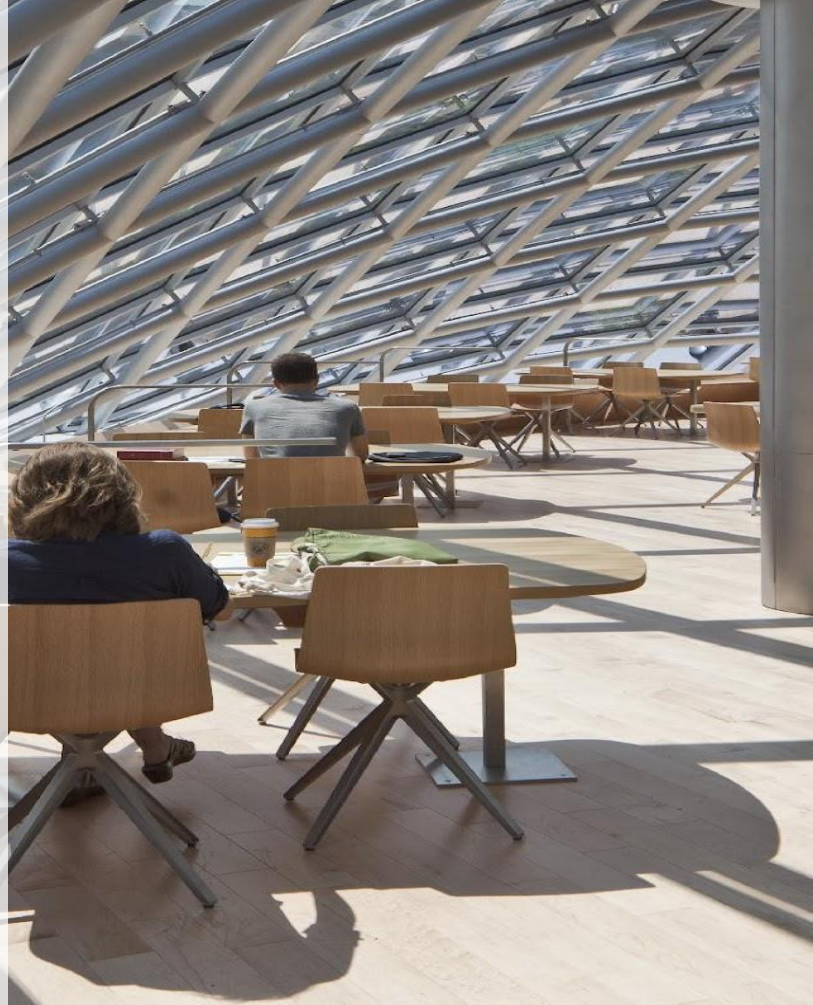# Prime Trading

Project Lab - The University of Chicago
May 16th meeting

Futures Basis Model

Presented by

Armand Dang, Haoshu Wang, Kevin Xu,

Mooseok Kang, James Chen

1. Theoretical value for basis

1. Theoretical value for basis

Data Cleaning

- BTIC , Dividend Futures, ES front month parsing
- Code Snippets

```python
.with_columns([
    pl.when(pl.col("month_code")=="F").then(1)
    .when(pl.col("month_code")=="G").then(2)
    .when(pl.col("month_code")=="H").then(3)
    .when(pl.col("month_code")=="J").then(4)
    .when(pl.col("month_code")=="K").then(5)
    .when(pl.col("month_code")=="M").then(6)
    .when(pl.col("month_code")=="N").then(7)
    .when(pl.col("month_code")=="Q").then(8)
    .when(pl.col("month_code")=="U").then(9)
    .when(pl.col("month_code")=="V").then(10)
    .when(pl.col("month_code")=="X").then(11)
    .when(pl.col("month_code")=="Z").then(12)
    .otherwise(None)
    .alias("contract_month")
```

Implied Financing Cost

- **Recall**
- In D.E Shaw Publication, it highlights the surge in additional financing cost
- Also, previously our theoretical price was constantly below the market price
- Thus we need to take into consideration, the financing cost
- **Practical Considerations**
- What financing rate should we use ? Repo ? Proprietary model?
- We can use implied financing spot rate in practice
- Brief Paper review (**Implied Futures Financing Rate, Gunther, 2021**)

The Implied Futures Financing Rate[*]

Nicholas L. Gunther[†]   Robert M. Anderson[‡]   Lisa R. Goldberg[§]
Alex Papanicolau[¶]

February 20, 2021

THE UNIVERSITY OF CHICAGO

Implied Financing Cost

- **Brief Paper Review**
- Data we would need to implement,
- 1. Front, Near Month Trade data
- 2. SPX Option implied dividend yield

- Use option around ATM, ~T2

$$E_t[M(T_2, T_1)] = \frac{K_{div}(t) \times IFFR}{CX_t}$$

$$K_{div}(t) = 1 - r_{div}(t)\Delta T$$

① IFFR (Inverse forward futures rate)

$$= \frac{F(t, T_1)}{F(t, T_2)}$$

② ΔT : time between T_1, T_2 maturity $\times 3$ mos.

③ r_{div} : Implied dividend yield from SPX option from P-C Parity relation.

— provided by Optionmetrics on WRDS

$$C - P = e^{-r\tau}(Se^{(r-\delta)\tau} - k) = Se^{-\delta\tau} - ke^{-r\tau}$$
$$= F_i - Ke^{-r\tau}$$

Let, $y_i = \ln\left(\frac{F_i}{S}\right)$ $\tau_i = T_i$

Run regression on

$y_i = \beta x_i$ for different strike.

$\delta(t) = -\hat{\beta}$

④ CX_t : convexity adjustment.

we can observe.

What we can compute.

r

t T_1 T_2 t
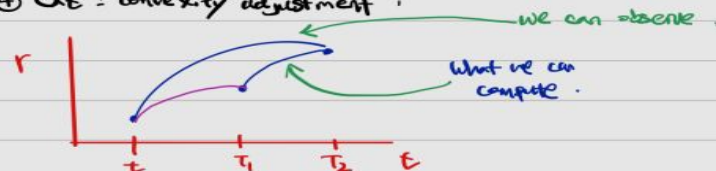
Thus, $(1 + r(t, T_1))(1 + f(T_1, T_2)) - 1 = r(t, T_2)$

we can extract implied spot rate.

Implied Financing Cost

- **What we did**
- We fed the D.E Shaw paper's plot and asked GPT to produce approximate values for each date
- Shortcomings : the plot was 20day rolling average thus has some errors
- GPT produced the best approximate values but not exact values
- Going back to basic used simple discrete carry model without considering tax which we mentioned the last time

Interpolation methods

- **PWC vs Linear**
-

SOFR Rate Comparison Over Time
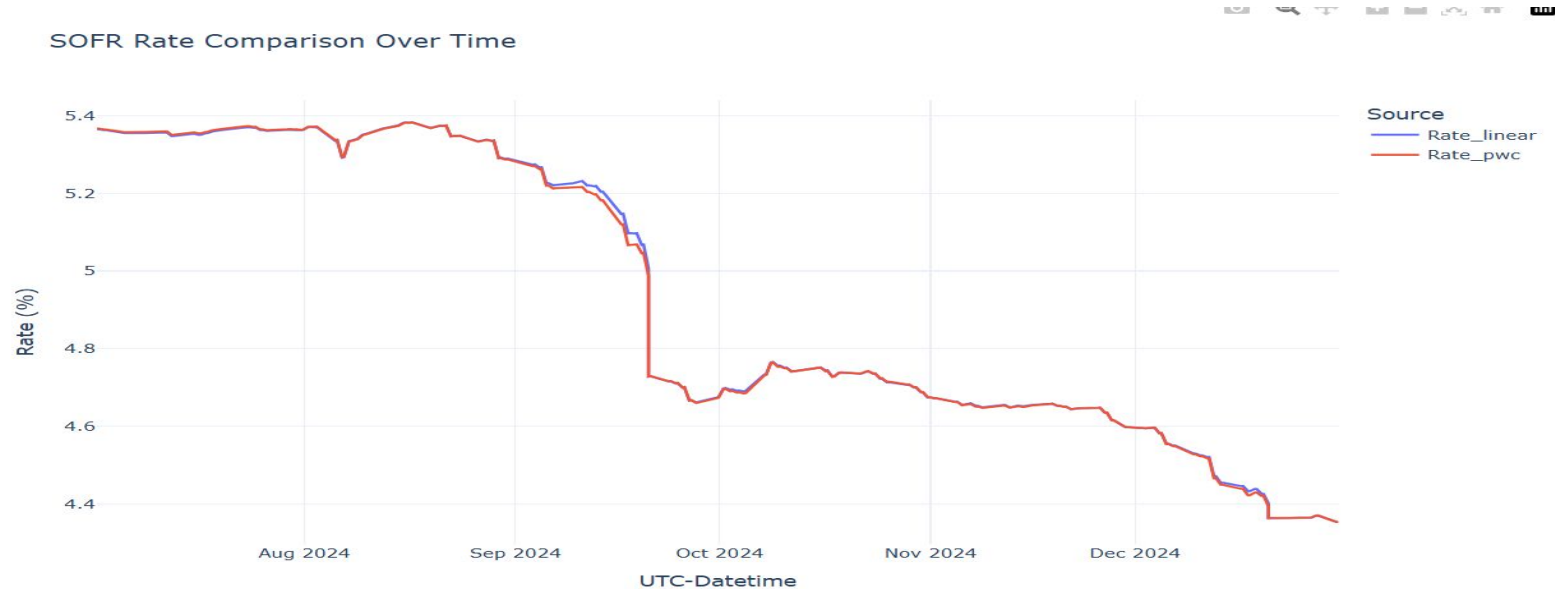
Visualization

- Spreads / percentage change / twinx / twinx for specific date
  (for two different interpolation methods; pwc & linear)
- See html file

Next Steps

- Wrap up and write a readme file on how to run the code
- Give a summary of what we did for previous weeks

- **Worth researching on Prime Trading's side:**
- Use implied futures forward rate to calculate the implied spot rate
- Doesn't even need complex interpolation methods
- Consistent with no arbitrage argument

Thank you!