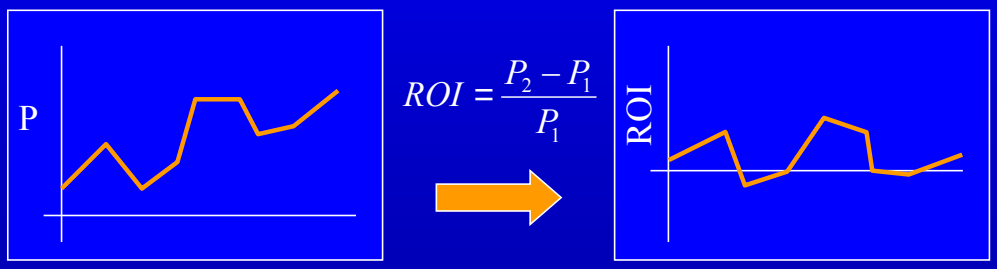
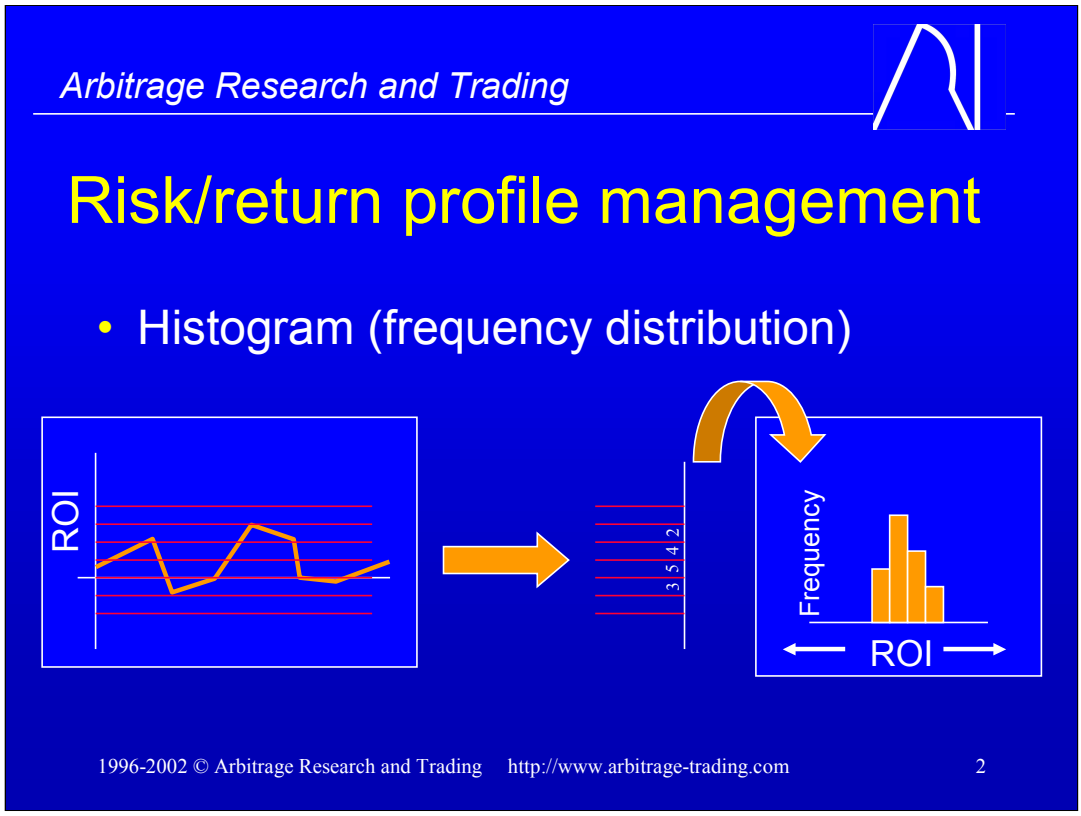
Risk/return profile management

- One approach to R/R measurement



Here is a sample slide introducing one particular development for quantifying risk/return. This slide illustrates that a given price history or portfolio value history may be converted to a returns history. In this example, a simple Return on Investment (ROI) calculation is used, though other measures of returns may also be used.



A "risk/return profile" may be based on "frequency plots" or "histograms". This is accomplished by splitting the returns history into a number of "strata" or "bins", and counting the number of time the returns history exists in each bin. The bin counts are then divided by the total number of returns in the history to produce "frequencies". Finally, the frequencies are plotted against the corresponding returns. Note that "frequencies" are often associated with "probabilities", though technically this is only true in limiting cases.

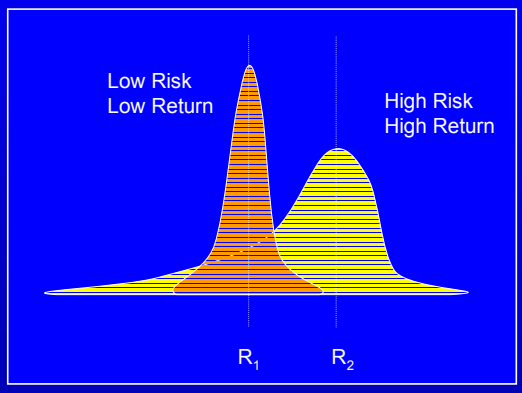
The histogram provides a "frequency distribution" (or roughly, a "probability distribution")for the returns. If the future behaves like the past, then we can use this distribution to make statements about the expectation for the risk/return performance in the future. Of course the degree to which the future behaves like the past in the real world is deep question on its own, but for now let's assume that it does in this context.

It is convenient to use only "summary measures" of the distribution. The simplest case of this is to use the average of the distribution as a predictor of returns, and to use some measure of the "width" of the distribution as a predictor of "risk". Standard deviation is the most common measure of "width". Though note "width" is not "risk" in the "loss" sense, but rather "risk" of how often the "average return" is not reached.

It is important to remember that using only returns and standard deviations, while convenient, often do not provide a complete picture, especially when the distribution is complex (e.g. skewed, or fat tailed etc) as is almost always the case for real traded portfolios. Additionally, the number of points used to determine the distribution is also important, as shown in later sections.

Risk/Return Profile Management

- Given two "risky" investments, which would YOU prefer?
- Risk/Return are "connected"



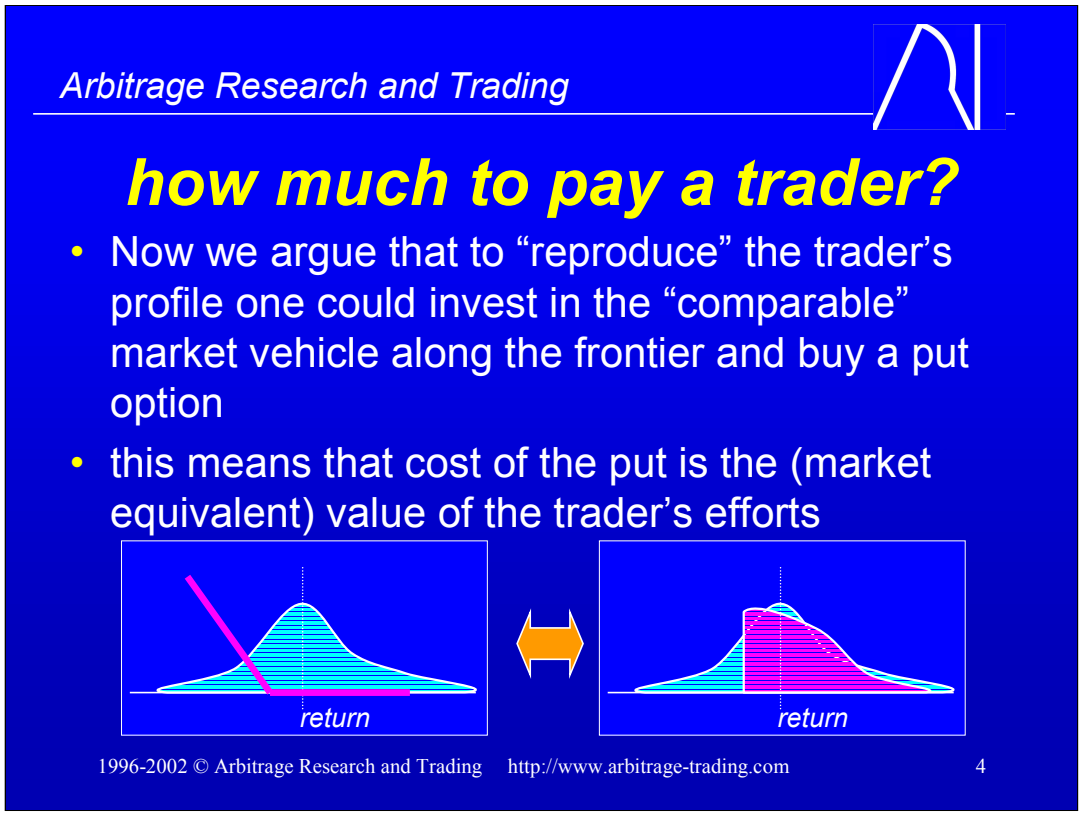
Applying the statistical machinery from the early slides, consider the frequency distribution for two hypothetical assets: A, and B. Asset A is "low risk/low return", since its average return, R1, is relatively low, and its "width" is relatively narrow, implying a high degree of certainty about the likelihood of obtaining the average rate of return. On the other hand, Asset B has a relatively high rate of average return, R2, though it is also "risky" in the sense the width of distribution implies a very wide range of possible returns.

Notice that Asset B also has a very highly skewed distribution, so if we were only to use the average/width summary measure approach, then we would not obtain a full picture (since those two measure ignore skew and other features).

Since greater risk (width) implies a reduced chance of obtaining the average return, we normally wish to have a higher average return for riskier investments.

Now, suppose we had a large audience of investors and we asked them to vote for their preference as an investment from amongst asset A and B. Some investors would vote for asset A (the risk averse investors), other investors would vote for asset B (the risk takers). Who is right? Well, everybody is right, since risk/return is subjective, and each investor must find a risk/return profile that suits their needs.

Notice also that some investors may wish to have a risk/return somewhere other than A and B. If asset is a bond, and asset B is an equity, then we could construct structured product that is some combination of A and B to provide the required risk/return (e.g. a convertible bond).



Here is slide from a series of slides in another section of a presentation that makes of use of combining risk/return profiles, options theory, and portfolio theory.

The example has a number of slides and proposes to consider one method for quantifying the bonus that a trader may be paid based on the trader's trading performance over some period.

The risk/return profile idea is applied by considering the risk/return profile of the trader's P&L and comparing this to other possible profiles that the trader might produce, or importantly to profiles that management could produce without the trader. For example, if the blue distribution is that of the "investment", then buying a put option in addition to the "investment" converts the "protected portfolio's" distribution to the "purple" distribution. Notice that the new distribution will have a lower average return (since we had to pay for the put), but importantly it also has limited down side and smaller risk (a narrower distribution).

Again note that standard approaches that only make use of the average and standard deviation will not be able provide a complete analysis of such trading, since clearly the new distribution is heavily skewed.