

BUS 421, Derivative Securities and Risk Management

Term Project: Conversion of an Equity Portfolio to a Long-Short Hedge Fund

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WinORS-2020 version (FRAME)

Deliverable submissions must be made by email: ghdash@uri.edu

Email Subject Line: BUS 421, Hedge Fund Simulation

[Due Date: See class audit blog](#)

This is a 100 point assignment.

Learning Objectives

This project's objective is to bring together all the concepts learned during the semester into a cohesive report for a hypothetical client. The report should address at least the following sections:

1. Portfolio objective and client goals
2. Portfolio insurance
3. Option based macro hedge
4. A long-short hedge fund
5. Mitigation of portfolio risk

The project emphasizes two learning methodologies that of experiential learning and project based learning. Both are defined below.

Experiential learning: This is a process through which students develop knowledge, skills, and values from direct experiences outside a traditional academic setting. Experiential learning encompasses a variety of activities including internships, service learning, **undergraduate research**, study abroad, and other creative and professional work experiences. Well-planned, supervised and assessed experiential learning programs can *stimulate academic inquiry* by promoting interdisciplinary learning, civic engagement, career development, cultural awareness, leadership, and other professional and intellectual skills. Learning that is considered "experiential" contain all the following elements:

1. **Reflection, critical analysis and synthesis**
2. Opportunities for students to take initiative, make decisions, and be accountable for the results
3. Opportunities for students to engage intellectually, creatively, emotionally, socially, or physically
4. A designed learning experience that includes the possibility to learn from natural consequences, mistakes, and successes

Source: [University of Colorado Experiential Learning Center](#)

Project based learning: A course in which the classroom project(s) facilitates learning through complex tasks, challenging questions requiring students' problem solving, decision making, investigative skills and reflection. This type of learning may or may not have an external client.

Resources, Tools, and Setup

1. ARMDAT – Chapters 6, 10, 18, 19 & 20.
 2. Previous CALS: 1 & 3
 3. WinORS-2020 on FRAME
 4. MONOSNAP
 5. Videos and other online material as required on www.ARMDAT.com .
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ASSIGNMENT

I. Portfolio Oversight

The Prospectus

The purpose of this section is to state a short fund prospectus. Please keep in mind that holdings of your fund must meet the statements you have advertised in the prospectus (e.g., random selection of equities; model URI Ram Fund, etc.). Additionally, some or all of the following considerations should play a part in your deliverable.

1. **Investment Objectives** – stated in terms of returns (capital gains vs. dividends) and over what investment horizon (long-, intermediate-, or short-term).
2. **Principal Investment Strategies**
 - a. Target index for comparative analytics (e.g., DJIA, S&P 500, etc.).
 - b. Sector composition
 - c. Efficient optimality considerations (choose an efficient portfolio to follow)
3. **Quantitative Risk factors**
 - a. Market risk (beta and adjusted-beta analysis)
 - b. Beta Depth (3D chart)
 - c. Cap Risk (small-, mid-, large-cap risk)
 - d. Foreign investment risk (if any)

The Portfolio

Reference: ARMDAT, Chapter 18

Create a group-based ‘client’ equity portfolio with at least **40 stocks**. The portfolio may be uniquely designed or created by a random selection of equities. Please observe these restrictions:

1. No ETFs
2. No ‘pink sheet’ stocks (penny stocks)

After creation, update prices and fundamental characteristics – follow the menu tree:

Techniques | Portfolio Management | Equity/Hedge Portfolios | Price Portfolio

Generate the Efficient Frontier (Efficient Set)

Reference: ARMDAT, Chapter 19 (p9, 16-)

The purpose of this step is to create the efficient frontier (set) of efficient portfolio allocations. The Markowitz efficient set represents portfolios with returns that are maximized for a given level of risk based on mean-variance portfolio construction. When computed the traditional “half-moon” shape appears for your group of securities. The portfolios that lie on the efficient set are represent the asset diversification that produce the smallest level of portfolio risk at a given portfolio return level (chance of deviation from the expected return). Individual securities and inefficient portfolios lie interior to the efficient set. Stated differently, at a given risk level no other portfolio can generate a higher rate of return. To create your efficient set, follow these steps:

1. Review the theory of the Markowitz diversification approach.
2. Follow the instructions for creating a “Markowitz Efficient Set in WinORS”
3. Be sure to select an efficient portfolio that is closely aligned to the objectives of the managed portfolio and post this efficient portfolio into the Equity Portfolio template (tab A). Follow menu tree: **Techniques | Portfolio Management | Create Equity Portfolios | Efficient Set Reference**. On the dialog box choose the column letter (e.g., D) of the desired portfolio to “paste” into the Equity Portfolio tab – sections that include columns AB – AE (this is a time-consuming calculations, *patience...*).
4. Capture and Save (WriteORS) intermediate results for this section
 1. List of Companies in the “selected” efficient portfolio pasted to Equity Portfolio tab.
 2. Efficient frontier chart Fundamental Portfolio Charts (**Insert|Charts**)
 3. Fundamental Portfolio Charts (**Insert|Charts**)

II. Insure the Client Portfolio / Protective Put

Reference: ARMDAT, Chapter 6 (p27) and 18 (p19)

1. Reference is made to the tab titled: "Portfolio Insurance". Portfolio insurance is designed to protect an investor's wealth when the investment portfolio is decreasing in value due to falling market prices. As the portfolio decreases in value the index option position increases in value, thereby leaving net worth "unchanged." With this stated, the WinORS portfolio insurance computation is best viewed over a period and produces the more interesting analysis when markets are in decline. To choose a start date and then update prices daily over a period).
2. With the Portfolio Insurance tab in focus, update the values on the tab by using the menu tree: **Techniques | Equity/Hedge Portfolio | Portfolio Insurance**
3. The Insurance level dialog box appears. The default level of portfolio insurance is set at 5%. This means that you want to choose index put strike levels to provide against a 5% decline in the value of the equity portfolio. You may change this protection value as desired. Using the value entered, WinORS chooses the index put option with the lowest premium (lowest cost insurance) for the desired level of insurance. For comparative purposes, and convenience, put contracts for several major indexes are automatically tracked (see tab). On your first visit to this tab, choose:
 - a. Insurance % (5% decline is default)
 - b. Choose Maximum Insurance (highest feasible strike); or, Minimum Cost (lowest feasible strike).
 - c. Choose radio button "Establish a new Protection Strategy"
 - d. Click OK
 - e. *NOTE: this is a time-intensive data operation. Patience*
4. On a daily (i.e., periodic) basis, bring the Portfolio Insurance tab into focus and update values
 - a. Go to menu item: **Techniques | Portfolio Management | Equity-Hedge Portfolio | Portfolio Insurance**
 - b. On the Dialog Box, choose the radio button (bottom): Update Current Protection Strategy
 - c. *NOTE: try this step after a market decline..! You might want to capture the results after a market decline. When the market resumes a bullish move, the insurance will become less needed.*

Deliverable Considerations (explanations):

1. Discuss - the purpose of taking "portfolio insurance"
2. On the insurance tab, select one options contract to focus on.
3. Provide a profitability analysis for the focus ticker
4. How many contracts would you need to "insure" the portfolio (see, AMRDAT, 6)?
5. What is the time period over which you tested the insurance

III. Option-Based Macro Hedging Basics for the Equity Portfolio

1. Merge-in the option-pricing template for equity indexes (e.g., Dow, S&P, etc.) by using the following menu tree: **Techniques | Options Analysis | Open Template | Index Option** . The Index Option Analysis template is merged into the next available tab.
2. Choose the index that you would like to use for the portfolio hedge.
 - a. There are 7 index tickers to choose from
 - b. If it is reported by WinORS that the ticker is not available, then: Go to the menu tree: **Techniques | Options Analysis | Change Ticker Symbol**
3. Upon clicking on OK, WinORS will fetch a list of all options currently written against the index. When the list appears you may choose up to four (4) calls and four (4) puts. *NOTE (1): remember to center your selection around NTM options.* Perform this operation by using standard Windows keystrokes. That is, hold down the CTRL key with your left hand (a finger). Use the left-mouse button to choose an option (continue to hold down the CTRL key). This is a toggle; that is, to deselect an item simply use the left-mouse click again. Choose all desired call and put options. When done click on OK. *Note (2): Whoa! Remember the lecture demonstration. Index options behave somewhat differently than equity options. For example, you might want to consider skipping over a strike price (or two) rather than taking sequential strike prices.*

4. Using your learned experience, examine advanced spread strategies for the chosen index (*reference: CAL 3*).
5. Following the format established in CAL 3, for one Index call contract, provide a detailed definition of the computed BSOPM Greek terms. Your explanation should be presented within the context of the stated volatility scenario (*reference: Cal 1*).
 - a. Delta
 - b. Implied Volatility (include both 2D and 3D supporting charts for both call and put options).

Deliverable Considerations (explanations):

1. What does option market volatility (IV) suggest for the performance of the portfolio (highly volatile NAV, range-bound NAV, etc.)?
2. Following the approach developed in CAL 3, provide a statement explaining why the chosen strategy is the “recommended” strategy for the underlying portfolio.
3. Explain Delta-neutral hedging for the portfolio

IV. Convert the Equity Portfolio to a Long-Short Hedge Fund

1. This step was demonstrated in class lecture session. Written reference is available in chapter 20
2. FYI: Alternative equity hedge fund styles can be found here:
<http://www.hedgeindex.com/hedgeindex/en/default.aspx?cy=USD>
3. Click on the “Equity Portfolio” tab.
4. For each member in the Group, choose a ticker in the portfolio against which options are currently trading. Following the CAL 3 experience, solve for one (1) recommended option spread. Add the “recommended” equity ticker option into the portfolio. For example, if there are three individuals in the group then you will add three option spread strategies to the equity portfolio.
5. *Summary:* By way of example, there are three team members then your group portfolio now contains option spreads for three stocks. To expand, if each group member choose a spread strategy that uses 3 options, then there should 9 option position in the portfolio
6. Update the value of the portfolio (Price the portfolio – Last Trade price only).

v. Mitigate Portfolio Risk: The Basics of the Stock Index Futures Hedge

This part of the project introduces “optimal” hedging of an equity portfolio using stock index futures contracts. This is accomplished by conducting a historical simulation of your equity portfolio using WinORS Monte Carlo simulation methods.

1. Put your portfolio tab in view (tab A).
2. On the WinORS Historical Valuation dialog box: **Techniques | Portfolio Management | Equity/Hedge Portfolio | Historical Valuation with Futures Hedge**
 - a. Two drop-down menus appear. You must choose: a market index and a corresponding futures contract.
 - b. In your deliverable be sure to explain why the chosen index is the best representation of general market price behavior and why the chosen futures contract is “linked” to the chosen market index.
3. Create a dynamic look-back hedge by back-testing your portfolio. Use the twin calendars to set the begin and end dates of the back test period. Due to data limitations and computational complexity, it is suggested that you limit your back test to a range of 60 to 90 days (2 to 3 months). See ARMDAT, chapter 10 for details and examples. In the deliverable, be sure to explain the output:
 - a. Describe (narrative statement) the properties (components) of the stock index hedge ratio as first described in chapter 10.
 - b. Single-out one “Open” and “Close” hedge operation. Explain the role of the Stock Index Futures Hedge Ratio (*Hint: see Futures Tab for **Number of Contracts**, Hedge Open and Hedge Close*).
 - c. At the end of the simulation period, summarize explain the findings for overall wealth change the two components of the hedge: the change in portfolio value and the profit contribution from the futures hedge.

Deliverable Considerations (explanations):

Using performance measures located on the History Tab along with diagnostic graphs (Insert|Analytics), compare and interpret the following for the managed portfolio and the market index.

- a. Market Tracking (charts)
 - i. Indexed: Portfolio v/s Market index value
 - ii. Indexed: Unhedged v/s Index Value
 - iii. Present (copy/paste to your document) the chart titled “Indexed Portfolio v/s Market Index (History tab)
 - iv. One Technical Indicator graph (e.g., Momentum, Bollinger-Bands, etc). Be sure to define and or discuss the relevance of the technical indicator chart to the risk assessment of the portfolio.
- b. Average return and associated standard deviation.
 - i. Arithmetic (or geometric) **portfolio returns** (hedged and unhedged) vs Index returns
 - ii. Simple measure of risk (e.g., **Std Deviation**, Skewness, etc.). Are these appropriate?
- c. Risk-Adjusted Performance Measures
 - i. Sharpe and Treynor measures
 - ii. VaR; both unadjusted and indexed
 - iii. CVaR; both unadjusted and indexed
 - iv. Omega
 - v. Sharpe-Omega
 - vi. M²

VI. Concluding Remarks

Provide your *Qualified Opinion*: Which financial derivative-based hedging approach did your team prefer – option contracts (and their associated spread strategies) or futures contracts? Be sure to differentiate

ASIDE: Sector Analysis

The sector analysis is keyed to Yahoo! Finance. For you convenience some of the sector list is presented below:

Yahoo! Sector List	WinORS Code
Basic Materials	1
Capital Goods	2
Conglomerates	3
Consumer Cyclical	4
Consumer Non-Cyclical	5
Energy	6
Financial	7
Healthcare	8
Services	9
Technology	10
Transportation	11
Utilities	12
Undefined	13