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Stocks and inflation - It's all about the interest rate

by KAI LEHMANN

Abstract

The extensive support measures taken by governments and central banks in the wake of the corona pandemic could lead to higher inflation rates in the medium to long term. In such an environment, equities are considered an attractive investment class. Rightly so? This study examines the empirical correlation between the development of the stock market and inflation, taking into account the interest rate level. For this purpose, historical stock market returns within different inflation phases are examined. It is shown that the nominal interest rate in particular is of decisive importance.

Zusammenfassung

Die umfangreichen Unterstützungsmaßnahmen der Staaten und Notenbanken im Zuge der Corona-Pandemie könnten mittel- bis langfristig zu höheren Inflationsraten führen. Aktien gelten in einem solchen Umfeld als attraktive Anlageklasse. Zurecht? Im Rahmen der vorliegenden Studie wird untersucht, welcher empirische Zusammenhang zwischen der Entwicklung der Aktienmärkte und der Inflation unter Berücksichtigung des Zinsniveaus besteht. Hierzu werden historische Aktienmarktrenditen innerhalb verschiedener Inflationsphasen untersucht. Es zeigt sich, dass insbesondere dem Nominalzins eine entscheidende Bedeutung zukommt.



Motivation

The corona pandemic will continue to leave its mark on the capital markets well beyond 2020. Admittedly, looking at the index levels at present, one is inclined to believe that the crisis has largely been overcome. However, the major stock indices have risen sharply, not least as a result of various fiscal and monetary policy stimuli and not because the earnings prospects of companies have suddenly improved. However, as the stock market reflects the future, the rapid rise in share prices also reflects a belief in the effectiveness of the support measures and thus in the stabilisation of earnings in the medium term. Beyond rising prices, however, there are also indications that the interventions could be accompanied by serious collateral damage: for example, the money supply in the major currency areas has risen significantly as a result of the support measures taken by governments and central banks (**Figure 1, left**). In the USA, the growth of cash in circulation and demand deposits (money supply M1) has amounted to 33.5% since the beginning of the year. According to the textbooks, this should sooner or later lead to rising inflation, as real goods production is not expected to follow this enormous money supply growth. The changed exchange ratio of money supply and goods would then cause the price of goods and services to rise.

The fact that the money supply is growing faster than real production is not a completely new observation, however, but has been the case for many years. For example, money supply growth in the USA has already been 11.0 % p.a. since 2010, in the euro zone 7.5 % p.a. and in Japan 5.7 % p.a., and thus far above the growth rates of the respective gross domestic product (GDP). On the surface, however, the inflation rate has so far not been affected by the enormous flood of money. If, however, instead of consumer prices (CPI), asset prices are taken into account, the expansion of the money supply is very evident. For example, the prices of tangible and financial goods in Germany have risen by 4.3 % annually since 2010. By ¹contrast, the official inflation rate was just 1.3% on average.

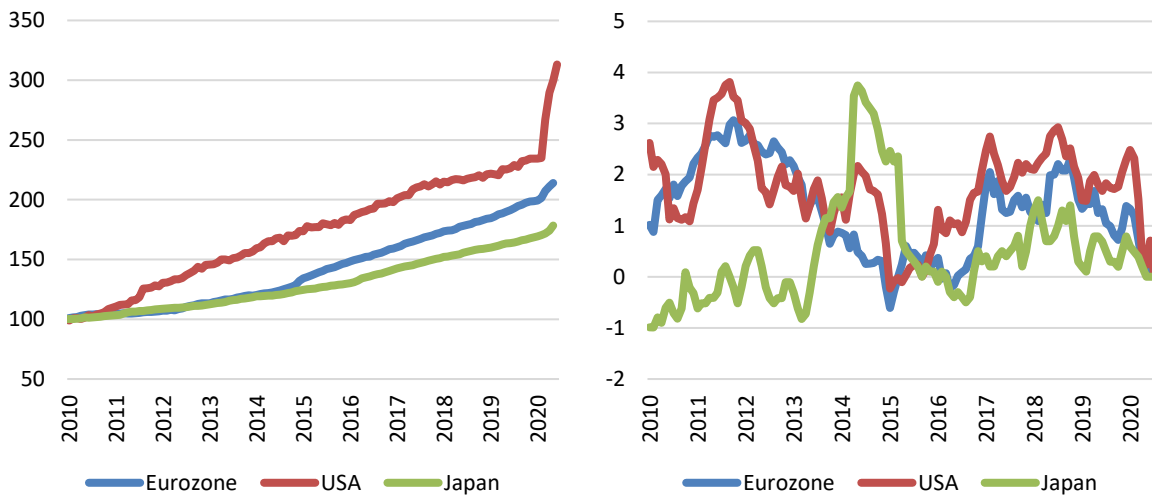
Recently, consumer prices even showed deflationary tendencies. Inflation rates in the above-mentioned currency areas have recently fallen to zero with great dynamism (**Figure 1, right**). This is probably due to the fact that the uncertainties about the medium to long-term economic effects of the corona crisis are not yet foreseeable, which is leading to reluctance to invest on the part of companies and, on the part of consumers, to consumer

¹ See Flossbach by Storch Research Institute, FvS Vermögenspreisindex Deutschland, available at: <https://www.flossbachvonstorch-researchinstitute.com/de/deutschland/>, as of August 2020.



restraint and an increase in the savings rate. In addition, energy prices have fallen sharply as a result of macroeconomic uncertainties.

Figure 1: Indexed developments of M1 money (left) and inflation rates in selected currency areas (right).*



*Past performance is not a reliable indicator of future performance.

Source: Refinitive, Flossbach from the Storch Research Institute, August 2020.

In the medium to long term, however, it seems quite likely that consumer prices will eventually be affected by the massive money overhang. In addition to the model-theoretical considerations of monetary expansion in excess of GDP growth, it should also be borne in mind that the recent sharp rise in budget deficits and steadily increasing national debt levels require a certain degree of inflation, so that the political will to counteract the threat of deflation is likely to be strong. In addition, in the light of recent experience, companies may be more inclined to become less dependent on international supply chains, which would also drive prices up due to the loss of comparative cost advantages.

From an investor's point of view, the question arises as to what investment strategy should be used to counter such a depreciation of money. Fixed-interest investments appear unattractive when inflation rates rise, as long as rising prices do not result in rising interest rates. But rising interest rates on fixed-term deposits or coupons for bondholders can also be accompanied by losses in real value. The recent rally in the gold price could reflect a loss of confidence in paper money that has begun in anticipation of rising inflation rates. However, if interest rates rise along with inflation, the opportunity cost of holding gold also rises, as it cannot pay coupons or dividends. For this



reason, in addition to real estate, shares are often seen as a suitable instrument with which it should be possible to preserve one's assets even in times of high inflation.

The present study will therefore examine the empirical relationship between the development of stock markets and inflation, taking into account the level of interest rates. For this purpose, historical stock market returns within different inflation phases will be examined in the further course of the study. First, however, it is necessary to work out the theoretical relationship between inflation and stock prices.

Equities and inflation - what does theory say?

In principle, the intrinsic value of a share (*fair value*) is derived from the present value of the expected free cash surpluses that a company will generate in the future (*free cash flows*). If the cash flows increase while interest rates (*i*) remain unchanged, the present value and thus the fair share price increases *ceteris paribus*. It is irrelevant whether the increases in cash flows are based on real growth or merely reflect inflation. However, this only applies as long as rising inflation rates do not result in rising interest rates. However, in order to achieve the objective of price stability, central banks would have to raise key interest rates at the latest when inflation exceeds 2% on a sustained basis.² This would reduce the present value of the series of payments and thus cause share prices to fall.

$$Fair\ Value = \sum \frac{Free\ Cashflow_t}{(1 + i)^t}$$

In contrast to fixed-interest bonds, whose coupons are always subject to inflation risk, *free cash flows are* inflation-indexed cash flows. If prices rise, sales revenues increase and, *ceteris paribus*, so do income and distributions. This assumes, however, that costs do not increase more than the revenues generated. Only then will the earnings situation and thus the ability to pay dividends keep pace with inflation. This depends to a large extent on the pricing power of the respective company and the elasticity of demand for products and services in the respective sector. For example, demand for basic foodstuffs and fuels is largely inelastic, while demand for luxury goods tends to decline sharply when prices rise.

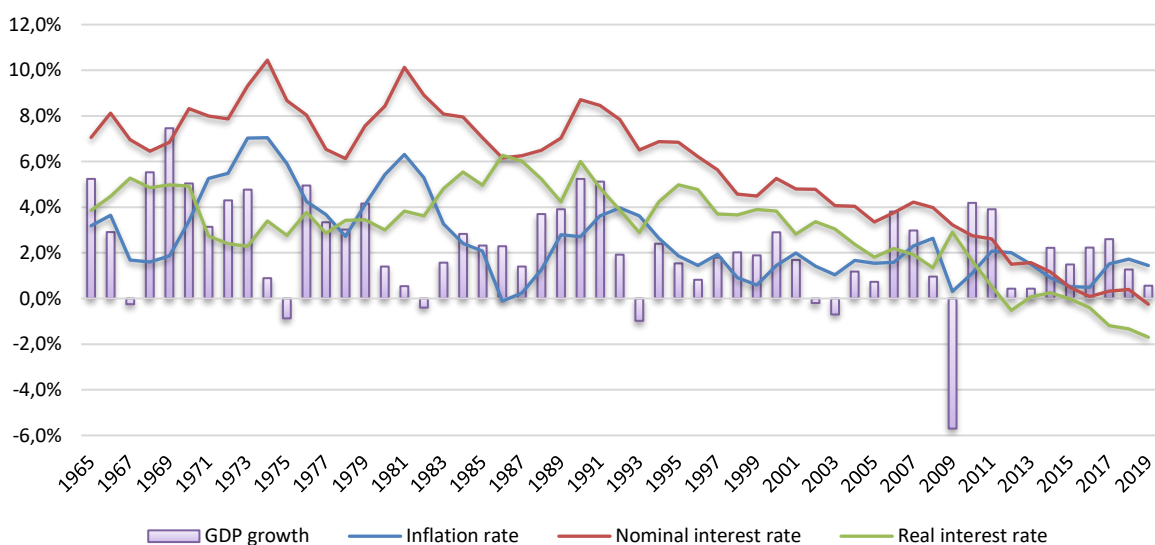
² Why the central banks believe that their objective of price stability at 2% inflation has been met: Federal Reserve: "*Why does the Federal Reserve aim for 2 percent inflation over time?*", available at: https://www.federalreserve.gov/faqs/economy_14400.htm, last accessed on 31 August 2020.



The capital intensity of the business model is also a significant factor. When investment needs are high, rising prices are reflected in the form of higher investment disbursements and are reflected in the income statement in the form of higher depreciation. But here, too, it depends on the individual case. If, for example, a company has a high proportion of high-quality land and buildings on its balance sheet, these should also be affected by inflation. As noted above, it has been clear in recent years that while the expansion of money supply has not been able to drive up consumer prices, it has driven up asset prices, which has strengthened the asset side of many corporate balance sheets, at least in nominal terms.

It should be borne in mind in these considerations that inflation is not an exogenous variable but is closely linked to economic developments. Looking back, high inflation rates are often accompanied by high GDP growth rates, as consumption and the labour market are robust and wage increases are easier to implement. For the same reasons, deflationary developments often occur during periods of recession. This in turn has an impact on the nominal interest rate, which follows the inflation rate with a slight lag (**figure 2, left**). As the figure shows, since the early 1990s the nominal interest rate in Germany has fallen much more sharply than the rate of inflation, so that the real interest rate has been negative for some years.

Figure 2: Inflation rate, nominal interest rate (10-year federal bond) Real interest rate (nominal interest rate minus inflation) and GDP growth in Germany since 1965.*



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Source: Refinitive, Flossbach from the Storch Research Institute, August 2020.



The decisive factor for share prices is that two forces are at work, inflation and nominal interest, which theoretically have the opposite effect on prices. High rates of inflation cause cash flows to rise in nominal terms, while high interest rates depress the cash value. If interest rates are higher, payments made far in the future make a comparatively smaller contribution to the intrinsic value of a share. If, on the other hand, interest rates fall below zero, the valuation model is thrown off course. Now, for a given cash flow, it appears to be favourable if the cash flows are generated as late as possible, as this increases their present value.

At first glance, the seemingly structural changes in these central adjusting screws do not result in any systematic differences in the observable DAX yields (Figure 2, right). The extent to which this statement stands up to a more in-depth analysis will be examined below.

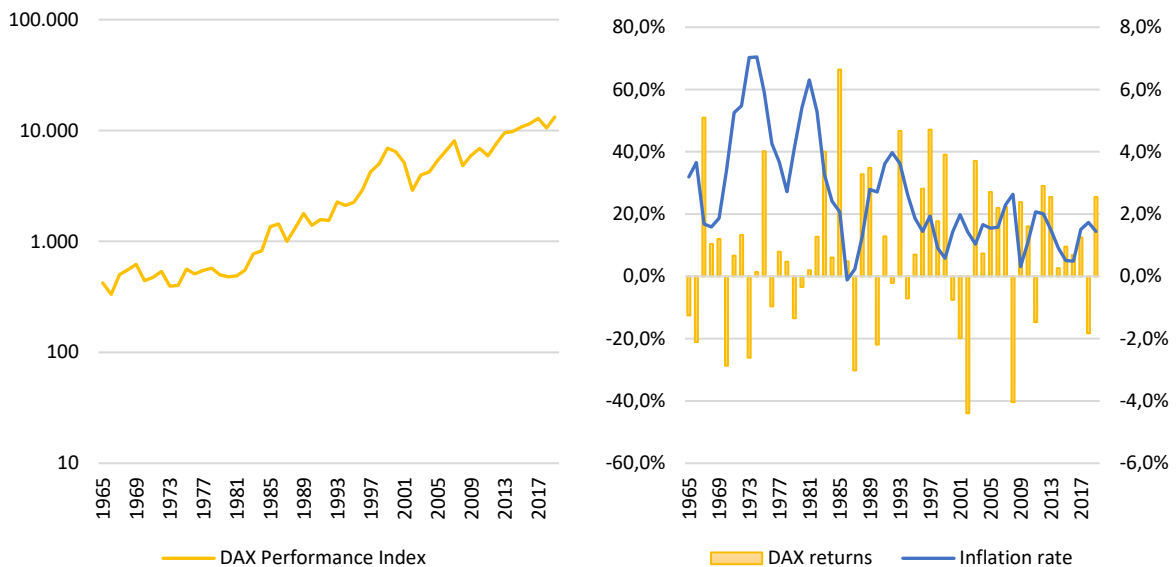
Shares and inflation - Empirical evidence

In order to check the connection, we will first look at the situation in Germany before the results are mirrored in the next step with the observations that arise for the USA. The stock market returns for Germany are calculated on the basis of the DAX-30 and for the USA on the basis of the S&P-500. The inflation rate is measured by the consumer price index (CPI) determined by the respective national statistical office. Both stock market returns and inflation data are initially based on annual data. The period covered is 1965-2019.

For the DAX Performance Index, the average nominal stock market return for the period under review is 9.0% p.a. with an average inflation rate of 2.6% (**Figure 3**). The real yield is thus 6.4% p.a. on average. The fluctuation in yields is immense. The minimum rate of return was -43.9% in 2002 and the maximum 66.4% in 1985.



Figure 3: DAX-Performance Index (logarithmised) and returns of the DAX-Performance Index and inflation rate since 1965.*



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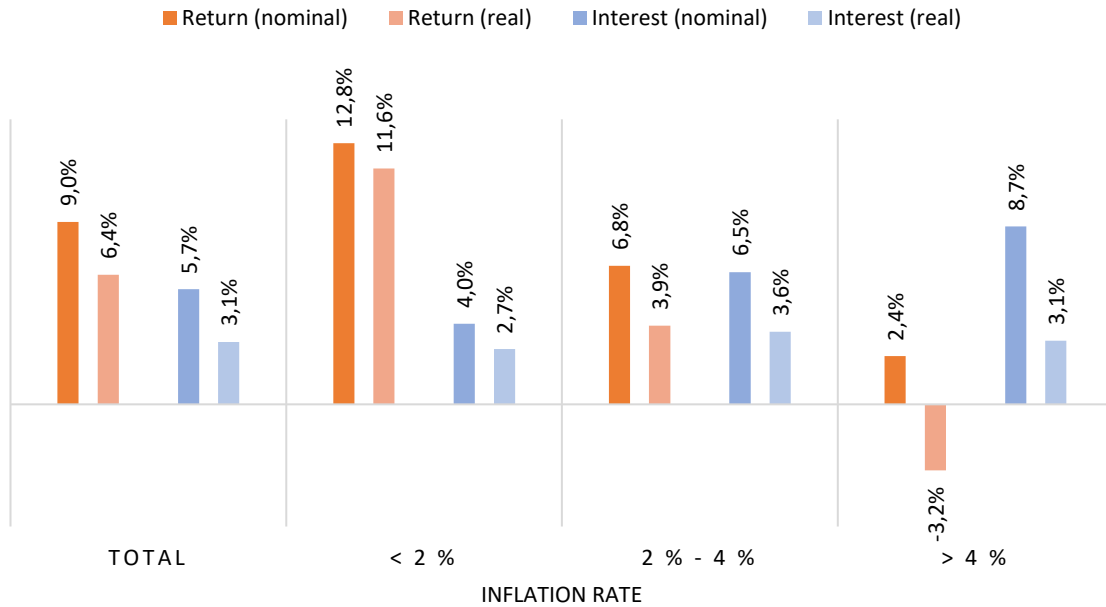
Source: Refinitive, Flossbach from the Storch Research Institute, August 2020.

If the returns are grouped into different clusters according to the level of the respective inflation rate, at first glance there is a clearly negative correlation between stock market returns and the inflation rate, i.e. high returns on the DAX are associated with low inflation rates and vice versa. If the inflation rate was below 2% in the past, the DAX yield was 12.8% on average. If it was between 2% and 4%, the average yield was 6.8%. If inflation even rose above 4%, the nominal yield was just 2.4%. If real yields are taken into account, the differences are, as expected, even greater. For example, in years of very high inflation, the real return on the DAX was clearly negative at -3.2%.³ This is due to the interplay between inflation and interest rate levels described above. For example, a rise in inflation is accompanied by a rise in the general interest rate level as central banks try to curb inflation rates by raising key interest rates. For example, the average nominal yield (measured in the case of Germany by the interest rate on 10-year federal bonds) is 4.0 % in times of comparatively low inflation, whereas it is 6.5 % in times of medium inflation and 8.7 % in times of very high inflation. There are no significant changes in the real interest rate on the basis of the grouping, i.e. the level of inflation and interest rates rise by roughly the same percentage.

³ This impression is confirmed when the median, which is less prone to outliers, is taken as the basis (see Appendix, **Figure A-1a**). For example, the average DAX yield in years when inflation was below the median of 2.01% was 12.8%, while in years when inflation was above the median it was only 4.3%. Real yields even differ by almost 12 percentage points.



Figure 4a: Average DAX yield as a function of the inflation rate in percent.*



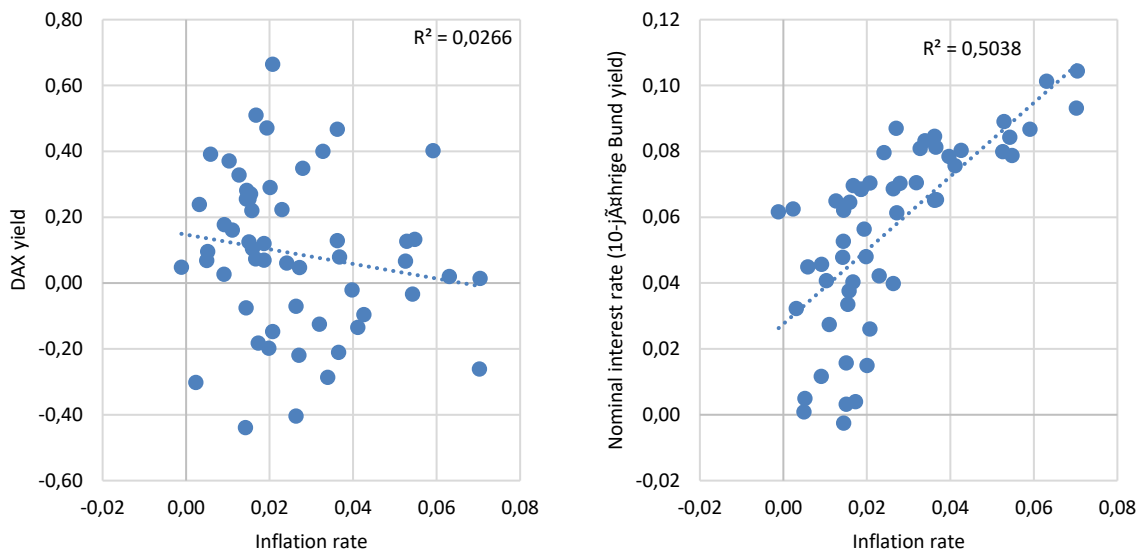
*Past performance is not a reliable indicator of future performance.

Source: Refinitive, Flossbach from the Storch Research Institute, August 2020.

If one were to make a statement on the analysed correlation solely on the basis of the average values used and the groupings made, one would be inclined to claim that inflation cannot be low enough from an investor's point of view. As **Chart 4b (left)** shows, this impression is not incorrect, but it is not statistically reliable due to the wide dispersion of yields. The very low R^2 of 0.03 illustrates that inflation hardly provides any explanation for fluctuations in DAX yields. In contrast, the correlation between the inflation rate and the interest rate level is very high (**Figure 4b, right**). The R^2 here is 0.50.



Figure 4b: Point clouds DAX yields and inflation rate and nominal interest rate and inflation rate.*



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Source: Refinitive, Flossbach from the Storch Research Institute, August 2020.

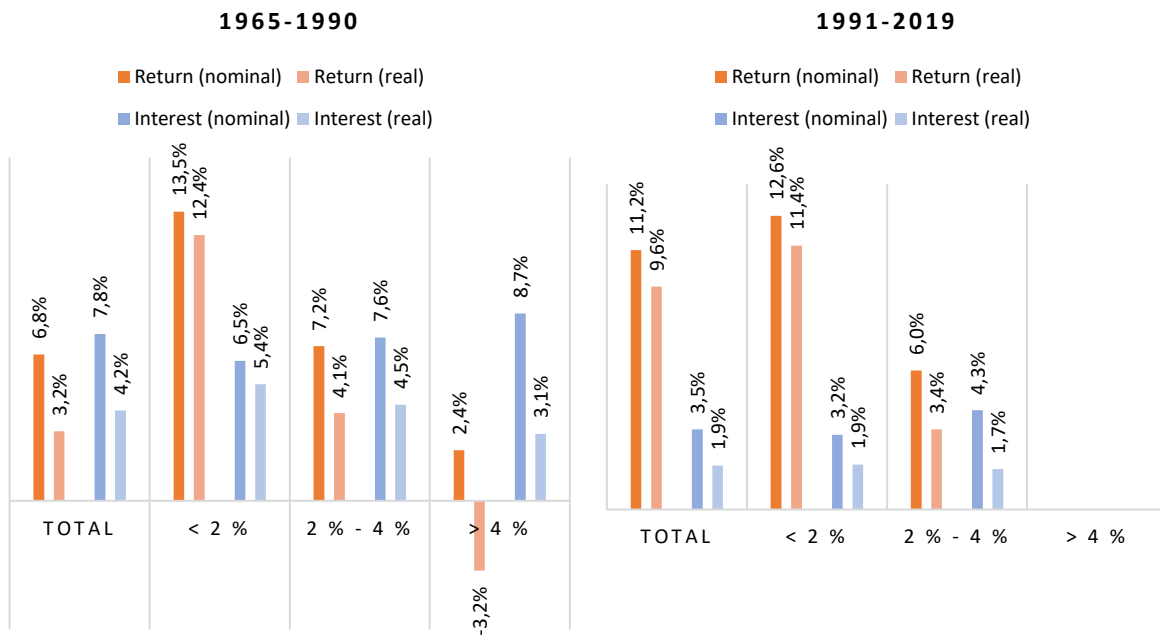
As **Figure 2** shows, the period under review is characterised by two fundamentally different phases. Until the early 1990s, economic growth was high, with high inflation and high interest rates. As the nominal interest rate was always higher than inflation, the real interest rate was clearly positive, ranging between 3% and 5%. Since then, growth, inflation and interest rates have fallen significantly. As the nominal interest rate has fallen much more sharply than inflation, real interest rates have fallen sharply and have been clearly negative for several years. Because of this structural break at the beginning of the 1990s, we will now divide the period under examination into two phases and repeat the above analysis.

As **Figure 4c** illustrates, the previous relationship also applies to the two periods considered separately. However, it should be noted that average yields have been at a much higher level since the early 1990s than before (11.2% vs. 6.8%), mainly due to the fact that there have not been any years since then with inflation rates above 4%, which was previously associated with very weak stock market years with negative real yields.

The yield advantage since the beginning of the 1990s is accompanied by significant differences in interest rates. While between 1965 and 1990, nominal interest rates of 7.8% were recorded on the 10-year federal bond, this figure falls to 3.5% in the second phase. Overall, the real interest rate has also fallen significantly since then (1.9% vs. 4.2%).



Figure 4c: Average DAX yield as a percentage of inflation 1965-1990 and 1991-2019.*



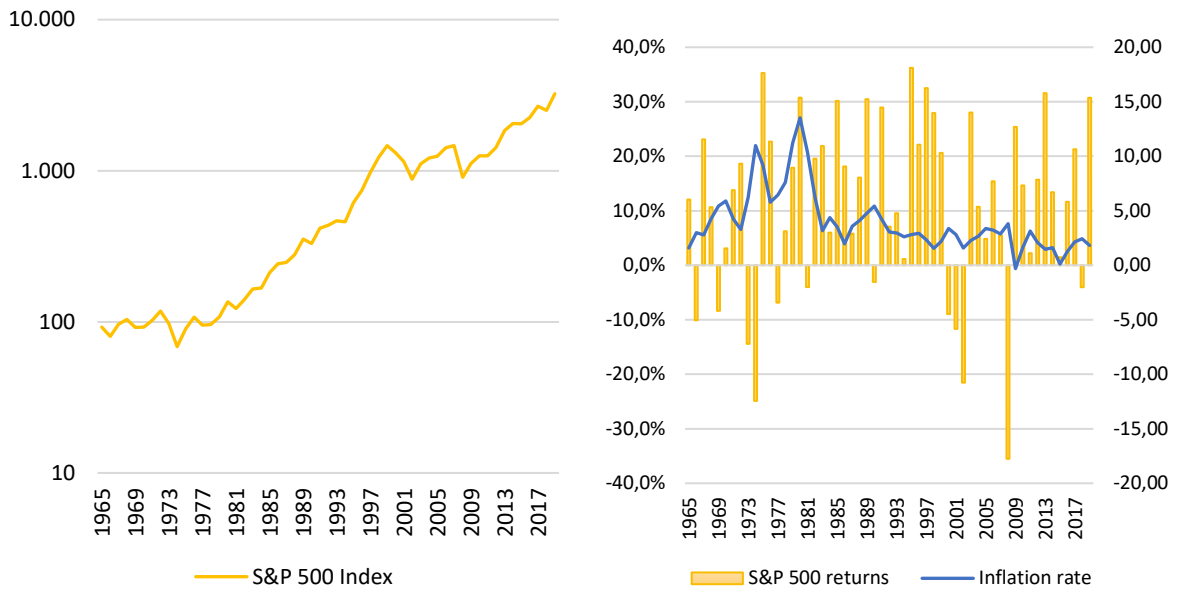
*Past performance is not a reliable indicator of future performance.

Source: Refinitive, Flossbach from the Storch Research Institute, August 2020.

In the next step, we want to mirror the observations with the corresponding development, which is based on the S&P 500 Index for the USA. For the S&P 500, the nominal stock market return averages 11.0% p.a., with inflation averaging 3.9% (Figure 5). On a real basis, this results in an average return of 7.1% p.a. Even if the fluctuation range of the yields is somewhat smaller overall than that of the DAX, it is still considerable. The minimum return is -35.5% in 2008, while the maximum is 36.2% in 1995.



Figure 5: S&P 500 Index (logarithmised) and returns of the S&P 500 Index and inflation rate since 1965 .*



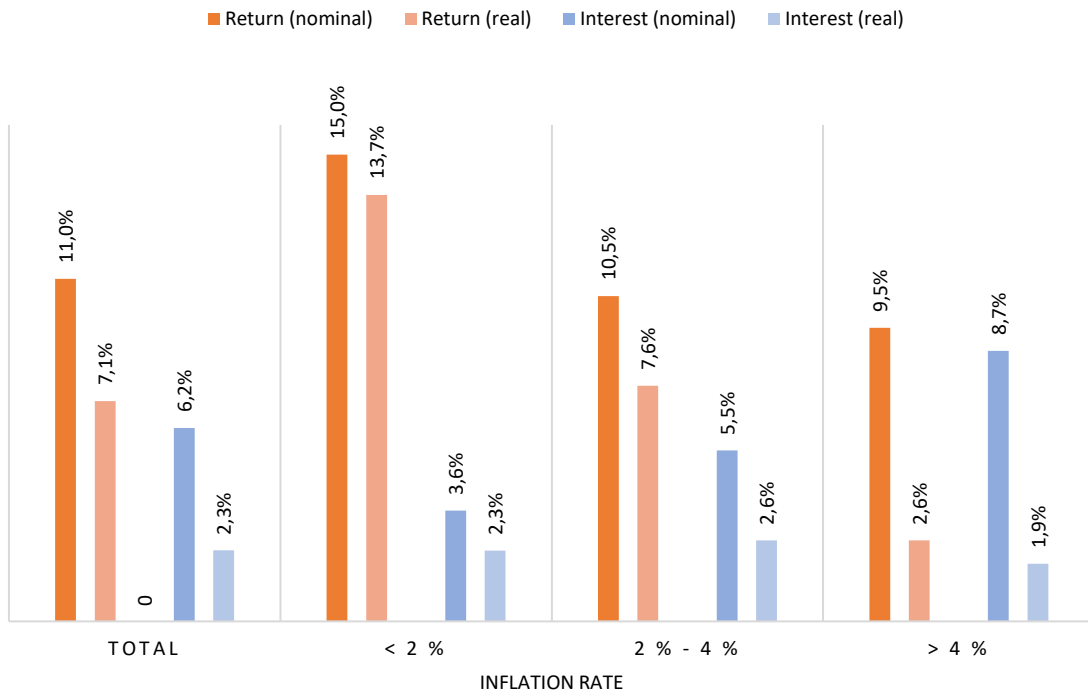
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Source: Refinitive, Flossbach from the Storch Research Institute, August 2020.

With regard to the grouped returns in relation to inflation, the picture is similar to that of Germany. Here too, yields decrease as inflation rises (**Chart 6a**). Here too, however, as with the DAX, inflation provides little statistical explanation for yields (**Figure 6b**) due to the broad spread of stock market yields, while the inflation rate and interest rate level show a close statistical correlation. With regard to the sub-sample divided into two individual periods, the differences are somewhat less pronounced than in Germany (**Figure 6c**). This is partly due to the fact that, in the period 1965-1990, comparatively high nominal yields of 9.5% on average were observed in the USA even during periods of high inflation. However, similar to Germany, the differences in real yields in the first sub-sample (1965-1990) at 5.4% are much smaller than in the second sub-sample (1991-2019) at 8.9%, due to much higher inflation.



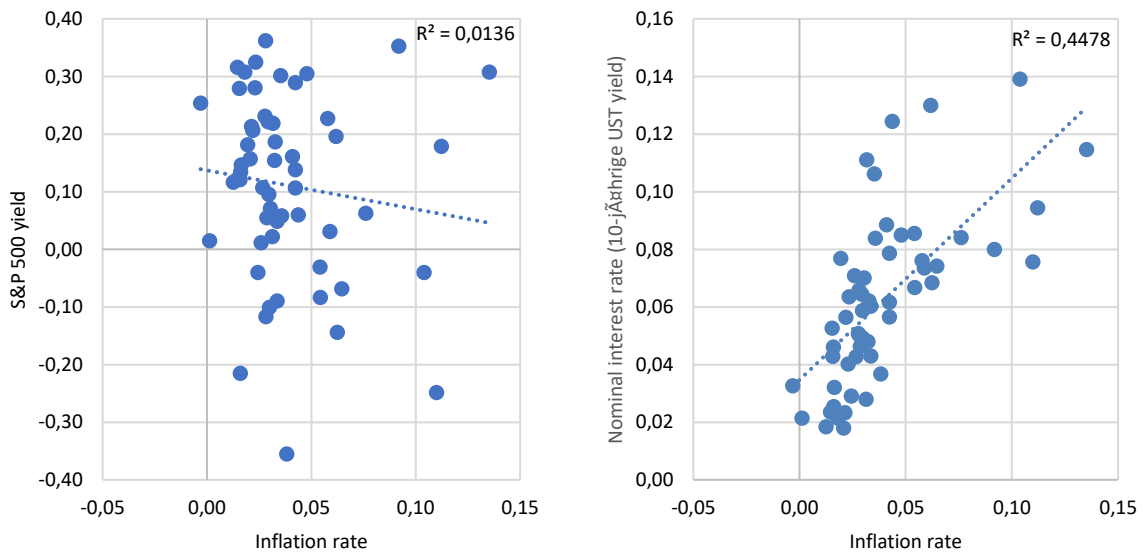
Figure 6a: Average S&P 500 yield as a percentage of inflation.*



*Past performance is not a reliable indicator of future performance.

Source: Refinitive, Flossbach from the Storch Research Institute, August 2020.

Figure 6b: Point cloud S&P 500 yield and inflation rate and nominal interest rate and inflation rate*

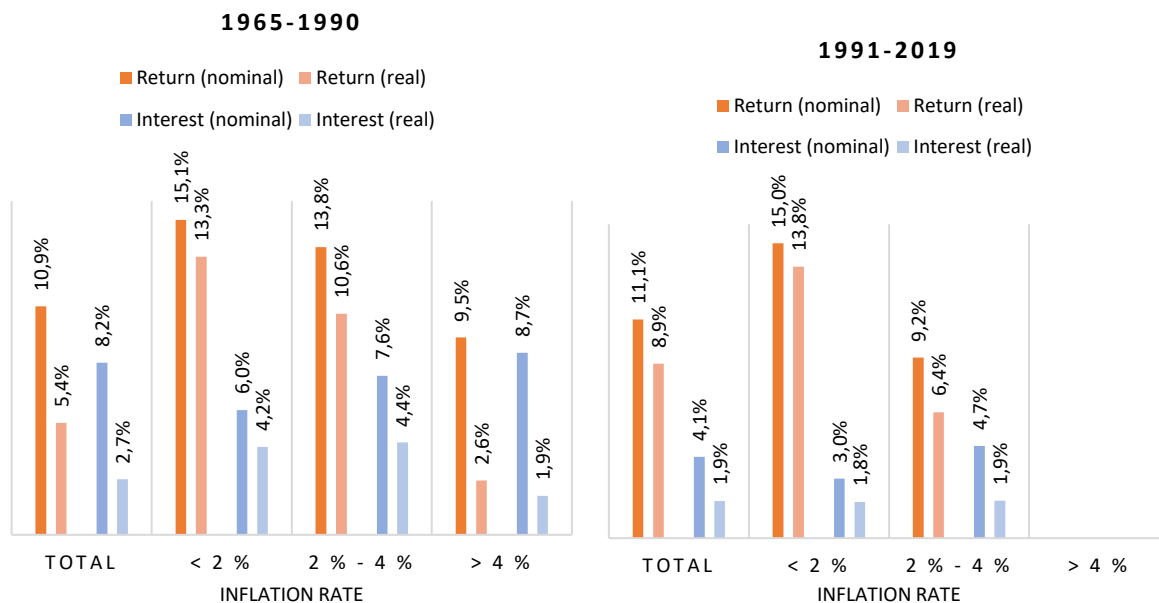


*Past performance is not a reliable indicator of future performance.

Source: Refinitive, Flossbach from the Storch Research Institute, August 2020.



Figure 6c: Average S&P 500 yield as a percentage of inflation 1965-1990 and 1991-2019.*



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Source: Refinitive, Flossbach from the Storch Research Institute, August 2020.

Based on the findings, we will then conduct a more detailed analysis of the stock market. Since the influence of inflation cannot be isolated from that of interest rates, and since it is therefore only possible to make a statement on correlation but not on causality, the stock market as such must be viewed in a more differentiated manner.

As explained at the beginning, sectors and business models are affected to varying degrees by inflation or changing inflation expectations. Shares of companies that have a strong cash flow base for a long time, but whose growth potential is rather limited and are therefore relatively favourably valued by the market, are called "value" shares. These typically include companies in the consumer goods, insurance or energy sectors. These sectors in particular should have few problems with high inflation rates, given that they can pass on price increases to customers relatively easily. By contrast, companies whose shares are referred to as "growth" shares often do not have a solid cash flow history, but are said to have strong growth prospects, which often leads to a comparatively high valuation. Their ability to pass on rising costs to customers is limited due to the high proportion of sales that are far in the future. In addition, as shown above, high inflation is accompanied by high nominal interest rates. In theory, growth shares are likely to suffer more than value shares, as the discount factor has a greater impact the further into the future the *free cash flows are*. Conversely, in the case of low inflation and falling interest rates, "growth" stocks will benefit disproportionately. This has



been demonstrated very impressively over the past decade, during which "Growth" shares have been able to outperform their "Value" counterparts by far when interest rates are falling.

However, in order to subject these considerations to a more comprehensive review over time, we reflect the inflation trend in the USA with the development of the S&P 500-"Value" and S&P 500-"Growth" sub-indices since 1975. In order to⁴ obtain a sufficient number of observations, monthly data are used in contrast to the previous analysis. Since the differences between two sub-indices are now at issue, no division into two periods is made.

Figure 7a: Average S&P 500 "Value" and S&P 500 "Growth" returns as a percentage of inflation.*



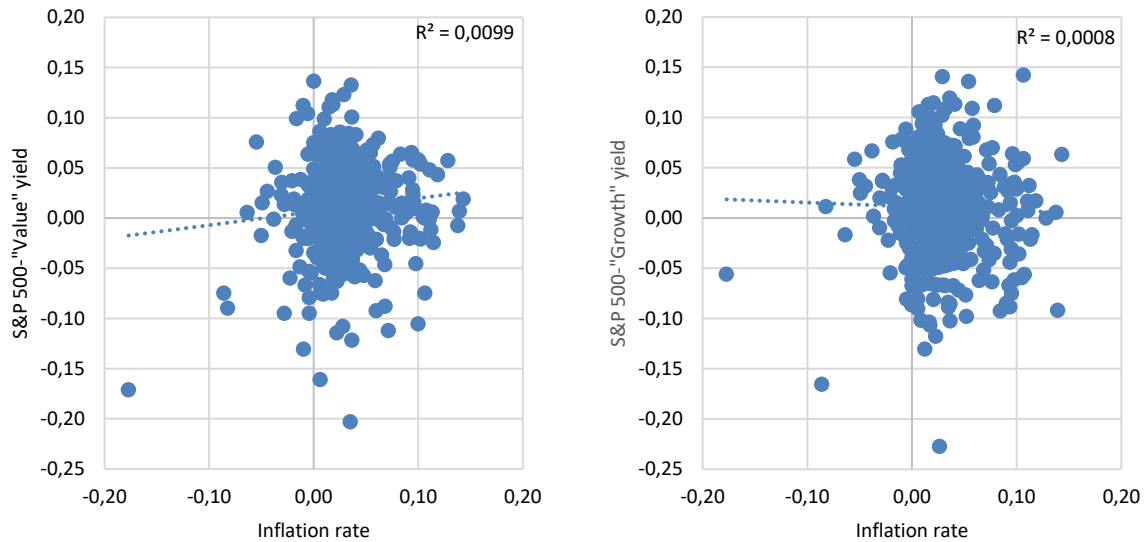
*Past performance is not a reliable indicator of future performance.

Source: Refinitive, Flossbach from the Storch Research Institute, August 2020.

⁴ The corresponding indices have only been calculated since 1975, so the observation period differs from previous analyses.



Figure 7b: Point cloud of S&P 500 "Value" and S&P 500 "Growth" yield and inflation rate and nominal interest rate and inflation rate.*



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Source: Refinitive, Flossbach from the Storch Research Institute, August 2020.

As **Figure 7a** shows, there are no significant differences between the subsamples, contrary to the hypothesis derived earlier. Contrary to expectations, "value" shares have outperformed "growth" shares in an environment of low inflation and thus low interest rates. As expected, "Growth" shares suffer somewhat more than "Value" shares if the monthly inflation rate rises above 0.45%. However, **figure 7b** suggests that the differences are not statistically significant.

Conclusion

The extensive support measures taken by governments and central banks in the wake of the corona pandemic could lead to significantly higher inflation rates in the medium to long term. Many market participants regard equities as an attractive asset class in such an environment. This can be confirmed empirically to the extent that the stock markets under review have in the past been able to generate positive real returns even in an environment of inflation rates of up to four percent. However, their performance was far better, especially in an environment of low inflation rates. By contrast, they were unable to fulfil the value-preserving function attributed to them in periods of high inflation. This is due to the close correlation between inflation and interest rates. There is an inverse relationship between stock prices and



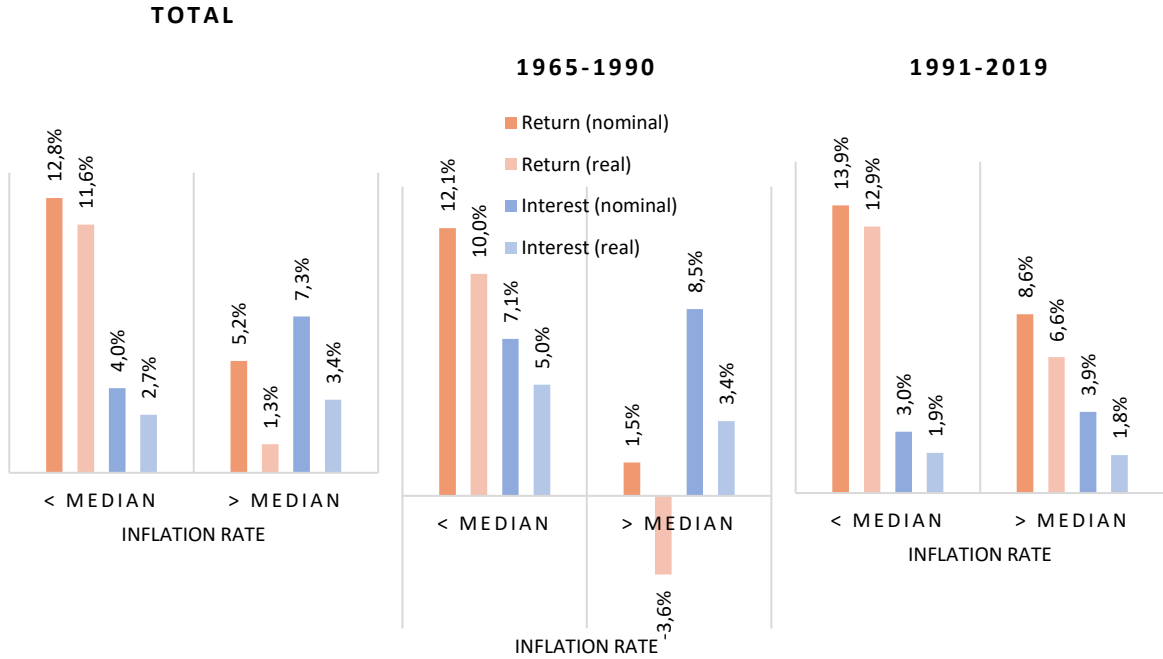
interest rates. High interest rates lead to a reduction in the present value of future cash flows and thus a reduction in the fair value of the share price.

Looking ahead, however, it is questionable to what extent a likely resurgence of inflation will be accompanied by an increase in interest rates. The ever-increasing burden of national debt is likely to keep nominal interest rates close to zero for the foreseeable future. This would be a promising environment for stock markets.



ANNEX

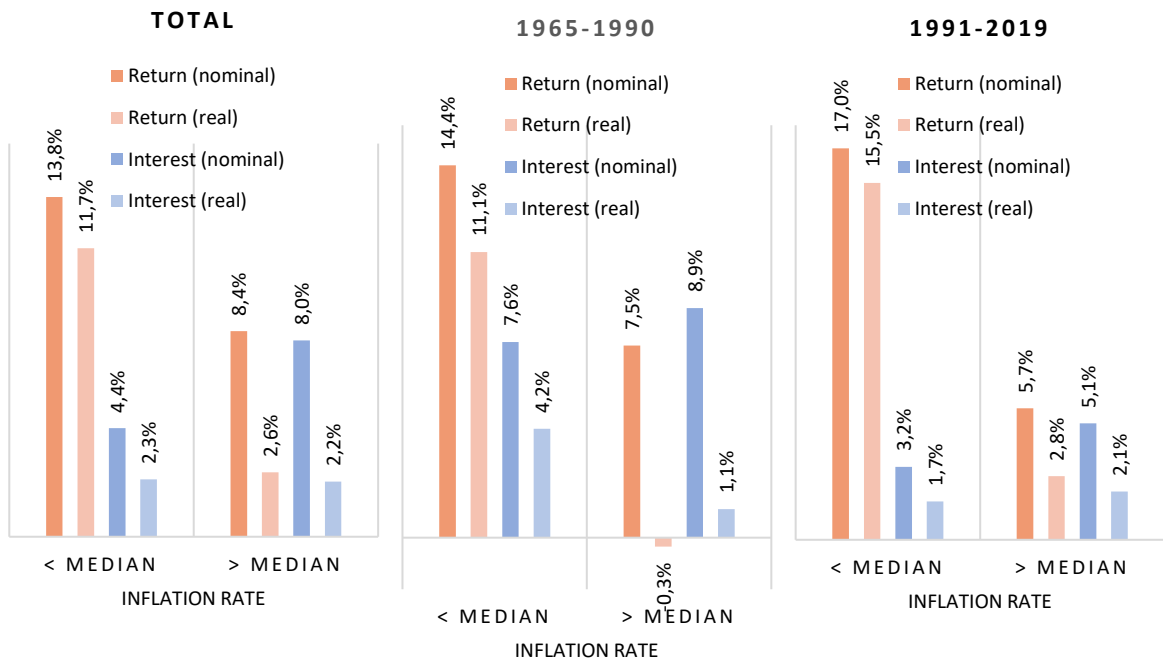
Figure A-1: Average DAX yield as a function of the inflation rate in percent (median split) over the entire period under review and 1965-1990 and 1991-2019*.



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Source: Refinitive, Flossbach from the Storch Research Institute, August 2020.

Figure A-2: Average S&P 500 return as a function of the inflation rate in percent (median split) over the entire period under review and 1965-1990 and 1991-2019*.



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