

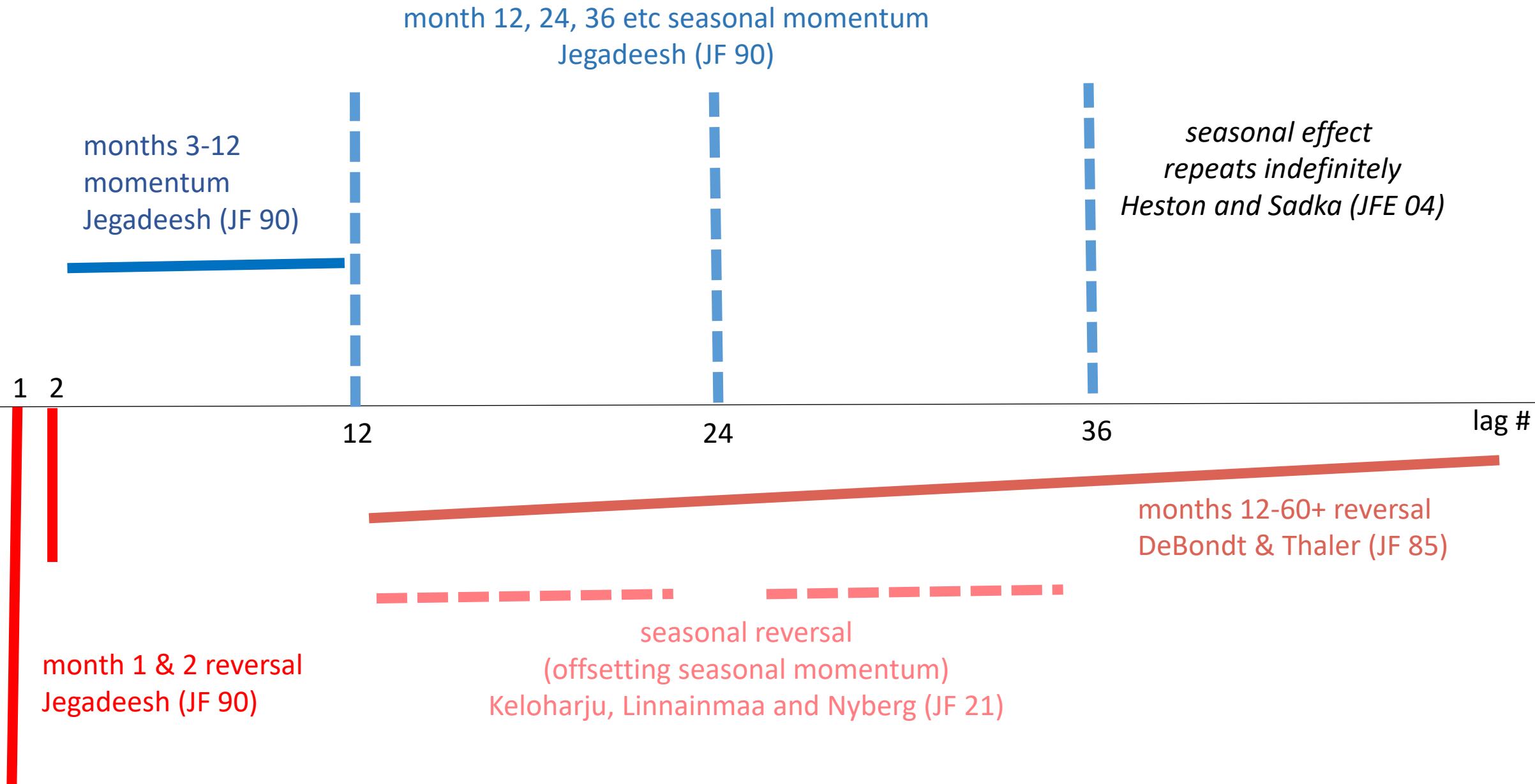
# The term structure of stock return predictability in high resolution

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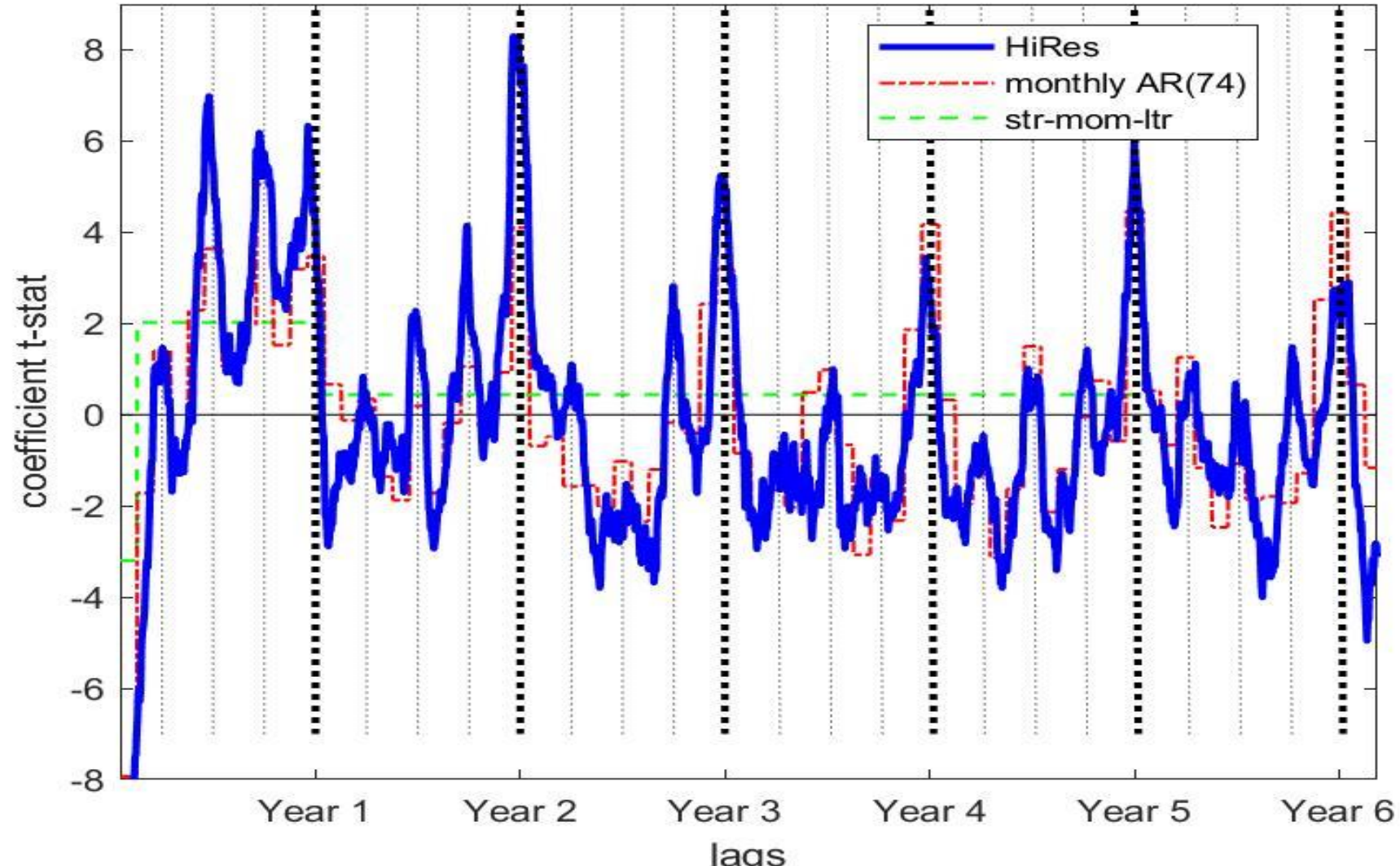
CRETE2022

# term structure of predictability: stylized facts

cross-sectional autocorrelations, monthly returns

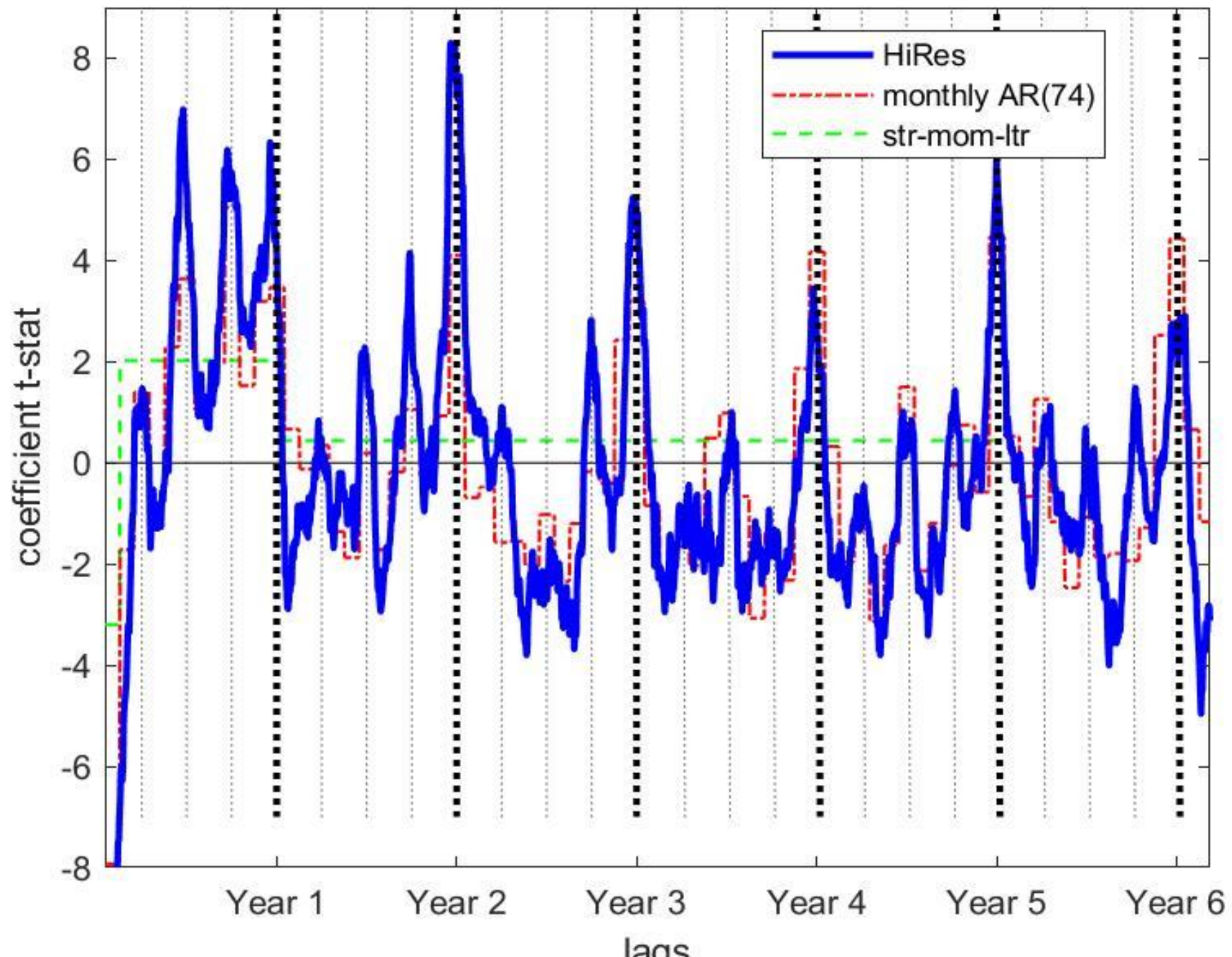


# new high resolution facts



# term structure of predictability: new high resolution findings

- Quarterly waves in predictability as function of lags (monthly in Japan)
  - Partially offsetting momentum and reversal seasonalities
  - Sharp peaks ‘same weekday closest to the same day-of-the-month in any earlier quarter’
    - e.g. Thursday June 9th 2022 & Thursday March 10th 2022
- Common variation of RMS effects over time
  - Positive and negative exposures to each other
  - Strong exposures to HML and predictability in ‘panic’ states
  - Disappearance of momentum & weekly seasonality since 1995
  - Intermediate reversal distinct to short-term reversal
- Standard monthly term structure is just MA of high resolution term structure
  - Investment strategies based on HRTS very effective
  - MOM and STR spanned by HRTS factors



# interpretation of high resolution facts (1/3)

## **1. Stylized facts as crude approximation due to temporal aggregation**

- HiRes factor spans STR and MOM
- STR aggregates distinct immediate, short-term and intermediate effects
- MOM
  - Nets weekly, quarterly and annual seasonality & immediate reversal
  - Troughs upward sloping bearing on echo (Novy-Marx 2012 vs Goyal & Wahal 2015)
  - Has disappeared since 2005 when purged of seasonal momentum!
- Annual seasonality is partly due to quarterly seasonality

# interpretation of high resolution facts (2/3)

## 2. Term structure dominated by waves affected by factors

Mispricing or its correction concentrated around quarterly anniversaries:

- Sharp peaks on 'same day of month in earlier quarters': due to recurring events as in Hartzmark and Salomon (2018)
- Partially offsetting momentum and reversal seasonalities: mispricing cause as in KLN (2021)
- Has not disappeared despite erosion of bleeding

STR, INTR, LTR vs MOM can be interpreted as another wave!

- Negative exposure to each other as with quarterly seasonality and its reversal

Extent of mispricing reflects market conditions:

- Factor effect, not idiosyncratic (as in annual effects of KLN, 2021)

# interpretation of high resolution facts (3/3)

## 3. Why waves?

Waves might arise from clienteles reacting to info moving returns with correlated direction and speed:

- Reconciles weak predictability over long horizons & strong over short
- Contrarians' & trend-followers' returns (MOM vs STR & ITR and quarterly vs quarterly reversal) inversely:
  - exposed to HML
  - predicted by 'panic'
  - move relative to each other (controlling for above and other exposures)

Arbitrage capital insufficient to entirely eliminate waves (Nagel 2012 explains ITR)

- +ve relation between immediate reversal & all effects (except intermediate reversal)
- Increase in arbitrage since 95 caused disappearance of several effects since around 05



# methodological contributions

## 1. High Resolution models (1600 weekday lags)

- Computationally feasible (1.6K lags, 2.8K stocks, 10K dates)
- Estimation uncertainty comparable to simple (single lag) regressions!
- Easily interpretable: because temporal aggregation takes simple form empirically
- Empirically useful: Non-trivial, very robust patterns (tradable)

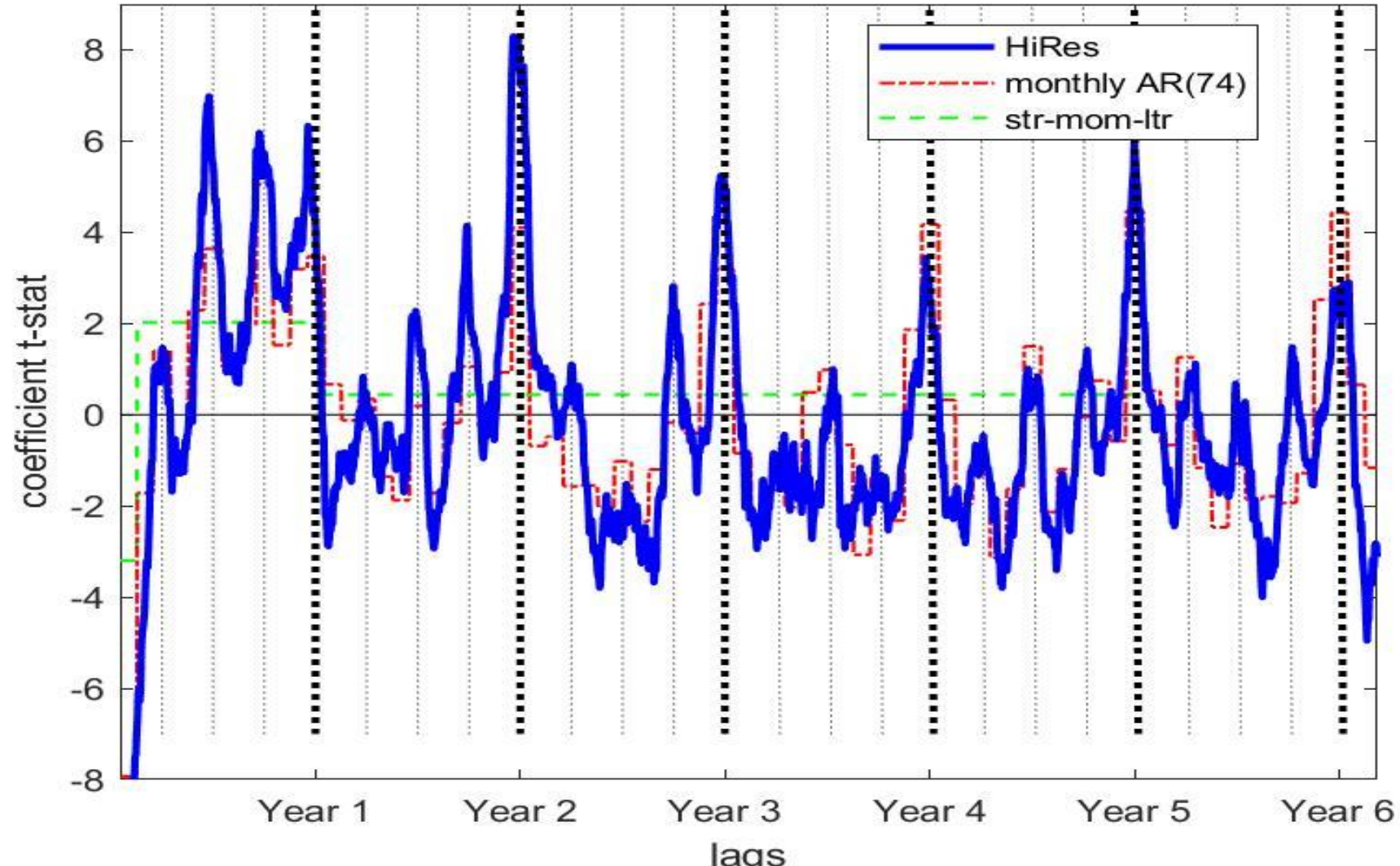
## 2. Ridgeless time averaged cross-sectional regression

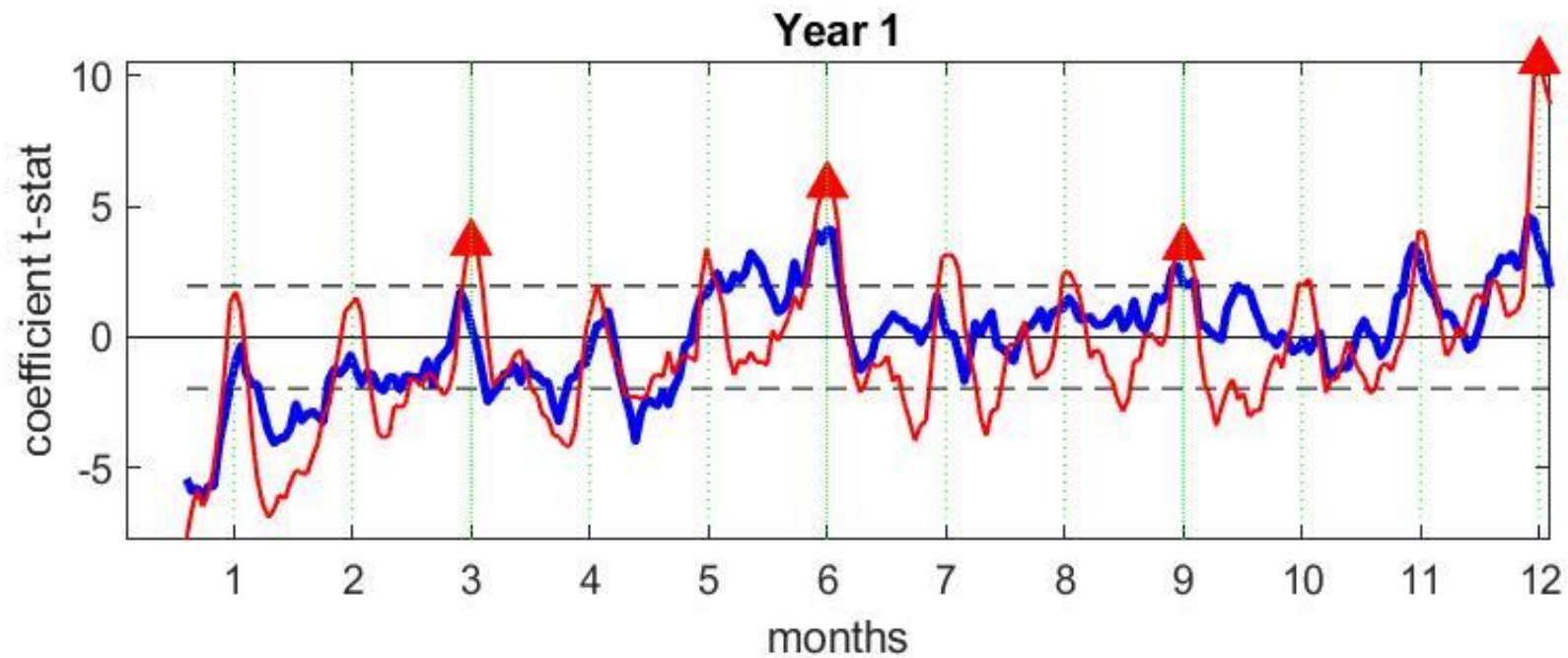
- FM return regression with more predictors than stocks!
- Measure relevance of *independent* component of signal in each return lag

## 3. Normalized Fama portfolio

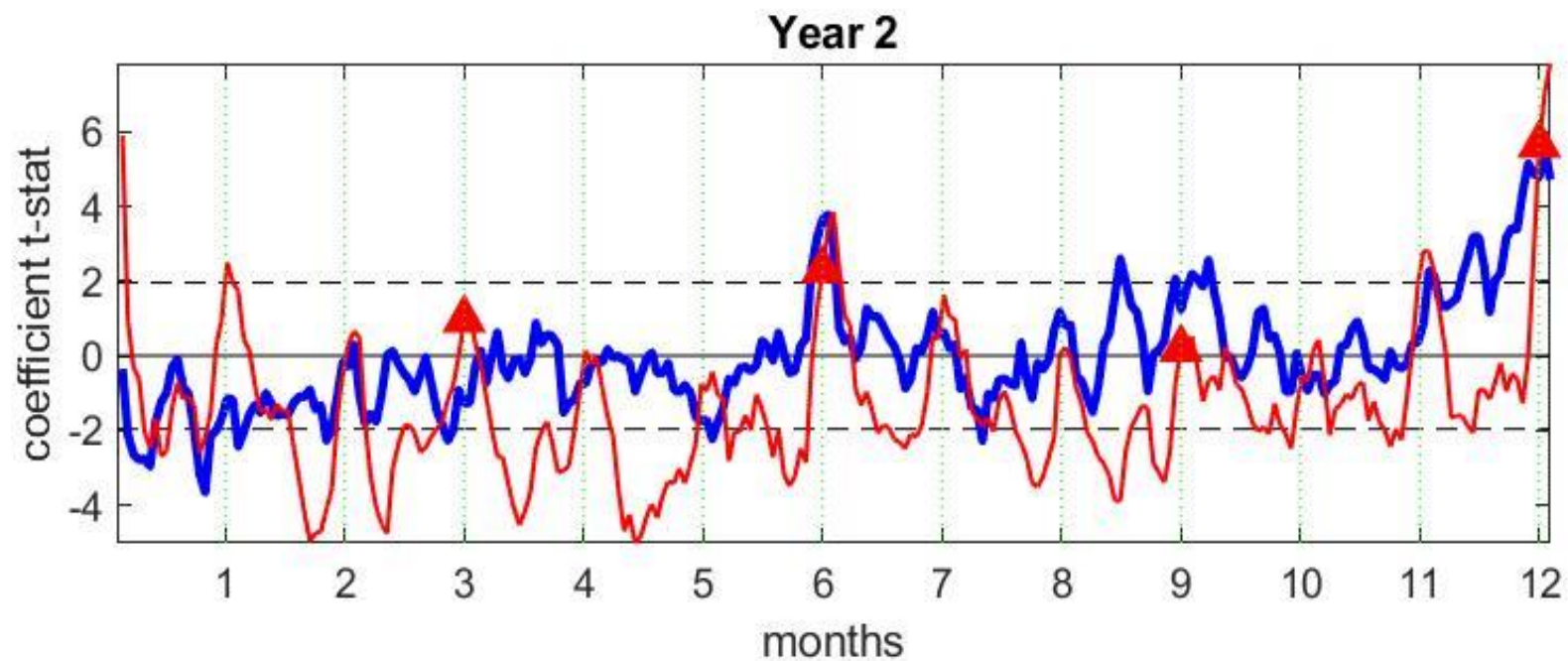
- Computationally convenient performance evaluation of many orthogonalized signals
- Normalization: Improves interpretability of performance

# waves in term structure of predictability

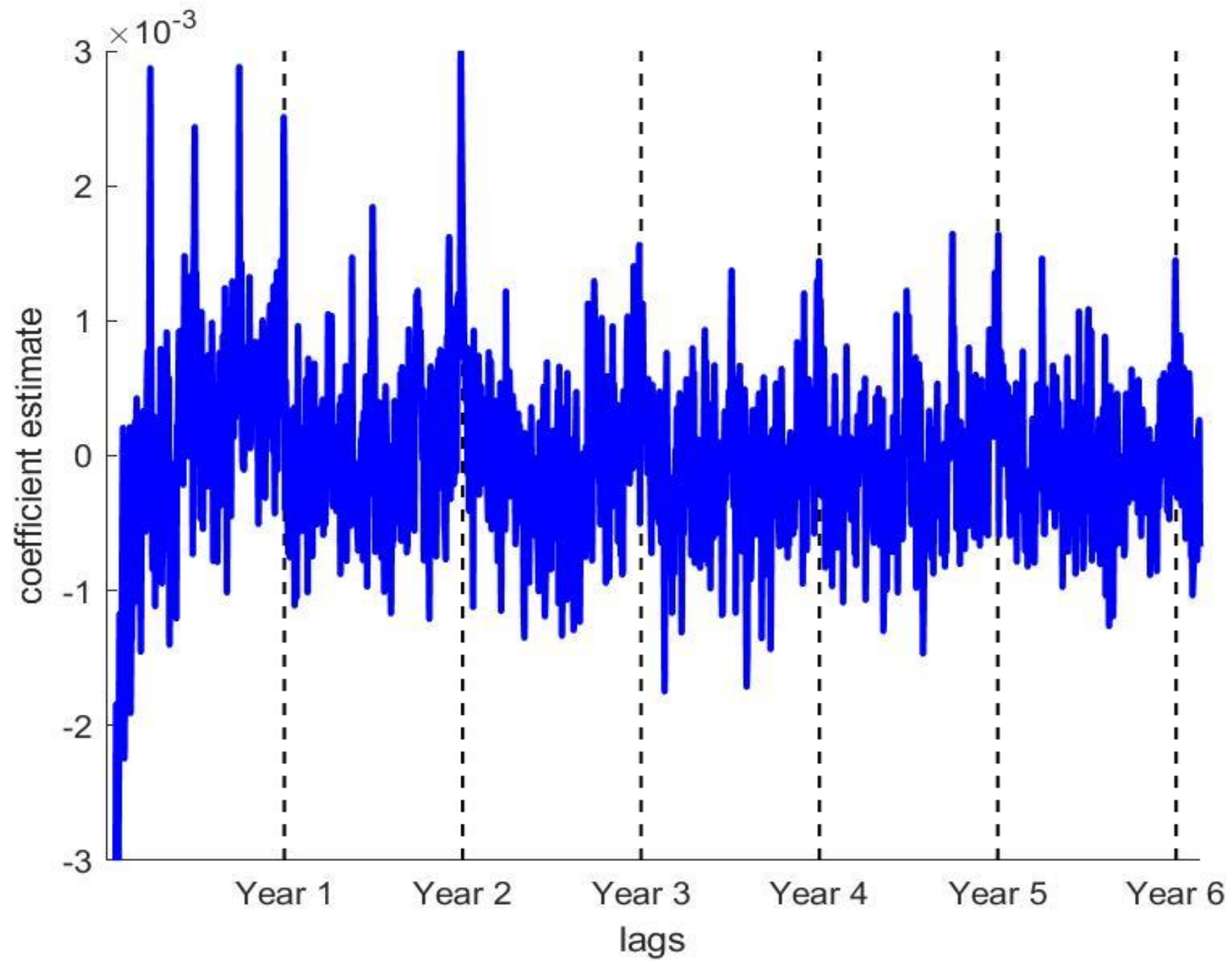




**Reassessment of Japan vs US**  
 Both: weekly, quarterly &  
 annual reverting seasonalities



US missing monthly seasonality  
 Japan missing momentum



# sharp peaks on appropriate anniversary

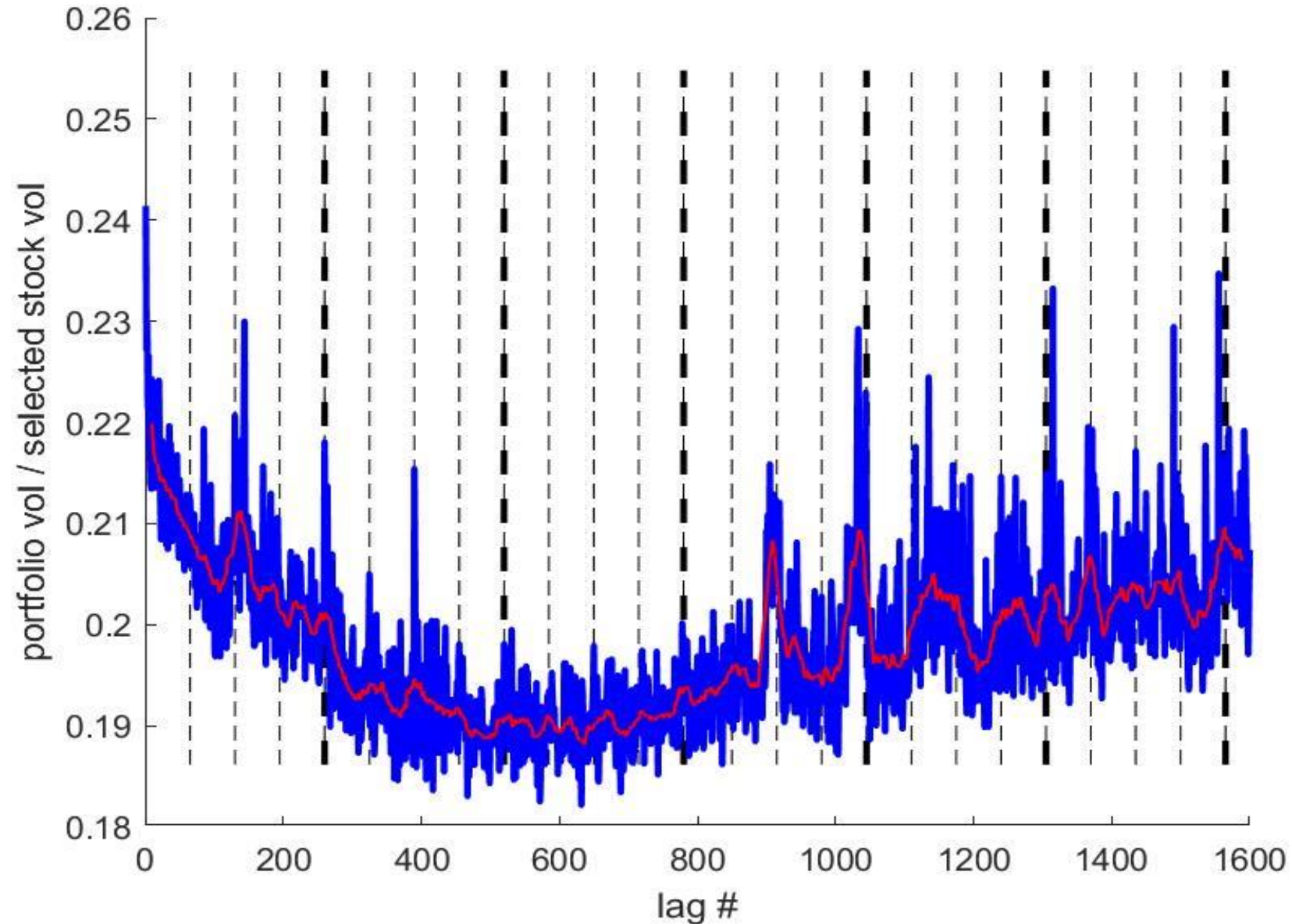
I same weekday closest to same date	II 65*month	III same date	IV month	V month excluding I	VI 2 weekdays each side of I	VII month excluding VI
0.89*** (8.43)	0.62*** (6.03)	0.54*** (4.26)	0.08*** (3.54)	0.05** (2.27)	0.34*** (7.53)	0.01 (0.22)

‘same weekday closest to same date of month in earlier quarter’  
 e.g. Thursday June 9<sup>th</sup> 2022 vs Thursday March 10<sup>th</sup> 2022

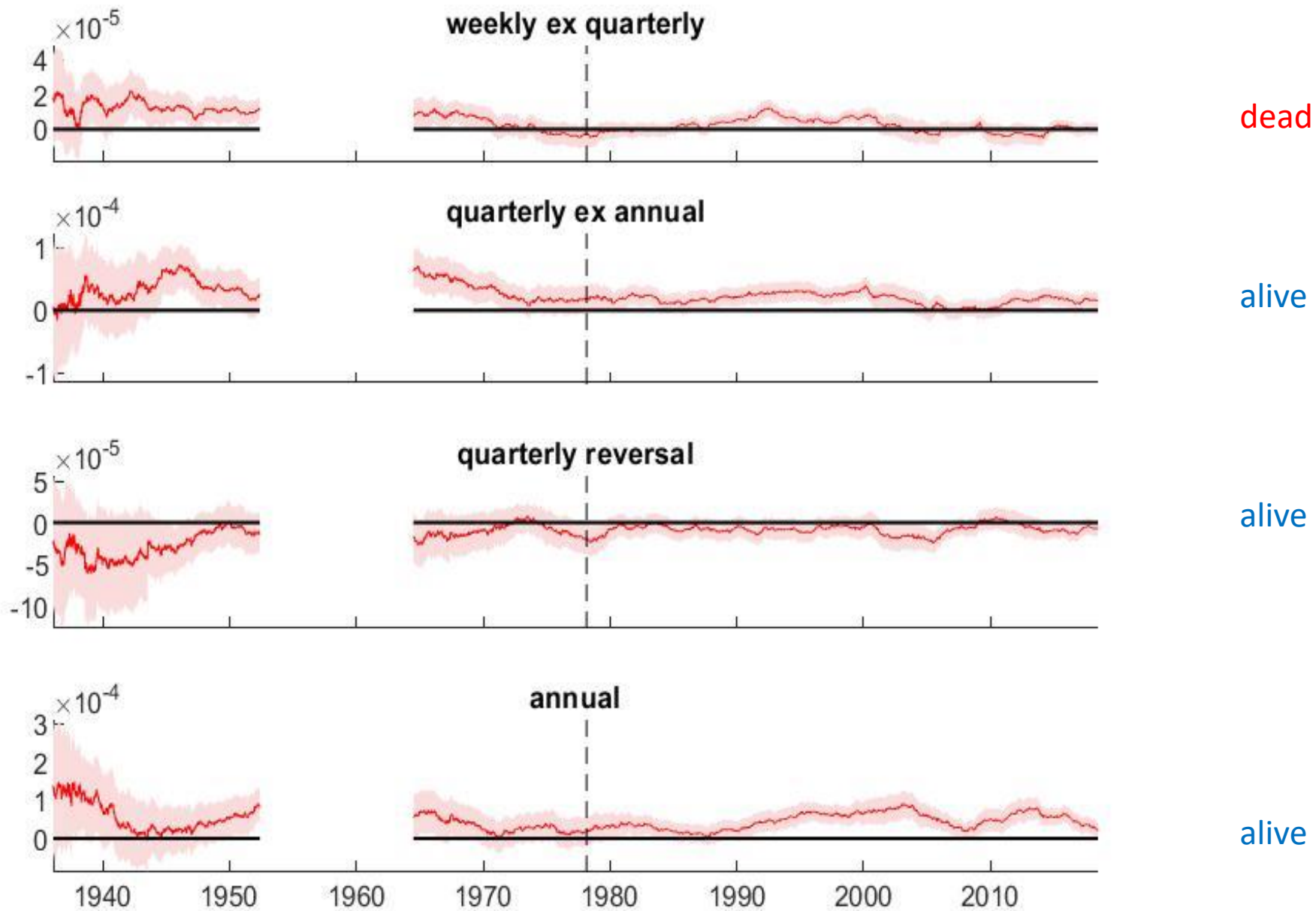
# partially offsetting quarterly seasonalities

	I day 1	II quarterly	III annual	IV quarterly reversal
Alpha	22.16*** (25.85)	0.17*** (3.72)	0.22*** (2.75)	0.07*** (4.19)

# factor effect, not idiosyncratic



# seasonality effects





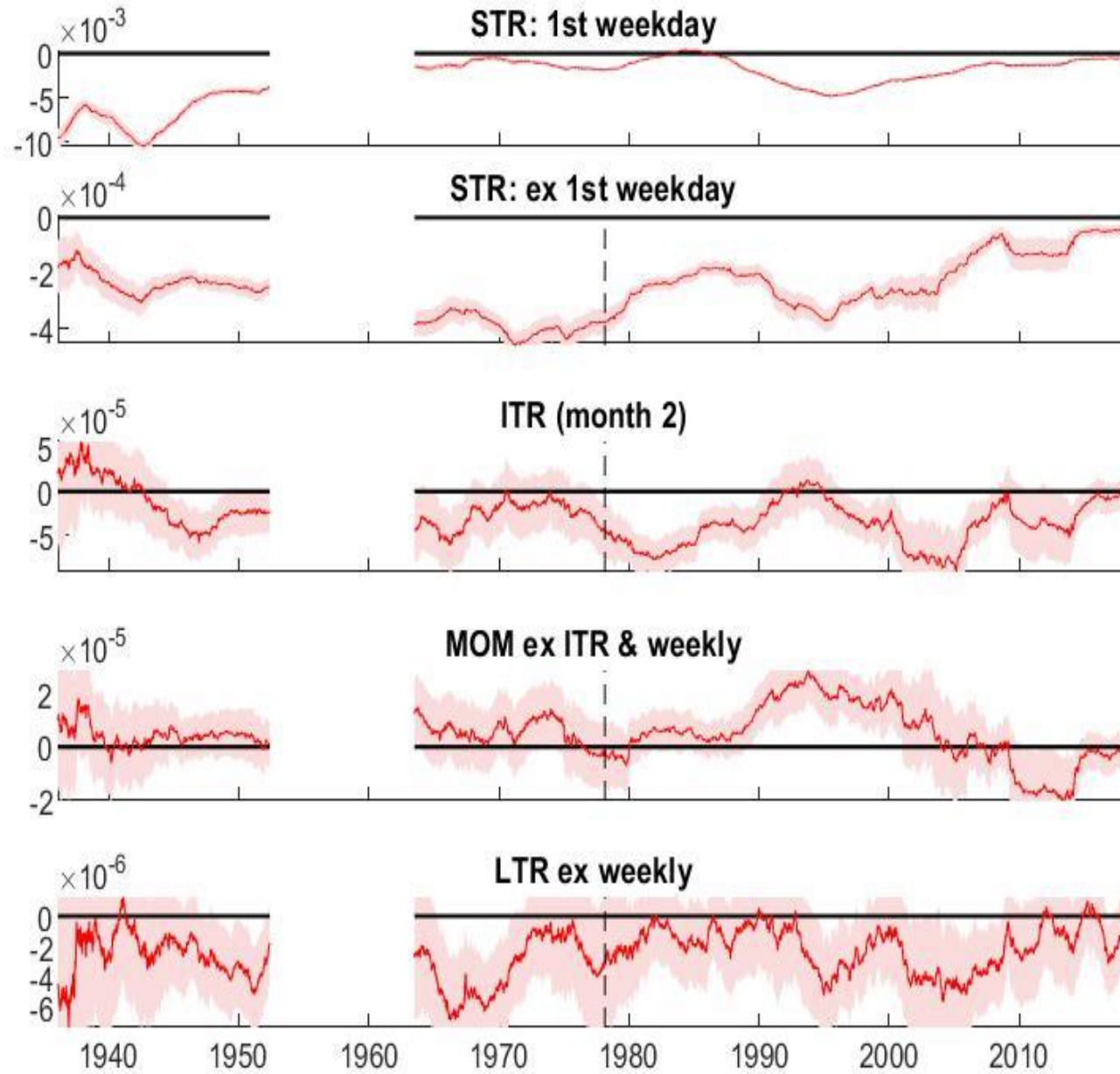
# immediate reversal related to many effects (flattening)

	<u>day 1</u>	
	Alpha	19.16*** (22.30)
	day 1	
MOM opposition?	month 1	1.32*** (9.66)
	month 2	-0.37*** (-3.25)
	MOM	1.05*** (3.72)
	LTR	0.50 (0.70)
	weekly	0.97 (1.53)
	quarterly	0.09 (0.68)
	annual	0.21*** (2.63)

may be due to insufficient  
arbitrage capital, i.e. mispricing

The diagram consists of three blue arrows originating from the text 'may be due to insufficient arbitrage capital, i.e. mispricing' on the right side of the table. One arrow points to the coefficient for 'month 1' (1.32\*\*\*), another points to the coefficient for 'MOM' (1.05\*\*\*), and the third points to the coefficient for 'annual' (0.21\*\*\*). Additionally, a blue arrow points from the text 'MOM opposition?' on the left to the 'month 2' row.

# momentum / reversal effects



alive

?

?

dead

alive

# contrarians' & trend-followers' returns inversely related (level effect)

STR, INTR, LTR  
and MOM might  
be interpretable  
as another wave

	<u>MOM</u>
Alpha	0.13*** (4.91)
day 1	0.00*** (3.81)
month 1	-0.02*** (-4.53)
month 2	-0.08*** (-13.96)
MOM	
LTR	0.04 (0.96)
weekly	0.49*** (17.26)
quarterly	0.03*** (5.25)
annual	0.01** (2.12)
MKT	0.03*** (6.78)
SMB	0.01 (1.46)
HML	-0.07*** (-2.03)

	<u>quarterly reversal</u>
Alpha	0.07*** (4.19)
day 1	0.00 (-0.09)
quarterly	-0.02*** (-5.12)
annual	0.00 (-0.78)
quarterly reversal	
quarterly (post)	-0.06*** (-7.75)
quarterly (post)	-0.06*** (-7.30)
annual (pre)	-0.01*** (-2.98)
annual (post)	-0.02*** (-4.88)
MKT	-0.01** (-2.27)
SMB	0.01 (1.14)
HML	0.01** (2.03)

Wave effects net  
out when  
predicting longer  
horizons

exposed to value  
in opposite direction

# summary

## **1. High resolution predictability term structure revealed**

Stylized facts are crude approximation consistent with temporal aggregation

## **2. Term structure dominated by waves**

Mispricing or its correction concentrated around quarterly anniversaries

STR, INTR, LTR vs MOM can be interpreted as another wave!

Extent of mispricing reflects market conditions

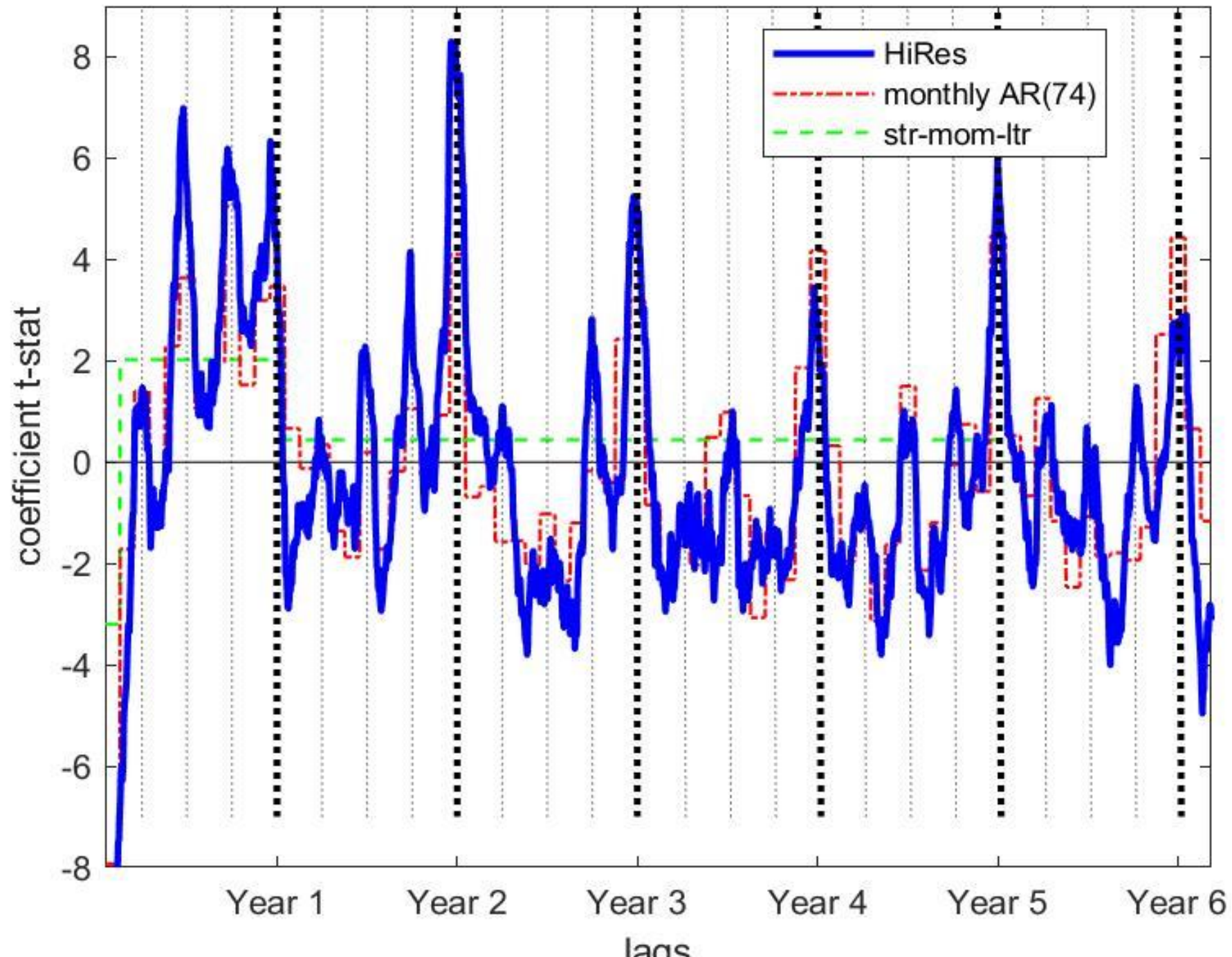
## **3. Why waves?**

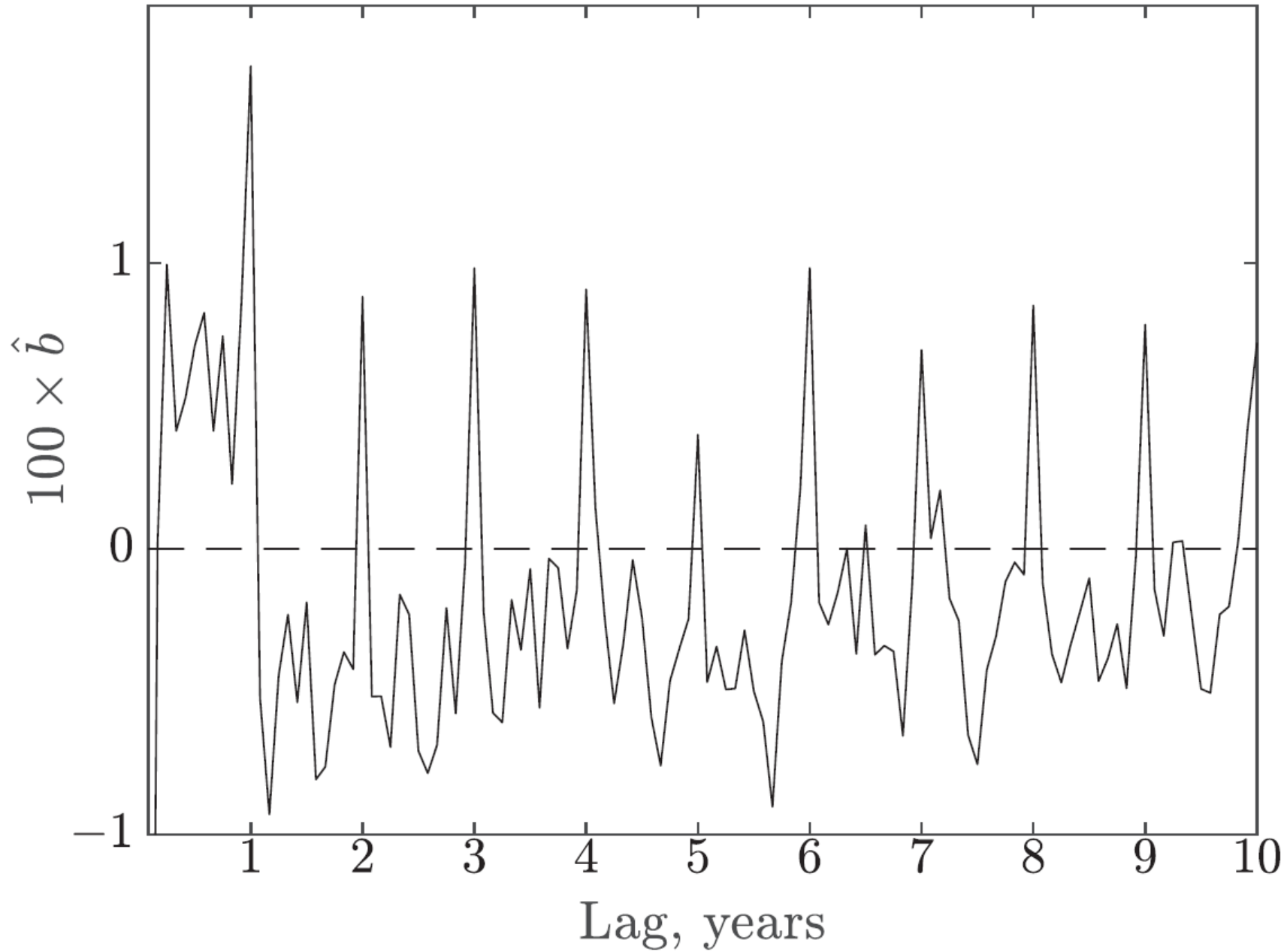
Waves might arise from correlated direction and speed of reactions to info

Lack of sufficient arbitrage capital to eliminate this effect

**+ HiRes model, ridgeless x-section autoregression and norm Fama portfolio**

Much more to do.... e.g. variation across countries





Cross-sectional autocorrelations  
monthly returns  
From KLN (2021)