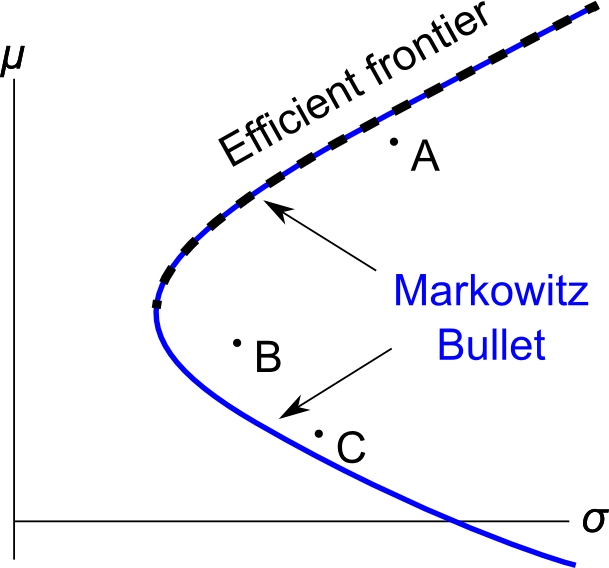
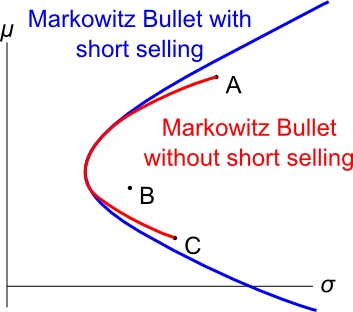
***The Markowitz Bullet and the Efficient Frontier of Risky Assets (excluding rf)***

* The Markowitz bullet is the boundary line that contains the minimum risk portfolios for each return.
* Also called the Minimum Variance Set (MVS) of risky assets or the portfolio possibility frontier.
* The **top half** of the Markowitz bullet is called the **efficient frontier**.
* The portfolios that comprise the efficient frontier are the only ones worth investing in because they give the highest return for a given standard deviation.
* Mathematically, the bullet shaped graph is a hyperbola.

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***The Markowitz Bullet with Short Selling Restrictions***

* To short sell stock, investors must locate a stock lender, usually a broker or investment bank. The broker charges a fee for lending the stock.
* Sometimes a stock lender cannot be found or the fee is prohibitive.
* In 2008/09, shorting financial stocks was made illegal for some time.
* Restrictions on short selling lead to a shrunk Markowitz bullet.
* Without short selling, the highest return possible is that of the highest return stock. You cannot have a weight of more than 1 in the highest return stock because weights must sum to 1 and negative weights in other stocks means short selling.



* In common sense terms, you can’t earn a return more than the highest return stock since you can’t invest more than your wealth. To over-invest you must borrow some asset which is short-selling that asset.