Deprecated Slides
FRE7241, Fall 2024

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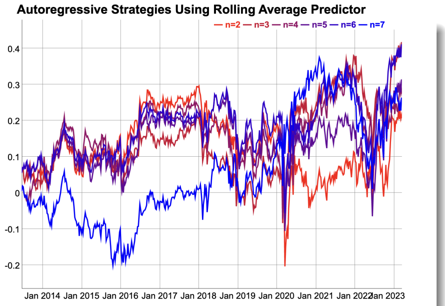
depr: Autoregressive Strategy Using Average Past Returns

The *out-of-sample* forecasts can be improved by using the rolling average of the returns as a predictor.

This is because the average of returns has a lower *variance*.

But the average also has a higher *bias* because it includes past returns that may be unrelated to the present.

Using the rolling average of returns as a predictor reduces the forecast variance at the expense of increasing its bias (known as the *bias-variance tradeoff*).




```
> # Define predictor as a rolling mean
> nagg <- 5
> predm <- HighFreq::roll_mean(matrix(retp), nagg)
> # Define predictor matrix for forecasting
> predm <- sapply(1+nagg*(0:dimax), rutils::lagit, input=predm)
> predm <- cbind(rep(1, nrows), predm)
> # Calculate the forecasts as function of the AR order
> fcasts <- lapply(2:NCOL(predm), function(ordern) {
+   predinv <- MASS::ginv(predm[insample, 1:ordern])
+   coeff <- drop(predinv %*% respv[insample])
+   drop(predm[outsample, 1:ordern] %*% coeff)
+ })  # end lapply
> names(fcasts) <- paste0("n=", 2:NCOL(predm))
```

```
> # Calculate the out-of-sample PnLs
> pnls <- sapply(fcasts, function(x) {
+   cumsum(sign(x)*retp[outsample])
+ })  # end sapply
> colnames(pnls) <- names(fcasts)
> pnls <- xts::xts(pnls, datev[outsample])
> # Plot dygraph of out-of-sample PnLs
> colorv <- colorRampPalette(c("red", "blue"))(NCOL(pnls))
> dygraphs::dygraph(pnls[endd],
+   main="Autoregressive Strategies Using Rolling Average Predictor"
+   dyOptions(colors=colorv, strokeWidth=2) %>%
+   dyLegend(width=300)
```

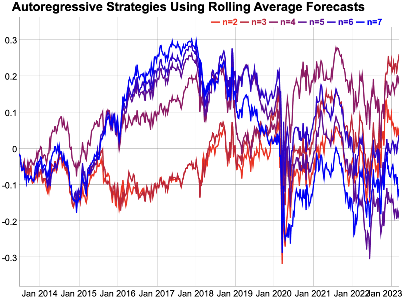
depr: Autoregressive Strategy Using Average of Past Forecasts

The *out-of-sample* forecasts can be further improved by using the average of past forecasts.

This is because the average of forecasts has a lower *variance*.

But the average also has a higher *bias* because it includes past forecasts that may be unrelated to the present.

Using the rolling average of past forecasts reduces the forecast variance at the expense of increasing its bias (known as the *bias-variance tradeoff*).




```
> # Calculate the PnLs using the average of past forecasts
> nagg <- 5
> pnls <- sapply(fcasts, function(x) {
+   x <- HighFreq::roll_mean(matrix(x), nagg)
+   cumsum(sign(x)*retp[outsample])
+ })  # end sapply
> colnames(pnls) <- names(fcasts)
> pnls <- xts::xts(pnls, datev[outsample])
```

```
> # Plot dygraph of out-of-sample PnLs
> dygraphs::dygraph(pnls[endd],
+   main="Autoregressive Strategies Using Rolling Average Forecasts"
+   dyOptions(colors=colorv, strokeWidth=2) %>%
+   dyLegend(width=300)
```