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ORF 435/535 Final Project
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Part 2: Due January 16, 2018, 5 pm

This is the second part of the term project. Students must work alone and cannot discuss with others. Indicated percentages are referenced to the second part of the project (the first and second part have equal weights).

As before, the overall grade will depend upon the quality of the analysis and the final report.

1. Improving Synthetic Bank Model (30%)

In this question, you are able to include a long-duration U.S. government bond fund (TLT) in the assets for the synthetic bank model from part 1 of this project. Government bonds are more volatile than a general corporate/government bond index such as AGG, but the expected returns are generally higher than AGG. Also, the performance of TLT is often better than AGG during economic downturns due to a "flight to quality" behavior.

Add TLT to the static and the dynamic strategies developed in part 1 (TLT return attached, employ adjusted close). Show if this addition will improve risk-adjusted performance. What are possible implementation issues that might arise with this asset? Provide a short appendix to your previous report discussing these issues and making your recommendations. Be concise with the recommendations.

2. Property Casualty Re-Insurance (40%)

The property and casualty (P&C) market provides insurance against losses that are caused by accident and weather related events, including hurricanes and earthquakes. Primary insurance companies work with individuals and companies, and protect themselves against the most severe events by purchasing re-insurance. The primary insurers are regulated by state insurance laws in the U.S. Herein, these firms are often encouraged to give up expected gains to reduce the left tail losses. Thus, re-insurance firms provide excellent profit on average, but can experience severe losses when there are many severe events. For instance, the year 2017 caused over $135 Billion in

insured losses due to three major hurricanes, plus fires in California and other weather events. See the attached article.

In this section, we focus on one of the most innovative re-insurance firms – Renaissance Re-Insurance (RNR), based largely in Bermuda. Renaissance developed a global risk management system about 24 years ago, after they began business after Hurricane Andrews hit South Florida. Dr. James Stanard was the CEO and had considerable experience in the area of re-insurance with F&G Re. The RNR risk management system begins with a scenario generator for losses as a function of a large number of events – hurricanes and earthquakes. Each event is plausible scenario for the entire firm. The attached papers discuss the nature of optimizing the enterprise for a global re-insurance firm. RNR applies their risk management system as a critical part of their operational and strategic decision making.

Given the monthly returns for RNR (provided, use adjusted close), calculate the standard reward (geo returns) and risk measures. Suppose that you are interested in combining the cash flow streams of the re-insurance firm with your recommended synthetic bank (include the analysis from the previous question with TLT). Will RNR help with diversification? What is the best combination of the synthetic bank and RNR in terms of risk-adjusted performance?

3. Asset and Liability Management for Individuals (30%)

Individuals are faced with multiple and conflicting goals throughout their lives. These include: 1) saving and investing for retirement; 2) saving and investing for a down payment for a home or condo; 3) saving and investing for college tuition; 4) purchase of life insurance to protect a spouse and children; 5) long term care insurance in case of disability, and so on.

We can apply the principles of financial risk management to these problems. For example, we could develop a ALM system for addressing retirement similar to the ones implemented by DB pension plans. Here, the individual (or family) will estimate long term goals – such as retiring at age 68 with 70% of her salary in the final working year. Then, there could be a prescribed savings plan, such as saving 15% of salary each year (in addition to social security), with raises based on inflation and promotion projections. The topic is now called ***goal-based investing***.

In addition, the individuals must balance their cash inflows and outflows each period. Loans can be incurred in selected cases: a mortgage is a critical issue for most people. Student loans are a second category. Individuals often add credit card debt, despite the high interest rates and penalties. Due to the lack of education and mobility and the types of jobs available, many people struggle to balance all of these demands and live without much long term financial planning. Thus, savings is quite low in many developed countries, including the U.S., and income disparity has been increasing for the past 20 to 30 years.

Often, even successful professionals do not develop systematic financial plans. They are often too busy and the day-to-day stresses crowd out the necessary space for a "long term view." In addition, humans confront numerous uncertainties that are non-financial, yet have major impacts. Health related risks are ever present. Employment opportunities will arise that present terrific possible outcomes, but these must be reconciled with life style and family conflicts. Should I take the job in Hangzhou with Alibaba?

Also, the selection of a financial advisor is another decision task fraught with uncertainties. Will the cost of hiring an advisor be worth it? How can I evaluate this decision? Where do I get the names of reliable advisors? Can I manage my affairs on my own with help from family members and friends? Typically, financial advice can be expensive and time consuming.

In response these issues, there have been a number of automated system for individual ALM, sometimes called robo-advisors. These systems are designed to be employed with or without a professional financial advisor. Princeton co-sponsored a two-day conference on robo-advisors last April in Princeton and will do the same in April 2018 in Seoul, South Korea. There is much interest in this topic in Asia especially China and South Korea, as part of the thrust to conduct path breaking research in FinTech.

QUESTION 1: A critical issue involves the extent of the goal-based ALM model. Should the system be designed to address single goals by themselves, for example, for retirement (saving and investing)? Alternatively, the nature of cash budgeting is to balance conflicting goals, more saving for retirement and less saving for a condo. Briefly, discuss the pros and cons of a fully integrated ALM system for an individual (or family), versus a sequence of goal based ALM systems for separate goals.

QUESTION 2: A critical issue involves the calibration of the expected returns of the asset categories over long time horizons. Experts such as Jack Bogle and Ray Dalio have argued with supporting evidence that the expected returns of stocks and bonds will be much lower over the next two decades than has been the historical returns. It is clear that if lower expected returns occur, individuals will need to saving more and perhaps retire later or with less security than their parents. What might be the macro-economic impacts if a majority of individuals decide to noticeably increase saving?

QUESTION 3: Should these robo-advisors be regulated? Returning to the previous question, what are the issues to address with respect to the estimation of the expected returns of the assets? Be brief.