Asset Allocation Strategy Based on Inflation Expectation Economic Cycle

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ABSTRACT
Economy is periodically. In different period of economic, different kinds of asset (stock, bonds, commodities, gold) met different situation. How to divide and identify economic cycle accurately that is very important to make an investment strategy and asset allocation. The traditional way to divide economic period was based on the Merrill Lynch Investment Clock. According to GDP growth rate and inflation rate, economic is divided into 4 periods, including inflation, deflation, disinflation, reflation. There are different strategies to allocate assets. For example, before 2012, ML’s Investment Clock are very effective in China, but after 2012 this strategy was out of order. Hence, it is important to explore a new strategy about division of economic periods. In the paper below, we separate economy into 4 periods based on the magnitude and direction of inflation expectation. We study in the performances with different assets on different economic periods. Base on the performance of various assets in different economic cycles and the essence of assets, we establish a new strategy about allocate asset. And we back test our strategy by historical data to investigate whether our asset allocation strategy we developed are efficiency and reliable. In this strategy, we achieve annualized rate of return 14.84% and sharp ratio1.16. In the following research, we will pay attention to various cyclical industry allocation strategies or sector allocation strategies in different economic cycles.

Keywords: Inflation expectation, Investment Clock, Asset allocation, Economic periods

1. INTRODUCTION
Economy is periodically, just like a wagon wheel scroll forward. For instance, the Oil Crisis in 1973, 1978, 1990 prove the periodical feature of the economy, and also Covid-19 is a typical international event which make a tremendous influences on global economy. Economy is not immutable and frozen, different kinds of asset (stock, bonds, commodity, gold) performs differently in different periods of economic. For example, during 2008 when Global Economic Crisis happened, economy experienced the recession period, and buying bonds is the best option in this economic period. Subsequently, in first half of 2009, government of China launched the four trillion investment plan to stimulate the economy which is declining and damaged. At the period of this plan was just launched, economy began to recover and the most valuable asset was stock in this period. However, in the second half of 2009, the four trillion investment plan became effective, economy recovering exceeded the expectation and economy was overheating, so the best option in the four kinds of assets is commodity. At last in second quarter of 2010, economic growth rate fall down and the inflation rate rise up, this situation called period of stagflation. Cash is the best option in the period of stagflation. It is thus clear that the economy in China used to be periodical, and we could use ML’s Investment Clock to make the best allocation of asset. How to divide and identify economic period accurately are so important to distribute policy, make investment strategy and allocating asset. For policy maker, they could understand the economic operation status and make right judgment about whether tight policy or stimulate policy should be used. As for investor, they could allocate asset properly and pursue excess revenue. ML’s Investment Clock is a guidance about how to allocate assets in different economic cycle. although each economic cycle has some distinguishing characteristics, it is helpful to investor to make money by analyzing the similarities. It divided economy into four periods based on GDP growth rate and inflation rate, and make different asset allocation strategy in these four periods. Before 2012, ML’s Investment Clock was very effective in China, it did not operate such effective after 2012. Because Chinese economic growth rate
gradually slow down and the economic fluctuation is not obvious than it used to be, and it is hard to make a distinction between what the economic status undergoing with. Therefore, it is necessary to explore a new method about how to divide economic periods.

After 2008 Global Economic Crisis, the function of the Federal Reserve Board [10] as the global central bank is constantly strengthening, which makes the monetary policies in different countries more and more similar. Nearly all major assets were obviously and periodically influenced by the policy of Fed. Hence, we want to divided economic periods based on attitude and policy of Fed. In consideration of Fed frequently guide market expectation after 2008, and make “traction” on long side interest rates. Nowadays, real interest rate, inflation expectation, nominal interest rate and other important indicators in US bond market is an expectation of the Fed's attitude more than the reflection of economy expectation. Consequently, we trying to make judgment to attitude of Fed based on US bond market’s signal [11].

In the following passage, according to magnitude and direction of inflation expectation, we divided four economic periods at first. Specifically, the economy is divided into four cycles according to whether the inflation rate is lower than the Fed's policy target inflation rate and the direction of the market's inflation expectations (up / down). We compare the performances of some major assets in different economic periods. We found that gold and bond perform well in deflation period, bond is the best option in disinflation period, gold and commodity are the best choice in inflation period, and stock and goods performances best in the reflation period. We establish a new asset allocation strategy based on the previous analysis, in the back test with 14 years' historical data, this strategy achieves annualized rate of return 14.84% and sharp ratio 1.16.

The rest of this article is organized as follows. In Section 2, we will demonstrate the method and logic principle used for economic cycle division. After 2008 Global Economic Crisis, the function of the Federal Reserve Board (Fed) as the global central bank is constantly strengthening, which makes the monetary policies in different countries more and more similar. Increase or decrease the deposit reserve rate, buy and sell bonds, and increase or decrease the discount rate are the three monetary policies frequently used by Fed. Monetary policy has a significant impact on the prices of various assets. After observing the market, the Federal Reserve often formulates and implements monetary policy to affect the bond market, so we can infer the intention of the Federal Reserve and the market's understanding of the intention of the Federal Reserve by observing the bond market.

Specifically, the nominal interest rate can be divided into two parts, including real interest rate and inflation expectation. In this article, the nominal interest rate is measured by observing the interest rate of U.S. ten-year Treasury bonds [12] (T-bond). As for the real interest rate, we inspect the implied interest rate of the ten-year Treasury Inflation Protected Securities [13] (Tips, which is a kind of bond associated with inflation index. It has a unique clause design in avoiding inflation risk, which can help investors offset the loss of purchasing power caused by inflation.) The above two interest rates are subtracted to calculate inflation expectations. (The historical trend of T-bond and tips is shown in Figure 1) The inflation expectation is used to infer the intention of Fed and the market's understanding of Fed's intention. The inflation expectation has three major advantages. First, the inflation expectation is computed with the interest rate of T-bond and Tips, which are representative, objective and authentic, since they are both generated by trading in the market. Secondly, interest rate data are available every day and can be observed during the trading period. The timeliness and availability of data are very strong. Thirdly, inflation expectation reflects everyone's expectations of the future inflation trend, as well as everyone's interpretation and expectations of the Fed's policy, which is a leading indicator. Hence, we use the data of inflation expectation to analyze the intention of the Fed and the understanding of the market, so as to divide the economic cycle.

2. THE METHOD OF ECONOMIC CYCLE DIVISION

In this section, we will introduce the method and logic principle used for economic cycle division. After 2008 Global Economic Crisis, the function of the Federal Reserve Board (Fed) as the global central bank is constantly strengthening, which makes the monetary policies in different countries more and more similar. Increase or decrease the deposit reserve rate, buy and sell bonds, and increase or decrease the discount rate are the three monetary policies frequently used by Fed. Monetary policy has a significant impact on the prices of various assets. After observing the market, the Federal Reserve often formulates and implements monetary policy to affect the bond market, so we can infer the intention of the Federal Reserve and the market's understanding of the intention of the Federal Reserve by observing the bond market.

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Figure 1: The historical trend of T-bond and tips and inflation expectation

Our rule for economic cycle division is quite straightforward. We divide the economics into four states according to the level and trend of inflation expectation. Since the policy target inflation rate of Fed is 2%, we identify the expectation for inflation is high or low based on whether inflation expectation is higher or lower than 2%. We recognize the expectation for the trend of inflation by the moving average of inflation expectation. If the inflation expectation is above the moving average of the past 40 days, we believe that the inflation expectation is in the upward trend. On the contrary, if it is below the moving average, it is considered to be in the downward trend. Rule of economic cycle's Division is shown in Table 1.

| Inflation expectations exceed policy targets | Inflation expectations did not exceed policy targets |
|---------------------------------------------|-----------------------------------------------|
| inflation                                   | reinflation                                    |
| disinflation                                | deflation                                      |

Table 1: Rules of economic cycle's Division

3. ASSET ALLOCATION STRATEGIES UNDER DIFFERENT ECONOMIC CYCLES

3.1 Logic of asset allocation strategy

Various assets will perform differently in different economic cycles. We have allocated the assets with the best performance in different economic cycles to maximize income.

We divide the economy into four cycles according to whether inflation expectations exceed policy objectives and the trend of inflation expectations. The first period is deflation period which means inflation expectations below the policy target but actually Fed do not reduce real interest rate on time, then the market expects inflation to decline further. The market expects the economy to continue to decline. Usually, there is a risk event impact at this time. Allocate gold and bonds, which can hedge risks [14]. The second period is reinflation period which means Fed expect real interest rate lower than natural interest rate and this led to a rebound in inflation, and actually Fed reducing real interest rate lower than natural interest rate, which leads to inflation expectations rise. The market expects the Fed's stimulus policy to take effect, so it can allocate stocks and commodities with high returns in the economic recovery. The third period is inflation period, which is opposite to the first period. Therefore, it is in the stage of inflation and the market expects that the Fed cannot control inflation, so inflation will come. All anti-inflation assets, commodities and gold should be allocated. The fourth period is disinflation, which is opposite to the second period. It shows that the market expects the Fed's tightening policy to take effect and should allocate bonds.

3.2 Data validation of asset allocation strategy

We selected the data of 10-year Treasury bonds and 10-year Treasury Inflation-Protected Securities (Tips) to calculate inflation expectations. For stock assets, we select China’s representative stock index CSI 300, for commodities, we select the Nanhua industry index, as for gold, we select the loco London, and the bond index selects the medium and high-grade credit bond index. All data is from June 1, 2004 to July 20, 2021, and downloads from Wind (https://www.wind.com.cn/) .

We divide the economic cycle according to the method described in Section 2. In order to avoid the instability of economic cycle division caused by small fluctuations, we need to judge the same economic cycle for three continues days before confirming the current economic cycle. A total of 127 cycles were passed, and each cycle lasted 27.8 days on average. The number of
different economic states and the average duration are shown in Table 2. The definition state occurs the most times and the inflation lasts the longest. The occurrence times of the four states are basically the same, and the duration of reinflation and inflation is longer which is 31 days, while deflation and disinflation have a short time of duration about 24 days.

**Table 2**: The average duration of different economic states

| State     | Total Days | Times | Average Days |
|-----------|------------|-------|--------------|
| Deflation | 890        | 35    | 25.42        |
| DisInflation | 695      | 30    | 23.16        |
| Inflation | 1007       | 31    | 32.48        |
| Reflation | 943        | 31    | 30.41        |

In order to test the effectiveness of the allocation strategy, we calculate the average daily return, standard deviation and sharp ratio of different assets in each economic state. The corresponding results are shown in Table 3 Table 4 and Table 5.

**Table 3**: The average daily return of different assets in each economic state

| State     | stock | gold | commodity | bond |
|-----------|-------|------|-----------|------|
| Deflation | 4.36  | 7.77 | -1.99     | 3.83 |
| DisInflation | -7.98 | -3.80 | -3.96     | 2.39 |
| Inflation | -8.16 | 2.56 | 1.29      | 1.66 |
| Reflation | 14.94 | 3.28 | 10.16     | 0.73 |

In the reinflation state stocks are the best option, commodities are the second best, bonds and gold perform poorly. Therefore, we should allocate stocks and commodities, the theoretical and practical data verify each other. In the inflation cycle, gold and commodities theoretically are the best, while bonds and stocks perform poorly. The data show that gold is the best, and bonds are slightly better than commodities, but the performance of bonds is not as good as that in the deflation state and disinflation state. In the disinflation, bonds are optimal and other assets have negative returns. Theory is consistent with practice. In the deflation, gold is risk resistant, bonds are also low risk, hence we should allocate this kind of asset to make anti-inflation, and stocks and commodities perform poorly. In conclusion, from the data, our theoretical configuration strategy and data are mutually verified.

4. **BACK-TEST**

In this section, we will verify the effectiveness of our investment method through back-test. In order to simulate my asset allocation strategy, the allocation proportion of various assets in each state is shown in the Table 6.

**Table 6**: Allocation weight of various assets under different economic conditions

|                         | CSI300 index | Nanhua industry index | loco London | medium and high grade credit bond index : 003429 |
|-------------------------|--------------|-----------------------|-------------|-----------------------------------------------|
| Deflation               | 0            | 0                     | 0.5         | 0.5                                           |
| DisInflation            | 0            | 0                     | 0           | 1                                              |
| Inflation               | 0            | 0.5                   | 0.5         | 0                                              |
| Reflation               | 0.5          | 0.5                   | 0           | 0                                              |

We take the equal weight allocation portfolio of four assets as the benchmark. We trace the historical performance of strategy portfolio and benchmark portfolio. The logarithm of the net value of the
allocation portfolio, benchmark and excess return is shown in Figure 2. As can be seen from the figure, our strategy continues to defeat the benchmark strategy stably. Their risk return indicators are shown in Table 7, our strategy achieves total return 59.63%, annualized return 14.84%, sharp ratio 1.16, and excess return 314.21%

![Figure 2: The log net value of Strategy, Benchmark and Excess](image)

Table 7: Their risk return indicators of Strategy, Benchmark and Excess

|       | Total Return | Annualize Return | Annuallize Volatility | Sharpe |
|-------|--------------|------------------|-----------------------|--------|
| Strategy | 596.34% | 14.84% | 12.79% | 1.16 |
| Benchmark | 68.11% | 3.77% | 9.34% | 0.40 |
| Excess | 314.21% | 10.66% | 9.38% | 1.13 |

The return by year is shown in Table 8. In terms of absolute return, only 2011 and 2013 are negative income, and in terms of relative income, only 2011 and 2019 are below the benchmark.

Table 8: The return by year for Strategy, Benchmark and Excess

|       | Strategy | Benchmark | Excess |
|-------|----------|-----------|--------|
| 2008  | 13.46% | -21.70% | 44.90% |
| 2009  | 75.66% | 37.19% | 28.03% |
| 2010  | 10.53% | 9.29% | 1.13% |
| 2011  | -5.21% | -2.75% | -2.53% |
| 2012  | 12.76% | 6.08% | 6.30% |
| 2013  | -3.34% | -15.54% | 14.45% |
| 2014  | 5.10% | 4.62% | 0.46% |
| 2015  | 7.62% | -2.49% | 10.37% |
| 2016  | 32.97% | 9.79% | 21.12% |

In conclusion, our strategy is effective, which can stably overcome the benchmark, obtain excess return and absolute return.

5. CONCLUSIONS

In this article, we discussed about how to divide and identify economic cycle accurately, and allocate different kind of assets in different period of economic to make an investment strategy and asset allocation. We propose a new economic cycle division method based on inflation expectation, and give asset allocation strategies under different economic cycles. In above, we illustrate the effectiveness of the strategy through simulation and back-test, which achieves annualized return 14.84%, sharp ratio 1.16. In the following research, we will pay attention to various cyclical industry allocation strategies or sector allocation strategies in different economic cycles.

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