

# QPP Contents Guide

## Page by Page Explanation of Quantities and Features in QPP

This guide is designed to familiarize users with each piece of input and output included in the first six pages of QPP, pages 9 and 10 of QPP, and the Correlations Matrix. The structure of this document follows the structure of QPP itself, marching through the measures and metrics in QPP as they appear in the program, page by page.

**NOTE: Quantext is not a registered investment advisor. No information in this document should be taken as advice to buy or sell any asset. Any and all information obtained from Quantext is on an "AS IS" basis.** Please note that the numbers/tickers used in the QPP screen shots and examples are for illustrative purposes only and are not to be taken in any way as advice.

Within QPP there are several different parts (or *sheets* as they are called in Excel.) Here is a list of those parts, brief descriptions of what they contain, and how to locate them in the program:

### **Portfolio Planning Report**

The Portfolio Planning Report is the main body of all of Quantext's planners. All of the user input (except for custom glide path information) goes into this portion of QPP. Most of the output is also within this portion of the planner. If you need to get back to this sheet, click on the tab labeled *Portfolio Report* at the bottom of the Excel screen.

### **Correlations Matrix**

The Correlations Matrix is found by clicking on the tab marked *Correlations* at the bottom of the Excel screen. This matrix contains the correlations of each of the portfolio components to one another, as well as to the portfolio itself.

## **Custom Savings/Draw Tool**

This tool is found by clicking on the Tab labeled *Savings-Income*, located at the bottom of the Excel screen. This feature is not included in the free trial version, but is included in all licensed versions of Quantext's portfolio planners (QPP, QPP40, and QRP.)

The Custom Savings/Draw Feature allows users to model the future of their portfolio even if they intend to diverge from the typically assumed situation of saving a consistent amount (inflation adjusted) until you retire, and then drawing a fixed amount (inflation adjusted) for the rest of your life. This feature allows users to explore possibilities such as saving a consistent amount until, say, age 55, and then NOT drawing for ten years, and then ramping up the draw on their portfolio over the next ten years. Any unique path can be specified on a year by year basis.

This document does not contain explicit details about how to use this tool. However, included on every CD (licensed versions of Quantext's portfolio planners) is a file that is a user's guide for this feature. It is called *IncomeGlidePath –user guide*. Also, the following article demonstrates the use of this tool:

<http://www.quantext.com/IncomeGlidePath.pdf>

## **Stock Options Tool and Employee Stock Options Tool**

The Stock Options Tool and Employee Stock Options Tool are one and the same. This feature is actually located within the Portfolio Planning Report (pages 7 and 8), however, details for the use of this tool are not included in this document. Please see these articles for a demonstration of the use of this tool:

<http://www.quantext.com/GoogleEmployeeStockOptions.pdf>

<http://www.quantext.com/GoogleEmployeeStockOptions-2.pdf>

## Portfolio Planning Report

# Portfolio Planning Report

This section will describe what the inputs and outputs of the Portfolio Planning Report mean. Default settings, if any, are given. Links to articles illustrating the specific features will be given. (All of the referenced articles exist in Quantext's warehouse of articles at this address: <http://quantext.com/subpage.html>.)

## Page 1 Basic Input and Economic Projections

<i>Quantext Portfolio Planning Report</i>			
Prepared For:		Preparation Date:	
<b>Your Name</b>		9/25/2008	
<b>Page 1: Basic Input and Economic Projections</b>			
<a href="http://www.quantext.com">www.quantext.com</a>			
Note: Please see the end of this report for important disclaimers			
Current Age	64	Assumed Inflation Rate (Annual)	Annual Standard Deviation of Market Return (% of normal)
Date of Retirement	2008	3.00%	100.00%
Age at Retirement	64	Annual Standard Deviation 15.07%	
Annual Contribution (Current Dollars)	\$0	Delta Return	Average Annual Return of Market
Current Portfolio Value	\$1,400,000	-2.00%	8.30%
Inflate Contributions at inflation?	Yes	Note: Delta Return is your estimate of the difference between annual return in the future and historical annual return from the S&P500	
Inflate Income Draw?	Yes		
Income in Retirement (Current Dollars)	\$50,000		
OR			
Target Percentage Draw	0%		
Minimum Draw (Current Dollars)	\$0		

**Figure 1: Screen shot of page 1 of QPP's Portfolio Planning Report.**

- **Current Age:** Current age of portfolio owner.
- **Date of Retirement:** Year in which the owner plans to retire.
- **Age at Retirement:** (This is calculated by QPP.)
- **Annual Contribution (Current Dollars):** This is the amount the owner plans to invest annually until retirement.
- **Current Portfolio Value:** This is the amount that exists currently in the portfolio.
- **Inflate Contributions at Inflation?** This is asking you if QPP should inflate the *Annual Contribution* at the specified *Assumed Annual Inflation Rate*. Answer **Yes** or **No**. You specify the *Assumed Annual Inflation Rate* on page 1 of QPP.
- **Inflate Income Draw?** This is asking you if you would like QPP to inflate the amount that will be drawn from the portfolio in retirement. Answer **Yes** or **No**.

Next, you need to choose how the draw in retirement will be determined. Use one feature or the other:

- **Income in Retirement?** *Income in Retirement* only accounts for money drawn from this portfolio; it does not include social security or pension income. QPP does not account for taxes.

**Income in Retirement** directs QPP to simply assume a fixed annual draw, inflated annually if the above box was filled with Yes. If *Income in Retirement* is used, set *Target Percentage Draw* and *Minimum Draw* to zero.

- **Target Percentage Draw/Minimum Draw:** *Target Percentage Draw* only accounts for money drawn from this portfolio; it does not include social security or pension income. QPP does not account for taxes.

The *Target Percentage Draw* feature directs QPP to draw a certain percentage of the portfolio's value, say 4%. However, this requires the specification of a *Minimum Draw*. (If the portfolio tanks, one would still need to draw a minimum amount to live on, even if it is greater than 4% of the portfolio's value at that time.) If you are using this method, set *Income in Retirement* to zero.

The following is at the top, right side of page 1 of QPP:

- **Assumed Inflation Rate (Annual):** This is the assumed average inflation rate of the market as a whole for the future. This quantity determines the rate at which QPP will inflate the owner's contributions and *Income in Retirement* if *Inflate Contributions at Inflation?* and/or *Inflate Income Draw?* are filled with *Yes*. You can adjust this quantity.
- **Annual Standard Deviation of Market Return (% of normal):** This piece of input establishes the assumed long term, future volatility of the market as a whole. It is important in that QPP uses *reversion to the mean* in projecting the value of the portfolio for the future, and this helps to determine the mean. "Normal" Annual Standard Deviation of the Market is 15.07% and this is accepted by entering 100% in this box. This value is derived and discussed in this article: <http://www.quantext.com/EquityRiskPremium.pdf> Quantext recommends tinkering with the **Annual Standard Deviation of Market Return (% of normal)** to test the sensitivity of your portfolio to this assumption; this type of exploration will give users a clearer sense of the range of possible futures for their portfolios.
- **Annual Standard Deviation:** This is a measure of the volatility of the market as a whole. (It is calculated by QPP based on the user's input in *Annual Standard Deviation of Market Return (% of normal)*.) Note: This quantity does not change from zero unless the username and password are entered correctly and the license is current. (The downloaded free trial must be correctly unzipped, as well.)
- **Delta Return:** *Delta Return* is the input that allows the user to control the assumed future annual return of the market. Quantext's default setting for this quantity is -2. (Please read the next definition for more detail.)

- Average Annual Return of Market:** This value is 10.3% plus the number that is in the *Delta Return* box. For example, if *Delta Return* is -2, then the *Average Annual Return of the Market* for the future is assumed to be 8.3%. This value is derived and discussed in this article: <http://www.quantext.com/EquityRiskPremium.pdf> Quantext recommends tinkering with the *Average Annual Return of Market* to test the sensitivity of your portfolio to this assumption; this type of exploration will give users a clearer sense of the range of possible futures for their portfolios.

## Page 2 Portfolio Components

Quantext Portfolio Planning Report					
Prepared For: Your Name			Preparation Date: 9/26/2008		
Page 2: Portfolio Components					
<a href="http://www.quantext.com">www.quantext.com</a>					
Fund or Stock Ticker	Beta	Standard Deviation (Annual)	R <sup>2</sup>	Check	
TIP	-32%	9%	29%	OK	
AGG	-9%	5%	7%	OK	
IVV	101%	15%	99%	OK	
IWM	126%	19%	72%	OK	
EFA	98%	15%	63%	OK	
EEM	164%	25%	52%	OK	
RWR	122%	18%	39%	OK	
^DJIC	-3%	26%	0%	OK	
COY	101%	15%	39%	OK	
EWJ	52%	21%	14%	OK	
EWM	87%	28%	23%	OK	
IGE	113%	34%	25%	OK	
IXJ	58%	9%	38%	OK	
IYE	113%	33%	26%	OK	
IYT	76%	26%	19%	OK	
DVMKX	0%	1%	0%	OK	
C	173%	26%	38%	OK	
-	100%	15%	100%	OK	
-	100%	15%	100%	OK	
-	100%	15%	100%	OK	

Figure 2a: This is the left hand portion of QPP's page 2.

- Fund or Stock Ticker:** QPP will go out onto the web and retrieve historical data on the tickers listed in this column. You can include up to twenty tickers in this list, even if you do not plan to use all of them in your portfolio. (On page 3 of QPP you allocate percentages of the portfolio to these tickers; you can allocate 0% to some tickers.) The tickers can be in any order. (The one exception is if you are planning on using the *Stock Options Tool*. In this case, the stock for which you plan to consider call options or employee stock options must be in the top ticker slot. QPP will only handle one stock for options considerations.)

Please be aware that the tickers in this column must be typed correctly, and that the tickers must be acceptable. ETFs, mutual funds, and individual stocks, as well as some others, are acceptable. Acceptable tickers include those listed at Yahoo!Finance that have historical data available. For more information on identifying acceptable tickers, please see our Troubleshooting Guide, Tip 12. <http://quantext.com/troubleshooting.html>

Finally, please note that these ticker slots may NOT be left blank. See the bottom three ticker slots in *Figure 3a*. Most versions of Excel will allow a “-“ to be put into the ticker slots. However, if you experience an error message, see Tip 2 in the Troubleshooting Guide <http://quantext.com/troubleshooting.html>

- **Beta:** This is forward-looking Beta for the individual ticker. QPP calculates this by combining the assumed, forward-looking, long term behavior of the market with the historical data retrieved from Yahoo!Finance. This Beta and Historical Beta will be similar, as Beta is preserved in QPP. Beta is essentially an indicator of the returns from S&P500 drive the returns of the portfolio. For a more detailed definition of Beta, please see: <http://www.investopedia.com/terms/b/beta.asp>
- **Standard Deviation (Annual):** This is the forward-looking annual standard deviation for the individual ticker. To calculate this quantity, QPP combines the assumed, forward looking, long term behavior of the market with the historical data retrieved from Yahoo!Finance. Standard deviation is a measure of volatility; it is a measure of risk. For a more precise definition of standard deviation please see: <http://www.investopedia.com/terms/s/standarddeviation.asp>
- **R<sup>2</sup>:** This is the historical R<sup>2</sup> (“R squared”) for the individual ticker. R<sup>2</sup> is a measure of how closely the ticker tracks the market, specifically, the S&P500. For a more precise definition, please see: <http://www.investopedia.com/terms/r/r-squared.asp>
- **Check:** This column will fill with “OK”, “Short Record”, and/or “Bad Data” responses once you have sent QPP to retrieve data from the web. Unless all of the rows with tickers in them have “OK” in the *check* column, the results from the rest of the program are not valid. *Short Record* means that there was not data available for the whole time period that was specified on the far right of page 2 of QPP. *Bad Data* can mean several different things. It will require that you go to Yahoo!Finance (<http://finance.yahoo.com/q?s=DVMKX> ) and check that the ticker is listed and does have historical data, most easily seen on the graph to the lower right side of the Yahoo!Finance screen. For more details, please see Tip 12 in our Troubleshooting Guide: <http://www.quantext.com/troubleshooting.htm>

And further to the right of QPP’s page 2:

Start Date 4/30/2005	End Date 4/30/2008
GET DATA: ctrl-r	
Months 36	Years 3.0
Preserve R <sup>2</sup> ? (Y/N):	N

Figure 2b: This screen shot is of the far right of QPP's page 2.

## General Information:

### Choosing Historical Period

In this box, you are specifying the period of time for which QPP will retrieve data and base its calculations. Three to five years is what we have found to be the most useful.

For tickers that do not have the requested three (to five) years of data, QPP will put *short record* in the *Check* column (page 2 of QPP, shown above in Figure 2a.). You can't run with a 'short record'; the check column must fill with **OK** for every row in which there is a ticker.

If you decrease the period too drastically, say, set the historical period to 1 year, the statistics will not be stable. A range of testing suggests that three to five years for the historical data period is good because there is enough data for major stocks and funds and the statistics are stable. You can try a longer historical period, say 10 years, but you are more likely to encounter a *short record*. Also, the information you are using if you are running with a 10 year historical period, is not as representative of present behavior. (The portfolio planner already accounts for long term risk – return behavior of the market.)

We have found remarkably good results using a standard of three years of data. That said, Quantext endorses stress testing with other historical periods. If you get substantially different results with five years of data vs. three years, you are a victim of 'over tuning' the model. In an environment where the volatility is in considerable flux, it is more likely that you will see portfolio risk change in time. It is a good idea to test a portfolio in a range of market conditions.

Other than leaving something with a *short record* out, you can find a *proxy* (a similar company, ETF, or fund.) You can check graphs of their data on Yahoo!Finance (Y!F) to make sure that they have behaved similarly. At Y!F one can pull up the maximum length graph for one ticker, and from that screen, ask Y!F to overlay the graph of any other ticker for comparison. Directly below is information on *individual bond proxies* and *cash proxies*. You can also use index data in the portfolio as a proxy for a short lived index fund. For example, the commodity ETF, DJP, tracks the Dow Jones-AIG Commodity Index which can be obtained on Y!F using the ticker ^DJC. If you use ^DJC in place of DJP, change the Increase in Average Return variable (on the right side of page 3) to reflect the expense ratio in the ETF vs. the index (which has zero expenses).

### **Proxies for Individual Bonds:**

QPP won't handle individual bonds. You can use a bond fund, such as AGG, as a proxy when trying to model an individual bond. --or use an ETF that invests in inflation protected bonds, TIPS (TIP). --or, you could look on Yahoo!Finance for a bond fund that suits your purposes.

### **Proxies for Cash in Portfolio:**

For cash, DVMKX, a money market fund that is publicly traded, can serve as a proxy. It has been around a long time – some haven't been. (Some are offered as cash repositories for clients, but are not publicly traded.) You can try publicly traded ultra short bond funds, also. For more details, please see Tip 12 in our Troubleshooting Guide:

<http://quantext.com/troubleshooting.html>

- **Start Date:** This defines the earlier end of the historical period that you would like to retrieve data for. For example, if you would like to study the three years from April 30, 2005 through April 30, 2008, the **Start Date** would be 4/30/2005 (and must be entered in that format.)
- **End Date:** Continuing our example, the End Date would be 4/30/2008.
- **GET DATA:** Hit this button once you have entered the tickers on page 2 of QPP, the Start Date, and the End Date, (as well as the password and username from page 1). By hitting this button, you are asking QPP to go out onto the internet to retrieve data. To do this you must be connected to the internet. Any high-speed connection will work. Dial-up connections sometimes work, but cause issues with “hanging up” much more frequently.
- **Months:** This is calculated by QPP based on the Start and End Dates entered by the user.

If QPP does not calculate this quantity correctly after you have entered the *Start and End Dates*, first check to see that Excel's Calculations are set to Automatic (Tip 3, in the Troubleshooting Guide.) If that does not do it, please see Tip 13 in the Troubleshooting Guide about number formats.

<http://quantext.com/troubleshooting.html>

- **Years:** This is calculated by QPP based on the Start and End Dates entered by the user.

If QPP does not calculate this quantity correctly after you have entered the *Start and End Dates*, first check to see that Excel's Calculations are set to Automatic (Tip 3, in the Troubleshooting Guide.) If that does not do it, please see Tip 13 in the Troubleshooting Guide about number formats.

<http://quantext.com/troubleshooting.html>

- **Preserve R<sup>2</sup>?** (answer **Y** or **N** in the box) This is asking you if you would like QPP to keep the projected R<sup>2</sup> the same as the historical R<sup>2</sup> for the portfolio. QPP does preserve Beta. The **Preserve R<sup>2</sup>** option was built into the original version of the software, but for most (if not all) of Quantext's benchmarking, R<sup>2</sup> is not preserved. **N** is our default setting.

# Page 3 Portfolio Allocations and Monte Carlo Outcomes

Portfolio Planning Report				
Prepared For: Your Name		Preparation Date 9/26/2008		
Page 3: Portfolio Allocations and Monte Carlo Outcomes				
			Portfolio Stats	
Fund Name	Percentage of Funds	Average Annual Return	Average Annual Return	Standard Deviation(Annual)
TIP	10.0%	5.30%	9.10%	12.61%
AGG	10.0%	3.47%		
IVV	10.0%	8.35%		
IWM	10.0%	10.28%	Historical Data	
EFA	10.0%	8.15%	Start:	End:
EEM	10.0%	13.07%	4/30/2005	4/30/2008
RWR	10.0%	9.98%	Average Annual Return	Standard Deviation (Annual)
^DJC	10.0%	12.99%	10.66%	7.77%
COY	10.0%	8.38%	Historical Beta: <b>71.99%</b>	
EWJ	10.0%	11.43%	Historical Yield: <b>2.58%</b>	
EWM	0.0%	14.51%	Portfolio R^2: <b>68.6%</b>	
IGE	0.0%	17.76%	Performance of S&P500 over historical period	
IXJ	0.0%	5.15%	Avg Ann Return S&P500 (no dividends)	
IYE	0.0%	17.35%	5.58%	
IYT	0.0%	13.79%	Annual Standard Deviation on S&P500	
DVMKX	0.0%	1.10%	8.94%	
C	0.0%	13.74%		
-	0.0%	-		
-	0.0%	-		
-	0.0%	-		
Sums to	100.0%			
Simulated Portfolio Beta 71.99%			Market Index (S&P500)	
			Average Annual Return	Standard Deviation (Annual)
			8.30%	15.07%
Diversification Metric:		41%		

Figure 3a: This is the left hand side of QPP's page 3.

- **Fund Name:** This column of tickers (funds, individual equities, etc.) is carried from page 2 to this page by QPP. If you change the tickers on page two of QPP, remember to hit GET DATA before considering the output!
- **Percentage of Funds:** This is where the user allocates the portfolio to the tickers. These can be changed repeatedly without updating the historical data (without hitting GET DATA.) In the screen shot in Figure 3a, the first ten tickers have been (carelessly) allocated to ten percent each. Any combination of the twenty tickers will work, as long as the total (**Sums to**) equals 100%.
- **Average Annual Return:** This column contains the Monte Carlo results (forward-looking projections) for the individual tickers in the portfolio. (Even if they are allocated to zero in the portfolio.) This return is the *total* projected return for the specified portfolio; it includes dividends and splits.
- **Sums to:** This is an extremely important little box to keep an eye on. Every time that you reallocate funds to the portfolio, check to make sure that 100% of the portfolio has been allocated!
- **Portfolio Stats:** This is the turquoise box to the right side of page 3. These are the projected (forward-looking) *Average Annual Return* and *Standard Deviation (Annual)* for the portfolio. Many of Quantext's articles illustrate the usefulness of this quantity. Here are some:

<http://www.quantext.com/RiskandReturn.pdf>

<http://www.quantext.com/RiskReturn2.pdf>

<http://www.quantext.com/AllETF.pdf>

<http://www.quantext.com/SectorOutlook.pdf>

<http://www.quantext.com/MarketNeutral.pdf>

<http://www.quantext.com/PerformancePredictionOOOO.pdf>

<http://www.quantext.com/PerformancePrediction.pdf>

<http://www.quantext.com/MakingSenseofTrailingPerformance.pdf>

<http://www.quantext.com/DiversificationPremium.pdf>

<http://www.quantext.com/InvestingAtHome.pdf>

<http://www.quantext.com/RealEstate2.pdf>

These projections are long-term average annual return and Standard Deviation in annual return (SD). The market evolves, so these values evolve, but Quantext thinks of them (and tests them) as though they are for several years or so into the future. Please understand that Average Annual Return is not the same as compounded annual return (often abbreviated as CAGR):

<http://www.quantext.com/CostOfVolatility.pdf>

Keeping in mind that returns and standard deviations change in time, testing on a regular basis is a good idea. The projected default risk of Bear Stearns (BSC) increased dramatically in one month (see this article:

<http://www.quantext.com/BearStearns.pdf> ). However, this is unusual.

QPP's projected portfolio performance assumes annual rebalancing. Rebalancing is actually more complex than many people think. For some thoughts on the role of rebalancing, the reader may find this article to be of interest:

<http://www.quantext.com/RethinkingRebalancingv2.pdf>

**Average Annual Return (under Portfolio Stats):** This is the *projected* return based on QPP's calculations. This return is the *total* projected return for the specified portfolio; it includes dividends, splits, and all expenses other than loads. (Accounting for loads will be covered in this document towards the end of this "Page 3" section.)

QPP's projected returns are expected average returns—not a specific forecast for the coming year. If you measure the height of every person in a group, the average value is a measure of what you will average out to if you measure a number of people but this may be quite far off the mark as a prediction for any individual.

QPP assumes dividends are reinvested.

QPP does not handle taxes, but taxes can have a large effect. A number of users manage two QPP portfolios--one for their taxable and one for their tax advantaged portfolios. (Tip 11 in the Troubleshooting Guide will help you set this up successfully. <http://quantext.com/troubleshooting.html>)

Over what time period is the "projected" average annual return? The **long term** expected returns and volatility are given -on the order of a year or more. (Momentum effects can be powerful influences out to a year but at a year or more, reversion to the mean is a stronger force.) Though the projections are long term, you can re-check a portfolio every quarter, say, and note any changes in the projections. (As new information is processed in, the results can change.)

If you want to see the historical returns for a specific ticker, allocate 100% to that ticker and look at the table labeled **Historical** (see below). (You do not need to hit "Get Data" again.) Another option is to unhide the Excel sheet called "Historical". To do this, go to Format > Sheet > Unhide > Historical > OK.

As well as understanding what you're seeing with regards to historical vs. projected returns, it is important to understand the asymmetry associated with volatility (positive and negative movement in stock price.) It is possible for a stock to have a positive average annual return and a negative cumulative return. Consider a stock with the following returns:

Yr 1 100%

Yr 2 50%  
Yr 3 -80%

At the end of the three years, \$1 invested is worth \$0.60, a cumulative loss of 40%. (After one year, you have \$2. After the next year, you have \$3. After the third year you have lost 80% of that; you have \$.60.) BUT the average annual return is 23% (average of 100%, 50%, and -80%). For more details: <http://www.quantext.com/CostOfVolatility.pdf>

## **Annual Standard Deviation (Annual) (under**

**Portfolio Stats):** This is the projected, long-term annual standard deviation of the portfolio. This is an indicator of how risky the portfolio is.

- **Historical Data:** This yellow box contains historical data for the time period that specified on page 2 of QPP. The *Start and End Dates* of the period are repeated at the top of the yellow box. The *Average Annual Return* and *Annual Standard Deviation* for the portfolio, for this time period, are given. These are total returns, including splits and dividends. *Historical Beta* is the beta for the portfolio over the specified time period. *Historical Yield* is the yield (dividends) for the portfolio over the specified time period. *Portfolio R<sup>2</sup>* is the R-squared of the portfolio over the given time period. For definitions of the above mentioned quantities, please visit Investopedia at <http://www.investopedia.com/terms>. *Performance of S&P500 over historical period*, both the *Average Annual Return of the S&P500* and the *Annual Standard Deviation of the S&P500*, are given as a reference for comparison. These are, again, for the historical period specified by the user.
- **Market Index (S&P500):** In the gray box in the lower right portion of page 3 of QPP, the *assumed future performance of the S&P500* is shown. These pieces of information were specified (and are adjustable by the user) on page 1 of QPP. These greatly influence the Monte Carlo outcomes of the portfolio. The user can manipulate both the expected (average) annual return of the market and the annual standard deviation on market returns (on page 1 of QPP) and instantly see the effect that these views have on the projected Portfolio Stats. Please see “PAGE 1”, above, in this document, to review Quantext’s default settings for these quantities.
- **Simulated Portfolio Beta:** Beta is preserved in QPP. Therefore, *Simulated Portfolio Beta* and *Historical Beta* are similar. Simulated Portfolio Beta is an indicator of how closely the portfolio tracks the S&P500.
- **Diversification Metric:** In all versions of our portfolio planning software, we have an analytical function that accounts for non-market correlation between portfolio components. This is important because many asset classes have correlation to one another beyond what can be captured by Beta. (Beta, by definition, captures correlation to the S&P500, “the market”.) Looking at non-market correlation is important for many portfolios, especially those with

concentrations in a sector. Diversification is discussed in these articles:

- <http://www.quantext.com/TrueDiversification.pdf>
- <http://www.quantext.com/DiversificationPremium.pdf>
- <http://www.quantext.com/BetterPortfolioPlanning.pdf>
- <http://www.quantext.com/MarketNeutral.pdf>

Our software generates a statistic, **Diversification Metric (DM)**, that measures how effectively the non-market components of returns actually diversify one another. In the best possible case, the non-market component of returns would be totally uncorrelated with one another. In the worst case, they would be highly correlated. DM measures how un-correlated the non-market returns are across the portfolio. Higher values of DM mean that the non-market component of returns shows low correlation across the portfolio. Higher DM means that you are getting more *real* diversification out of your portfolio. There seems to be an upper limit of about 60% -70%.

Note: The *Correlations Matrix* in Quantext’s portfolio planners helps one to determine how correlated each asset in a portfolio is to the portfolio as a whole, as well as to each of the other individual components—this is historical correlations for the historical period used. QPP’s projections do not simply preserve the correlation matrix. The *Correlations Matrix* is found by clicking on the tab marked *Correlations* at the bottom of the Excel screen.

Ticker	Beta	Increase in Average Return (%)	Historical Annual Dividend Yield	Min Rolling Annual Yield	SD Multiplier
TIP	-32.5%	0.0%	3.28%	0.86%	100%
AGG	-9.2%	0.0%	4.15%	4.29%	100%
IVV	100.6%	0.0%	0.82%	0.42%	100%
IWM	126.4%	0.0%	0.71%	0.34%	100%
EFA	98.0%	0.0%	2.16%	1.92%	100%
EEM	163.7%	0.0%	1.30%	1.18%	100%
RWR	122.4%	0.0%	3.29%	2.55%	100%
^DJC	-2.5%	-0.7%	-	-	100%
COY	101.0%	0.0%	9.37%	8.34%	100%
EWJ	52.1%	0.0%	0.75%	0.00%	100%
EWM	87.3%	0.0%	3.83%	0.00%	100%
IGE	112.6%	0.0%	0.00%	0.00%	100%
IXJ	57.7%	0.0%	1.06%	0.71%	100%
IYE	112.8%	0.0%	0.34%	0.32%	100%
IYT	75.9%	0.0%	-	-	100%
DVMKX	0.2%	0.0%	3.89%	3.12%	100%
C	172.7%	0.0%	4.16%	2.93%	100%
-	100.0%	0.0%	-	-	100%
-	100.0%	0.0%	-	-	100%
-	100.0%	0.0%	-	-	100%

Figure 3b: This chart is the right hand side of QPP’s page 3.

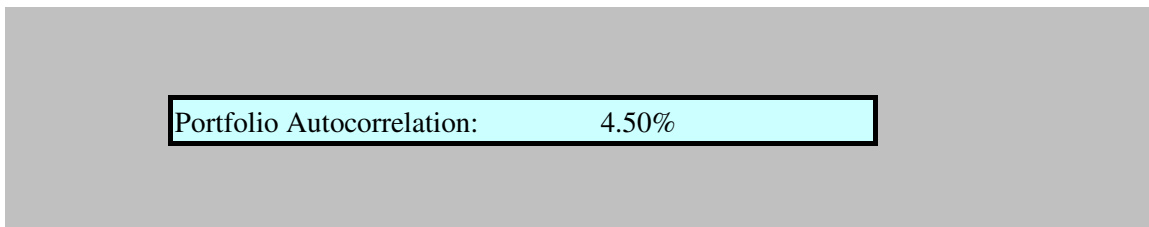
- **Ticker:** QPP merely carries the list of tickers to this chart.
- **Beta:** These are the historical Beta’s for the individual holdings.
- **Increase in Average Return (%):** This is where one can adjust the projected return on the individual tickers in the portfolio.

The user can account for **loads**. The Returns given in QPP automatically account for annual expenses (fees), but not loads. The way to account for loads is to go to page 3 of QPP and scroll over to the right, just past the data ‘check’ column. You will see a column in RED type where you can manually change the returns for the individual tickers. To account for loads, you can think about how long you might keep a fund, and then spread the load over that amount of time. For example, if the load on a fund is 5%, and you are thinking you might keep the position for five years, you can lower the annual returns of that fund by 1% by putting a “-1%” in the RED ink column.

Sometimes, one may wish to use an index as a proxy for a fund. For example, DJP is an ETF that, as of 2008, does not have the requisite three years of historical data. A proxy that can be used for DJP is the Dow Jones AIG commodity *index*, ^DJC. As this is an index, and not an ETF, you need to account for fees. In the case of including an index in a portfolio, you can use the **Increase in Average Return (%)** column to account for fees. Using ^DJC as a proxy for DJP, we use -0.7% in the RED INK column. (This is captured in the above screen shot.)

If you have a varying *view* on a specific ticker’s outlook from what is given on the left hand side of QPP’s page 3, you can adjust the projected expected return of that ticker in this column.

- **Historical Annual Dividend Yield:** This is the average annual dividend yield for the historical period.
- **Minimum Rolling Annual Yield:** This is the lowest dividend yield for any 12-month period in the sample data. If this is substantially different from the average yield, this indicates that there might have been a one-off special dividend in the sample period, for example.
- **SD Multiplier:** This is a redundant feature—ignore it.



**Figure 3c: This is the lower right side of page 3 of QPP.**

- **Portfolio Autocorrelation:** Portfolio autocorrelation is the correlation between returns in successive months for a portfolio in the historical data. QPP does not model this. If you see high absolute values for this (>20%), there is some evidence for persistence (momentum) in the data--which can cause more



- **Pie chart showing portfolio allocations.**
- **Probability of Running Out of Money:** Though this is a small box on the screen, it is a very powerful chart in that it is showing the distribution of possible outcomes for one's future based on all of the given input and the Monte Carlo simulator's calculations.

**To aid with the understanding of this output, here is some discussion of the example in the screen shots:** Note that the *age at retirement* is shown directly above this chart. (This is adjustable on page 1 of QPP, not on page 4.) In the example, the *age at retirement* is 64. The chart shows us that in 10 out of 100 possible outcomes, statistically, the portfolio runs out of money by the time the person is 104 years old. In 25 out of 100 possible future outcomes, the person runs out of money by age 129. Notice that the age 129 is repeated throughout the rest of the chart. This does not mean that there is not a statistical distribution beyond this age; it merely reveals that QPP has a maximum age at which it just fills the chart.

In continuation of this example, let's go back to page 1 of QPP and change the **current portfolio value** from \$1.4 million to \$1.0 million. (Our example situation still entails a 64 year old at his/her year of retirement.)

Probability of Running Out of Money	Age
10%	85
15%	87
20%	88
25%	91
30%	94
35%	98
40%	104
45%	107
50%	114

**Figure 4b: This chart shows the revised outcomes on page 4 of QPP.**

Now the *Probability of Running Out of Money* chart shows a more pronounced statistical distribution. In 10 out of 100 possible outcomes (“the 10<sup>th</sup> percentile”) this person will run out of money by age 85 according to QPP. In half of the possible projected scenarios, the 50<sup>th</sup> percentile, this person has no money left by age 114. Here is where one must assess their *longevity risk* tolerance. If you have many relatives that have lived past the age of 91, is it tolerable to have a 25% chance of being broke at that age? Is a 10% chance of having no money at age 85

reasonable? Though these are not easy questions to answer (and Quantext does not even attempt to do that) a reasonable glimpse into the future has been laid out. Further manipulations of *Retirement Date*, *Income in Retirement*, etc. will demonstrate the sensitivity of these factors.

All of the quantities on page 1, if adjusted, will immediately be reflected in this chart. Similarly, the allocations on page 3 of QPP can be changed and the results will be immediately reflected in this chart. (There is no need to hit GET DATA again.) Of course, if you alter the tickers on page 2 of QPP –or the historical period – you must hit GET DATA before the rest of the program will reflect that change.

The statistical distribution shown in the *Probability of Running Out of Money* chart is also shown in graph form at the end of the Portfolio Planning Report, on page 10 of QPP.

- **Portfolio Stats:** These are merely reproduced here for your convenience; they are the same as those at the top right of page 3 of QPP.
- **Portfolio Beta:** This is the same as Simulated Portfolio Beta, copied from page 3 of QPP for your convenience.

# Page 5 Estimated Portfolio Value

Portfolio Planning Report					
Prepared For: Your Name		Preparation Date: 9/29/2008			
Page 5: Estimated Portfolio Value					
Year	Age	Median Portfolio Value	80th Percentile Value	20th Percentile Value	Baseline Portfolio Draw
2008	64	\$974,566	\$1,001,814	\$943,731	-
2009	65	\$1,012,066	\$1,143,567	\$870,280	\$51,500
2010	66	\$1,052,188	\$1,247,570	\$876,187	\$53,045
2011	67	\$1,077,191	\$1,343,952	\$871,348	\$54,636
2012	68	\$1,110,909	\$1,423,664	\$868,652	\$56,275
2013	69	\$1,136,572	\$1,510,890	\$864,411	\$57,964
2014	70	\$1,201,330	\$1,595,269	\$829,126	\$59,703
2015	71	\$1,192,053	\$1,650,147	\$815,086	\$61,494
2016	72	\$1,267,742	\$1,757,671	\$800,644	\$63,339
2017	73	\$1,267,433	\$1,955,699	\$754,114	\$65,239
2018	74	\$1,324,238	\$2,115,136	\$756,403	\$67,196
2019	75	\$1,384,144	\$2,218,057	\$786,488	\$69,212
2020	76	\$1,325,829	\$2,312,830	\$718,623	\$71,288
2021	77	\$1,406,885	\$2,498,104	\$704,801	\$73,427
2022	78	\$1,408,472	\$2,686,296	\$703,645	\$75,629
2023	79	\$1,442,165	\$2,883,662	\$684,797	\$77,898
2024	80	\$1,466,957	\$3,124,522	\$656,122	\$80,235
2025	81	\$1,447,856	\$3,187,827	\$592,489	\$82,642
2026	82	\$1,525,246	\$3,317,911	\$574,392	\$85,122
2027	83	\$1,566,142	\$3,544,086	\$533,092	\$87,675
2028	84	\$1,544,248	\$3,646,200	\$426,069	\$90,306
2029	85	\$1,633,354	\$3,791,062	\$349,986	\$93,015
2030	86	\$1,613,335	\$3,996,308	\$264,530	\$95,805
2031	87	\$1,715,512	\$4,467,411	\$171,106	\$98,679
2032	88	\$1,703,187	\$4,875,273	\$90,174	\$101,640
2033	89	\$1,656,515	\$4,959,830	\$0	\$104,689
2034	90	\$1,678,649	\$5,322,434	\$0	\$107,830
2035	91	\$1,780,614	\$5,633,015	\$0	\$111,064
2036	92	\$1,756,146	\$6,480,890	\$0	\$114,396
2037	93	\$1,775,616	\$6,677,448	\$0	\$117,828
2038	94	\$1,734,385	\$7,270,842	\$0	\$121,363
2039	95	\$1,834,624	\$7,807,013	\$0	\$125,004

Figure 5: This shows QPP’s page 5 and is based on the revised example, the \$1 million dollar portfolio at the person’s age of retirement.

- **General Information about this page:** This page lays out the 50<sup>th</sup> (median), 20<sup>th</sup> and 80<sup>th</sup> percentiles for the portfolio in the years show in the left hand column. These projections are showing the probable *long term behavior* of the portfolio.
- **Year:** This is the year of consideration.
- **Age:** The age of the owner of the portfolio.
- **Median Portfolio Value:** This is the average (50<sup>th</sup> percentile) value of the portfolio in that year.

- **80<sup>th</sup> Percentile Value:** This means that in 80% of the projected scenarios the portfolio has this much or less in it in the given year. In 20% of the possible outcomes the portfolio has more. One can think of this as the rosier future.
- **20<sup>th</sup> Percentile Value:** This means that in 20% of the projected scenarios the portfolio has this much or less in it. In 80% of the possible outcomes the portfolio has more. This is an indicator of what a grimmer future might hold.
- **Baseline Portfolio Draw:** This column shows what is being drawn from the portfolio each year, in inflated dollars. Notice, in the screen shot above, that our example has the person retiring in 2008. In 2008, no money is drawn from the portfolio. In 2009 we see the first draw. Though we have set the annual draw at \$50,000 on page 1 of QPP, the first draw appears as \$51,500. This is because of the 3% inflation that we are assuming. (The inflation rate is adjustable on page 1 of QPP.)

# Page 6 Estimated Portfolio Value

Portfolio Planning Report			
Prepared For: Your Name	Preparation Date 9/29/2008		
<b>Page 6: Portfolio Risk and Projected Return</b>			
<b>Portfolio Value:</b>	<b>\$1,000,000</b>	<b>comments</b>	
Time Horizon (days):	365		
Portfolio Beta:	71.99%		
Percentile	Portfolio Value	Gain / Loss	Return
1%	\$810,841	-\$189,159	-19%
5%	\$880,211	-\$119,789	-12%
10%	\$925,600	-\$74,400	-7%
15%	\$957,998	-\$42,002	-4%
20%	\$985,131	-\$14,869	-1%
25%	\$1,003,512	\$3,512	0%
30%	\$1,025,013	\$25,013	3%
35%	\$1,046,094	\$46,094	5%
40%	\$1,061,366	\$61,366	6%
45%	\$1,078,022	\$78,022	8%
<b>50%</b>	<b>\$1,094,229</b>	<b>\$94,229</b>	<b>9%</b>
55%	\$1,110,426	\$110,426	11%
60%	\$1,124,682	\$124,682	12%
65%	\$1,140,476	\$140,476	14%
70%	\$1,159,222	\$159,222	16%
75%	\$1,176,133	\$176,133	18%
80%	\$1,195,804	\$195,804	20%
85%	\$1,219,282	\$219,282	22%
90%	\$1,247,700	\$247,700	25%
95%	\$1,303,913	\$303,913	30%
99%	\$1,385,460	\$385,460	39%
<b>Average</b>	<b>\$1,091,739</b>	<b>\$91,739</b>	<b>9%</b>

Figure 6: Page 6 of QPP is shown here.

- General Information about this page:** This page models the portfolio in the nearer term. From the current portfolio value, without including contributions or draws, it calculates the statistical possibilities for the portfolio. It is to be used in considering what the portfolio might do over the time period of 1 day up to 365 days, however using statistical models to examine the near term (like this) is not ideal. Statistical models are, by definition, most useful for modeling long term behavior. Rare occurrences in the near term may not be

captured. That said, this chart is featured in the following articles which do indicate that it does have merit. One article analyzes QPP's abilities at projecting risk levels, benchmarking against Moody's Market Implied Ratings.

<http://www.quantext.com/StocksVsFunds.pdf>

The other article studies QPP's abilities at capturing default risk.

<http://www.quantext.com/BearStearns.pdf>

- **Portfolio Value:** This is the current portfolio value (that was input on page 1 of QPP.)
- **Time Horizon (days):** This is the time period that will determine the projections in the table on this page of QPP.
- **Portfolio Beta:** This is the Simulated Portfolio Beta merely copied from page 3 of QPP.
- **Percentile:** This column lists the percentiles, from 1<sup>st</sup> to 99<sup>th</sup> percentile.
- **Portfolio Value:** This is the portfolio value at the specified number of days out from the end of the Historical Period.
- **Gain/Loss:** This is the portfolio's gain or loss over the time period specified.
- **Return:** This is the gain or loss in form of a percentage of the portfolio value.
- **Average:** This is a row at the bottom of page 6. It shows the average of each of the quantities in the table.

# Page 9 Disclaimers and Information

IMPORTANT: The projections and other information provided by Quantext Retirement Planner (this software) regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results and are not guarantees of future results

The underlying mathematical assumptions and methods are described in the documentation that accompanies this software. In brief, the model:

- 1) uses Beta to capture correlation between stocks and funds for the market as a whole
- 2) assumes returns on stocks and mutual funds are a random walk in time
- 3) assumes returns on stocks and mutual funds are normally distributed
- 4) ignores variations in the risk free rate of return in time
- 5) ignores variations in the rate of inflation in time
- 6) uses risk-return balancing so that risk and return have a consistent relationship

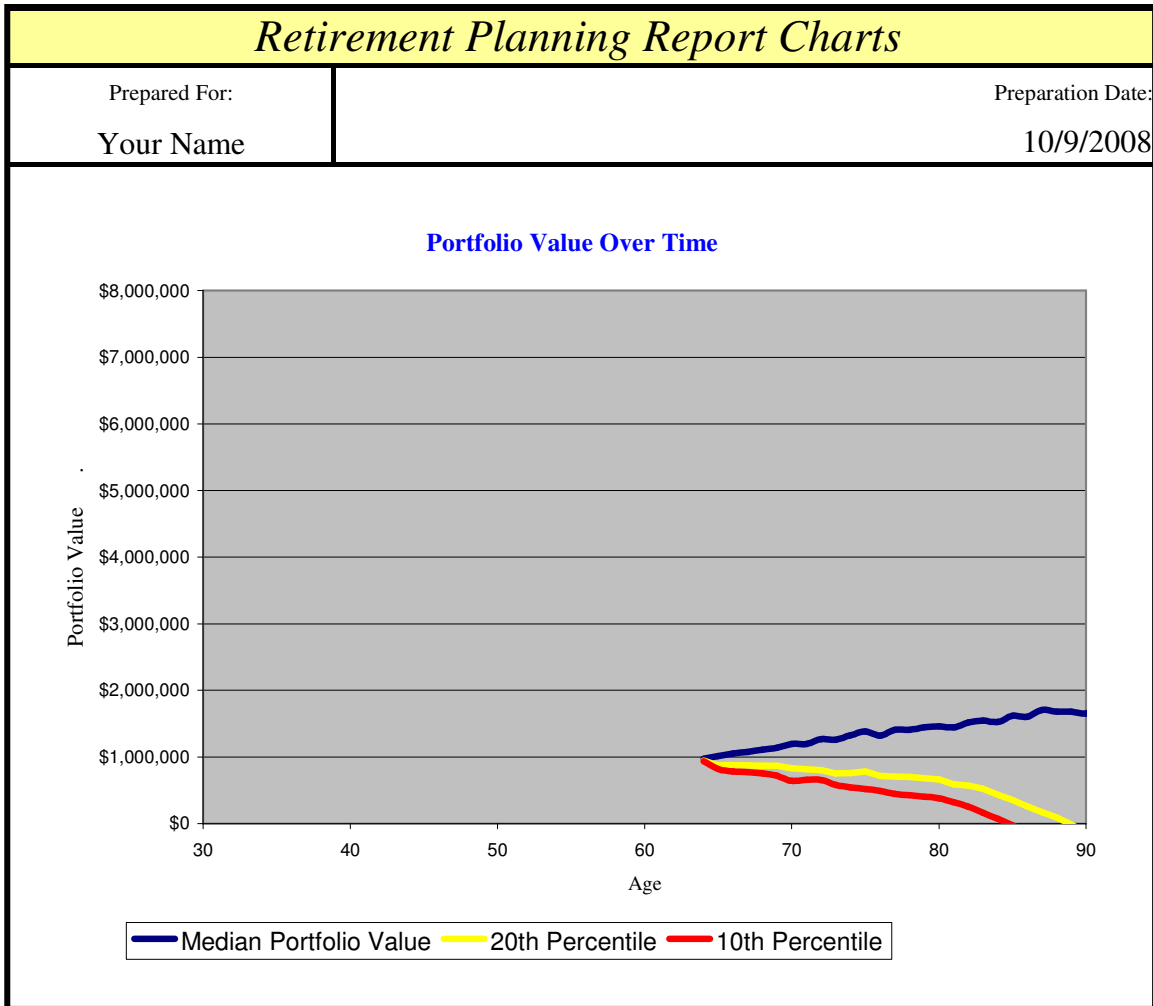
Because of changing market conditions, user assumptions, and use of different historical periods, the results of the analysis generated by the model may change materially with each use and over time.

The universe of possible investment alternatives, period of historical data used, and final assumptions about the future Beta, volatility, and average return are determined by the user. The software does not indicate the suitability of any investment alternative or combination thereof for any individual. The software is a computational tool that allows the user to examine possible future outcomes, based on his/her judgment about future market conditions and future prospects for individual investments.

The software is provided on an 'AS IS' basis and Quantext, Inc. makes no representation about the suitability of the software for specific applications and users.

**Figure 9: This shows page 9 of QPP.**

# Page 10 Value of Stock Options –assuming portfolio re-investment



**Figure 10:** This shows page 10 of QPP. This is a continuation of the example that was used in illustrating the Probability of Running Out of Money chart (on page 4 of QPP). The results for the \$1 million portfolio are shown here. Note that the age of the owner in our example is 64 and this is the year of his/her retirement.

**General Information about this page:** This graph shows several possible trajectories of the portfolio into the future. This graph will reflect the use of the Custom Savings/Draw Tool, if it is used. For information on this tool, please see below in the following article:  
<http://www.quantext.com/CostOfVolatility.pdf>

If the Custom Savings/Draw Tool is not used, QPP assumes annual savings as specified on page 1 of QPP up to and including the year of retirement (page 1 of QPP), and annual drawing of the specified amount (again, page 1) every year after the year of retirement.

- **Portfolio Value Over Time:** This graph shows part of the information from the Probability of Running Out of Money chart (from page 4 of QPP.)
- **Portfolio Value:** The value of the portfolio at the given age of the owner.

- **Age:** Age of owner of portfolio.

- **Key:**

**Median:** The blue line (representing the 50<sup>th</sup> Percentile) shows the portfolio not running out of money when the owner is age 90.

**20<sup>th</sup> Percentile:** The yellow line shows the portfolio running out of money by the time the owner is 88 years old in 20% of the possible projected futures.

**10<sup>th</sup> Percentile:** The red line shows the portfolio running out of money by the time the owner is 84 years old in 10% of the possible projected futures.

Age at Retirement: 64	
Probability of Running Out of Money	Age
10%	84
15%	87
20%	88
25%	91
30%	94
35%	98
40%	104
45%	107
50%	113

**Figure 10b:** This is taken from page 4 of QPP. It is the **Probability of Running Out of Money** chart. It is shown here to illustrate where the graph of page 10 of QPP comes from.

## Correlations Matrix

# Correlations Matrix

The Correlations Matrix is a handy tool that is reachable by selecting the tab marked *Correlations* at the bottom of the Excel screen.

There are several papers that illustrate the use of this tool. Some of these are:

<http://www.quantext.com/China.pdf>

<http://www.quantext.com/AllETF.pdf>

The *Correlations Matrix* in Quantext's portfolio planners helps one to determine how correlated each asset in a portfolio is to the portfolio as a whole, as well as to each of the other individual components. This shows historical correlations for the historical period used. QPP's projections do not simply preserve the correlation matrix.

The colors merely indicate high, medium, or low correlation between the entities being compared; they are only meant as an aide for seeing the ranges more easily.

## Custom Savings/Draw Tool

# Custom Savings/Draw Tool

This feature, only enabled in the licensed versions, is reachable by clicking on the Tab labeled *Savings/Income* at the bottom of the Excel screen.

To motivate the usefulness of this tool, let's consider an example: Sally, who worked 80 hour weeks in a high paying job and was able to save a lot in the early decades of her career, wishes to consider what the future might hold if she changes employment for the last decade of her working years. The second career that she is considering will not allow her to save at all but she will not need to draw income from it. After a decade of not touching her portfolio, she would like to start drawing income from it.

Typical retirement planning tools do not allow you save, draw nothing while the portfolio grows for a decade, and then draw in retirement. The Custom Savings/Draw Tool in QPP allows you to create any path of savings and drawing, specified year by year.

Though this document does not contain explicit details about how to use this tool, the following article demonstrates the use of it:

<http://www.quantext.com/IncomeGlidePath.pdf>

## Historical Data

# Historical Data

It can be difficult to meaningfully compare results from QPP to other financial planning software because many other programs simply use trailing data to describe funds, stocks, and/or portfolios. If you want to see QPP's calculations of the historical risk and return for individual stocks and funds, you can look at the Historical data sheet. You can Unhide this sheet if you like (Tools > Sheet > Unhide > Historical).