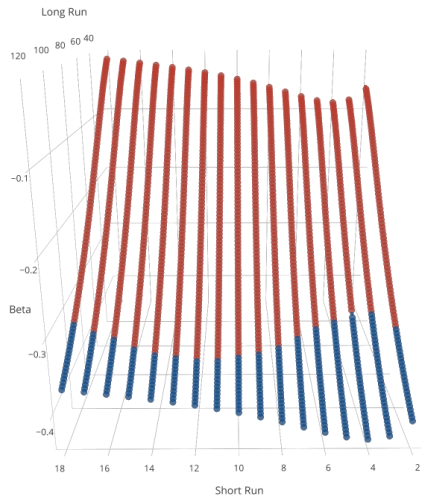
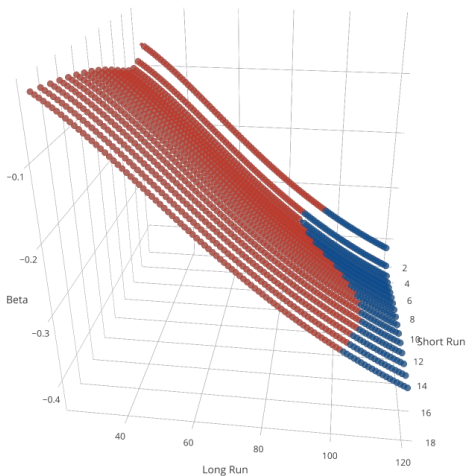
- **Are Macro economic variables captured in all different combinations of term spread?**
- If the term spreads vary based on the combination we select. Does it mean that the result for the spanning hypothesis will also be different across various combinations of term spread?

Spanning Hypothesis Test Model Setup

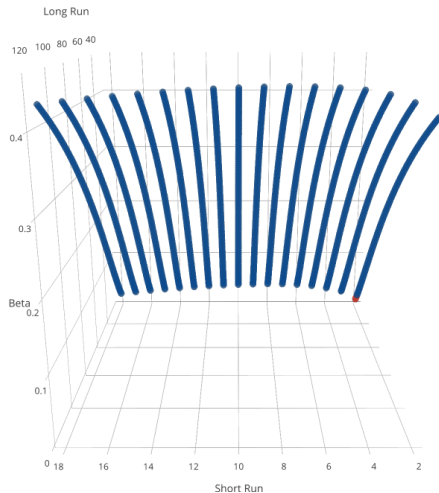
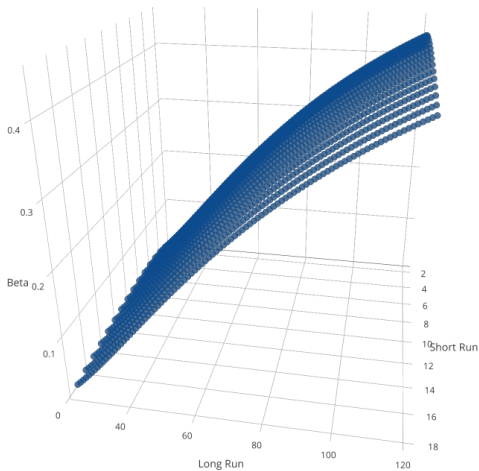
$$TS_t^i = \alpha^{(i,m)} + \beta^{(i,m)} macro_t^m + \varepsilon_t^{(i,m)}$$

- $i: \{1,1649\} \times 4$
- $macro_t^m: \{\Delta\pi_t^{CPI}, u_t\}$
- $\Delta\pi_t^{CPI}$: Yearly Change in Inflation
- u_t : Civilian Unemployment Rate
- t : monthly data = 1995-01-30 to 2018-10-31 = 286 observations

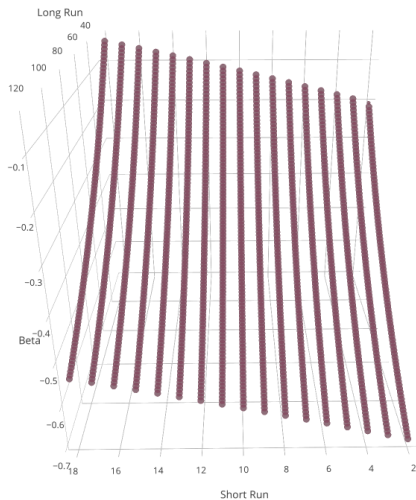
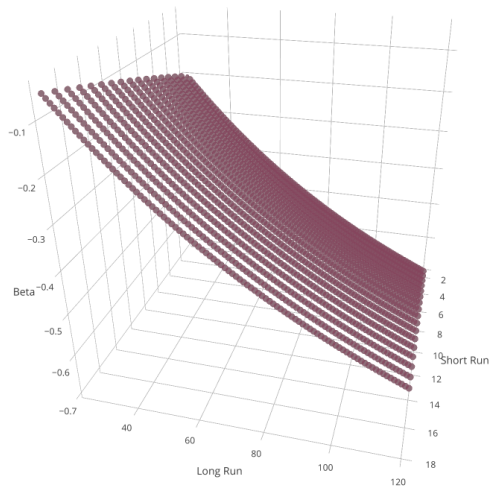
Spanning Test of YLDS Term Spread against CPI



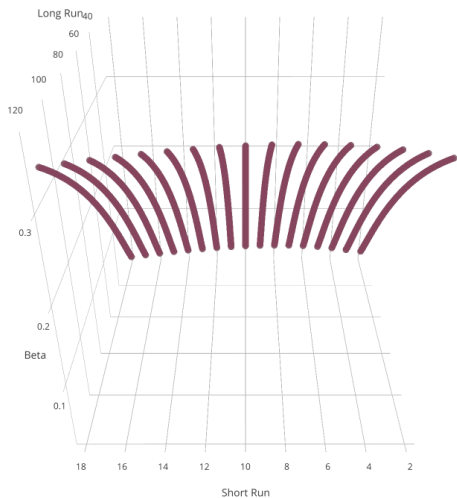
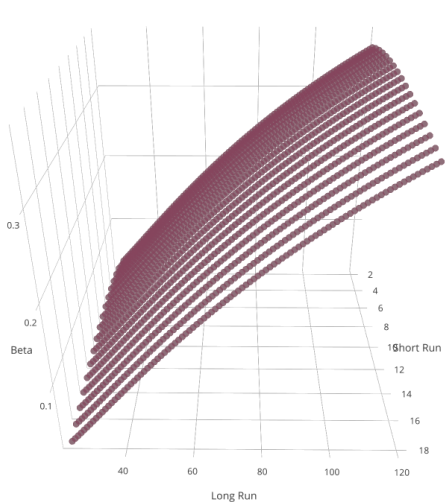
Spanning Test of YLDS Term Spread against UNEMP



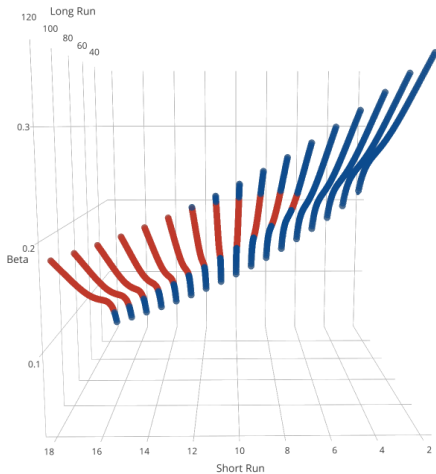
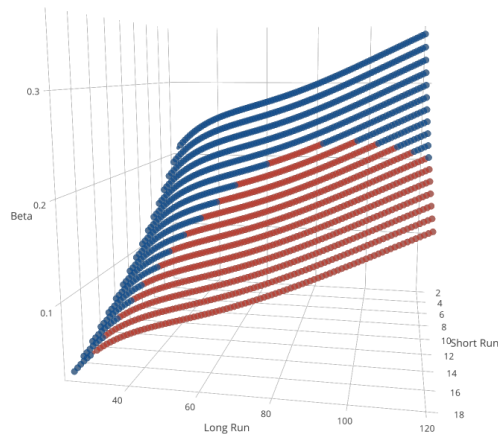
Spanning Test of EXP Term Spread against CPI



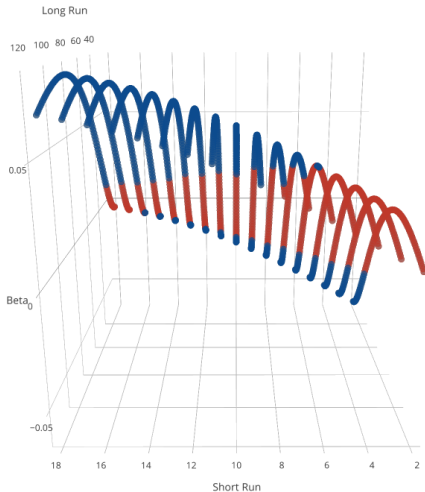
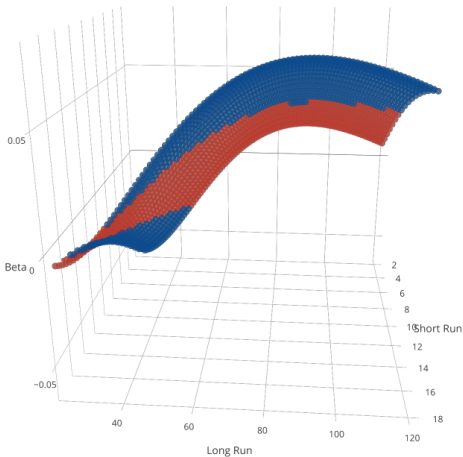
Spanning Test of EXP Term Spread against UNEMP



Spanning Test of TP Term Spread against CPI



Spanning Test of TP Term Spread against UNEMP



2nd Research Question Takeaway

- **Are Macro economic variables captured in all different combinations of term spread?**
- The results indicate that some combinations and components of term spread hold better for the Spanning Hypothesis of CPI and UNEMP than others.

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- **Are Macro economic variables captured in all different combinations of term spread?**
- The results indicate that some combinations and components of term spread hold better for the Spanning Hypothesis of CPI and UNEMP than others.
- This shows that different segments of the Term Spreads have different macro variables spanned.
- While developing a macro finance model, this approach can be used to identify the best combination of term spread.

3rd Research Question

- **Can different term spread combinations be used to explain future movements in macro variables?**

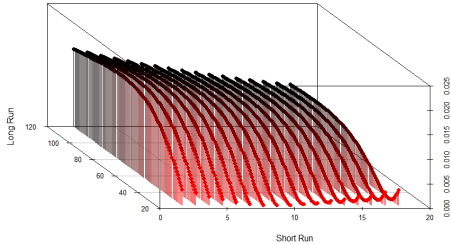
Explaining Future Movements Model Setup

$$macro_t^m = \alpha^{(i,m,h)} + \beta^{(i,m,h)} TS_{t-h}^i + \varepsilon_t^{(i,m,h)}$$

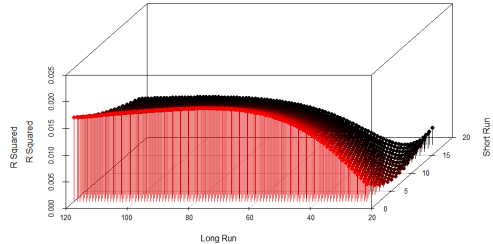
- $i: \{1,1649\}$
- $h : \{3,120\}$ months
- $macro_t^m: \{\Delta\pi_t^{CPI}, u_t\}$
- $\Delta\pi_t^{CPI}$: Yearly Change in Inflation
- u_t : Civilian Unemployment Rate
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Explaining CPI Over Short Run

CPI forecast with Term Spread over Short Run [R Squared Value]

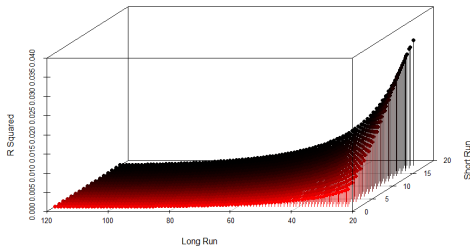


CPI forecast with Term Spread over Short Run [R Squared Value]

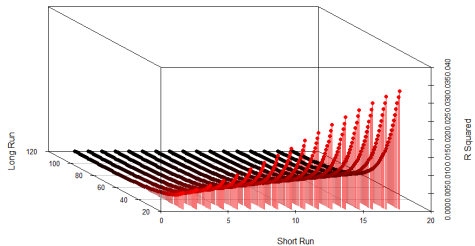


Explaining CPI Over Long Run

CPI forecast with Term Spread over Long Run [R Squared Value]

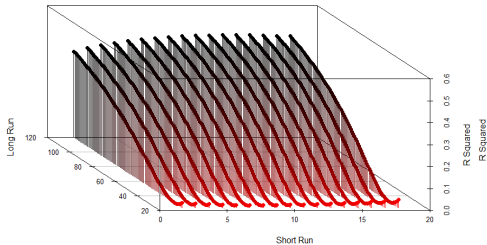


CPI forecast with Term Spread over Long Run [R Squared Value]

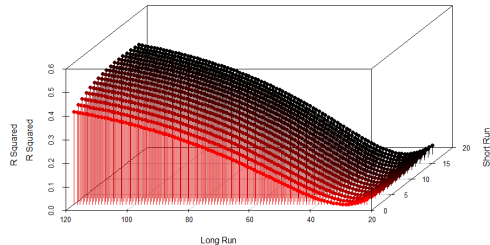


Explaining UNEMP Over Short Run

unemp forecast with Term Spread over Short Run [R Squared Value]

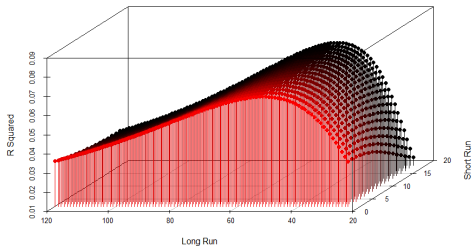


unemp forecast with Term Spread over Short Run [R Squared Value]

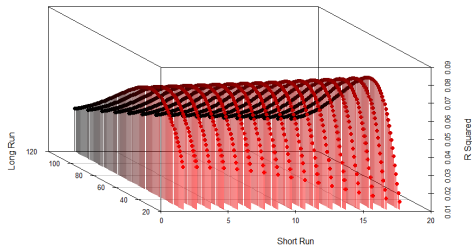


Explaining UNEMP Over Long Run

unemp forecast with Term Spread over Long Run [R Squared Value]



unemp forecast with Term Spread over Long Run [R Squared Value]



3rd Research Question Takeaway

- **Can different term spread combinations be used to explain future movements in macro variables?**
- The results indicate that different combinations of the term spread have varying power in explaining future movements in CPI and UNEMP.

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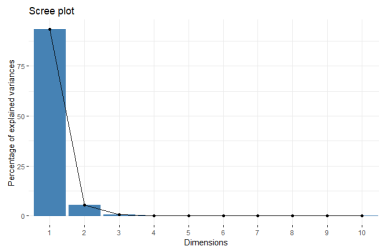
- **Can different term spread combinations be used to explain future movements in macro variables?**
- The results indicate that different combinations of the term spread have varying power in explaining future movements in CPI and UNEMP.
- This approach can be used to identify the best combination of term spread that can be used to explain future movements in a macro economic variable.

Main Takeaway

- It is important to take into consideration the different combinations and components of short run and long run yields curves that result in varying term spreads.
- This is because the spanning of macro variables vary across different segments of Term Spread, which have varying power in explaining future movements in macro variables.

Further Work

- Would taking the PCA of the 1649 different combinations of term spread give us the single best term spread to use?



- Applying a gradient for the significance of beta values in the Spanning Hypothesis graphs to identify varying level of significance across different combinations.

Questions