CAPM Review

Under strict assumptions, the CAPM results in a prescription for a fair return (price):

The fair expected return on an asset depends only on the market risk premium and on the measure of systematic risk beta.

Stocks with high betas have higher expected return, stock with low betas have lower expected return, but there is no compensation for any risk factor other than the systematic market risk (beta).

CAPM Critique

- Roll (1977) points out that the CAPM is not directly testable
  - It is a one period model
  - The market portfolio cannot be identified empirically
  - To test the model, we need the market portfolio to be on the “efficient frontier” (proxies won’t work)
- Indirect tests fail to support the CAPM
  - Other risk factors are priced (firm size, book-to-market ratio), but there is no theoretical (economic) explanation for these risk factors.

Market Efficiency - Overview

- Efficient market:
  Returns are fair / normal = The market is in equilibrium

- Key Insight:
  We can test whether returns are fair / normal only within the context of (assuming) a specific asset pricing model
  We can test the asset pricing model only within the context of (assuming) a market that is in equilibrium / efficient

Normal and Abnormal Returns

- Normal returns:
  Fair or equilibrium returns given by a theoretical asset pricing model like the CAPM

- Abnormal returns:
  Returns that are systematically higher (or lower) than the normal returns

Normal and Abnormal Returns

- For each asset / the CAPM predicts a fair / normal, risk-adjusted rate of return:
  \[ E(R_i) = rf + \beta_i \cdot [ E(R_m) - rf ] \]

- We observe asset \( i \) over time \( t \) and compare the realized return \( R_{it} \) to the model (CAPM) return:
  \[ \alpha_i = R_{it} - E(R_i) = R_{it} - ( rf + \beta_i \cdot [ E(R_m) - rf ] ) \]

- If the realized return of asset \( i \) is systematically higher than the model (CAPM) return, we say that the return of asset \( i \) is abnormal.
  Abnormal return: Average [\( \alpha_i \) = \( \alpha_{i1} + \alpha_{i2} + \ldots + \alpha_{iT} \)] / \( T > 0 \)
The Efficient Market Hypothesis

- Three forms of efficiency:
  - Weak form market efficiency
  - Semi-Strong form market efficiency
  - Strong form market efficiency

- Note that the EMH is a Hypothesis
  - We should look for evidence that reject the hypothesis
  - We should look for evidence to decide which form of EMH is more likely

Weak Form Efficiency

- Definition:
  A market is weak form efficient if the current asset prices reflect all historical price information

- Implication:
  Trading strategies based on the analysis of historical prices should not yield abnormal returns (on average!)

Semi-Strong Form Efficiency

- Definition:
  A market is semi-strong form efficient if the current asset price reflects all publicly available information

- Implication:
  Trading strategies based on the analysis of publicly available information (fundamental analysis such as analyst reports) should not yield abnormal returns (on average!)

Strong Form Efficiency

- Definition:
  A market is strong form efficient if the current asset price reflects all information (including private / insider information)

- Implication:
  There is no (legal) trading strategy that yields abnormal returns (on average!). One cannot make money even by following the trades of informed insiders.

Nesting

- Information:
  Information about past prices is included in the set of publicly available information, which is included in the complete set of information.

- Market efficiency:
  The strong form of market efficiency implies the semi-strong, which implies the weak form.

Note that the strongest form of the EMH is the strongest and the most restricting efficiency assumption: the complete set of information is included in the prices.

Evidence of Weak Form EMH

- Consistent evidence:
  Technical trading rules, based on past price patterns, do not appear to be profitable.

- Contradicting evidence:
  The “January” effect – almost every January, stock returns (usually for small firms) are positive.
Evidence of Semi-Strong Form EMH

- Consistent evidence:
  New publicly available information (such as earnings release) affects prices quickly.

- Contradicting evidence:
  Small firms and firms with high ratio of book-value to market-value have, on average, higher returns.
  Some portfolio managers consistently outperform the market (Peter Lynch, Warren Buffet, John Templeton and John Neff are in Paul Samuelson’s hall of fame, 1989).

Market Efficiency and Equilibrium

- An efficient market is a market in (CAPM) equilibrium
- Inefficient markets occur when asset prices are different from their equilibrium prices
- In theory, traders who exploit market inefficiencies should move market prices back to their fair / equilibrium level.

Evidence of Strong Form EMH

- Consistent evidence:
  Insiders of corporations appear able to earn abnormal returns from their trades. On average, price increases just after insiders purchase the stock and decreases just after a they sell the stock.

- Contradicting evidence:
  Prices react to public information that had been private. For example, prices react to earning announcements even though someone must have known their content before the official announcement day.

MEH – Are Markets Efficient?

- Grossman and Stigliz (1980): the logical question must always be to what extent markets are efficient
- Empirical evidence
- Implications for trading strategies?
  - Technical analysis
  - Fundamental analysis
  - Trading on insider information
- Is there a portfolio manager who systematically outperforms the market?
  - Is a small abnormal return detectable?
  - Will they tell us about their winning strategy (selection bias)?
  - How can we distinguish between luck and talent?

The Joint Hypothesis Problem

- A test of market efficiency can only be conducted by using a theoretical asset pricing model to define normal returns (fair prices)
- Finding an abnormal average return can be interpreted in more than one way:
  - Reject the Market Efficiency Hypothesis (MEH)
  - Reject the theoretical asset pricing model of fair / normal returns
  - Reject both

Economist on Market Efficiency

Eugene Fama, of the University of Chicago, defined its essence: that the price of a financial asset reflects all available information that is relevant to its value.

Efficiency and beyond
The Economist, Jul 16th 2009
Economist on Market Efficiency Cont.

From that idea powerful conclusions were drawn, not least on Wall Street. If the EMH held, then markets would price financial assets broadly correctly. Deviations from equilibrium values could not last for long. If the price of a share, say, was too low, well-informed investors would buy it and make a killing. If it looked too dear, they could sell or short it and make money that way. It also followed that bubbles could not form—or, at any rate, could not last: some wise investor would spot them and pop them. And trying to beat the market was a fool’s errand for almost everyone. If the information was out there, it was already in the price.

Economist on Market Efficiency Cont.

Mr Scholes thinks much of the blame for the recent woe should be pinned not on economists’ theories and models but on those on Wall Street and in the City who pushed them too far in practice. He has also been “criticizing for years” the “value-at-risk” (VAR) models used by institutional investors to work out how much capital they need to set aside as insurance against losses on risky assets. These models mistakenly assume that the volatility of asset prices and the correlations between prices are constant, says Mr Scholes. When, say, two types of asset were assumed to be uncorrelated, investors felt able to hold the same capital as a cushion against losses on both, because they would not lose on both at the same time. However, as Mr Scholes discovered at LTCM and as the entire finance industry has now learnt for itself, at times of market stress assets that normally are uncorrelated can suddenly become highly correlated. At that point the capital buffer implied by VAR turns out to be woefully inadequate.

Economist on Market Efficiency Cont.

In 1980 Sanford Grossman and Joseph Stiglitz, another subsequent winner of a Nobel prize, pointed out a paradox. If prices reflect all information, then there is no gain from going to the trouble of gathering it, so no one will. A little inefficiency is necessary to give informed investors an incentive to drive prices towards efficiency.

Economist on Market Efficiency Cont.

However, a second branch of financial economics is far more skeptical about markets’ inherent rationality. Behavioral economics, which applies the insights of psychology to finance, has boomed in the past decade.

Mr Thaler concedes that in some ways the events of the past couple of years have strengthened the EMH. The hypothesis has two parts, he says: the “no-free-lunch part and the price-is-right part, and if anything the first part has been strengthened as we have learned that some investment strategies are riskier than they look and it really is difficult to beat the market.” The idea that the market price is the right price, however, has been badly dented.

Economist on Market Efficiency Cont.

Financial economists also need better theories of why liquid markets suddenly become illiquid and of how to manage the risk of “moral hazard”—the danger that the existence of government regulation and safety nets encourages market participants to take bigger risks than they might otherwise have done. The sorry consequences of letting Lehman Brothers fail, which was intended to discourage moral hazard, showed that the middle of a crisis is not the time to get tough. But when is?

Lucas on the EMH and the Crisis

THERE is widespread disappointment with economists now because we did not forecast or prevent the financial crisis of 2008. … two fields, macroeconomics and financial economics …

Robert Lucas, University of Chicago
In defense of the dismal science
The Economist, Aug 6th 2009
Lucas on the EMH Cont.

One thing we are not going to have, now or ever, is a set of models that forecasts sudden falls in the value of financial assets, like the declines that followed the failure of Lehman Brothers in September. This is nothing new. It has been known for more than 40 years and is one of the main implications of Eugene Fama’s “efficient-market hypothesis” (EMH), which states that the price of a financial asset reflects all relevant, generally available information. If an economist had a formula that could reliably forecast a week in advance, say, then that formula would become part of generally available information and prices would fall a week earlier. (The term “efficient” as used here means that individuals use information in their own private interest. It has nothing to do with socially desirable pricing; people often confuse the two.)

Lucas on the EMH Cont.

Mr Fama tested the predictions of the EMH on the behavior of actual prices. These tests could have come out either way, but they came out very favorably. His empirical work ... has been thoroughly challenged by a flood of criticism which has served mainly to confirm the accuracy of the hypothesis. Over the years exceptions and “anomalies” have been discovered (even tiny departures are interesting if you are managing enough money) but for the purposes of macroeconomic analysis and forecasting these departures are too small to matter. The main lesson we should take away from the EMH for policymaking purposes is the futility of trying to deal with crises and recessions by finding central bankers and regulators who can identify and puncture bubbles. If these people exist, we will not be able to afford them.

Krugman: How did economists get it so wrong

Few economists saw our current crisis coming, but this predictive failure was the least of the field’s problems. More important was the profession’s blindness to the very possibility of catastrophic failures in a market economy. During the golden years, financial economists came to believe that markets were inherently stable — indeed, that stocks and other assets were always priced just right. There was nothing in the prevailing models suggesting the possibility of the kind of collapse that happened last year. Meanwhile, macroeconomists were divided in their views.

Krugman Cont.

By 1970 or so, however, the study of financial markets ... was dominated by the “efficient-market hypothesis,” promulgated by Eugene Fama of the University of Chicago, which claims that financial markets price assets precisely at their intrinsic worth given all publicly available information. (The price of a company’s stock, for example, always accurately reflects the company’s value given the information available on the company’s earnings, its business prospects and so on.) And by the 1980s, finance economists, notably Michael Jensen of the Harvard Business School, were arguing that because financial markets always get prices right, the best thing corporate chieftains can do, not just for themselves but for the sake of the economy, is to maximize their stock prices. In other words, finance economists believed that we should put the capital development of the nation in the hands of what Keynes had called a “casino.”

Krugman Cont.

To be fair, finance theorists didn’t accept the efficient-market hypothesis merely because it was elegant, convenient and lucrative. They also produced a great deal of statistical evidence, which at first seemed strongly supportive. But this evidence was of an oddly limited form. Finance economists rarely asked the seemingly obvious (though not easily answered) question of whether asset prices made sense given real-world fundamentals like earnings. Instead, they asked only whether asset prices made sense given other asset prices. Larry Summers, now the top economic adviser in the Obama administration, once mocked finance professors with a parable about “ketchup economists” who “have shown that two-ounce bottles of ketchup invariably sell for exactly twice as much as one-ounce bottles of ketchup,” and conclude from this that the ketchup market is perfectly efficient.

Cochrane’s Response to Krugman

Krugman’s attack has two goals. First, he thinks financial markets are “inefficient,” fundamentally due to “irrational” investors, and thus prey to excessive volatility which needs government control. Second, he likes the huge “fiscal stimulus” provided by multi-trillion dollar deficits.

It’s fun to say we didn’t see the crisis coming, but the central empirical prediction of the efficient markets hypothesis is precisely that nobody can tell where markets are going — neither benevolent government bureaucrats, nor crafty hedge-fund managers, nor ivory-tower academics.

Krugman writes as if the volatility of stock prices alone disproves market efficiency, and efficient marketers just ignored it all these years. ... There is nothing about “efficiency” that promises “stability.” “Stable” growth would in fact be a major violation of efficiency.
Cochrane’s Response Cont.

In fact, the great “equity premium puzzle” is that if efficient, stock markets don’t seem risky enough to deter more people from investing! Gene Fama’s PhD thesis was on “fat tails” in stock returns.

It is true and very well documented that asset prices move more than reasonable expectations of future cashflows. This might be because people are prey to bursts of irrational optimism and pessimism. It might also be because people’s willingness to take on risk varies over time, and is lower in bad economic times. As Gene Fama pointed out in 1970, these are observationally equivalent explanations. Unless you are willing to elaborate your theory to the point that it can quantitatively describe how much and when risk premiums, or waves of “optimism” and “pessimism,” can vary, you know nothing. No theory is particularly good at that right now.

Cochrane’s Response Cont.

Are markets irrationally exuberant or irrationally depressed? It’s hard to tell. This difficulty is no surprise. It’s the central prediction of free-market economics, as crystallized by Hayek, that no academic, bureaucrat or regulator will ever be able to fully explain market price movements. Nobody knows what “fundamental” value is. If anyone could tell what the price of tomatoes should be, let alone the price of Microsoft stock, communism would have worked.

The case for free markets never was that markets are perfect. The case for free markets is that government control of markets, especially asset markets, has always been much worse. ... Careful behavioralists know this, and do not quickly run from “the market got it wrong” to “the government can put it all right.”

Practice Problems

BKM 7th Ed. Ch. 11:
1-9, 14, 16-18, 25, 27-28;

BKM 8th Ed. Ch. 11:
1-3, 6-5, 13, 19, 20, 23, CFA: 1-4.