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Global Equity Markets: An Empirical Study of Return Prediction and Diversification Benefits

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Abstract: My research delves into the equity market trends of China, Japan, and the UK in the post-2000 era. I analyze a dataset of macroeconomic variables from 2000 to 2022 to assess their ability to predict equity market returns. My study reveals that all three nations have seen an upward trajectory in their equity markets, with China's market experiencing the most substantial growth. In addition, I explore how macroeconomic variables affect stock prices and identify the variables that have the most significant impact on equity market returns. Finally, I conclude that a diversified investment strategy in multiple countries' stock markets produces higher Sharpe ratios than any single-country investment.

Keywords: Equity Market, Diversification Benefits, Return Forecasting

1. Introduction

Macroeconomic indicators are important factors that affect the stock market. Understanding this impact can help investors comprehend the market mechanism better, predict market trends, and make more informed investment decisions. The study identifies the fundamental relationship between firm-level earnings and macroeconomic variables and explores the relationship between the total earnings of all firms in the market and stock market returns [1]. The study also finds that news about macroeconomic changes and how investors interpret the news and stock market returns also impact stock market returns [2]. If one knows how these macroeconomic variables affect stock market returns, then one can utilize these patterns to make more accurate predictions about future stock market returns. The study indicates that volatility forecasts can be improved on a monthly and quarterly scale by attaching macroeconomic variables [3].

Various macroeconomic factors can have an impact on stock prices. One research finds a positive correlation between stock price and currency value. This means that stock prices tend to appreciate when the local currency appreciates and depreciate when the currency depreciates [4]. My research concludes that the variable "JPM_PPI_REER ToT Z-score," which represents the real exchange rate, has a positive effect on stock prices in both China and Japan, which is consistent with the findings of this paper but hurts the UK. In addition, another research shows that an increase in the predicted exchange rate in the future will lead to a rise in the stock price [5]. In my study, the variable "1m FX MOM," which represents future short-term FX value trends, positively impacts stock prices in all three countries studied in this paper.

Monetary policy is also an essential factor affecting stock prices. Belke and Beckmann [6] uses the CVAR model to analyze the stock market behavior of five developed economies and three

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emerging economies. They find that monetary policy can affect the development of the stock market through broad money supply, overnight interest rates between banks, and net capital flow, and thus affect the stock price. These effects are much more pronounced in emerging markets than in developed markets. In my research, among the variables that affect monetary policy, only the "UnempFcast" and "Terms Trade" variables show significance in China. In contrast, the regression coefficients for other variables such as EconSurprise and Trade Balance are much higher in China than in the UK and Japan.

In addition, some macroeconomic variables can indirectly affect stock prices by influencing monetary policy. Central banks usually set monetary policy based on macroeconomic indicators. Policy changes could have broad implications for the stock market. The expected unemployment rate is an important indicator that affects stock prices. Researchers divide stock return data into multiple quantiles and analyze the relationship between stock return and unemployment rate within each quantile. They find that over a quantile range of 0.35 to 0.80, a rise in the expected unemployment rate leads to an increase in stock market prices [7]. This is because high unemployment can lead a country to adopt a loose monetary policy, which leads to low interest rates and high stock prices. Inflation surprise is also an essential factor that has caught the attention of many researchers. Burge and John [8] also find that the market is highly sensitive to monetary policy expectations, especially during unexpected inflation. If inflation exceeds market expectations, people will worry that the government will adopt a tight fiscal policy to raise interest rates, causing stock prices to fall.

Discounted cash flow (DCF) models predict and estimate stock prices based on the present value of future cash flows. If the variable can affect the company's future cash flow or discount rate, the impact of these variables on the stock price can be explained by the DCF model. Researchers find that news about future cash flow growth increases expectations for stock prices, which is consistent with the DCF model [9]. Among the variables used in this paper, EST_PX_CASHFLOW_FY3_AGGTE and EST_PX_EBITDA_FY3_AGGT respectively represent the estimated value of the company's future cash flow and EBITDA (earnings before interest, taxes, depreciation, and amortization) are positively correlated with the stock price, which is consistent with previous studies. In addition, the variable BEST_PX_CPS_RATIO used to estimate the company's future cash flow harms the stock price, which means the higher the valuation (measured by price to cash flow per share), the lower the stock price. This result is consistent with the DCF model. It is established that the discount rate affects stock prices directly through the discount rate channel or indirectly through the cash flow channel because the expected future cash flow growth changes with the discount rate. In general, a higher discount rate reduces the price of a stock [10]. Variables such as the PX_TO_CASH_FLOW ratio are correlated with the discount rate in DCF mode and negatively correlated with the stock price. Jean-Paul Décamps et al. [11] investigated the impact of free cash flow and issuance costs on stock prices, which complements the findings about cash flow and stock price dynamics. Similarly, Söhnke M. Bartram [12] explored corporate cash flow and stock price exposures to foreign exchange rate risk, which aligns with the examination of exchange rates and stock prices in this study.

Many past studies have examined the impact of a single aspect of macroeconomic variables on stock market returns. Most of these studies have scrutinized a country's macroeconomic data and stock returns. Cynthia J. Campbell et al. [13] studied multi-country event-study methods, which provide methodological support for my cross-country research on the impact of macroeconomic variables on the stock market. Similarly, K.C. Chan et al. [14] explored risk and return factors, which are consistent with this paper's investigation of the relationship between macroeconomic variables and stock returns. To comprehensively study the impact of macroeconomic variables on stock market returns, I synthesized various macroeconomic variables, including monetary policy, the unemployment rate, international trade, exchange rate, financial market data, and more.

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Simultaneously, I selected the stock markets of China, Japan, and the United Kingdom as my research subjects, analyzed the distinct impacts of different macroeconomic variables in each country, and compared the strength of the stock markets of the three countries affected by macroeconomic changes. My research results verify the effects of the unemployment rate and terms of trade on the stock market, as mentioned in previous literature. Additionally, I find that foreign exchange momentum, fixed-income market returns, and other factors have an impact on the stock market. After comparing the regression results of China, Japan, and the United Kingdom, I find that the stock market of China, a developing country, receives significantly more macroeconomic variables than the other two countries. Previous research has shown that there is a higher fundamental correlation between stock prices in emerging markets [15]. My research also finds that macroeconomic factors affect China more significantly than the UK and Japan. Moreover, I find that the stock market of Japan, also a developed country, is significantly more affected by changes in macroeconomic factors than that of the UK, suggesting a substantial difference in the impact of macroeconomic changes on developed countries as well.

The remainder of my paper is organized as follows. Section 2 briefly introduces the history of the stock markets in China, Japan, and the UK. Section 3 describes the data and methodology and provides summary statistics. Section 4 examines the benefits of diversification. Section 5 analyzes the relationship between macroeconomic variables and stock market returns. Section 6 concludes the paper.

2. Background of Equity Markets in Sample Countries

2.1. Equity Market in China

As a developing country, China's equity market has experienced significant volatility in the past 20 years.

Bull market (2006-2007): China's A-share market has seen a clear upward trend during this timeframe. This is evident in the rapid rise of the Shanghai Composite Index (SHCOMP). This surge was mainly attributed to the accelerated growth of the Chinese economy, the positive outlook of investors, and the ongoing reforms in the A-share market. In late 2006, the SHCOMP soared above the 2,000-point threshold and reached an all-time high of nearly 6,000 in early 2007.

Global Financial Crisis (2007-2008): China's economy and A-share market have been affected by the crisis due to falling export demand, tighter liquidity, and loss of market confidence. This caused the Shanghai Composite Index to fall sharply in the second half of 2008 and early 2009, falling to a low of about 1,700 points.

A-share market adjustment (2015-2016): Between the end of 2015 and the beginning of 2016, the A-share market underwent a significant correction. This was primarily due to the relaxation of financing and bond financing regulations, the overheated speculative atmosphere in the market, and regulatory intervention. As a result, the market index fell to approximately 3,000 in early 2016.

Stable uptrend (2017-2020): The steady growth of the country's economy from 2017 to 2020 has been accompanied by a series of government policies, including easing restrictions, reforming the IPO system, promoting the listing of innovative companies, and strengthening supervision. This has led to rapid growth in China's tech stocks, with the emergence of tech giants such as Tencent and Alibaba also driving the overall market up.

COVID-19 Pandemic (2020): The COVID-19 pandemic significantly impacted the global financial markets, including the Shanghai Stock Exchange. Market confidence was affected in the early stages of the pandemic, and indices fell due to embargo measures and economic stagnation. However, as the pandemic gradually came under control, the economy started to recover, and policy

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stimulus measures began to take effect. As a result, the Shanghai Composite Index rebounded and continued to rise in the first half of 2021.

Overall, the Chinese equity market has maintained a rapid rise. From January 4, 2002, to October 27, 2022, the Shanghai Composite Index rose rapidly, rising 2.8 times to 5,088 points. The study also looked at the monthly returns of Chinese stocks between 2002 and 2022. The distribution of stock returns is analyzed, and the kurtosis and skewness of the distribution are calculated. In addition, key metrics such as mean, standard deviation, maximum correction, and Sharpe ratio are calculated to get a comprehensive risk and return profile of the Chinese equity market. Chinese equity market returns fluctuate between -26% and 28%, showing a peak and thick tail distribution. The kurtosis is 4.45, the highest among the three countries. The skewness is 0.05, and the distribution is slightly positive skewness. From the perspective of average return, the monthly average return of China's equity market is 0.89%, and the annual average return is 10.65%. The standard deviation of the monthly average return is 10.65%, and the standard deviation of the annual average return is 27.4%. In addition, the most significant retracement rate for the monthly data was 42.34%, which occurred in 2009, and the most considerable retracement rate for the overall sample daily data was 81.8%. Finally, assuming a risk-free interest rate of zero, the Sharpe ratio for the Chinese equity market is 0.11 per month and 0.39 per year.

2.2. Equity Market in Japan

As a developed country, Japan has also had periods of significant volatility in its equity market over the past 20 years.

The bursting of the dot-com Bubble (2000): The bursting of the global dot-com bubble in the early 2000s impacted the NKY index. The cooling of speculative enthusiasm in technology stocks caused the index to fall sharply.

Global Financial Crisis (2008): The global financial crisis of 2008 had a severe impact on the new Open Source Index. The market turmoil, the credit crunch, and the global recession caused the index to fall sharply, hitting a low of around 7,000 points.

Great East Japan Earthquake (2011): In March 2011, a powerful earthquake and tsunami struck Japan, resulting in an accident at the Fukushima nuclear power plant. The disaster greatly impacted Japan's economy and financial markets, including a sharp drop in the NKY index.

The global economic slowdown and Chinese equity market Crash (2015): The Chinese equity market crash of mid-2015 and early 2016, combined with the slowdown in global economic growth, had a significant impact on Japan’s equity market.

COVID-19 pandemic (2020): In early 2020, the global outbreak of the COVID-19 pandemic caused a global economic recession and significant market volatility. The NKY index also fell sharply but gradually recovered with government and central bank interventions and progress in vaccine development.

Overall, the Japanese equity market maintained a slow upward trend. From January 1, 2000, to October 27, 2022, the NKY index rose from 18,941 points to 39,126 points, roughly doubling. The study also looked at the monthly returns of the equity market in Japan between 2000 and 2022. Japan's equity returns have fluctuated between -24% and 16%, showing a slight spike distribution and a slight fat tail. The kurtosis is 3.79, the smallest of the three countries, and the skewness is -0.48, indicating a negative distribution skewness. In terms of average returns, the average monthly return of the Japanese equity market is 0.41%, and the average annual return is 4.87%. The standard deviation of the average monthly return is 5.46%, and the standard deviation of the average annual return is 18.9%. In addition, the most significant retracement of the monthly data was 16.29%, which occurred in 2010, and the most significant retracement of the daily data for the overall sample was 61.4%. Finally, given

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that the risk-free rate is zero, the Sharpe ratio for the Japanese equity market is 0.07 every month and 0.26 on an annual basis.

2.3. Equity Market in the UK

The UK equity market has also experienced periods of significant volatility over the past 20 years.

Bursting of the dot-com Bubble (2001): The bursting of the dot-com bubble harmed the UKX. The London Stock Exchange has introduced critical criteria for listing on TechMARK, requiring companies to demonstrate a high level of innovation and significant investment in research and development. Industry, scale, and location are not mandatory requirements for listing.

Global Financial Crisis (2008-2009): After the global financial crisis, the UKX index experienced a sharp decline and fell to a low of around 4,000 points in early 2009. The crisis has had a profound impact on the global economy, as well as equity markets around the world.

Brexit Referendum (2016): The United Kingdom's decision to hold a referendum on its membership of the European Union caused uncertainty and volatility in the markets. The Brexit process and related negotiations have had an impact on the UKX index, causing it to temporarily fall as investors react to uncertainty over the UK's exit from the EU.

COVID-19 Pandemic (2020): The COVID-19 pandemic has had a profound impact on global financial markets, including the UKX Index. In the early stages of the pandemic, the index experienced significant declines due to lockdown measures and economic disruptions. However, with the implementation of government and central bank interventions and progress in vaccine research and development, the index gradually recovered and reached a higher level.

Overall, the UK equity market maintained a relatively fast-rising trend. From January 1, 2000, to October 27, 2022, the UKX index rose from 6,930 points to 15,259 points, an increase of 1.2 times. The study also looked at the monthly returns of the equity market in the UK between 2002 and 2022. Stock returns in the UK fluctuate between -13% and 15%, showing a thick-tailed peak distribution with a kurtosis of 4.09 and a skewness of -0.57, indicating a slightly negative skewness of the distribution. In terms of average returns, the UK equity market has an average monthly return of 0.4% and an average annual return of 4.84%. The standard deviation of the average monthly return is 3.9%, and the standard deviation of the average annual return is 13.51%. In addition, the largest retracement in the monthly data was 17.73%, which occurred in 2008, and the largest retracement in the overall sample of daily data was 54%. Assuming a risk-free interest rate of 0, the Sharpe ratio for the UK equity market is 0.1 per month and 0.39 per year.

2.4. Differences and possible causes of the equity market in three countries

On the whole, these data reflect the characteristics of the economic development of various countries. As a developing country, the monthly return rate of Chinese stocks is 0.89%, and the annual return rate is 10.65%, which is much higher than that of developed countries, the United Kingdom and Japan. At the same time, as a new and less mature market, the standard deviation of the Chinese equity market is correspondingly much higher than that of the UK and Japan. This is evident from the distribution of monthly equity returns, where China has the highest kurtosis, indicating a higher number of outliers.

However, China is the only one of the three countries with a positively skewed distribution, meaning the monthly equity return pattern is below the median, indicating a higher investment risk compared to Japan and the UK. Regarding the biggest retracements, China experienced a dramatic 42.34% decline in August 2009, and the overall retracements were also more volatile. Interestingly, some events that had a significant impact on the Chinese equity market, such as the equity market crash of 2015-2016, had a significant impact on the maximum retracement in the corresponding

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month. On the other hand, events such as Brexit and the earthquake in Japan have led to large daily retracements, but monthly observations do not show significant long-term effects.

One of the reasons for the greater volatility in China's equity market compared with the UK and Japan may be the difference in funding sources. At present, there is much speculative investment in China, especially during the bull market, when a large number of investors make short-term trades to get quick profits. As a result, any market correction or market-moving event can easily trigger panic selling, causing stock prices to fall sharply. The impact on equity return expectations could also lead to a sharp market crash.

The UK and Japan, on the other hand, have substantial and mature pension systems, with considerable amounts of money flowing into pension funds each month and each year. These pension funds are an important source of funding for its equity market. The steady inflow of funds helps mitigate short-term market volatility caused by fluctuating liquidity. These pension funds typically employ long-term investment strategies to meet their pension obligations over several decades. This long-term approach reduces their sensitivity to short-term market fluctuations and contributes to the relative stability of the equity market. In addition, a new trend is for individuals to have more control over pension funds rather than handing them over to fund companies. Many people choose to invest their money regularly (such as dollar-cost averaging), minimizing the impact of short-term equity market fluctuations on their investments. As a result, China's equity markets tend to experience more volatile swings than those in the UK and Japan.

3. Data and Methodology

3.1. Data description

Our sample includes monthly data from January 2000 to September 2022 on stock market returns for three countries: China, Japan, and the United Kingdom. To study the effect of macroeconomic variables on stock market returns, I collected several variables that may affect stock prices from January 2000 to September 2022, including the expected unemployment rate, the balance of trade, terms of trade, and so on. To conduct better research, I pre-processed the collected variables, removed the missing values and outliers in the variables, and screened and standardized the variables. First, I performed stability tests on these variables and took the differencing approach to make non-stationary variables stationary. Since I am studying monthly stock returns, I exclude those with an update frequency of 2 months and above from these variables. I standardized these variables to visualize their impact on future stock price expectations.

3.2. Model design

Since it is necessary to observe the impact of macroeconomic variables on the stock market return over a long period to study the prediction of these variables on the future stock return, I use the method of time series analysis and the linear regression model to analyze the macroeconomic variables and stock return data used in the study from 2000 to 2022. In this study, the dependent variable measures the impact of macroeconomic variables on stock returns and then forecasts the stock return rate in the future. Therefore, stock returns for the next month are chosen as the explanatory variable. The explanatory variables selected in this study are stable and have a frequency of update within two months in China, Japan, and the United Kingdom. These include trade balance, terms of trade, foreign exchange volume, and so on. I conducted a regression analysis of the explained variables for each country. Therefore, the model of this paper is as follows:

$$\text{Return}_{t+1} = \beta_0 + \beta_1 X_{it} + u_{it} \quad (1)$$

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where X_{it} represents the selected macroeconomic variables, $Return_{t+1}$ is the dependent variable, which is the next month's stock market returns, and u_{it} is the residual term.

4. The Influence of Diversification

4.1. The benefits of diversification

To explore the effect of diversification on returns, I assume an investor uses a simple equal-weight approach. This investor would invest in two or three countries. For instance, he might invest 50% of his money in the Chinese stock market and 50% in the UK stock market. This approach results in four different portfolios: half in China and half in Japan, half in China and half in the UK, half in Japan and half in the UK, and one-third in each of China, Japan, and the United Kingdom. From 2000 to 2022, I calculate the monthly stock returns for these portfolios. Based on these returns, the distribution of stock returns in each country can be plotted, and their kurtosis and skewness can be calculated. Furthermore, the average return, standard deviation, maximum retracement, and Sharpe ratio can also be calculated.

By comparing this data to the situation in the previous section, where investments are made only in individual countries, I can explore whether there is an advantage to a diversified investment strategy. To facilitate the study, the above four portfolios are named Group A, Group B, Group C, and Group D in the above order.

First, for Group A, the kurtosis of monthly stock returns is 5.01, and the skewness is -0.66, showing a slightly negative skewness distribution. In terms of average returns, the average monthly return is 0.8%, and the average annual return is 9.62%. The standard deviation of the average monthly return is 5.34%, and the standard deviation of the average annual return is 18.49%. In addition, the monthly maximum retracement of the Group A stock market was 22.49%, and the maximum retracement of the overall sample of daily data was 72.91%. Finally, given that the risk-free rate is 0, the Sharpe ratio for the Group A stock market is 0.15 every month and 0.52 on an annual basis.

Then, for Group B, the kurtosis of monthly stock returns is 6.42, and the skewness is -0.13, showing a slightly negative skewness distribution. In terms of average returns, the average monthly return is 0.64%, and the average annual return is 7.63%. The standard deviation of the average monthly return is 4.24%, and the standard deviation of the average annual return is 14.7%. In addition, the monthly maximum retracement of the Group B stock market was 22.72%, and the maximum retracement of the overall sample of daily data was 67.91%. Finally, given that the risk-free rate is 0, the Sharpe ratio for the Group B stock market is 0.15 every month and 0.52 annually.

In addition, for Group C, the monthly stock returns have a kurtosis of 4.17 and a skewness of -0.13, showing a slightly negatively skewed distribution. In terms of average returns, the average monthly return is 0.4%, and the average annual return is 4.84%. The standard deviation of the average monthly return is 4.18%, and the standard deviation of the average annual return is 14.47%. In addition, the monthly maximum retracement of the Group C stock market is 18.5%, and the maximum retracement of the overall sample of daily data is 53.5%. Finally, given that the risk-free rate is 0, the Sharpe ratio for the Group C stock market is 0.1 every month and 0.33 annually.

Finally, for Group D (the only portfolio that invests in all three countries simultaneously), the monthly stock return has a kurtosis of 5.05 and a skew of -0.81, indicating a negative skew of the distribution. In terms of average returns, the average monthly return is 0.67%, and the average annual return is 8.09%. The standard deviation of the average monthly return is 4.33%, and the standard deviation of the average annual return is 15%. In addition, the monthly maximum retracement of the Group D stock market was 19.06%, and the maximum retracement of the overall sample of daily data was 64.27%. Finally, given that the risk-free rate is 0, the Sharpe ratio for the Group D stock market is 0.16 every month and 0.54 annually.

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To facilitate a direct comparison between the original strategy of investing only in individual countries and the new diversification strategy involving four portfolios, I will focus primarily on the Sharpe ratio as a key metric. The Sharpe ratio can be viewed as the ratio of the risk premium (excess return above the risk-free rate) to the standard deviation of the return. The higher the Sharpe ratio, the better the risk-adjusted return. This means the higher the return for each unit of risk taken. By examining the Sharpe ratio of both strategies, I can better understand the relative merits of the two approaches. It can be seen that the diversified investment strategy produced a higher Sharpe ratio, especially when diversified in all three countries, where the Sharpe ratio was the highest.

4.2. Possible reasons

Diversification across multiple national stock markets can deliver better returns, mainly because this strategy reduces the overall risk of the portfolio to some extent. This is because the stock markets of different countries are affected by various economic and political factors as well as industry and company characteristics, which can lead to different degrees of fluctuations and trends in different times and spaces. Therefore, when investors allocate funds in multiple national stock markets, they effectively reduce the influence of specific countries or industries, thus reducing the volatility of the overall portfolio.

Also, diversification helps capture investment opportunities on a global scale. The economic cycle and market performance of different countries may not be perfectly synchronized, and the stock market of some countries or regions may be in an upward phase while the stock market of others may be in a downward phase. By diversifying investments across multiple countries, investors have the opportunity to explore more investment possibilities from different market performances, thereby enhancing the potential return of their portfolio.

Mature stock markets, like those in the United States, European countries, and Japan, typically offer a stable economic and political environment, along with well-developed financial and pension systems. These factors contribute to the relative stability of these markets and make them suitable for long-term investment. By diversifying into these mature markets, investors can earn more reliable long-term returns.

5. Equity market returns prediction

5.1. Regression result analysis

In the regression analysis conducted for China, several variables were identified as significantly affecting stock market returns. The coefficient of the variable "TermsTrade" was positive and highly significant, indicating that an improvement in trade conditions leads to an increase in future stock returns. The coefficient of the variable "BEST_EPS" was also positive and highly significant, suggesting that higher corporate earnings lead to elevated investor expectations for future returns. Conversely, the coefficient of "PX_TO_CASH_FLOW" was negative and highly significant, implying that as companies possess more cash flows relative to their market value, market estimations of their stock returns become more optimistic, aligning with the Discounted Cash Flow (DCF) model. The coefficients of "Fixed Income Leveraged Positioning" and "Fixed Income Uncertainty" were negative. In contrast, the coefficient of "Fixed Income Real Money Positioning" was positive, and all three variables had a significant impact on stock returns. This indicates that during periods of increased risk in the bond market, investors tend to shift towards the stock market, driving up stock prices. Conversely, when interest in the bond market increases, stock prices tend to decrease.

In the regression analysis for Japan, several variables were found to influence stock market returns significantly. The positive and highly significant coefficients of "INDX_ADV_VOL" and "Equity Index Real Money Positioning" indicate that heightened investor interest and increased trading

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volume lead to higher expected stock returns. Additionally, the positive coefficients of "EST_PX_CASHFLOW_FY3_AGGT", "EST_PX_EBITDA_FY3_AGGTE", and "EV_EST_EBITDA_NEXT_YR_AGGTE" suggest that companies with higher cash flows tend to have more optimistic market estimations of stock returns, consistent with the DCF model. The negative coefficient of "PX_TO_CASH_FLOW" also had a significant impact on stock returns.

Surprisingly, in the regression analysis for the United Kingdom, most of the selected variables showed minimal influence on stock market returns from 2000 to 2022. Notably, "CitiBroadREER" and "CitiNarrowREER" had positive and significant effects on future stock returns, indicating that an increase in exchange rates is favorable for stock price appreciation. Apart from these variables, only "EconSurprise", representing the difference between economic data releases and market expectations, had a significant positive impact on stock prices.

5.2. Comparison of findings in three countries

From the regression analysis of the macroeconomic variables for each of the three countries on the stock market returns for the following month, it can be seen that the regression results for the Chinese stock market have the most variables that are significant, i.e., the most macroeconomic variables that will affect the returns of the Chinese stock market when they fluctuate, which is in line with the aforementioned fact that the Chinese stock market has the highest volatility in terms of monthly returns. The possible reason for this is that as an immature capital market, the Chinese stock market is not deep enough to absorb macro shocks. At the same time, many Chinese investors take a speculative approach to stock trading, and they are more likely to be influenced by market sentiment and behavior. Finally, China's unique political system makes the government's influence on the stock market very strong, so stock market returns are more likely to fluctuate widely in response to changes in government policy.

In contrast, the UK stock market is relatively little affected by macroeconomic changes, with only three variables showing not particularly strong significance. This outcome may be attributed to the UK's status as a mature economy with developed capital markets. Mature capital markets typically feature diverse participants, including individual investors, institutional investors, and international investors. These participants are often well-educated and clearly understand risks and returns, allowing them to respond more rationally to market fluctuations. The high liquidity of the capital and mature government regulations also enables the market to absorb the impacts of macroeconomic shocks better.

Finally, Japan, a developing country whose capital market is not as deep as the UK's, is in between China and the UK regarding its exposure to macroeconomic changes.

6. Conclusion

Through an in-depth study of the 20-year historical performance of the stock markets in China, Japan, and the United Kingdom and the impact of macroeconomic factors on stock market returns, we draw the following conclusions:

Because of the different levels of economic development, stock market returns in different countries show different characteristics, and the stock markets of China, Japan, and the UK show different characteristics over the past 20 years. China's stock market is relatively more volatile, with a kurtosis in the distribution of monthly returns, indicating the presence of more extreme volatility. In contrast, the stock markets of the UK and Japan are relatively more stable, with smoother return distributions.

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A diversification strategy is very effective in reducing overall portfolio risk and increasing risk-adjusted returns. Diversifying funds across multiple national stock markets can mitigate the impact of specific countries or sectors, thereby reducing portfolio volatility.

Macroeconomic factors in different countries have different impacts on stock market returns. For example, stock market returns in China are sensitive to real exchange rate movements, while stock market returns in the UK are positively affected by exchange rate movements. This suggests that macroeconomic variables significantly impact stock market performance, but the exact impact varies from country to country. This emphasizes the need to consider a combination of country characteristics and the impact of macroeconomic factors when forecasting future stock market returns.

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Appendix A: Variable Definitions.

Variables	Description
Main variables	
Monthly return	We use the monthly return of the stock market as the main explained variable.
Log bid rank	*Log bid rank* equals the natural logarithm of (1 plus the number of previous IPO participations before the current IPO of each institution on the same day).
Macroeconomic variable	

DOI: 10.54254/2754-1169/91/20241117

1m FX MOM	One-month Foreign Exchange Momentum, measuring the change in foreign exchange rates over one month.
1mFwdYield	The one-month forward yield represents the expected yield over the next month.
3y FX MOM	Three-year Foreign Exchange Momentum, measuring the change in foreign exchange rates over three years.
BEST_EPS	Best Earnings Per Share (EPS) indicates the optimal level of earnings per share for a company.
BEST_PX_BPS_RATIO	Best Price-to-Book Value Per Share Ratio, indicating the ratio of a company's stock price to its book value per share.
BEST_PX_CPS_RATIO	Best Price-to-Cash Flow Per Share Ratio, indicating the ratio of a company's stock price to its cash flow per share.
BEST_PX_SALES_RATIO	Best Price-to-Sales Ratio, indicating the ratio of a company's stock price to its sales revenue.
BigMac	Big Mac Index is a tool measuring currency exchange rates relative to the price of a Big Mac from McDonald's.
BudgetBalanceFcast	Budget Balance Forecast, indicating the expected balance between government revenues and expenditures.
CitiBroadREER	Citigroup Broad Real Effective Exchange Rate, measuring a country's currency relative to a basket of currencies.
Citi-Broad-REER/ToT Z-score	Z-score of Citigroup Broad Real Effective Exchange Rate relative to Terms of Trade.
CitiNarrowREER	Citigroup Narrow Real Effective Exchange Rate, measuring a country's currency relative to a narrower basket of currencies.
Citi-Narrow-REER/ToT Z-score	Z-score of Citigroup Narrow Real Effective Exchange Rate relative to Terms of Trade.
CUR_RATIO	Current Ratio, measuring a company's liquidity by comparing short-term liabilities to short-term assets.
EconSurprise	Economic Surprise Index, measuring the difference between released economic data and expected values.
Equity Index Leveraged Positioning	Positioning of leveraged funds in equity indices, indicating the extent of leveraged investments in stock index markets.
Equity Index Real Money Positioning	Positioning of real money funds in equity indices, indicating the extent of investments by real money in stock index markets.
Equity Index Retail Positioning	Retail positioning in equity indices, indicating the extent of investments by retail investors in stock index markets.
Equity Index Total Positioning	Total positioning in equity indices, representing the overall level of investments by all investors in stock index markets.
Equity Index Uncertainty	Uncertainty in equity indices, measuring the market's uncertainty about the future trends of stock index markets.
EST_PX_CASHFLOW_FY3_AGGTE	Estimated Price to Cash Flow for the Fiscal Year 3, aggregated total.
EST_PX_EBITDA_FY3_AGGTE	Estimated Price to Earnings Before Interest, Taxes, Depreciation, and Amortization for the Fiscal Year 3, aggregated total.
ETF Sharpe	Exchange-Traded Fund (ETF) Sharpe Ratio, a measure of risk-adjusted return for ETFs.
EV_EST_EBITDA_NEXT_YR_AGGTE	Enterprise Value to Estimated Earnings Before Interest, Taxes, Depreciation, and Amortization for the next year, aggregated total.
Fixed Income Leveraged Positioning	Positioning of leveraged funds in the fixed-income market, indicating the extent of leveraged investments in fixed-income securities.
Fixed Income Real Money Positioning	Positioning of real money funds in the fixed-income market, indicating the extent of investments by real money in fixed-income securities.
Fixed Income Total Positioning	Total positioning in the fixed-income market, representing the overall level of investments by all investors in fixed-income securities.
Fixed Income Uncertainty	Uncertainty in the fixed-income market, measuring the market's uncertainty about the future trends of fixed-income securities.
IDX_EST_DVD_YLD	Index Estimated Dividend Yield, representing the estimated yield from dividends for a given index.

DOI: 10.54254/2754-1169/91/20241117

INDX_ADV_VOL	Index Advanced Volatility measures the volatility of a given index.
InfConsensusChg	Inflation Consensus Change indicates the change in consensus expectations for inflation.
InfSurprise	Inflation Surprise Index, measuring the difference between released inflation data and expected values.
IVOL_MONEYNESS	Implied Volatility Moneyness a measure of how the current price of an option compares to its strike price.
JPM_CPI_REER	J.P. Morgan Consumer Price Index Real Effective Exchange Rate measures a country's currency relative to a basket of currencies using the Consumer Price Index.
JPM_PPI_REER	J.P. Morgan Producer Price Index Real Effective Exchange Rate measures a country's currency relative to a basket of currencies using the Producer Price Index.
JPM-CPI-REER/ToT Z-score	Z-score of J.P. Morgan Consumer Price Index Real Effective Exchange Rate relative to Terms of Trade.
JPM-PPI-REER/ToT Z-score	Z-score of J.P. Morgan Producer Price Index Real Effective Exchange Rate relative to Terms of Trade.
LONG_TERM_PRICE_EARNINGS_RATIO	Long-term price-earnings Ratio, representing the ratio of a company's stock price to its long-term earnings.
OPER_MARGIN	Operating Margin indicates the percentage of revenue that remains after covering variable costs of production.
PCT_MEMB_MACD_GT_BASE_LINE_0	The percentage of members with MACD (Moving Average Convergence Divergence) greater than zero indicates the percentage of a group with bullish short-term momentum.
PPP Z-score	Purchasing Power Parity Z-score, measuring the deviation of the exchange rate from its theoretical value based on the relative price levels of two countries.
PROF_MARGIN	Profit Margin indicates the percentage of revenue that represents profit.
PX_TO_CASH_FLOW	Price to Cash Flow Ratio, representing the ratio of a company's stock price to its cash flow.
PX_TO_TANG_BV_PER_SH	Price to Tangible Book Value Per Share Ratio, representing the ratio of a company's stock price to its tangible book value per share.
RSI_30D	Relative Strength Index (RSI) over a 30-day period, measuring the speed and change.
SELL Sentiment	Description: Sentiment related to selling activities, reflecting the overall negative sentiment or inclination toward selling in the market.
TermsTrade	Description: Terms of Trade, measuring the relative value of a country's exports to its imports.
TOT_DEBT_TO_EBITDA	Description: Total Debt to Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA) Ratio, indicating the leverage of a company by comparing its total debt to its earnings.
TradeBalance	Description: Trade Balance, representing the difference between a country's exports and imports.
UnempFcast	Description: Unemployment Forecast, indicating the predicted level of unemployment.
vol-adj carry	Description: Volatility-adjusted carry is a measure considering the interest rate differential adjusted for market volatility.

DOI: 10.54254/2754-1169/91/20241117

1. Table 1 Return analysis of different investment portfolios

In this table, we report the summary statistics of the main stock indexes in China (SHSZ300), Japan (NKY Index), and the UK (UKX Index). In addition, I drew statistical charts on the stock market returns of these three countries and calculated their skewness and kurtosis. In panel A, I report statistics on a monthly basis. In panel B, I report statistics on a yearly basis and Max DD over the full sample time. In addition, I created four experimental groups to study the returns when the funds were invested in any two of these three countries in equal proportions to study the impact of diversification on returns. In panel C, I reported the summary statistics on diversification on a monthly basis. In panel D, I report all statistics on a yearly basis and Max DD over the full sample time of diversification.

	N	Mean	Std	Kur	Skew	Max DD	Sharpe Ratio
Panel A:							
SHSZ300	249	0.89%	10.65%	1.45	0.05	42.34%	0.11
NKY Index	273	0.41%	4.87%	0.79	-0.48	16.29%	0.07
UKX Index	273	0.40%	4.84%	1.09	-0.57	17.73%	0.10
Panel B:							
SHSZ300	249	10.65%	27.40%	1.45	0.05	81.81%	0.39
NKY Index	273	4.87%	18.90%	0.79	-0.48	61.40%	0.26
UKX Index	273	4.84%	13.51%	1.09	-0.57	54.00%	0.36
Panel C:							
SHSZ300 +NKY	249	0.80%	5.34%	2.01	-0.66	22.49%	0.15
SHSZ300 +UKX	249	0.64%	4.24%	3.42	-0.13	22.72%	0.15
NKY+UKX	273	0.40%	4.18%	1.17	-0.65	18.50%	0.10
SHSZ300 +UKX+NKY	249	0.67%	4.33%	2.05	-0.81	19.06%	0.16
Panel D:							
SHSZ300 +NKY	249	9.62%	18.49%	2.01	-0.66	72.91%	0.52
SHSZ300 +UKX	249	7.63%	14.70%	3.42	-0.13	67.91%	0.52
NKY+UKX	273	4.84%	14.47%	1.17	-0.65	53.50%	0.33
SHSZ300 +UKX+NKY	249	8.09%	15.00%	2.05	-0.81	64.27%	0.54

DOI: 10.54254/2754-1169/91/20241117

2. Table 2 The Influence of macroeconomic variables on stock market returns

In this table, I used time series analysis to test the impact of changes in macroeconomic variables on stock market prices. In Table A, I show the impact of macroeconomic changes on the Chinese stock market. In Table B, I show the impact of macroeconomic changes on the UK stock market, and in Table C, I show the impact of macroeconomic changes on the Japanese stock market. The Variable definitions are provided in Appendix A. We use ***, **, and * to denote significance at the 1%, 5%, and 10% levels (two-sided), respectively.

Variables	Coefficient	T-Stat	P-Value	R-Square
Panel A:				
TradeBalance	0.001	0.12	0.91	0.01%
EconSurprise	0.005	0.93	0.35	0.35%
TermsTrade	-0.035***	-3.81	0.00	5.61%
InfSurprise	-0.008	-1.54	0.13	0.96%
BigMac	-0.047 *	-1.93	0.06	1.50%
JPM_CPI_REER	-0.031	-1.61	0.11	1.05%
JPM_PPI_REER	-0.001	-0.17	0.87	0.01%
UnempFcast	-0.006*	-1.67	0.10	1.13%
Fixed Income Uncertainty	0.01 **	2.14	0.03	1.85%
Fixed Income Total Positioning	0.007	0.87	0.38	0.31%
Fixed Income Leveraged Positioning	0.016**	2.12	0.04	1.81%
Fixed Income Real Money Positioning	-0.023**	-2.38	0.02	2.27%
BEST_EPS	0.027***	4.62	0.00	8.05%
BEST_PX_BPS_RATIO	0.001	0.62	0.53	0.16%
BEST_PX_CPS_RATIO	0.001	0.38	0.70	0.06%
BEST_PX_SALES_RATIO	0.018**	2.40	0.02	2.31%
CUR_RATIO	-0.003	-1.54	0.12	0.97%
EST_PX_CASHFLOW_FY3_AGGTE	-0.002	-0.39	0.70	0.06%
EST_PX_EBITDA_FY3_AGGTE	-0.001	-0.15	0.88	0.01%
EV_EST_EBITDA_NEXT_YR_AGGTE	-0.002	-0.35	0.73	0.05%
IDX_EST_DVD_YLD	0.000	-0.10	0.92	0.00%
INDX_ADV_VOL	-0.005	-0.98	0.33	0.39%
LONG_TERM_PRICE_EARNINGS_RATI	0.004	0.73	0.46	0.22%
OPER_MARGIN	0.004	0.81	0.42	0.27%
PCT_MEMB_MACD_GT_BASE_LINE_0	0.007	1.45	0.15	0.86%
PROF_MARGIN	0.000	-0.06	0.95	0.00%
PX_TO_CASH_FLOW	-0.014***	-2.79	0.01	3.09%
PX_TO_TANG_BV_PER_SH	0.003	0.52	0.61	0.11%
RSI_30D	0.007	1.35	0.18	0.74%
TOT_DEBT_TO_EBITDA	-0.003	-0.59	0.56	0.14%
1m FX MOM	0.003	0.61	0.54	0.15%
3y FX MOM	-0.003	-0.52	0.61	0.11%
vol-adj carry	0.010**	1.99	0.05	1.60%
ETF Sharpe	0.006	1.22	0.22	0.61%
PPP Z-score	0.007	1.23	0.22	0.61%
Citi-Broad-REER/ToT Z-score	0.008	1.46	0.15	0.87%
Citi-Narrow-REER/ToT Z-score	0.008	1.48	0.14	0.88%
JPM-CPI-REER/ToT Z-score	0.007	1.38	0.17	0.78%
JPM-PPI-REER/ToT Z-score	0.009*	1.66	0.10	1.12%
Panel B:				
TradeBalance	-0.003	-1.04	0.30	0.40%
EconSurprise	0.004*	1.71	0.09	1.07%
TermsTrade	-0.002	-0.91	0.36	0.31%

DOI: 10.54254/2754-1169/91/20241117

InfSurprise	-0.002	-0.65	0.51	0.16%
InfConsensusChg	-0.001	-0.33	0.74	0.04%
CitiBroadREER	0.004*	1.89	0.06	1.31%
CitiNarrowREER	0.005**	2.07	0.04	1.57%
BudgetBalanceFcast	-0.001	-0.73	0.47	0.20%
Equity Index Uncertainty	0.002	1.48	0.14	0.81%
Fixed Income Uncertainty	0.002	0.98	0.33	0.36%
Equity Index Leveraged Positioning	-0.003	-0.78	0.44	0.23%
Equity Index Total Positioning	-0.003	-0.71	0.48	0.19%
Equity Index Real Money Positioning	0.001	0.26	0.80	0.02%
Equity Index Retail Positioning	-0.002	-0.64	0.52	0.15%
SELL Sentiment	0.001	1.28	0.20	0.60%
BEST_PX_BPS_RATIO	0.003	1.12	0.26	0.47%
BEST_PX_CPS_RATIO	0.002	0.56	0.58	0.11%
BEST_PX_SALES_RATIO	0.001	0.48	0.63	0.08%
EST_PX_CASHFLOW_FY3_AGGTE	0.001	0.52	0.60	0.10%
EST_PX_EBITDA_FY3_AGGTE	0.003	1.18	0.24	0.52%
EV_EST_EBITDA_NEXT_YR_AGGTE	0.001	0.43	0.67	0.07%
IDX_EST_DVD_YLD	0.001	0.27	0.78	0.03%
INDX_ADV_VOL	0.001	0.50	0.62	0.09%
LONG_TERM_PRICE_EARNINGS_RATI	0.002	0.92	0.36	0.32%
OPER_MARGIN	0.002	0.84	0.40	0.26%
PCT_MEMB_MACD_GT_BASE_LINE_0	0.001	0.61	0.55	0.14%
PROF_MARGIN	0.002	0.82	0.41	0.25%
PX_TO_CASH_FLOW	-0.002	-1.06	0.29	0.42%
PX_TO_TANG_BV_PER_SH	0.001	0.33	0.74	0.04%
RSI_30D	-0.002	-0.67	0.51	0.17%
TOT_DEBT_TO_EBITDA	0.002	1.62	0.11	0.97%
1m FX MOM	0.003	1.16	0.25	0.50%
3y FX MOM	0.000	0.11	0.91	0.00%
vol-adj carry	0.001	0.22	0.82	0.02%
ETF Sharpe	0.001	0.49	0.63	0.09%
PPP Z-score	0.004	1.56	0.12	0.90%
Citi-Broad-REER/ToT Z-score	0.001	0.60	0.55	0.13%
Citi-Narrow-REER/ToT Z-score	0.002	0.63	0.53	0.15%
JPM-CPI-REER/ToT Z-score	0.002	0.65	0.52	0.16%
JPM-PPI-REER/ToT Z-score	0.001	0.52	0.60	0.10%
Panel C:				
TradeBalance	-0.003	-0.77	0.45	0.22%
EconSurprise	0.001*	0.22	0.82	0.02%
TermsTrade	-0.001	-0.37	0.71	0.05%
InfSurprise	-0.006	-1.73	0.08	1.10%
InfConsensusChg	-0.004	-1.33	0.18	0.66%
CitiBroadREER	-0.005	-1.36	0.17	0.69%
CitiNarrowREER	-0.003	-1.05	0.30	0.41%
JPM_CPI_REER	-0.004	-1.35	0.18	0.67%
JPM_PPI_REER	-0.004	-1.16	0.25	0.49%
1mFwdYield	-0.001	-0.34	0.73	0.04%
Fixed Income Uncertainty	0.001	0.58	0.56	0.13%
Equity Index Uncertainty	0.005**	2.47	0.01	2.22%
Equity Index Total Positioning	0.005	0.97	0.33	0.35%
Equity Index Leveraged Positioning	0.000	-0.08	0.93	0.00%

DOI: 10.54254/2754-1169/91/20241117

Equity Index Real Money Positioning	0.011**	2.09	0.04	1.60%
Equity Index Retail Positioning	-0.007	-1.34	0.18	0.66%
BEST_EPS	0.004	0.96	0.34	0.34%
BEST_PX_BPS_RATIO	0.009**	2.15	0.03	1.68%
BEST_PX_CPS_RATIO	0.007*	1.75	0.08	1.13%
BEST_PX_SALES_RATIO	0.001	1.07	0.29	0.42%
EST_PX_CASHFLOW_FY3_AGGTE	0.009 **	2.12	0.04	1.64%
EST_PX_EBITDA_FY3_AGGTE	0.009**	2.08	0.04	1.59%
EV_EST_EBITDA_NEXT_YR_AGGTE	0.008 **	2.06	0.04	1.55%
IDX_EST_DVD_YLD	0.001	0.61	0.54	0.14%
INDX_ADV_VOL	0.011***	2.99	0.00	3.21%
IVOL_MONEYNESS	0.004	1.41	0.16	0.73%
LONG_TERM_PRICE_EARNINGS_RATI	-0.003	-1.17	0.24	0.51%
PCT_MEMB_MACD_GT_BASE_LINE_0	0.006*	1.94	0.05	1.38%
PX_TO_CASH_FLOW	-0.006 *	-1.84	0.07	1.25%
PX_TO_TANG_BV_PER_SH	0.000	0.11	0.91	0.00%
RSI_30D	0.006*	1.87	0.06	1.29%
1m FX MOM	-0.003	-0.86	0.39	0.27%
vol-adj carry	0.006*	1.68	0.09	1.04%
PPP Z-score	0.003	0.88	0.38	0.29%
Citi-Broad-REER/ToT Z-score	-0.002	-0.47	0.64	0.08%
Citi-Narrow-REER/ToT Z-score	-0.002	-0.45	0.65	0.08%
JPM-PPI-REER/ToT Z-score	-0.001	-0.34	0.73	0.04%