

Test Assets and Weak Factors

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The estimated strength or weakness of a risk premium factor in asset pricing should be derived from a broad set of assets; this work proposes a novel methodology to select assets from a universe of test assets and to estimate the risk premium of a particular factor by accounting for all weak factors.

For the investor hoping to insure her investments against possible risks, the list of hazards is nearly limitless. She might worry about risks stemming from climate change, political instability, health care crises like pandemics, wild swings in GDP growth, and a host of others. To hedge against such shocks, an investor might tailor her portfolio by making investments that, in effect, insure against specific risks. For example, an investor that is worried about climate risks will look for investments that increase in value when climate risks materialize.

One natural way to buy insurance against specific risks is to use derivative markets. For example, an investor worried about inflation can buy so-called “inflation swaps” that specifically target inflation. For many risks, however, there are no derivative markets that investors can directly access. For example, there isn’t a clear market where one can insure against climate risks.

If derivative markets are not available, investors can still try hedging the risks by building portfolios that provide similar insurance out of assets that are actually tradable (like equities). There are two fundamental obstacles in doing so:

- First, building a portfolio of equities that insures against a particular risk, and only that particular risk, requires taking a stand on what other risks are important to investors. This allows the investor to focus on only the risk they are interested in hedging.
- Second, it requires the assets that one wants to use to build the portfolio to actually be substantially exposed to those risks. As an example, one can easily build a portfolio that hedges climate risks if one can identify assets that are highly exposed to it (e.g., green companies that do well when the climate deteriorates). In other cases, however, this is more difficult; for example, one may want to insure against fluctuation in aggregate consumption, but most stocks are only weakly related to this risk, so the hedging portfolio will have poor hedging properties.

New research by Stefano Giglio, Dacheng Xiu, and Dake Zhang, which builds on earlier work, offers a methodology that aims to address both issues by exploiting the benefits of dimensionality. They show that even if the true risk factors that drive asset prices are not known, statistical techniques (principal component analysis) can be used to extract from a large panel of returns from a set of factors that help isolate the risk of interest (e.g., climate risk) from all other risk factors.

In addition, and most importantly, the methodology also addresses the issue of weak exposure of the assets to the factor of interest. The idea is simple: identify – using statistical methods – among the universe of assets those assets that are most exposed to the risk of interest. For example, in the case of aggregate consumption, the methodology will identify those stocks that have historically exhibited high co-movement with consumption. The hedging portfolio will then use only those, more informative, assets. All other stocks are discarded.

More generally, the authors argue that the strength or weakness of a risk factor, that is, whether many assets or only a few are exposed to that risk, should not be viewed as a property of the factor itself; rather, it should be viewed as a property of the set of test assets used in the estimation. As another example, a liquidity factor may be weak in a cross-section of portfolios sorted by, say, size and value, but may be strong in a cross-section of assets sorted by characteristics that capture exposure to liquidity. Their methodology, called “supervised PCA,” or SPCA, exploits this insight and builds a hedging portfolio for any risk factor appropriately accounting for other risk factors investors might care about, and independently on the strength of the factor.

SPCA is not the endgame in the effort to understand how to build hedging portfolios, according to the authors. However, this work shows that systematically addressing the issue of weak factors in empirical asset pricing is an important step forward and opens the door to the study of factors that, while important to investors—like our hypothetical investor from above—may be not as pervasive as they fear.