THE OPTIMAL ASSET ALLOCATION FOR CAPITAL PRESERVATION: AN EVIDENCE FOR AUSTRALIAN PORTFOLIO

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ABSTRACT

This study analyzes optimal asset mix for Australian portfolios with the main investment objective for capital preservation. An alternative measure of risk of annual maximum drawdown has been used to reflect investor preference for capital preservation as opposed to conventional risk measure of standard deviation and variance. The contribution of the study is two folds. First, this study has put different perspective to look at portfolio risk in the view of capital preservation. Second, the optimal weight for asset class mix that minimizes annual maximum drawdown has been analyzed for the case of Australian market. The results suggest that for capital preservation, investors should expect lower returns and need to put a greater allocation on less risky assets such as cash or bond. To this end, cash and bond have provided stable long term annual returns along with contained level of annual maximum drawdowns. In contrast, when investors demand higher expected return, they should increase asset allocation into stocks (equities) market at the expense of higher maximum drawdowns.

Keywords: portfolio allocation, asset class, Australia

ABSTRAK

Studi ini menganalisis bauran aset optimal untuk portofolio Australia dengan tujuan investasi utama untuk pelestarian modal. Ukuran alternatif risiko penarikan maksimum tahunan telah digunakan untuk mencerminkan preferensi investor untuk pelestarian modal dibandingkan dengan ukuran risiko konvensional standar deviasi dan varians. Kontribusi dari penelitian ini adalah dua lipatan. Pertama, penelitian ini telah menempatkan perspektif yang berbeda untuk melihat risiko portofolio dalam pandangan pelestarian modal. Kedua, bobot optimal untuk campuran kelas aset yang meminimalkan penarikan maksimum tahunan telah dianalisis untuk kasus pasar Australia. Hasilnya menunjukkan bahwa untuk pelestarian modal, investor harus mengharapkan pengembalian yang lebih rendah dan perlu menempatkan alokasi yang lebih besar pada aset yang kurang berisiko seperti uang tunai atau obligasi. Untuk tujuan ini, uang tunai dan obligasi telah memberikan pengembalian tahunan jangka panjang yang stabil bersama dengan tingkat penarikan maksimum tahunan. Sebaliknya, ketika investor meminta pengembalian yang diharapkan lebih tinggi, mereka harus meningkatkan alokasi aset ke pasar saham (ekuitas) dengan mengorbankan penarikan maksimum yang lebih tinggi.

Kata kunci: alokasi portofolio, kelas aset, Australia

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1. Introduction

One of the most important decisions investors and fund managers face is to determine the optimal weight of asset allocations that can yield optimal portfolio returns. In Australia, Furey (2015) shows the importance of asset allocation for Australian portfolio. He argues that around 90% of performance variability in Australia portfolios can be explained by asset allocation. It also confirms study of Brinson et al. (1991) which showing around 94% of portfolio performance variability of 91 U.S Pension funds between 1974 and 1983 explained by the asset allocation decision.

Given the importance of asset class allocation for portfolio return, this study utilizes a modified Markowitz Portfolio Theory to determine optimal asset class mix in achieving optimal portfolio returns given certain of risks for the case of Australian markets. The contribution of the study is two folds. First, this study puts different perspective to look at portfolio risk in the view of capital preservation. Second, the optimal weight for asset class mix that minimizes annual maximum drawdown is also analyzed for the case of Australian market.

2. Literature Review

2.1 Aseet Allocation

There are mixed arguments about the optimal weight for asset allocation. Some researchers argue that long term investors should have more allocation on stocks (Siegel, 2002) and (Barberis, 2000), while others argue fixed income should be used as the major asset class for long term investors who value stability of income (Viceira & Campbell, 2001). With regards to the asset allocation strategies, establishing an appropriate asset mix is a dynamic process, and it plays a key role in determining investor portfolio's overall risk and return. There are no such one-size-for all strategy in asset mix allocation. The portfolio asset mix should reflect investor's goals and risk tolerance; and it differs from one investor to another.

There are different strategies of asset allocations, including strategic, constant-weighting, tactical, dynamic, insured and integrated asset allocation. The strategic asset allocation refers to a base policy mix - a proportional combination of assets based on expected rates of return for each asset class. For example, if stocks have historically returned 10% per year and bonds have returned five percent per year, a mix of 50% stocks and 50% bonds would be expected to return 7.5% per year. The constant-weighting asset allocation adopts a buy-and-hold strategy. With this approach, investors continually rebalance your portfolio.

The tactical asset allocation adds a market timing component to the portfolio, allowing investors to shift their portfolios in response to changing economic conditions. Investors may shift asset class into one particular asset class that is more favorable than others. In the dynamic asset allocation, investors constantly adjust the mix of assets as markets rise and fall, and as the economy strengthens and weakens. With this strategy investors may sell assets that are declining and purchase assets that are increasing, making dynamic asset allocation the polar opposite of a constant-weighting strategy. In the insured asset allocation strategy, investors establish a base portfolio value under which the portfolio should not be allowed to drop. This asset allocation strategy may be suitable for risk-averse investors who desire a certain level of active portfolio management but appreciate the security of establishing a guaranteed floor below which the portfolio is not allowed to decline. In the integrated asset allocation, investors consider both economic expectations and

risk in establishing an asset mix. This strategy is considered as a broader asset allocation strategy than other strategies.

Asset allocation is far more important than fundamental valuation or technical analysis in explaining asset returns (Ibbotson & Kaplan, 2000) and (Brinson, 1995). Ibbotson and Kaplan (2000) argue that asset allocation can explain about 90% of the variability of a fund's return over time; while (Brinson, 1995) finds that asset mix explains 93.6% of the average fund return variation.

There are large body of empirical evidences demonstrating that fundamental valuation based on financial ratios can systematically predict future returns (Abarbanell & Bushee, 1998), (Lakonishok et al., 1994), (Ohlson, 2001) and (Frankel & Lee, 1998). There are also strand of literature provide ample evidences suggesting that technical analysis has higher predictability in explaining future stock returns. For example, Hong et al. (2015) find that price-based technical analysis shown to be important in explaining shorter term stock return, while Smith et al. (2013) find that technical analysis used by active portfolio managers may result superior performance versus those that do not.

One of the earliest attempts to determine the optimal portfolio allocation is introduced by Harry Markowitz in the 1950s. Fabozzi et al. (2011) develop a mean-variance analysis to determine the optimal mix asset classes that can yield maximum return, while reducing its risk. They define an efficient frontier showing a set of portfolio that maximizes return for a given level of risk. While Markowitz Portfolio Theory has been widely used in the financial literature, it has several critical limitations. This theory is only based on a single-period perspective, while investors mostly have multiple investment horizons. Other limitation of this theory is that investors based their decisions only on historical return and risk, while in fact return and risk do change overtime.

This study uses an annual maximum drawdown as an alternative measure of investment risk. The annual maximum drawdown measures the largest peak-to-trough decline of portfolio value before a new peak is achieved in one particular year. It is a useful way to assess the relative riskiness of one asset class versus another, especially for investors with the main objective of capital preservation.

As most investors always trade risk versus return, the mean-variance optimization technique will identify portfolios, while minimizing risk (which is usually represented by the standard deviation or variance). While standard deviation is a common measure for risk, a standard deviation is only valid for return with normal distribution. Thus this measure may not be an appropriate indicator to reflect investment risk.

2.2 The Long Performance of Asset Class

Stocks have been regarded as one of the riskiest assets in the financial market, they have yielded attractive and high above average return compared to other asset classes. Over the period 30 years spanning from 1984 to 2014, stock has an annual average return of about 12.26% compared to fixed income (8.91 percent); property (10.27%) or money market (7.37%). With these higher average returns, these returns also represent for the compensation of the higher risks. The maximum drawdown for stocks is much higher compared to other asset classes. For example, the maximum drawdown for stock during observation periods (1984-2014) is about 40.4% or the second highest after property (54%). With regards to price volatility, stock returns also have much more volatility than fixed income and money market.

Siegel (2002) argues that stocks should be used as the main asset class for long-term investment. He compares annual real return of stocks, bonds and Treasury bills over 200 years in the U.S financial markets; and claims that most investors should hold stocks for the long run. Stocks produce positive real return in excess of bond and Treasury bills. Within the period spanning from 1802 to 1997, real return on stocks have an average annual return of seven percent with adjusted risk (standard deviation) of 18.1%.

In the short-term, however, returns of stocks fluctuate. There are periods when stock returns swing away from their long-term average, as stocks may experience bull or bear period. For instance, in a recent bull market from March 2011 to March 2014, the U.S stock market has given investors with superior returns of about 88.1% or 23.4% annualized, which is nearly 16.4 percentage point above its historical average. However, this superior stock returns may be followed by dreadful stock returns during the bear periods.

In the long run, risks in the stock market are much less than those found in fixed income and money market (Siegel, 2002). The standard deviation of real returns for stocks over long holding period, i.e over 20-year periods is roughly equal with fixed income and Treasury bills, and over 30-year periods the risk is even lower. It appears that stocks are no riskier than fixed income and money market for long-term investors that are able to hold their positions for at least a decade. Similar patterns are also noticeable in the global stock markets. However, investor with short-term holding horizon shows different picture. The stock market is much riskier than other asset classes.

Australian fixed income has yielded considerable attractive returns with the average annual return of about 8.91% within the period 1984-2014. The best single year return for bond is 24.7% with annual maximum drawdown of only -4.7%. The fixed income market has also been long considered as one of the safest instruments in Australian financial market, as it provides a stable return with low probability of default.

Australian property has also given a decent return for most Australian investors, despite a huge property price slump during global financial crisis (GFC) 2008. After the GFC, with prolonged low interest rate regime pursued by the Reserve Bank of Australia, it has added extra fuel to the modest increase of Australian property price in recent years. For many conservative investors, cash or money market can be one of the best asset classes. Money market has provided Australian investors with an average annual return of 7.37% with no negative return in any single year.

Table 1. Australian major asset-class returns from 1984 to 2014

Year	Cash[1]	Bond[2]	Stock[3]	Property[4]
1984	12.6%	12.0%	-2.3%	10.1%
1985	15.6%	8.1%	44.1%	5.2%
1986	18.1%	19.0%	52.2%	35.4%
1987	14.4%	18.1%	-7.9%	5.7%
1988	12.8%	9.1%	17.9%	16.1%
1989	18.4%	14.4%	17.4%	2.3%
1990	16.2%	19.1%	-17.5%	8.7%
1991	11.2%	24.7%	34.2%	20.1%
1992	6.9%	10.4%	-2.3%	7.0%
1993	5.4%	16.3%	45.4%	30.1%
1994	5.3%	-4.7%	-8.7%	-5.6%
1995	8.0%	18.6%	20.2%	12.7%
1996	7.6%	11.9%	14.6%	14.5%
1997	5.6%	12.2%	12.2%	20.3%
1998	5.1%	9.5%	11.6%	18.0%
1999	5.0%	-1.2%	16.1%	-5.0%
2000	6.2%	12.0%	3.6%	17.8%
2001	5.3%	5.5%	10.1%	14.6%
2002	4.8%	8.8%	-8.1%	11.8%
2003	4.9%	3.0%	15.9%	8.8%
2004	5.6%	7.0%	27.6%	32.0%
2005	5.7%	5.8%	21.1%	12.5%
2006	6.0%	3.1%	25.0%	34.0%
2007	6.8%	3.5%	18.0%	-8.4%
2008	7.6%	14.9%	-40.4%	-54.0%
2009	3.5%	1.7%	39.6%	7.9%
2010	4.4%	6.0%	3.2%	-1.1%
2011	-0.5%	5.2%	-15.2%	-10.7%
2012	-0.1%	1.8%	14.8%	28.4%
2013	-0.3%	-3.3%	18.5%	8.2%
2014	0.3%	3.8%	-0.9%	20.9%
Best return	18.40%	24.70%	52.20%	35.40%
Max Drawdown	-0.47%	-4.70%	-40.40%	-54.00%
Average return	7.37%	8.91%	12.26%	10.27%

Source: DataStream, Bloomberg and Thomson-Reuters database

Notes:
[1]UBS Australian Bank Bill Index
[2]UBS Australian Bond Composite Index with all maturities
[3]Australian Total Stock Market Return (ASX All Ordinaries Accumulation Index)
[4]The S&P/ASX 200 Property Trust Accumulation Index

2.3 Risk Measure

Risk reflects the probability that actual return on an investment may be very different than desired return. One conventional way to measure risk is to calculate variance and standard deviation of the distribution of returns (asset volatility). Asset volatility differs according to the type of asset class, such as stocks, bonds, property or money markets. The asset volatility can be associated with investment risk and quantified by calculating the historical variation in the investment return of particular asset class. A higher standard deviation of return indicates a greater volatility of asset class and, therefore, greater the investment risk. There are several drawbacks of using standard deviation as a measure of risk. First, it assumes the normality of returns, yet seldom does any investment return distributions follow a classic normal curve. A second problem is the use of historical data. The past results may be a good predictor for the future return, but actual results do change over time. A standard deviation is also highly sensitive to outliers.

Another way to measure investment risk is the use of coefficient of variation (CV). The CV can be a better measure of risk, as it quantifies dispersion of asset returns in relation to the expected return. While standard deviation measures the dispersion of returns, the CV measures their relative dispersions. There are also limitations of using the CV. Similar to the standard deviation, CV assumes that all investment returns follows normal distribution and are also based on the historical data and past results.

The use of maximum drawdown as an alternative to measure investment risk is relatively new compared to other measures of risk. Hoesli and Foort (2003) use a maximum drawdown as alternative measure of risk when constructing efficient portfolios. They use Swiss pension funds data from 1979 to 2002 and find that portfolios optimized in return/maximum drawdown, rather than in return/standard deviation, will yield better portfolios with higher expected returns.

3. Research Method

3.1 Asset Allocation Model

There are mixed arguments about asset allocation model should to be used. There is an argument asset allocation should be based according to the investor age. One argues that as wealth and income rise in age, investors should increase allocation of risky assets in their portfolios. Jappelli (2000) provides empirical evidences of five countries (US, UK, Netherlands, Germany and Italy), on how much one needs to allocate to equity and other asset classes based on their ages. He finds that the proportion of investors holding risky assets peaks in the 50-59 age groups, while the young age investors tend to hold less risky assets. It can be explained that young investors typically have less wealth, so they tend to hold small amounts of risky assets or none at all. As they are ageing, they will accumulate more wealth, and thus they will increase their portfolios into riskier assets in the later stage. Iwaisako (2003) uses Japanese data and reports a positive age impact on the stock participation. Japanese older investors are also keen to allocate riskier assets such as stock and property, as their level of wealth and income increase.

In contrast, Bodie (2015) suggests the proportion of risky assets should theoretically decline with age. The younger investors have the ability to work longer and generate more income than older investors. The former also have longer time horizon. It indicates that young investors have more flexibility to allocate riskier assets in their portfolios. Further et al. (2004) also argue that asset allocation should consider investor age, as the risk aversion changes with age. This study, however, does not consider asset allocation according to the investor age due to data limitation.

This study defines two types of asset class: risky and less risky assets. The risky assets are stock and property, while less risky assets are cash and fixed income (bond). To preserve capital, it is expected that long-term investors should put more proportion on the less risky assets, whereas more aggressive investors should towards on stock and property.

The portfolio optimization problem is to minimize an annual maximum drawdown (MDD), given a desired expected return of X. In formal form, if $X = (X(t), t \geq 0)$ is a random process with $X(0) = 0$,the drawdown at time T, $D(T)$ is defined as:

$$D(T) = \max_{\tau \in (0,T)} \left\{ \max_{t \in (0,\tau)} X(T) - X(\tau) \right\} \quad (1)$$

The MDD up to time T is the maximum of the annual maximum drawdown.

The optimization function is as follows:

$$Minimize: D(T) \quad (2)$$

Subject to:

$$\alpha_{cash} + \beta_{bond} + \gamma_{stock} + \delta_{property} = 1 \quad (3)$$

$$ER(portfolio) = \alpha_{cash} * ER(cash) + \beta_{bond} * ER(bond) + \gamma_{stock} * ER(stock) + \delta_{property}\, ER(property) \quad (4)$$

Where:
α_{cash}= weight allocation for cash;
β_{bond} =weight for bond;
γ_{stock}= weight for stock;
$\delta_{property}$= weight for property;
ER(*portfolio*)= desired expected return.

3.2 Data

This study uses historical data of 30 years of annual return of Australian Total Stock Market Return (ASX All Ordinaries Accumulation Index) spanning from 1984 to 2014. The ASX All Ordinaries Accumulation Index represents the entire of Australian stock universe, including big, mid and small cap stocks. The Australian bond market is represented by the UBS Australian Bond Composite Index with all maturities, while the S&P/ASX 200 Property Trust Accumulation Index represents Australian property market. The cash or money market index is represented by the UBS Australian Bank Bill Index. All data are collected from various sources, including DataStream, Bloomberg and Thomson-Reuters database.

4. Result and Discussion

Portfolio simulations with different asset classes have been done to determine optimal weight for each asset class. In this simulation, the objective is to minimize an annual maximum drawdown with the constraints of desired expected return. At the lower expected return (five-seven percent), it turns out that long-term investors should entirely allocate on cash or money market. Cash has a long tradition to generate a stable annual return with contained level of annual maximum drawdown.

At the higher expected return, investors should increase asset allocations into riskier asset such as stock and bond. For example, if investors expect to have eight percent returns, they need to allocate 59.2 percent on cash and 40.8 percent on bond. When investors demand at even higher expected return (i.e. 14%), they should allocate entirely (100%) in stock at the expense of higher annual maximum drawdown -40.4%. Table 2 shows the simulation results. For Australian market, it is interesting to note that property is not favorable asset class to be included in the asset mix, as it has the largest maximum drawdown with less average market return compared to other asset classes.

Table 2. Simulation result and optimal weight of allocation for each asset class

Desired expected return (%)	Annual maximum drawdown (%)	Asset weight (%)			
		Cash	Bond	Stock	Property
5	-0.5%	100%	0%	0%	0%
6	-0.5%	100%	0%	0%	0%
7	-0.5%	100%	0%	0%	0%
8	-2.2%	59.2%	40.8%	0%	0%
9	-5.6%	0%	97.4%	2.6%	0%
10	-16.3%	0%	67.5%	32.5%	0%
12	-37.7%	0%	7.7%	92.3%	0%
14	-40.4%	0%	0%	100%	0%

Source: Author's own calculation

5. Conclusion

This study analyzes optimal asset mix for Australian portfolios with the main investment objective for capital preservation. An alternative measure of risk of annual maximum drawdown has been used to reflect investor preference for capital preservation as opposed to conventional risk measure of standard deviation and variance.

The contribution of the study is two folds. First, this study has put different perspective to look at portfolio risk in the view of capital preservation. Second, the optimal weight for asset class mix that minimizes annual maximum drawdown has been analyzed for the case of Australian market.

The results suggest that for capital preservation, investors should expect lower returns and need to put a greater allocation on less risky assets such as cash or bond. To this end, cash and bond have provided stable long term annual returns along with contained level of annual maximum drawdowns. In contrast, when investors demand higher expected return, they should increase asset allocation into stocks (equities) market at the expense of higher maximum drawdowns.

5.1 Limitation of Study

This study focuses on the Australian financial market including Australian Total Stock Market Return (ASX All Ordinaries Accumulation Index), Australian Bond Market (UBS Australian Bond Composite Index), Australian Property Market (S&P/ASX 200 Property Trust Accmulation Index), cash (UBS Australian Bank Bill Index). However, this study does not consider foreign asset classes such as foreign government bond (US Treasury, EU bond, etc), foreign equities (US, EU, Japan, China stock, etc) or commodity market (gold, silver, etc).

5.2 Future Study

As this study only focuses on the Australian financial markets when constructing optimal asset mix, it is expected that future study may elaborate foreign asset classes, for instance foreign government securities, foreign equities, and commodity markets. Having more diverse asset classes both domestic and foreign asset classes may result into a more optimal asset mix.

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