



Macroeconomics

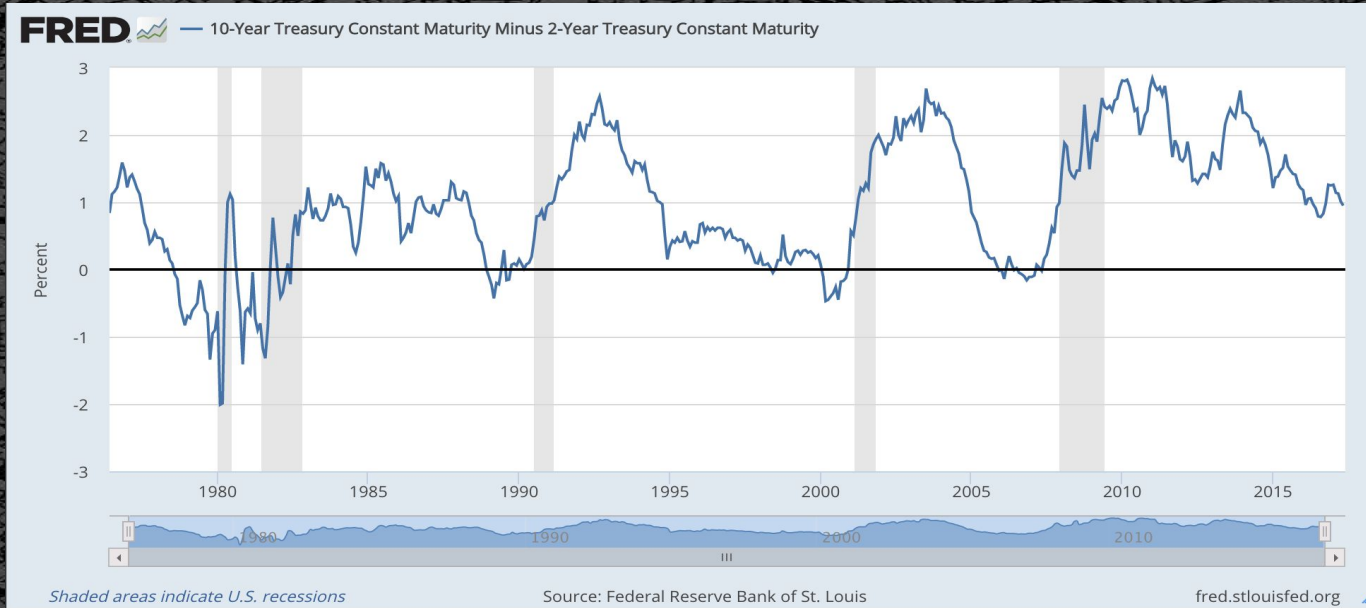
EDA & Feature Extraction

Feature Extraction - Reliable Pulse of Credit / Economy

Lending Spread = Mortgage Rate - Deposits Rate



Approximation of Spread Btw. Long & Short-term Interest Rates



Why Care? It's *Market Determined, Transparent, High Frequency in Availability, Stationary, and Forward-Looking.*

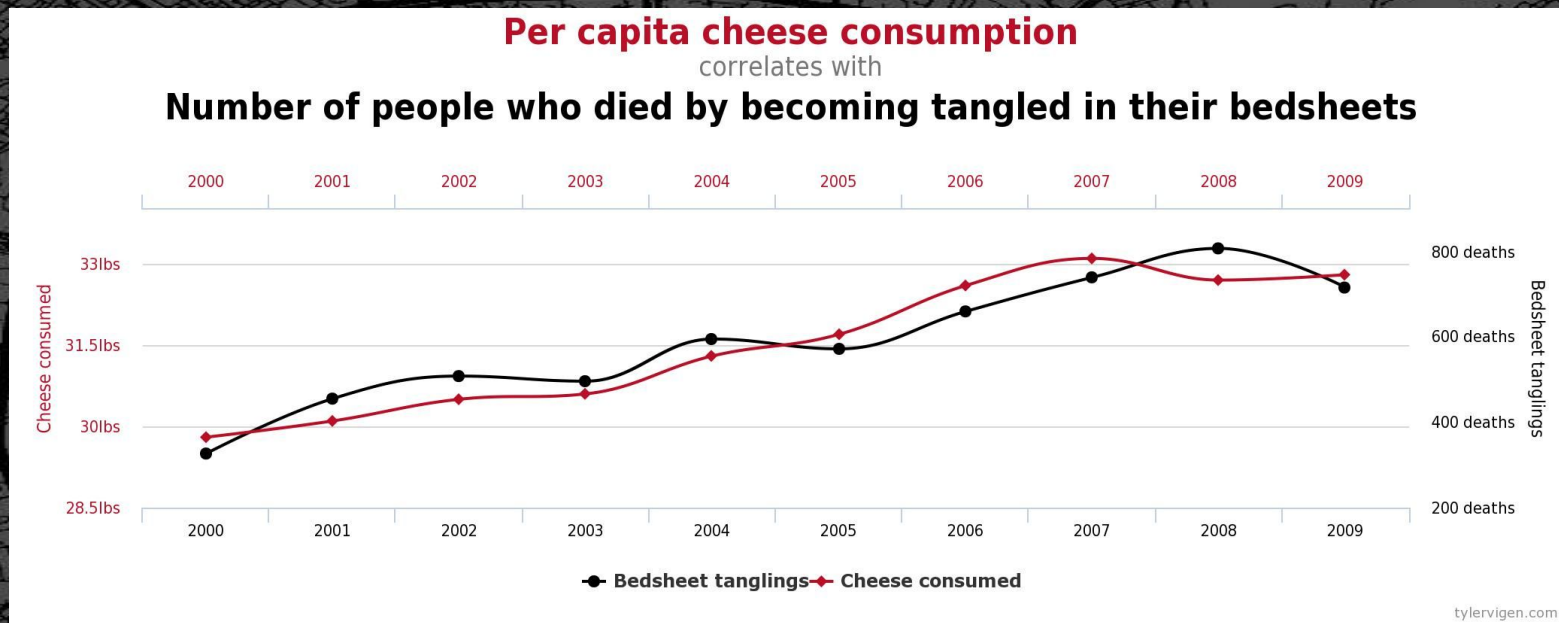
More importantly: change in lending spread generally corresponds with economic growth/contraction.



Macroeconomics

Time Series Analysis

Triangulating Dimensions of Time Series:



... the Dark Arts of Data Science: *Spuriato Regressum*

Stationarity Needed - Transform Series Through:



Rate of Change



YeoJohnson (Caret)

P-Hacking - Limitations of a Short Macro Data Set



Near-Optimal BIC yet...

Call:

```
lm(formula = price_square_meter ~ mortgage_rate + lending_spread +  
    brent_rub + rent_price_2room_bus + rent_price_2room_eco +  
    rent_price_1room_bus, data = macro)
```

Residuals:

Min	1Q	Median	3Q	Max
-0.11354	-0.03345	-0.01195	0.03105	0.15182

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.033641	0.005143	6.541	1.13e-10 ***
mortgage_rate	-0.275598	0.074613	-3.694	0.000237 ***
lending_spread	0.070005	0.015084	4.641	4.09e-06 ***
brent_rub	0.782498	0.039666	19.727	< 2e-16 ***
rent_price_2room_bus	1.158060	0.063055	18.366	< 2e-16 ***
rent_price_2room_eco	-2.764678	0.071194	-38.833	< 2e-16 ***
rent_price_1room_bus	-0.349147	0.051161	-6.824	1.81e-11 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.05044 on 754 degrees of freedom

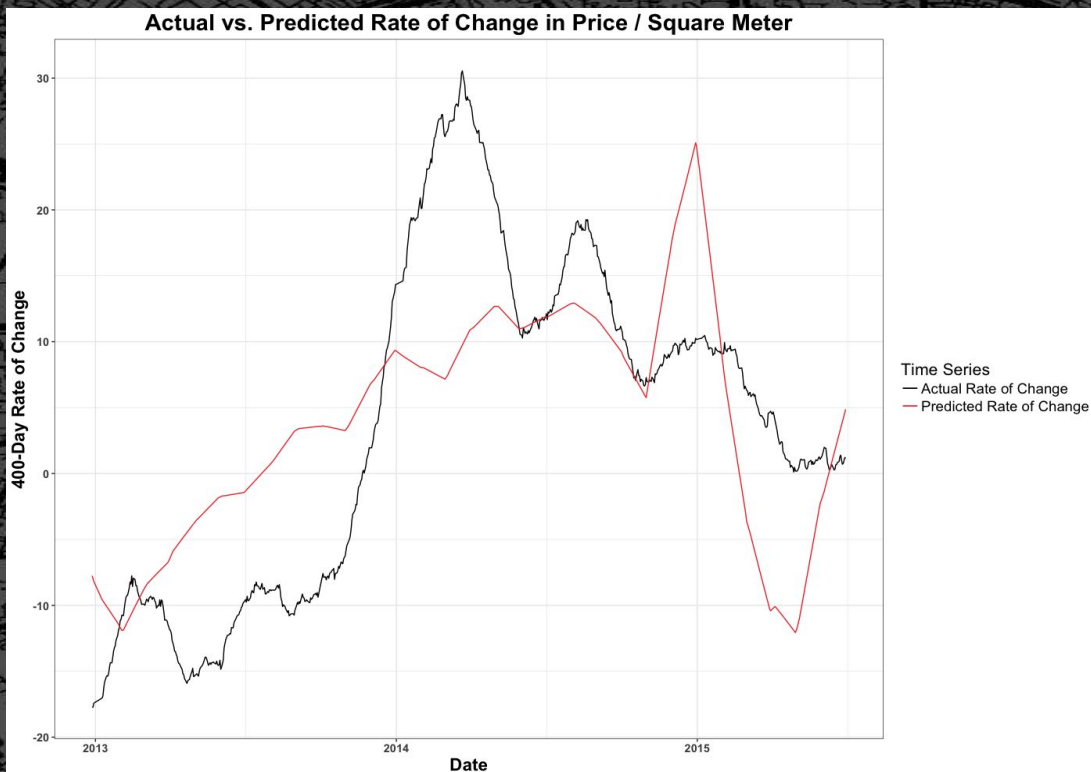
Multiple R-squared: 0.8423, Adjusted R-squared: 0.841

F-statistic: 671.1 on 6 and 754 DF, p-value: < 2.2e-16

Absurd Relationship / Overfit to Sample

Fitting to Short-Term Set or Portion of Economic Cycle Easily Yields Absurd Models

Model Selection / Interpretability As Check For Robustness



```
Call:
lm(formula = price_square_meter ~ mortgage_rate + lending_spread,
    data = macro)

Residuals:
    Min       1Q   Median       3Q      Max
-0.149396 -0.086085 -0.000934  0.062842  0.208094

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  0.060893   0.003844   15.84  <2e-16 ***
mortgage_rate -1.361857   0.055580  -24.50  <2e-16 ***
lending_spread -0.298989   0.016024  -18.66  <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.09324 on 758 degrees of freedom
Multiple R-squared:  0.4582,    Adjusted R-squared:  0.4568
F-statistic: 320.6 on 2 and 758 DF,  p-value: < 2.2e-16
```

Robust / Fits Basic Wisdom

Occam's Razor Wins the Day - Simplicity



RE Index Calculated on Model's Cumulative Predicted Change

