Treatise on Tactical Asset Allocation

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Abstract

Investment has always been a subject of fashion. There are always trends within the industry on how to best place money. Today there is a strong tendency to favor index products and to pick on active management styles. Despite fashion, this paper is on active tactical asset allocation.

Asset Allocation is the art of combining different asset classes into one single portfolio. For institutional wealth managers as well as for ultra high net worth individuals, the decisions to be taken in asset allocation are more important than picking single stocks or bonds. In section one, different forms of asset allocation are described. There is a strategic version which keeps allocation constant for a very long time. This differs from tactical asset allocation where allocation changes quite often and is driven by an active investment strategy. Finally, there is portfolio management, which relies on stock or bond picking. If successfully applied, tactical asset allocation will determine whether investors will suffer during a prolonged drawdown. Section one also defines three investment principles that will be used in construction models and investment processes. In this paper, risk is rather cut than spread during a drawdown. In the case of an uptrend, diversification is actively applied, therefore the level of complexity in the decision process is reduced. Simple approaches are favored over complex ones.

In section one you will also find a description of the data which was used in this study. An analysis of possible benchmarks is given by defining a set of 2'583 strategic asset allocation portfolios in three different currencies.

In section two, I'd like to present four simple tools which might be helpful in tactical asset allocation. Each model contains a quantitative measure which is able to indicate the attractiveness of an asset class and a set of rules on how to use the tool in asset allocation. Measure and a set of rules define the strategy. In order to select a single asset class, one needs to study the relation between different markets. Therefore, the tools presented are typically used within quantitative intermarket analysis. This is a relative young discipline within the field of technical analysis.

The first tool is a proprietary model developed by the author. To select one specific asset class, one needs to compare at least two of them. The classical measure in statistics in order to solve this task is correlation. Therefore, a set of rules was built around this simple indicator The second tool is relative strength Levy (RSL). This form of relative strength measures the momentum of current price relative to its own history. This indicator can then be used to either compare against other markets or to filter the level. The third tool is a classical momentum approach, as it is found in many of studies. This form of relative strength compares the asset against its peer. The final tool is ratio analysis, where two markets are compared as a ratio. The relative attractiveness of an asset class is defined by the way on how the ratio moves over time.

All four models are price driven. In section 3, two applications will be presented to test the effectiveness of the models. The first determines whether the tools could be used as an indicator for asset allocation at all. Let's assume an investor who can only hold one asset class in his portfolio at any point in time: He needs to choose between equities, bonds or cash time after time. The result of this tactical asset allocation is then compared to a set of portfolios that have a constant allocation over time. Results imply that the models in section 2 might be helpful to investors.

The second application explains how investors of global equity portfolios might determine the appropriate equity exposure within their portfolios. This is done by linking the models of section 2 with a money management scheme. The result is an equity exposure that corresponds with the tactical asset allocation showed in the first test.

Overall I found evidence that tactical asset allocation might be helpful for the average investor and that the tools presented in this paper will help investors to structure their own investment process.

1 Introduction

Investment has always been a subject of fashion. There are always trends within the industry on how to place money. Nowadays the trend is to buy index products and to pick on active management styles.

As a result of the recent financial crisis, there is a massive discussion amongst investors to increase their positions in passively managed products. In Europe, pension funds axed their allocation to active managers with managers citing opaque fees and poor returns over the years.[1] Proponents of index investments argue that there is no value in forecasting, asset allocation or any other form of market timing. The idea is to avoid the adverse consequences of being wrong in the asset allocation and to minimize investment fees. In terms of risk management, the assumption is that indexation will buy the best form of diversification. Although it sounds good we will see that for Japanese investors this assumption was not true for the last quarter of the century.

Modern finance theory is backing the tendency for passive products. Most universities are still teaching the efficient markets hypothesis, which implies that markets are informational efficient.[2] In consequence of this, investors should not consistently achieve returns in excess of average market returns on a risk-adjusted basis. The hypothesis was widely accepted until the 1990s, when empirical analyses[3] have consistently found problems, and behavioral finance theory has proposed that cognitive biases cause inefficiencies.[4]

Despite fashion, there are still strong arguments in favor of active investing.[5] Overall, I think that today we experience an unhealthy development in the financial industry. The tendency to de-risk and to favor indexing does not match the need to deliver appealing returns in a world that is driven by unattractive yields. The future stresses and strains of increasing stock market drawdowns paired with potential rising bond yields and rising inflation will not help investors to feed their hunger for yields. In a fast changing world investors need to react actively to upcoming challenges. Riding a portfolio through severe drawdowns needs skills and courage. These characteristics will not be found in indexing.

In this paper I apply active management to asset allocation. By asset allocation I mean the process of weighting equities, fixed income or cash as a class within a portfolio.[6] I will not examine the problem of stock or bond picking. To take the bird's eye view on asset allocation, I group it into 3 areas, i.e. strategic asset allocation, tactical asset allocation and portfolio management.

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[1] Johnson, 2012
[2] Fama, 1965; Fama, 1970; Samuelson, 1965
[3] Lo/MacKinlay, 1999
[4] Thaler, 1993
[5] Wessels, 2010; Wetzer, 2003
[6] Brennan et al, 1997

Strategic Asset Allocation (SAA)

This is a long-term approach that assumes that investors are aware of their risk appetite and their long-term investment goals. Therefore they define a portfolio by weighting certain asset classes that fulfill their long term needs. Once a SAA portfolio is set, it is not changed over time, unless there is a need for rebalancing or an adjustment of the risk/reward perception of the investor. This SAA portfolio serves as a benchmark for all kinds of active investments. Most institutional investors (pension funds, assurance companies …) view this as the core of their investment process. Since there are always adjustments and rebalancing in the single asset class portfolios it is not exactly a buy and hold approach, but comes very close to it.

Tactical Asset Allocation (TAA)

Most asset managers are allocating against a predefined benchmark or SAA. The decisions to shift the weightings of certain asset classes within a portfolio are usually taken by a committee or a rule-based approach. The nature of these decisions are usually based on short to mid-term time views. The outcome is measured against a benchmark or SAA portfolio. Success is either defined as outperformance of the SAA or as risk reduction against the SAA. Ideally, over time it is both.

Portfolio Management

Both, SAA and TAA can be viewed as a top down approach. First decide on the weightings of the asset classes and only then select single securities to fill them accordingly. The bottom up approach will be done in pure portfolio management. The portfolio manager implements the strategy and is measured against a set of benchmarks or strategies that have been defined by SAA and TAA. Within this framework, the managers pick their stocks and bonds, do the regular rebalancing and all other placements that go along with portfolio management. The impact on performance is usually not as high as for SAA or TAA.

In this study I will focus on tactical asset allocation. I would like to show that active investing is better for the average investor than a buy and hold strategy, since it may help to avoid severe loss of capital. Nowadays, capital preservation is the main concern among investors. In my analysis I will not use complex data modeling but focus on simple but effective ad-hoc rules that may help the asset allocator to find or underpin his decisions.

Simulation results provide encouraging evidence that these strategies lead to significant yield improvements in portfolio return and portfolio risk.

In my tests I assume certain things as the base of my testing. These assumptions will be included in the strategies that I present. Therefore they form my investment process for a long-only investor.

Principle 1: Cut your risk

The first and foremost assumption is the way I look at risk. Although being firm with the concept of diversification I will implement the principle that whenever I need to reduce risk, I will rather cut it then spread it! This means that I prefer to sell or close risky positions instead of diversifying them. Eventually this might be the real difference between active and passive management styles. However, there are different reasons.

(1) Save Haven Effect: If there is a fear that one particular asset class might run into a bear market, then investors will usually find a better performing asset class as an alternative. During stock market crises bonds usually outperform stocks by being the save haven.

(2) Correlation Unity Effect: During an equity market drawdown, it seems that diversification does not work since correlations tend to move to unity. At the time, when it is most needed, the risk offsetting effect of correlation does not work. Also, it remains unclear what will be a good number of stocks to hold in order to make the diversification effect work. Take a look at the number of constituents in the main indices in different countries: Switzerland 20 (SMI), Germany 30 (DAX), Europe 50 (ESTOXX), UK 100 (FTSE), Japan 225 (Nikkei), US 500 (S&P), World 2500 (MSCI). During the last decade they all experienced drawdown in the extent of 60 to 70 percent.

(3) Win to loss Relation: To me, the most important reason to cut risk is the relation between a drawdown and the market move that is necessary to recover from the drawdown. The formula to calculate the relation is

$$\text{win back}_\% = \frac{\text{loss}_\%}{1 - \text{loss}_\%}$$

If we plot this relation in a graph and insert also the drawdown for the MSCI World, it becomes clear that cutting risk instead of diversifying it away will add an element of capital preservation into your management concept.
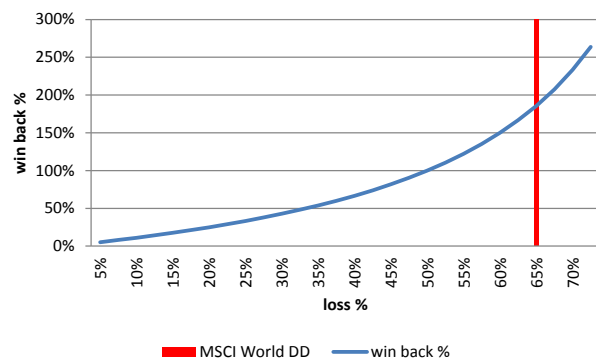

Chart 1: "Waiting for a 186% bull market to break even"

If it is possible to avoid at least a good part of the drawdown, this will give you a lot of leeway being wrong with your timing when reentering the market and it will also justify the cost involved with this type of management style.

Principle 2: Let the good times roll

Diversify in a bull market. Although I don't use diversification for risk management, I try to implement this approach during positive market phases. The reason is that within tactical asset allocation I would like to buy "the market" rather than selection single stocks. Also admitting that for my purpose it will be cheaper to implement the strategy on an index level rather than on single issues.

Principle 3: Reduce the level of complexity

With a multi-asset portfolio you can spend a lot of time analyzing everything: politics, economy, fundamental analysis of single issues, technicals, intermarket relations, psychology etc.! More often than not these endless discussions lead to indecisiveness. Alternatively, one could use rocket science to forecast, based on a huge number of input factors. In order to reduce the complexity of this situation, I am going to rely on a simple set of rules. It might not be perfect, but at least it takes decisions that are based on the principles outlined here. Therefore I abstain from forecasts and will not apply any form of numerical optimization or data mining. This might be wrong but at least it simplifies the process.

By following these three principles I try to incorporate the behavioral findings. Cutting losses and riding winners tries to avoid the typical effects of prospect theory. Using a rule based approach will help to avoid suffering from overconfidence and anchoring.[7]

Data

For the two test procedures that will be discussed, I used weekly data for equities, bonds and money markets for a period of 27 years, ranging from January 1987 to January 2014. Each time series contains 1365 data points. In the first test procedure I used S&P500, CitiGroup US Government Bond Index TR and Libor for the USA. For Euroland I used DAX, CitiGroup German Government Bond Index TR and Libor. For the period before the introduction of DEM Libor, rates published by the German Bundesbank were used. Finally, I used Topix, CitiGroup Japan Government Bond Index TR to test the Japanese market. In order to generate a price index that represents the local money markets, I built an index of weekly holding periods (d) and the rate used (i) as the deposit.

$$MM\ Index_t = MM\ Index_{t-1} * (1 + \frac{d}{365} * i_{t-1})$$

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[7] Tversky/Kahneman,1986

Bond indices are total return indices, i.e reflecting coupon income as well as price movement. Equity indices are represented either as index or futures markets prices. If futures prices are used, they are adjusted backwards to reflect the change in contracts.

The second test uses the following equity indices: S&P500, ESTOXX50, DAX, FTSE100, SMI, Nikkei225, Hang Seng and ASX All Ordinaries. For most of the markets the price history corresponds to the first test. Some indices are backward calculated, since they were introduced later. SMI price history starts in 1988, ASX only in 1992.

SAA Portfolios

The first step in my analysis is to define an appropriate benchmark for asset allocation. Therefore I measured the annualized returns and risks for the above discussed markets. The results are given in table 1.

	USD		EUR		JPY	
	Return	Risk	Return	Risk	Return	Risk
Equities	7,704%	17,156%	7,278%	22,580%	-0,718%	19,486%
Bonds	6,409%	4,278%	5,906%	3,510%	3,761%	2,805%
Cash	4,257%	0,405%	4,014%	0,384%	1,724%	0,347%

Table 1 : Annualized risk/return numbers for the markets (27 year period)

A good benchmark would be a portfolio where the weightings of the asset classes are kept constant over the entire time period. This is exactly the definition of a SAA portfolio from above. Since I cannot tell, which specific SAA portfolio would be appropriate, I simply constructed the total set of SAA portfolios that are available. I took the assumption of allocating asset classes in steps of 2.5% exposure holdings. With n as the number of possibilities to allocate one single asset class (100% / 2.5% + 1 = 41), the number of possible portfolio structures is calculated as

$$\text{PF Number} = \frac{n^2 + n}{2}$$

For one single currency portfolio consisting of three asset classes (equities, bonds, cash) this will give 861 different portfolio structures. For all 3 markets there are 2'583 SAA portfolios. For each of these SAA portfolios I calculated an annualized risk and return number and plotted them as the typical risk-reward graph that we always find in financial textbooks. For the US market this will give us
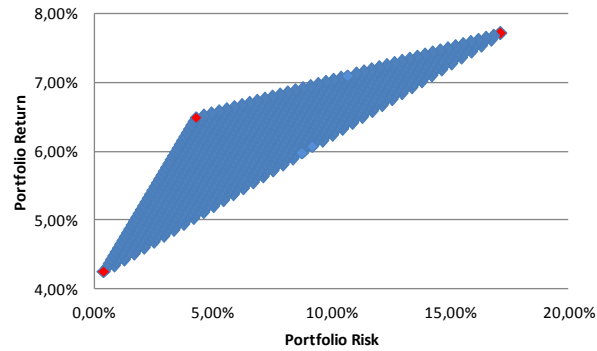
Chart 2: Risk reward graph for US market based on three asset classes

What we might see is that a pure stock portfolio has the highest return with the highest risk. Cash is on the other end of the scale and bonds are in between. I highlighted the three portfolios that contain only one asset class with red dots. As is the case in the discussion on active management, it is noteworthy that a lot of statements from financial textbooks are at least skewed. For example, if you show the risk return diagram for Japanese SAA portfolios, the most risky portfolio has the least return. Although not covered in the books, it was reality for Japanese investors during the last 27 years.
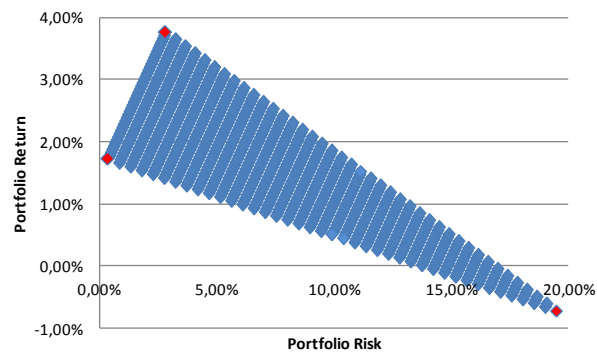

Chart 3: Risk reward graph for Japanese investors

The SAA portfolios will serve as a benchmark to compare the effect of applying strategies to the data. Later on I will also show how to pick one specific SAA portfolio in retrospective to compare it against an active strategy.

2   The Models employed

I will present four different tools that I will use later on in the testing procedures. All tools are comprised of a quantitative criterion and a rule set. The models are capable to select one asset class at a time. Most of the tools are rather classical ingredients of the hawker's tray of technical or momentum analysis. Only the first one is original and was introduced by the author in 2006. Although the nature of the models are quite similar, the results are not.

2.1   Intermarket Relations

This model was built especially for asset allocation. The starting point was the study of intermarket relations. Research published by brokerage firms or investment banks typically show graphs of different markets or economic data that shows a high grade of synchronism. Examples are oil prices versus Norwegian Krona or stock prices versus corporate bond spreads. Typically these relations are used to underpin the story of the research paper. It is the experience of the author that, if you rebuild these charts for a longer time period, the relationship shown will fall apart. The same is true for a lot of academic studies on the long term empirical relation between different markets.[8] Therefore the idea is to take decisions based on the strength of the relationship between two markets, hence to base decisions on correlation. In order to do that, I measure correlation between equities and bonds, and between bonds and money markets on a rolling 27 week time frame. The formula for correlation I used is

$$correl_i = \frac{\sum_i (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{(\sum_i (x_i - \bar{x})^2)(\sum_i (y_i - \bar{y})^2)}}$$

If we would plot correlation over time as an indicator, it would resemble an oscillator that is pending between -1 and +1. This can be seen in chart 4.

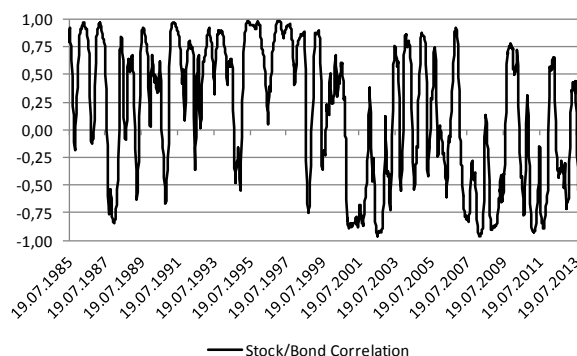---

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[8] Beirne/Gieck, 2012

Chart 4: stock/bond rolling correlation (26 week window) in EUR

To use this correlation for asset allocation, I built the following rule set:

- Buy equities, if the equity-to-bond correlation is positive or rising

- Buy bonds, if no equity position is indicated and the bond-to-cash correlation is positive

- Stay in cash if neither an equity nor a bond position is indicated

This simple rule set takes the following assumption: Generally it is good to be invested into equities since it generally offers the best return potential. Only if you have an indication that there is trouble ahead, switch from a higher volatility into an asset class with a lower volatility. A high correlation between equities and bonds implies that the sentiment among investors is good. Both asset classes represent a major part of the market capitalization in a country. If correlation gets negative I take this as a change in sentiment. One part of the investors feels that there is trouble ahead. In that case, assuming prudence, I leave the stock market and take another decision, whether I am better off in the bond market or in the cash market. To take this decision I apply the same technique. Since the money market is a steady rising total return index, negative correlation would imply trouble in the bond market. In this case, it is best to stay in cash and wait for a new signal that would indicate a change in sentiment.

2.2 Relative Strength Levy

The second tool is a mid to long term approach that will use the concept of relative strength as introduced by Robert Levy[9]. His idea was to calculate a number that could be used to compare the strength of a price movement of a single stock. In this version, the strength of a price movement is

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[9] Levy, 1967

referenced to the price history of the asset itself. Technically it is measured as the ratio of price to its simple moving average.

$$RS_t = \frac{price_t}{average_t^{27}}$$

The ratio is called RS, t reflects the current date and the look-back period of the average is 27 weeks. Relative Strength Levy is a classical technique in the tool set of technical and quantitative analysts and was also studied a lot in academia[10]

For the purpose of this study, I used this tool with the following rule set to allocate between the different asset classes:

- Buy equities, if the RS coefficient of Levy is higher than 1
- Buy bonds, if no equity position is indicated and bonds exhibit a RS coefficient bigger than 1
- Stay in cash if neither an equity nor a bond position is indicated

2.3 Momentum

This is the classical rule set in academic papers to test for relative strength of different assets.[11] It simply compares the performance of the last 27 weeks.

$$Perf_t = \frac{x_t}{x_{t-27}} - 1$$

The strategy uses the following rules to select the asset classes.

- Buy equities, if equity performance of the past 27 weeks is positive
- Buy bonds, if no equity position is indicated and bond performance is positive
- Stay in cash if neither an equity nor a bond position is indicated

2.4 Ratio Analysis

The last technique is another form of relative strength. This time the relative movement of two assets are compared against each other. This is a common technique in bond markets or among analysts

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[10] Kirkpatrick/Dahlquist, 2011, p. 516-520
[11] Jegadeesh / Titman, 1993

that perform intermarket analysis.[12] Technically, the price of one asset is divided by the price of a second asset.

$$ratio_t = \frac{asset\ x_t}{asset\ y_t}$$

This ratio is shows the analyst which asset is outperforming at the moment. A rising ratio indicates an outperformance of asset x and vice versa. The rule set for this model is

- Buy equities, if the four week difference within the equity to bond ratio is bigger than 0.2
- Buy bonds, if no equity position is indicated and the four week difference in the bond-to-cash ratio is positive
- Stay in cash if neither an equity nor a bond position is indicated

All four models are very simple to determine and to follow. They will now be applied in two different settings to show how these models perform.

3 Applications

In this section I applied the methods discussed above in two different ways. The first application studies the question whether these tools are suited as asset allocation indicators at all. Are they helpful to investors to pick the appropriate asset class reasonably well? If so, then investors might find it useful to integrate them into their own set up. It is not meant to use them as a single indicator.

The second application depends on the result of the first one. If there is additional value in using these tools as an indicators, it is of interest to investors to find ways, how to integrate them in order to improve the risk return characteristics of a portfolio.

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[12] Murphy, 1991

3.1 Asset Allocation indicators

What is a good way to measure the effect and the quality of an indicator? Successful asset allocation implies to be invested in the right asset class at the right time. In this first test I assume three investors. One is investing only in USD, one in EUR and one in JPY. At each data point, each one of them is restricted to choose between equities, bonds or cash. The portfolio therefore contains either pure equities, pure bonds or pure cash. Since I use weekly data, investors need to take decisions and are allowed to change their allocation only at that frequency. To select the appropriate asset class, they use the tools from section two. The results are then compared to a benchmark. Since we are looking at four different models used by three investors, I conducted 12 tests in total. Test length was 27 years.

	Strategy 1		Strategy 2		Strategy 3		Strategy 4	
	Return	Risk	Return	Risk	Return	Risk	Return	Risk
EUR	12.286%	13.388%	12.137%	13.921%	11.931%	14.323%	8.544%	12.713%
JPY	3.393%	12.647%	8.910%	12.025%	6.280%	11.570%	7.953%	9.292%
USD	10.978%	11.190%	7.623%	11.555%	8.823%	11.844%	7.109%	4.302%

Table 2 : annual risk/return results from testing strategies in three areas.

As can be seen, the strategies work best in European markets, but still look very appealing in the other areas. The results are promising even for Japan, where investors have experienced negative annual equity returns. In no case risk does increase dramatically. Therefore, the assumption of cutting risk instead of spreading it seems to hold.

The next step is to understand the dynamics of the strategies over time. For the EUR markets, the equity lines for the four strategies are given in chart 5. Results for USD and JPY are presented in the appendix.
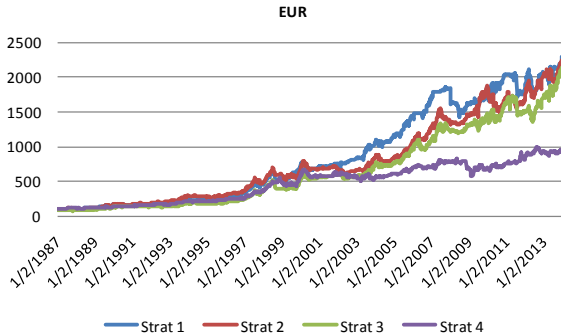

Chart 5: Equity Lines of four strategies in EUR

The next step is to compare the results of the indicator against a benchmark. The first benchmark will be the complete set of SAA portfolio. Each SAA portfolio represents a risk-return pair for one specific allocation that was kept constant over the 27 years. Since the strategies also have risk-return pairs, I can show the effect of TAA by including the results of the four strategies into the risk-return diagram of the SAA. Again the results look very attractive.
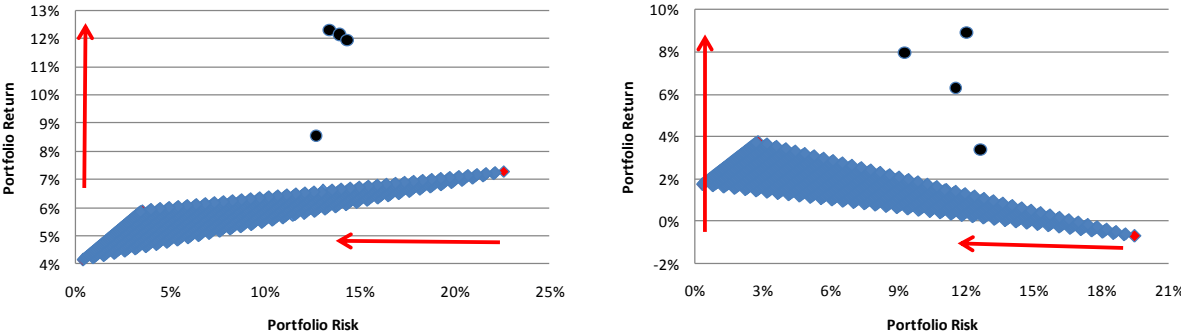

Chart 6: Risk-return diagrams for EUR and JPY - SAA versus TAA

Every risk-return combination of the TAA lies outside of the SAA cloud. Therefore active management obviously increases return or decrease risk relative to static SAA portfolios. Again, results for USD can be found in the appendix.

The next step in comparing the results is to pick one single SAA portfolio as the appropriate benchmark. Focusing on one single benchmark will give us deeper insights on the dynamics of risk. To find this benchmark, we first ask for the average holding of the TAA portfolio within the 27 year time period. This is the percentage of the time the portfolio was allocated into certain asset classes.
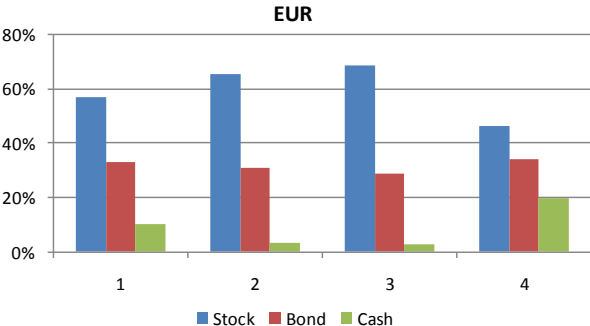

Chart 7: Average allocation of the four strategies for EUR investors

Chart 7 shows that for EUR investors, equity allocation for all four strategies was on average 50 to 60 percent. Bonds usually are a minor allocation and cash is fractional. USD and JPY results are given in

the appendix. For each strategy, we can now pick the single SAA portfolio, which comes closest to the average TAA portfolio. The reason for this is to compare the equity lines of the benchmark versus the strategy, and also to have a look on the drawdown behavior of both allocations. For example, in USD, the corresponding SAA portfolio for strategy number one was 65% equities, 27.5%bonds and 7.5 % cash. The results of the comparison can be seen in chart number 8.
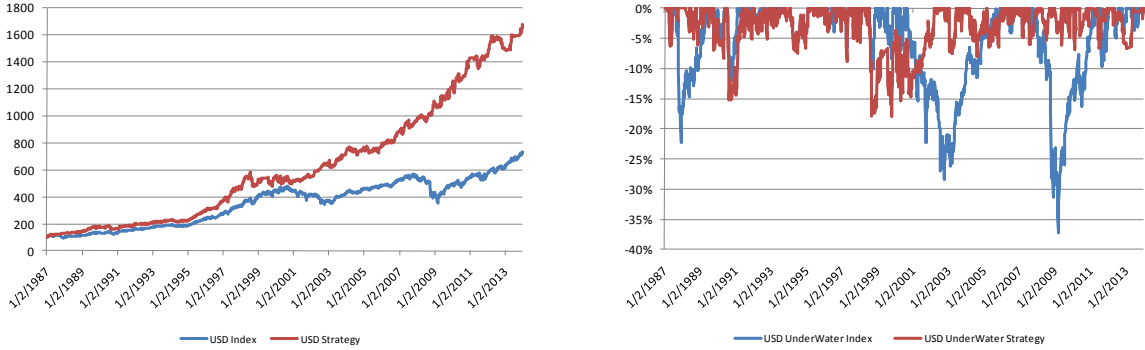

Chart 8: USD, TAA (first strategy) versus SAA. Equity line and under water equity

The striking difference is the risk behavior. The tactical strategy obviously was able to cut risk and therefore to avoid severe drawdown. This allowed the strategy to recover earlier and also to be invested in another asset class during the major equity drawdown. Tactical asset allocation preserves capital.

Since the results are very promising, I conclude that the tools in question do a great job in selecting asset classes. Again, it is not a trading strategy. The evaluation showed that these simple tools may be used as an indicator for tactical asset allocation.

3.2 Control equity exposure

In this second application I will show how the indicators may be used in a more trading related environment to control equity exposure within an asset allocation framework.

Origin of this idea is the method, the four described tools identify time periods for certain asset classes. As an example, chart 9 shows the time periods in which that strategy one was superiorly identified for the DAX index in Germany.
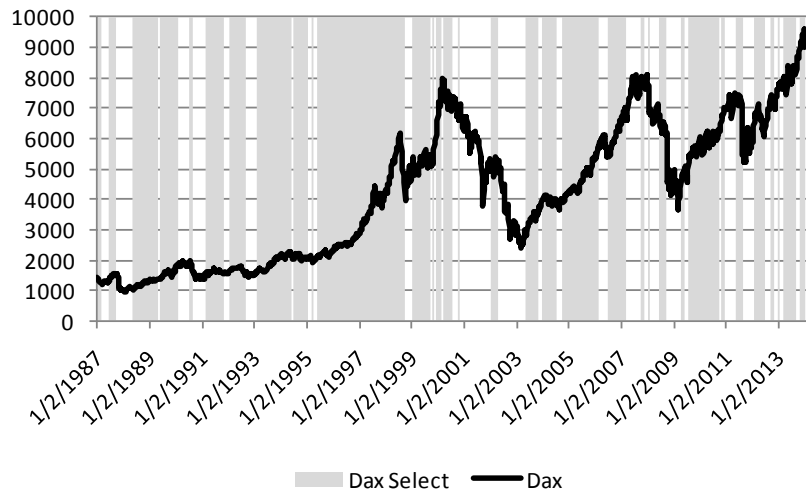
Chart 9: EUR: Example of the selection of strategy 1 versus the equity market

As one can easily observe, the strategy is far from being perfect. It is unable to pick turning points and will also omit good periods from time to time. But what really counts is its ability to avoid drawdown periods. This is the feature that we will exploit.

In this application I assume a tactical equity manager who is faced with the following situation. He is a long only investor who has the freedom to choose his equity allocation between a given lower and upper limit. To simplify, bandwidth is set at 100%. If someone is faced with a minimum or a maximum equity exposure, it is simply a question of scaling. The investor is allowed to allocate into global large to mid cap stock markets, but is forced to invest the remainder into national fixed income (i.e. bonds or cash). No benchmark is given. The client wants the manager to actively use the bandwidth, since a lot of manager don't dare to move away too far from a given benchmark. The manager has two tasks. He first needs to determine and invest the equity exposure, and as a second step he needs to invest the fixed income component.

To succeed, he will use an investment process that includes the three basic principles outlined in section one. It cuts risk in downtrend, diversifies in uptrend and focuses on simple procedures.

His first step in the investment process is to choose a global equity universe. He will work with market indices of major developed countries or regions, namely US (S&P500), Europe (ESTOXX50), Germany (DAX), UK (FTSE100), Switzerland (SMI), Japan (Nikkei225), Hong Kong (Hang Seng) and Australia (ASX All Ordinaries). This eight stock market indices contains 1468 large to mid cap stocks

in total. This offers a high degree of diversification. Additional, all of these markets could be traded either as an ETF or via liquid futures markets.

These markets can be traded via liquid index futures. I therefore assume that there is no FX risk except for the open P&L of the futures, which can easily be hedged in time. Using futures might also be very cost efficient.

The second step is to determine the proper equity exposure at every point in time. This is a two step process. One task is to decide on market timing. The other is to set up a money management scheme which defines the size of the positions.

The market timing issue is solved by applying the four simple strategies, but only to focus on the equity decision whether to hold stocks or not. This will lead to an indication at every single data point.

The money management scheme must assure that the total equity exposure can swing between the upper and lower bandwidth. My solution to this issue is to select a specific weight for each market and keep it constant over the entire test period. The weightings can be seen in table 3 and in the annex.

		Period 1	Period 2	Period 3	Period 4
S&P	19.07.1985	30%	30%	30%	30%
DAX	19.07.1985	20%	15%	10%	10%
EXTOXX	07.08.1987		15%	10%	10%
SMI	27.01.1989			10%	10%
FTSE	19.07.1985	20%	10%	10%	10%
Nikkei	19.07.1985	20%	20%	20%	10%
Hang Seng	19.07.1985	10%	10%	10%	10%
ASX	18.12.1992				10%
	Sum	100%	100%	100%	100%

Table 3 : Weighting table for EUR

By choosing the weights, investors can express their local favors. Either overweight the home market, or build equal blocks between US, Europe and Asia, or equal eight all of them. The possibilities are countless. In this example, the weighting for the Euro region is 40 % and for the other two region 30% respectively.

The weightings given to each market must be equal to the size of the given bandwidth itself, in our case 100 percent. Technically, the market selection strategy allocates a 1 or 0 at each data point for a given market. By multiplying this numbers with the weight for the specific market, we know the weight for one market. Therefore the total exposure at every data point is given as

$$equity\ exposure_t = lower\ bound + \sum_i weight_i * signal\ output_{i,t}$$

If I assume no minimum equity exposure (lower bound), then the formula will indicate a 100 percent equity allocation, when all markets are selected by the strategy, i.e. all models are bullish. If all models indicate an equity bear market, then the money management scheme indicates a flat position. All risk is cut, no stock exposure is left. And for any other combination of markets selected by the strategy, the indicated exposure will be in between the two extreme cases. Since I always buy the index itself, I achieve maximum diversification in bull markets, which was also a premise set in chapter one. By using exchange traded equity index futures, the exposure is not exhibited to foreign exchange risk, except for the open P&L of certain positions. This is a minor issue, since it is easy to hedge. The trading itself is be very cost efficient.

The last step is the allocation within the fixed income class (bonds versus cash). This topic was already covered in the previous section. Furthermore, all strategy presented in section two are capable of taking this decision. In order to keep it simple and to focus on the effect of equity allocation, I assume that the fraction which is not invested in equity will be held as a cash deposit.

$$fixed\ income\ exposure_t = 1 - equity\ exposure_t$$

Chart 10 shows an example of this money management scheme. The black area represents equity exposure, the reminder is fixed income exposure in the form of a deposit. As one can see, equity exposure is oscillating between 0% and 100% (lower and upper bound). Although the equity allocation looks quite nervous, one needs to keep in mind that this is a period of 27 years packed into the chart.
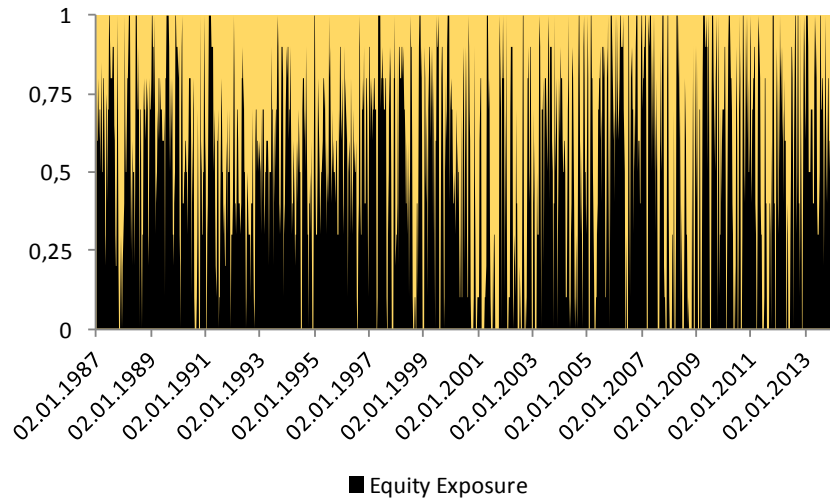
Chart 10: Equity (black) and fixed income (orange) exposure, model 4 in EUR

Average exposure for this 27 year period is 53%. This shows that risk is cut instead of spread. This could be seen best in chart 11, where I show the underwater equity line for strategy 4 in EUR against an index with the same underlying weighting structure, but without the money management scheme. This way of allocating exposure is very helpful during drawdown.
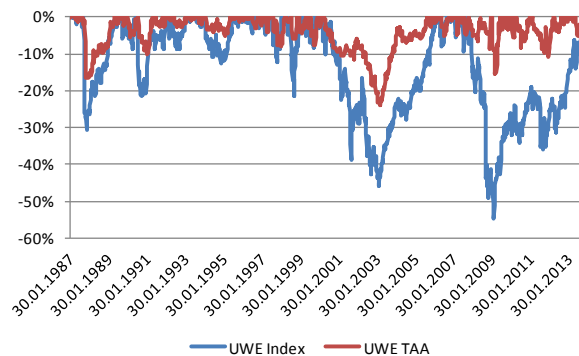

Chart 11: Risk behavior of the benchmark versus TAA, model 4 in EUR

The same effect can be seen in the numbers given in table 4. While returns are similar, annualized risk dropped from 15.7% to 8.3% which leads to an increase in the Sharpe ratio. The same is true for the drawdown.

	Index	Strategy 4 (EUR)
Start	02.01.1987	
End	03.01.2014	
Years	27,0	
risk-free rate	2,50%	
	Index	Strategy 4 (EUR)
Return (period)	483,9%	533,4%
Return pa	6,75%	7,07%
Risk p.a.	15,71%	8,39%
Max DD	-54,94%	-23,96%
Sharpe ratio	0,270	0,545
average exposure	100%	53,0%

Table 4 : Results for strategy 4 (EUR)

Finally the result of the example above example is shown in chart 12 as equity line. Again it shows the smoothness which is due to the tactical asset allocation from another corner. It is notable how exposure gets smaller during drawdown periods.
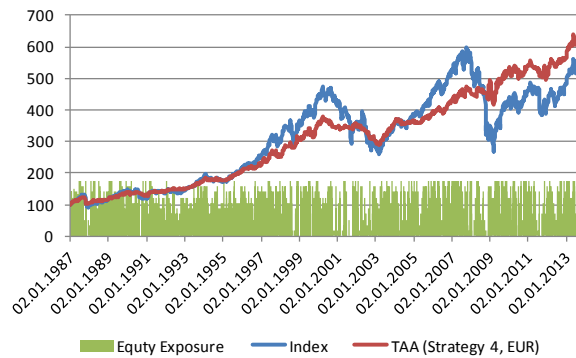

Chart 12: Performance charts and equity exposure for strategy 4 in EUR

As could be shown, outperforming the market is probably not possible during major bull markets, since principle two asks the investor for a diversified portfolio. In our example, I bought the index itself. But tactical asset allocation is favorable if applied over the longer term. This seems especially important for investors who should have a longer term view by definition, as pension funds, assurance companies and family offices.

4 Conclusion

In this paper I presented four simple, yet very effective strategies for tactical asset allocation. The ideas were presented and two tests were conducted from the perspective of investors from three different geographical regions. Results suggest that investors should prefer tactical asset allocation over any passive style. It also shows how equity exposure, which is the most volatile component within a portfolio, can be controlled using a simple money management scheme. In a nutshell, it appears that the achieved results are very promising towards this approach.

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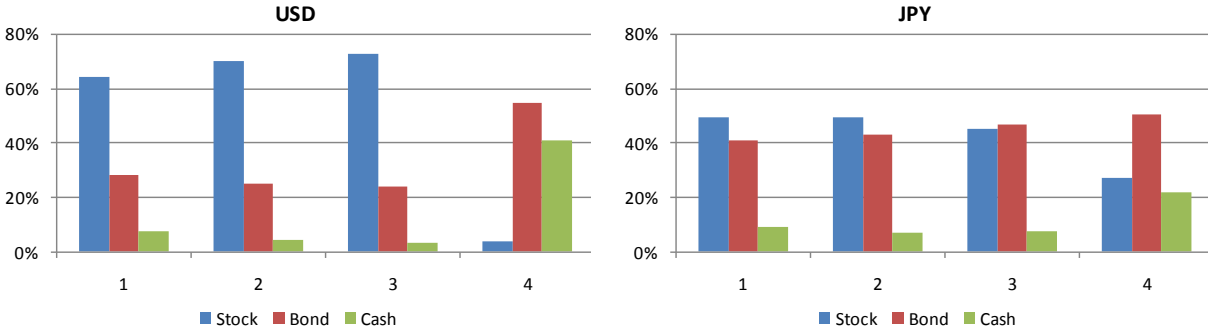
Appendix

(1) Risk-return diagram USD assets
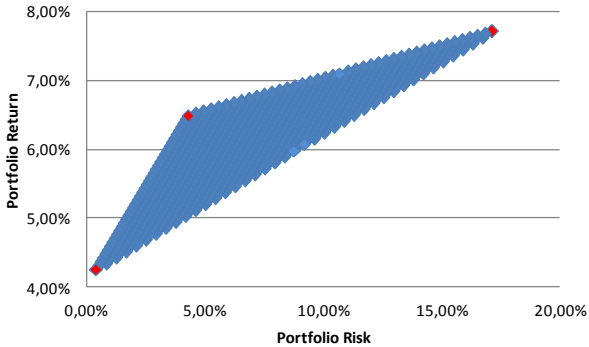
(2) Strategy performance in USD and JPY
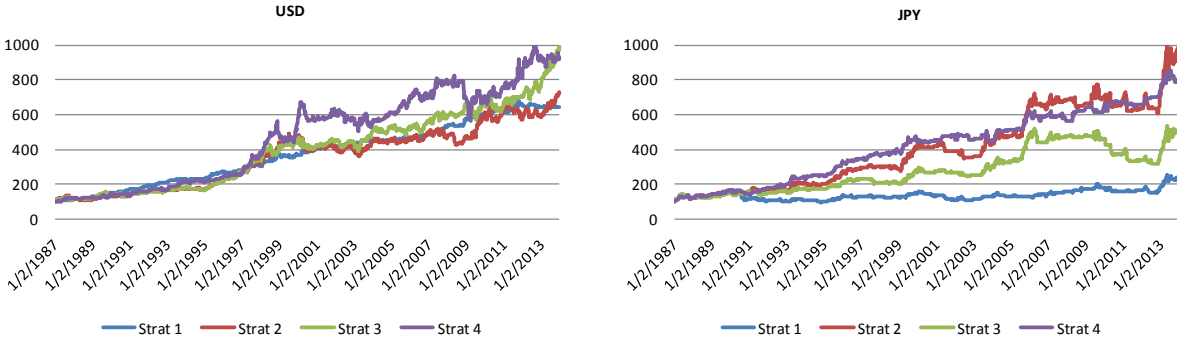
(3) Average allocation in test number 1 for USD and JPY

(4) Weighting schemes for USD and JPY in test number 2

		Period 1	Period 2	Period 3	Period 4
S&P	19.07.1985	40%	40%	40%	40%
DAX	19.07.1985	15%	10%	8%	8%
EXTOXX	07.08.1987		10%	8%	8%
SMI	27.01.1989			8%	8%
FTSE	19.07.1985	15%	10%	8%	8%
Nikkei	19.07.1985	20%	20%	20%	10%
Hang Seng	19.07.1985	10%	10%	10%	10%
ASX	18.12.1992				10%
	Sum	100%	100%	100%	100%

USD weighting scheme

		Period 1	Period 2	Period 3	Period 4
S&P	19.07.1985	30%	30%	30%	30%
DAX	19.07.1985	15%	10%	8%	8%
EXTOXX	07.08.1987		10%	8%	8%
SMI	27.01.1989			8%	8%
FTSE	19.07.1985	15%	10%	8%	8%
Nikkei	19.07.1985	20%	20%	20%	20%
Hang Seng	19.07.1985	20%	20%	20%	10%
ASX	18.12.1992				10%
	Sum	100%	100%	100%	100%

JPY weighting scheme