



Addition by Subtraction

More data isn't always better — it's relevance that matters

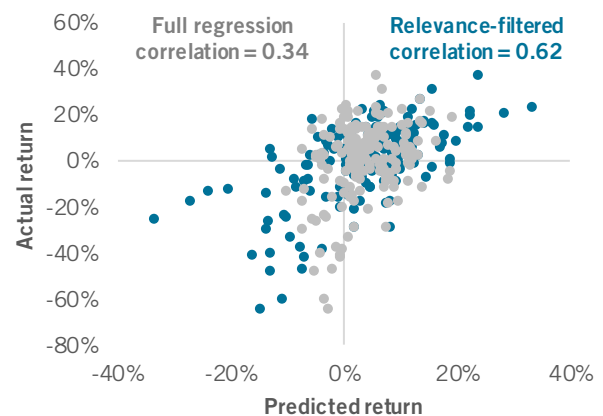
The notion that larger samples produce more reliable predictions is a core tenet of regression analysis. Consider, for example, how a growing sample size affects statistical significance: Test statistics increase and critical values decrease, implying that our confidence grows. But what if this gives too much credit to certain observations? What if some historical data points actually introduce noise because they're not particularly relevant? Just as investors or economists might look to a subset of relevant historical periods to understand today, we explore whether there is value in doing the same with regressions. And contrary to conventional “wisdom,” we find that more data isn't always better.

Our methodology begins by re-casting the prediction from a linear regression as a weighted average of the historical values of the dependent variable, where the weights are the relevance of the predictors. In this context, relevance has a precise meaning. It is the sum of an observation's statistical informativeness and similarity to today, both of which are defined as multivariate distances. Once we think of regression this way, we can uncover which historical periods are most important to today. It also begs the question: Does it make sense to include all historical data points to form our predictions, which is equivalent to a traditional regression, or should we focus, instead, on a subset of the most relevant observations?

To answer this question, we use economic variables to predict the returns of eight US equity factors. For each factor, we compare a full regression to a relevance-filtered model that generates its predictions from a subset of the 25 percent most relevant observations. In each case, relevance-filtering generates better forecasts than the full regression. For example, as shown in Exhibit 1, the correlation of predicted returns and actual returns for the US equity premium is 0.62 for the relevance-filtered model, compared to just 0.34 for the full regression. These dramatic results suggest that focusing on a subset of the most relevant data points can improve a model's predictive power, which is useful for forecasting factor returns and anything else that relies on regression.

For more on this topic, see our 2020 [journal article](#): “**Addition by Subtraction: A Better Way to Forecast Factor Returns (and Everything Else)**” by Megan Czasonis, Mark Kritzman, and David Turkington, *Journal of Portfolio Management*, Vol. 46, No. 8, September 2020.

Exhibit 1: Predicted versus actual returns
US equity premium




Based on quarterly observations from June 1974 through December 2018. We regress annual returns for the US equity premium on lagged levels and one-year changes of economic growth, the unemployment rate, inflation, and credit spreads. In the case of the filtered model, we focus on the 25 percent most relevant observations. Correlations are of the respective model's predicted returns and actual returns. Source: State Street Global Markets, FRED online library, Kenneth French's website

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