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Title thesis: The relationship between inflation and the demand for dividends – a study of US mutual fund flows

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Table of Contents

Abstract

This paper studies the relationship between the demand for dividends and the level of inflation in the United States. This paper attempts to cover a gap in the literature as even though the demand for dividends and the effect of inflation on financial markets has been extensively studied in the literature, to the best of my knowledge, there is no literature about the relationship between inflation and dividend demand. So, this paper attempts to answer the following research question: *How is the inflation level related to the demand for dividends, as reflected by the mutual fund flows of US domestic equity mutual funds between 1961 to 2021?* To do this, US mutual fund and macroeconomic data was collected for the entire period between 1961 and 2021. Several regressions were carried out to study the relationship between the inflation and the preference for dividend paying funds, which functioned as a proxy for the demand for dividends. The main finding of this paper was that, throughout the entire period, there is not a clear and significant relationship between the level of inflation and the preference for dividend paying funds. Nevertheless, a positive and significant relationship was found when only considering the observations before the year 1991. This illustrates that before the year 1991 there appeared to be a positive relationship between the level of inflation and demand for dividends, which was not the case afterwards. From this, I concluded that the level of inflation does not appear to be related to the demand for dividends and thus, during inflationary periods, managers should not raise dividends based on the believe that higher inflation relates to more dividend demand.

Section 1 - Introduction

As of March 2022, the consumer price index of the US has hit 7.9%, this is the highest level of inflation in the last 40 years, and it has created a lot of turmoil in financial markets as investors try to hedge their portfolios against this inflation. For this, theoretical arguments have been postulated about the possibility of using equities as a hedge. Equities present a claim of their real underlying assets and therefore they should be able to maintain their value regardless of the general price level (Ely & Robinson, 1997).

Fisher (1930) presented the theoretical framework for using equities as a hedge by stipulating that the market interest rate considers the information on the expected real interest rate and expected inflation. Since then, several papers like Bodie (1976), Nelson (1976) and Fama & Schwert (1977) provided evidence against this hypothesis by showing that inflation actually seems to have a negative relationship with the return of common equities.

Nevertheless, the papers mentioned studied the relationship between inflation and common stock returns in relatively short-time periods and further papers considering longer time periods have provided evidence for the hedging abilities of common stocks against inflation (Bampinas & Panagiotidis, 2016) (Ely & Robinson, 1997) (Schotman & Schweitzer, 2000). Basse (2009), Baker & Jabbouri (2017) and Basse & Reddemann (2011) provide a plausible explanation for this as they show that there are significant long-run relationships between the level of inflation and the dividend payments of firms. Basse (2009) and Baker & Jabbouri (2017) postulate that this could be due to two reasons, managers pursuing a dividend policy they believe is optimal as it pays out a desirable level of real dividend income to investors or that inflation may simply increase the nominal value of corporate earnings and therefore the dividends paid. More interestingly, Basse & Reddemann (2011) argue that if managers believe that there is an optimal level of dividend to be paid out to investors, they need to determine this optimal level and in doing so they may assume that investors have a preference for a stable source of continuous real income. Thus, they would assume that during inflation, investors will have a stronger preference for dividends.

This paper focuses on testing this theory and therefore the main research question is the following:

How is the inflation level related to the demand for dividends, as reflected by the mutual fund flows of US domestic equity mutual funds between 1961 to 2021?

To the best of my knowledge, no papers in the literature address this specific research question and although there are papers that study the relationship between flows and inflation or dividends, these relationships are studied in different papers and no papers so far have sought to reconcile this aspect of the literature. At the same time, previous papers have not considered as long of a period or controlled for the variety of factors controlled for in this paper when studying mutual fund flows and their relationship to inflation. As well, this paper contributes specifically to the literature around dividend demand by exploring the role inflation takes in determining the demand for dividends.

To study the preference for dividends, this paper studies the mutual fund flows of funds determined to be “dividend paying funds”, these fund flows are the money that is going into or out of funds, as result of investors wanting to buy or sell the shares of the fund. Thus, fund flows function as a proxy of investor behaviour where, in this case, higher fund flows into dividend paying funds, during an inflationary period, would signal that investors have a stronger preference for dividends during times of higher inflation.

To study the research question, mutual fund and stock market data was obtained from the Centre for Research and Security Prices (CRSP) database and macro-economic data was

obtained from the Organisation for Economic Co-operation and Development (OECD) database (this is explained more in depth in Section 3). Using the CRSP Objective codes in the CRSP Survivor-Bias-Free US Mutual Fund Database, I defined mutual funds as dividend paying funds when they had the classification of Growth and Income or Income equity funds. As well, funds were defined as dividend paying funds if their average dividend yield was higher than the average dividend yield of the S&P 500 (obtained from the Nasdaq Data Link website), following the classification based on dividend yield used in Harris et al. (2015).

Afterwards, several regressions were carried out which considered different periods and control variables. Firstly, a pooled OLS regression was carried out of the fund flow of US domestic dividend paying equity mutual funds against the inflation level in the US. This was done to study the relationship between the absolute fund flows into dividend paying funds and inflation. Based on the findings of Krishnamurthy et al. (2018), I expected that the inflation level would be negatively associated with the fund flows of dividend paying funds, thus, the first hypothesis in this paper is the following:

H1: There is a negative association between the level of inflation and the absolute fund flows of dividend paying equity mutual funds in the US.

Additionally, I also decided to study the relationship between inflation and the fund flows of dividend paying funds relative to all equity mutual funds. Thus, both a pooled OLS regression and a time-fixed effects regression were carried out, which included an interaction effect between the level of inflation and a dummy that defined a fund as a dividend paying fund or not. If there is a stronger preference for dividend paying funds during an inflationary period, then one would expect the interaction effect to have a positive and significant coefficient. Pilotte (2003) found a positive association between the dividend yield component of returns and inflation, while finding a negative association between the capital gains component of returns and the total returns with inflation. This suggests that entities that pay higher dividends are more likely to offer a better performance during an inflationary period, as compared to those that do not, given that a larger component of their returns is positively associated with inflation. From this, I considered that there should be a positive association between the level of inflation and the preference for dividend paying funds and thus, my second hypothesis is the following:

H2: There is a positive association between the level of inflation and the preference for dividend paying funds, when considering their fund flows relative to the fund flows of all equity mutual funds.

Finally, I noticed that the variance and the average level of inflation was significantly higher before the year 1991 than it was later, as illustrated by Figure D.1 and Table D.2. Thus, a

split-sample time-fixed effects regression was carried out, considering those observations before 1991 and those after 1990 separately. Considering that inflation is positively associated with the dividend yield component of returns, in times of higher inflation volatility and average levels of inflation, the preference for dividend paying funds should have an even stronger association with inflation and thus, my third hypothesis is the following:

H3: There is a stronger positive association between the preference for dividend paying funds and the level of inflation before the year 1991, as compared to after the year 1990.

In general, the main results of this paper were surprising. I found that inflation was not only positively associated with the fund flows of only dividend paying funds but it was also positively associated with the fund flows of all equity mutual funds, going against the findings of Krishnamurthy et al. (2018). Based on this, our first hypothesis is rejected, as the absolute fund flows of dividend paying funds were positively associated with the level of inflation, given that the fund flows of all equity mutual funds were positively associated with the level of inflation.

Moreover, the interaction effect between the level of inflation and the dividend paying fund dummy had a positive yet insignificant coefficient in both the pooled OLS and time-fixed effects regressions. Thus, our second hypothesis was also rejected. Therefore, even if the dividend yield component of returns is positively associated with inflation, as found in Pilotte (2003), this does not appear to create a clear preference for dividend paying funds during inflationary periods.

Finally, the results of the split sample time-fixed effects regression do show that the coefficient of the interaction effect was positive and significant before the year 1991, while remaining positive yet insignificant after the year 1990. This provided evidence in favour of the third hypothesis and thus I do not reject it.

This paper continues in the following manner: Section 2 presents a review of the relevant literature, Section 3 explains the data, where it came from and how some variables were transformed, Section 4 explains the methodology used to analyse the data, Section 5 presents the results, Section 6 explains and discusses the results in light of the literature and finally, Section 7 concludes.

Section 2 - Literature review

Mutual funds and the behaviour of their investors is a topic that has been extensively covered in the literature. This paper focuses specifically on mutual fund flows and the relationship between inflation and the preference of investors towards dividend-paying funds, as measured by their fund flows. To understand the theoretical background behind this, it is important to understand the reasons why investors choose to invest in mutual funds.

Papers like Jensen (1968) and Malkiel (1995) have studied the performance of mutual funds during different time periods, attempting to see whether mutual fund managers add value by outperforming passive investment strategies like a buy-the-market-and-hold policy. Surprisingly, both papers found that mutual funds underperform the market and Jensen (1968) even provides evidence that funds are not able to produce significantly better results than those which would be obtained from mere random chance. As well, even more surprisingly, both papers provide evidence that mutual funds perform worse than the market even gross of fund management expenses, meaning that even if investing in them came at no cost, passive investment strategies would still provide better returns.

These then begs the question, why would investors invest in mutual funds even though the returns you get are worse than in passive strategies?

Glode (2011), Moskowitz (2000) and Kosowski (2011) all provide evidence that mutual funds perform better in recessions. Thus, this suggests that investors may decide to invest in mutual funds because they believe that they provide them with better insurance against bad states of the economy. Moreover, Kacperczyk et al. (2005), Grinblatt et al. (1995) and Wermers (2000) provide evidence for the stock picking abilities of fund managers by showing that they outperform their benchmarks based on the returns of fund holdings. Thus, these six papers mentioned provide valid, rational reasons to invest in mutual funds due their superior performance during recessions as well as the stock picking abilities of some fund managers. Nevertheless, understanding why investors invest in mutual funds, which explains why fund inflows exist, does not allow us to understand completely the behaviour of fund flows and its relationship with dividends and inflation. So, let us go over some of the relevant literature behind mutual funds flows.

A variety of factors have been documented to relate to higher fund inflows. Fund flows have been seen to be higher in funds with higher recent returns, as well as funds with lower fees and, those that receive more media attention and belong to larger complexes (Sirri & Tufano, 1998). As well, focusing more on the decomposition of returns into different factors, Barber et al. (2016) estimated mutual fund alphas using six competing empirical models of managerial skill. These are the market-adjusted returns, CAPM, Fama & French (1993) three-factor

model, Carhart (1997) four-factor model with momentum, seven-factor model that adds the three industry factors of Pástor & Stambaugh (2002a, 2002b), and a nine-factor model that adds profitability and investment factors (Fama & French, 2015). The researchers found that the partial effect of the CAPM alpha on fund flows was roughly double that of its nearest competitor the (market-adjusted returns). Moreover, the results of this same paper also showed that flows were much less responsive to returns due to a fund's market risk (its beta) as compared to other components of return. Finally, Berk et al. (2004) derived a parsimonious rational model of active portfolio management that helps to explain the generally considered non-persistency of mutual fund performance. The model documents that investors rationally interpret high performance as evidence of superior managerial ability, leading new money to flow into better performing funds until the point at which expected excess returns going forward are competitive.

Now, when it comes to preference for dividends, some of the literature has provided evidence for dividends being related to fund flows. Jank (2012) shows that an increase in the dividend yield (which in this paper is the dividend yield of the S&P 500) is linked with outflows from equity mutual funds. This is because, higher dividend yields indicate riskier economic times as the dividend-price ratio becomes bigger as prices drop. This follows the information-response hypothesis, that suggests that information about the real economy drives both returns and flows (Fant, 1999). It is important to note that this does not mean that for individual mutual funds a higher dividend yield is associated with higher outflows, as in this context we are talking about the aggregate mutual fund flows and the overall dividend yield of the market.

On the individual level, Harris et al. (2015) study the effect of dividend "juicing". This is when firms purchase stocks before dividend payments to artificially increase their dividends. The researchers find that those funds that have an excess dividend ratio greater than 1.38 (where the excess dividend ratio is the ratio of the funds paid dividend distributions to the dividend distributions their quarterly position reports imply), receive on average an additional 6.8% in flows per year, while an excess dividend ratio greater than 2 is associated with an additional 12.2% in flows per year. This provides evidence that at an individual level, offering higher dividend yields could be related to higher fund inflows

Nevertheless, the evidence provided by both Jank (2012) and Harris et al. (2015) contradict Miller & Modigliani (1961) famous dividend irrelevance policy that a firm's dividend policy should be irrelevant to investors, as the price of stocks should drop by exactly the amount of dividend being paid. This theory although it is considered to be appropriate in an ideal world without taxation, in practice several papers have provided explanations for the relevance of

dividends in driving investor behaviour. Baker & Wurgler (2004) presented the theory of dividend catering. This theory is the idea that there exists an overall demand for dividends, driven by institutional and psychological reasons, and thus, some managers cater to investors by paying dividends when investors put a stock price premium on payers, and by not paying when investors prefer nonpayers.

Harris et al. (2015) focuses on studying this phenomenon further by studying the "juicing" behaviour of mutual funds. The main idea is that dividend juicing by funds is not a behaviour that can be easily explained by taxes or a need for income (Black & Scholes, 1974; Elton & Gruber, 1970),as funds can generate identical income streams by making tax-free distributions of invested capital instead of acquiring and distributing taxable dividends. Thus, this behaviour comes from the fact that mutual funds managers can only label cash distributions to investors as dividends if they correspond to dividends received by the fund on its underlying securities. Therefore, if, following the theory of dividend catering, investors demand a level of dividend yield higher than what can be provided from holding high dividend yield securities, funds need to resort to dividend juicing to provide the level of dividend yield desired. The researchers were able to find that among dividend-paying funds, in 7.4% of fund-years, funds paid dividend distributions more than twice as large as their quarterly position reports imply. The researchers considered that these excess dividend ratios were not merely random fluctuations, showing that dividend "juicing" is indeed a behaviour carried out by mutual funds. This evidences that fund managers take costly actions to have income labelled as dividends indicating that investors have an intrinsic demand for dividends themselves, providing evidence in favour of the dividend catering theory (M. Baker & Wurgler, 2004).

Thus, when looking at the individual investor behaviour, we have seen that there seems to be an intrinsic demand for dividends and that higher dividend yields seem to attract higher inflows. Now, how does this relate to inflation? To the best of my knowledge, there are no papers in the literature that address the relationship between investor demand for dividends and inflation. Most papers (several of which are mentioned in the introduction) focus on the idea that dividends can serve as a hedge against inflation. Nevertheless, the effect of inflation on mutual fund flows has been documented and it is worth going over.

Papers like Bodie (1976) and Fama & Schwert (1977) have showed negative links between inflation and stock returns. Thus, it would be logical to assume that, at least at an aggregate level, inflation should also be negatively related to equity mutual fund flows. Krishnamurthy et al. (2018) provides evidence of exactly this by evidencing a negative correlation between aggregate flow to equity mutual funds and the level of inflation. Additionally, the researchers

find that particularly the inflation illusion hypothesis (idea that investors erroneously discount real cash flows at nominal discount rates, resulting in depressed prices (Modigliani & Cohn, 1979)) is relevant in explaining this. The authors were able to consistently show that proxies for inflation illusion are significantly negatively related to aggregate inflows into equity mutual funds in the subsequent quarter.

Thus, we have seen that there are reasons why investors invest in mutual funds, what factors are associated with fund inflows and outflows, and how dividends and inflation relate to fund flows. Nevertheless, this paper adds to the literature by reconciliating the relationships that exist between mutual funds flows, inflation, and dividends under the same study. This allows a more holistic understanding of both the relationship of dividends as well as inflation with mutual funds flows, driving a better understanding of investor behaviour which is often studied with mutual funds flows. Additionally, most of the literature mentioned so far studies mutual funds and their behaviour in different timed periods between the 1960s all the way to the early 2010s. This paper extends this literal body by also including the period of the late 2010s, early 2020s, considering the entire period between 1961 to 2021.

Section 3 - Data

The following section presents the databases where data was collected from, what data was collected, the sample selection of funds and finally the data transformations done to some of the variables. Data was collected, at a yearly frequency, for all US domestic equity mutual funds between the period of 1961 to 2021.

3.1 - Databases

All the data in this paper, was obtained from two databases. These are the Center for Research and Security Prices (CRSP) database, accessed through the Wharton Research Data Services website, and the Organisation for Economic Co-operation and Development (OECD) database.

The CRSP database is a part of the Booth School of Business of the University of Chicago, and it contains a very large and comprehensive amount of data on the stock market. The mutual fund data for this paper was gathered from the Quarterly Update of the Survivor-Bias-Free US Mutual Fund Database. This database was chosen because not only is it very prevalent in mutual fund literature but also it contained data on the main mutual fund related variables for the entire period between 1961 to 2021. Moreover, as mentioned in the title of the database it is “survivor-bias-free”, meaning that it also provides data on funds that went

bankrupt, not only those that keep existing, giving a more representative sample of the population of US mutual equity funds.

The OECD is an intergovernmental organisation comprised of 38 member countries with the goal of stimulating economic progress and world trade. Its database contains a very large amount of data on several different economic, social, and demographical variables of countries. This database was chosen as it contained data on the main economic variables for the entire period between 1961 to 2021. Moreover, it is also used in the macroeconomic literature.

3.2 - What data was collected and from where?

Below I give a brief overview of the data which was obtained from each of the two database:

CRSP Database:

- CAPM alphas and yearly returns – using the CRSP Mutual Fund Monthly Returns and Fama-French Factors data, the CAPM alphas were calculated by running a rolling regression of the excess return of the fund over the risk-free rate against the excess return in the market over the risk-free rate, with a rolling window of 12 months, separated by the unique mutual fund indicator (crsp_fundno). Moreover, the monthly returns of the funds were annualized to obtain the yearly return, these yearly returns were then used to calculate the mutual fund flows, as explained in Section 4.1.
- The total net asset value of the fund – these were obtained from the Fund Summary section of the database. This were used to calculate the mutual fund flows as explained in Section 4.1
- Dividend yield – this was also obtained for the Fund Summary section of the database. It was calculated by dividing the calendar year-to-date dividend sum in each year by the net asset value of the fund at the end of the year.
- Years of fund operation and institutional fund dummy - These values were also obtained from the Fund Summary section. For the institutional fund dummy the database contained a particular variable (inst_fund) which served as an indicator for institutional funds. In this variable, funds were labelled as institutional if the value of the variable was a “Y”. Thus, from these the institutional fund dummy was developed.
- The S&P 500 yearly return – This was obtained from the Annual Update of the CRSP Database in the Index/ S&P 500 Indexes section. The raw returns obtained were of a monthly frequency and were annualized to obtain the yearly returns.

OECD Database:

- Inflation – measured following the change in the consumer price index.

- GDP – the gross domestic product was then used to calculate the GDP growth by dividing the difference between the current year's GDP and the previous year's GDP by the previous year's GDP.
- Long-term and short-term interest rates – the long-term interest rate is the interest rate of government bonds maturing in ten years and the short-term interest is based on the three-month money market rate.

3.3 - Sample selection of all US domestic equity mutual funds

Firstly, the analysis was limited to only US mutual funds given that the inflation figure used was that of the US and it would probably not be relevant for studying non-US mutual funds. Moreover, for the same reason, only domestic equity mutual funds were considered in this analysis. To select only the US domestic equity mutual funds, the CRSP Objective Codes were used, which were a database variable which helped to define in which types of assets funds invest. In the CRSP database the funds were filtered to only include funds that contained "ED" in their CRSP Objective Codes, which filtered out all non-equity and non-domestic equity mutual funds.

Afterwards, the sample was reduced following the sample selection procedure of Glode (2011) and Kacperczyk et al. (2008). Firstly, as the reported objective codes do not always identify whether a fund portfolio is balanced, I decided to exclude funds that, on average, had less than 80 percent or more than 105 percent invested in common stocks.

Moreover, Glode (2011) and Kacperczyk et al. (2008) followed the findings of Elton et al. (2010) and Evans (2004) which identified a form of survival bias in the CRSP mutual fund database, as a result of fund families incubating several private funds, only making public the track record of the surviving incubated funds, while the returns for those funds that are not terminated are kept private. Thus, to address this bias, in this paper observations were excluded where the year of the observation was before the reported fund-starting year, also excluding observations where the names of funds are missing in the CRSP database. This was done as data may be reported before the year of fund organization if a fund is incubated before it goes public, therefore, these funds might not report their names or some other fund attributes, as shown in Evans (2004).

Finally, the papers which were followed so far in the sample selection process also mentioned that because incubated funds tended to be small, they chose to exclude funds with less than $5 million dollars in assets under management at the beginning of the period. Nevertheless, I considered this too strict of an exclusion as it could be that funds just had poor performance in a year which led them to fall beneath this threshold. So, to control for

the possibility of this bias existing in small funds, I excluded all funds whose average assets under management were lower than 10 percent of the average assets under management of the entire sample. Thus, those funds whose average assets under management were lower than $61.9 million were excluded from the final sample. The final sample was comprised of 108235 fund-years and 8010 funds.

3.4 - Sample selection of US domestic dividend paying funds

To define the dividend paying fund dummy I had to define the criteria for what qualified a fund as a dividend paying fund. Firstly, I decided to label all funds that had the following CRSP Objective Codes, “EDYB” and “EDYI”, as dividend paying funds. This was because these funds were either Growth and Income or Income domestic equity funds, meaning that they were funds that at least partially concentrated on paying dividends to generate income streams for their investors.

Nevertheless, Harris et al. (2015) also provided a different definition for dividend paying funds, considering all funds that paid a dividend yield greater than 0.5 percent as dividend paying funds. However, I considered this threshold to be too low as the average dividend yield of the S&P 500 over the period of 1961 to 2021 was almost 2 percent, as calculated using data obtained from the Nasdaq Data Link website. Nevertheless, I did decide to label funds as dividend paying funds if the dividend yield they paid was high enough to grant them this classification. So, as a criterion, I also decided to select funds that had an average dividend yield which was higher than the average dividend yield of the S&P 500. The final sample of dividend paying funds was comprised of 25099 fund-years and 2074 funds.

3.5 - Data transformation

As can be seen in figures E.1 and E.2 in Appendix E, for the fund flows and the CAPM alpha, the data presented several outliers which clearly affected the distribution of the data. To prevent these outliers from having too much of a big effect in the results a data transformation was used. For the fund flows, the 0.002% of most extreme values, at each tail, were recoded to be the value in the 0.002 and 0.998 percentiles, respectively in each tail. The CAPM alpha followed the same procedure but only the 0.001% of most extreme values were recorded in each tail. This method is called winsorizing and it was explained in Tukey (1962) as a more balanced alternative to data trimming. Thus, the distribution of these variables ended up looking much more normal, heavily reducing the effect of outliers, as can be seen in figures E.3 and E.4 in Appendix E.

Section 4 - Methodology

The following section explains the methodology used in this paper. First, there is an explanation of the fund-flows, followed by an explanation of the controls used and finally the development of the regressions and models.

4.1 Fund flow calculation

Firstly, the fund flows of all mutual funds were calculated using the formula in Barber et al. (2016):

$$F_{pt} = \frac{TNA_{pt}}{TNA_{p,t-1}} - (1 + R_{pt})$$

Thus, the fund flow of fund p in period t was calculated by dividing the total net asset value of the fund in period t by that in period t – 1 and afterwards subtracting one plus the return of the fund in period t. The returns of the funds were calculated by annualizing the monthly returns to obtain the yearly returns.

4.2 Explanation of controls

Several control variables were chosen based mostly on the literature around mutual fund flows. These include:

1. CAPM alpha and its lags – this controlled for the performance of the fund following the findings of Barber et al. (2016).
2. Lag of fund flows – this control variable was not based on the literature, but I decided to include it in the analysis as previous fund flows can affect the current NAVs of funds which can affect current fund flows.
3. Dividend yield and its lags– Harris et al. (2015) provided evidence of the association of the dividend yield with fund flows, given that in this paper I studied the preference of dividend paying funds this seemed like a very relevant control variable to have.
4. Inflation – even though in the regression in Section 5.1 this is the main variable of interest, in further regressions inflation is introduced as a control variable for the interaction effect between inflation and the dividend paying fund dummy.
5. Long-term interest rate, short-term interest rate and yearly return of S&P 500 - Hartzmark & Solomon (2019) provided evidence that the demand for dividends were higher when the returns on the bond market and the equity market were lower as this can be considered as substitutes to dividends. Thus, the long-term interest rates and S&P 500 yearly returns were introduced as control variables. Additionally, I decided

to introduce the short-term interest rate to control for the returns in the money market, considering that this could also be considered as a substitute to dividends.

6. GDP growth - As GDP and inflation are related, I decided to control for this variable as it could be related to the preference for dividend paying funds due to the level of inflation.
7. Years of fund operation – this variable was not chosen based on literature but because it could be that funds that have been operating for different number of years have different investors whose preferences for dividend paying funds differs. Therefore, I decided to include this variable as a control.
8. Institutional fund dummy – Similar to the years of fund operation, Harris et al. (2015) provided evidence of the difference in demand for dividends between institutional and retail investors. Thus, as this could play a role in determining the preference for dividends due to the level of inflation, I decided to control for this variable.
9. Dividend paying fund dummy – This was added as a control for the interaction effect between the dividend paying fund dummy and inflation.

4.3 Explanation of regressions and models

In this paper four main regressions were carried out, and different models were developed in each of them. The four main types of regressions were:

1. Pooled OLS regression considering only the US dividend paying equity mutual funds.
2. Pooled OLS regression considering all the US domestic equity mutual funds, with an interaction effect between inflation and the dividend paying fund dummy.
3. Time-fixed effects regression considering all the US domestic equity mutual funds, with an interaction effect between inflation and the dividend paying fund dummy.
4. Split sample time-fixed effects regression considering all the US domestic equity mutual funds. The sample was split based on the observations before the year 1991 and those after the year 1990. Once again, an interaction effect between inflation and the dividend paying fund dummy was used.

Now, three models were developed for each of the first three regressions considered above, whose development followed the same general structure. It is important to note that in all regression standard errors were clustered by fund.

First, a model considering lags was developed. The number of lags were chosen based on the Bayesian Information Criterion (BIC) which as measure of goodness of fit. To control for the fact that adding different number of lags affects the number of observations, the models were developed based on the sample of observations in which the maximum number of lags allowed was used. In this case, I decided to include a maximum of three lags for each

variable, considering that the data has a yearly frequency. Controlling for the sample size, the optimal number of lags for each variable were then chosen following the BIC.

Afterwards, a second model was developed which aimed to maximise the number of observations used by not considering any lags. With this model it was easier to study the effect of lags on the results of the regression and how this affected the preference for dividend paying funds due to inflation.

Moreover, a third model was developed which was just the second model without lags but applied to the sample of the model with lags. This allowed me to confirm that indeed the model with lags presented a better goodness of fit, confirming that the results it presents were indeed more aligned with the data than a model without any lags.

Finally, when it comes to the time-fixed effects regressions, apart from controlling for lags, this also added a time-fixed effect for each year over the entire period considered. In the case of the third regression, in which the sample was not split, this followed the same model development procedure explained above. In the case of the split-sample regression, only the model with lags was considered, as this had consistently shown to be the model with the best goodness of fit, thus, to simplify the presentation and interpretation of results, only this model was considered.

Section 5 - Results

The following section presents the main results of the pooled OLS and time-fixed effects regressions. It is important to note that only the actual inflation level is considered in the regressions, not the forecasted inflation. As can be seen in the regression in Table A.1 of appendix A, forecasted inflation explains one hundred percent of the variance in the actual level of inflation. This indicates that forecasted inflation is a perfect proxy of inflation and therefore doing additional regressions with this variable does not create any more insights.

Table B.1 in Appendix B shows the descriptive statistic of the main variables across the entire time period between 1961 to 2021. Looking at the statistics for the dividend paying fund dummy, we can see that almost a quarter of all funds in the sample are dividend paying funds. Thus, this provides enough observations to study the relative preference for dividend paying funds as compared to all equity mutual funds. Moreover, it is interesting to note that both in the transformed and non-transformed versions, the CAPM alpha is on average negative. This means that, on average, equity mutual funds performed worse than the return expected for the amount of risk borne by the investors, which agrees with the findings of Jensen (1968) and Malkiel (1995).

5.1 – Pooled OLS regression for only US domestic equity dividend paying mutual funds

Table 5.1: Pooled OLS regression between US inflation and the mutual funds flows of US domestic dividend paying equity mutual funds, controlling for several factors and lags between the years 1961 to 2021

	Model 1 Fund flow (%)	Model 2 Fund flow (%)	Model 3 Fund flow (%)
First lag of fund flow (%)	.15***		
	(.019)		
Second lag of fund flow (%)	.061***		
	(.012)		
Third lag of fund flow (%)	.025***		
	(.007)		
CAPM alpha (%)	9.009***	15.834***	9.565***
	(1.186)	(1.857)	(1.141)
First lag of CAPM alpha (%)	8.486***		
	(1.232)		
Dividend yield (%)	-1.372***	-.393	-.404*
	(.496)	(.457)	(.223)
First lag of dividend yield (%)	-.353*		
	(.209)		
Second lag of dividend yield (%)	.403		
	(.598)		
Third lag of dividend yield (%)	2.527***		
	(.489)		
Institutional fund dummy	2.826***	12.764***	5.096***
	(1.041)	(1.797)	(1.334)
Short-term interest rate (%)	-2.509***	-2.573***	-2.768***
	(.59)	(.736)	(.525)
Long-term interest rate (%)	2.851***	7.571***	4.622***
	(.596)	(.945)	(.655)
Years of fund operation (Years)	-.221***	-1.215***	-.365***
	(.03)	(.099)	(.038)
Inflation (%)	2.069***	-.497	1.258***
	(.452)	(.815)	(.483)
GDP growth (%)	-.538*	-.837**	-.769***
	(.288)	(.387)	(.276)
First lag of GDP growth (%)	.079		
	(.392)		
Second lag of GDP growth (%)	-.538		
	(.41)		
Third lag of GDP growth (%)	-.295		
	(.352)		
Yearly return of the	.152***	.369***	.159***

S&P 500 (%)			
	(.025)	(.045)	(.026)
Constant	-1.86	14.421***	-2.76
	(3.086)	(3.251)	(2.027)
Observations	16223	22305	16223
R-squared	.078	.049	.024
BIC	179638.2	271231.1	180456.0

Note: Three models for the relationship of inflation and fund flows of dividend paying funds are developed. The first model also controls for the lags of fund flows, fund performance captured by the CAPM alpha, dividend yield of funds, returns on the bond market, captured by the long-term interest rate, and returns of the market, captured by the yearly return of the S&P 500. The second model does not control for any lags and the third model is the same as the second model, but this is applied to the sample of the first model to ensure that the first model indeed fits the data better, following the BIC.
Standard errors and units of variables are in parentheses
**** p<.01, ** p<.05, * p<.1*

Model 2 in Table 5.1 does not control for the lags of several variables. In this context, the pooled OLS regressions result indicates that there is no significant relationship between inflation and the fund flow of dividend paying equity mutual funds. Nevertheless, when controlling for lags, as is the case in model 1, we see that there is a highly significant and positive relationship between the fund flows and inflation.

Even though model 3 shows that the significance of this relationship may just be due to the reduced sample of observations, as lags were introduced, the coefficient of inflation in model 1 is much higher than the same coefficient in model 3, indicating that inflation is associated with a much larger change in fund flows when considering lags.

In overall, from the results in Table 5.1 we gather that a one percent increase in the level of inflation in the US is associated, on average, with a 2.069 percent increase in the flow of dividend paying equity mutual funds, holding all other variables constant. Thus, from this, I decided to reject hypothesis H1.

Nevertheless, it is important to note that in Table 5.1 the relationship of inflation with the fund flows of all US domestic equity mutual funds is not controlled for. Therefore, from Table 5.1 one cannot conclude that there is indeed a relationship between the preference for dividend paying funds and the level of inflation.

5.2 – Pooled OLS regression for all US domestic equity mutual funds

Table 5.2: Pooled OLS regression between all US domestic equity mutual funds flows and the interaction effect of the US inflation level with the dividend paying fund dummy controlling for several factors and lags between the years 1961 and 2021

	Model 1 Fund flow	Model 2 Fund flow	Model 3: Fund flow
First lag of fund flow (%)	.145***		
	(.009)		
Second lag of fund flow (%)	.038***		

	(.004)		
Third lag of fund flow (%)	.016***		
	(.003)		
CAPM alpha (%)	10.172***	16.739***	9.975***
	(.512)	(.67)	(.496)
First lag of CAPM alpha (%)	5.983***		
	(.379)		
Second lag of CAPM alpha (%)	1.4***		
	(.343)		
Yearly return of the S&P 500 (%)	.21***	.331***	.11***
	(.018)	(.023)	(.014)
First lag of yearly return of the S&P 500 (%)	.12***		
	(.02)		
Second lag of yearly return of the S&P 500 (%)	.112***		
	(.021)		
Dividend yield (%)	-1.889***	-1.921***	-.881***
	(.526)	(.399)	(.239)
First lag of dividend yield (%)	-.209		
	(.249)		
Second lag of dividend yield (%)	.6		
	(.543)		
Third lag of dividend yield (%)	2.275***		
	(.478)		
Institutional fund dummy	4.629***	11.018***	6.14***
	(.538)	(.868)	(.636)
Long-term interest rate (%)	1.643**	5.605***	3.684***
	(.72)	(.472)	(.321)
First lag of long-term interest rate (%)	2.339***		
	(.86)		
Second lag of long-term interest rate (%)	4.034***		
	(.612)		
Years of fund operation (Years)	-.357***	-1.769***	-.52***
	(.025)	(.085)	(.031)
GDP growth (%)	.038	.609***	.229*
	(.214)	(.171)	(.124)
First lag of GDP growth (%)	.104		
	(.275)		
Second lag of GDP growth (%)	-1.181***		
	(.26)		
Third lag of GDP growth (%)	1.456***		
	(.251)		
Inflation (%)	.882**	-2.5***	-.516**
	(.354)	(.386)	(.248)
First lag of inflation (%)	-.948**		
	(.414)		
Second lag of inflation (%)	1.175***		
	(.364)		

Third lag of inflation (%)	-1.967***		
	(.32)		
Inflation – dividend paying fund dummy interaction effect (%)	.264	-.238	-.06
	(.405)	(.593)	(.388)
Lag of inflation – dividend paying fund dummy interaction effect (%)	-.431		
	(.458)		
Dividend paying fund dummy	1.463	5.881***	2.388**
	(1.109)	(1.669)	(1.129)
Short-term interest rate (%)	-3.728***	-.652*	-1.532***
	(.492)	(.374)	(.268)
First lag of short-term interest rate (%)	.968		
	(.708)		
Second lag of short-term interest rate (%)	-1.057		
	(.711)		
Third lag of short-term interest rate (%)	-2.114***		
	(.468)		
Constant	-15.238***	20.968***	-1.334
	(1.795)	(1.864)	(1.029)
Observations	69972	95847	69972
R-squared	.078	.06	.032
BIC	776664.3	1170394.0	779883.6

Note: Three models for the relationship between the interaction effect between the dividend paying mutual funds dummy and the inflation level. The first model also controls for the lags of the fund flows, performance, as captured by the CAPM alpha, returns on the market, as captured by the returns of the S&P 500 index, returns on the bond market, as captured by the long-term interest rate, returns on the money market, as captured by the short-term interest rate, dividend yield of funds, GDP growth and the interaction effect. The second model does not control for any lags and the third model is the same as the second model, but this is applied to the sample of the first model to ensure that the first model indeed fits the data better, following the BIC.
Standard errors and units of variables are in parentheses
**** p<.01, ** p<.05, * p<.1*

Table 5.2 does control for the relationship of inflation with the fund flows of all US domestic equity mutual funds. The interaction effect between the level of inflation and the dividend paying fund dummy allows us to evaluate whether there is indeed a relationship between the preference for dividend paying mutual funds and the level of inflation.

From the results in Table 5.2, across all three models we see that the interaction effect coefficient is not significant, indicating that there is no significant relationship between the preference for dividend paying mutual funds, as illustrated by the fund flows, and the level of inflation. This is also the case when considering the lagged interaction effect, as can be seen in model 1.

However, model 2 does provide some evidence for the preference of investors towards dividend paying mutual funds, as the coefficient of the dividend paying fund dummy is highly

significant and positive. Nevertheless, when controlling for lags as in model 1, this coefficient is no longer significant and given that model 1 has both a better fit and more explanatory power than model 2, I conclude that there does not seem to be any clear preference for dividend paying mutual funds even irrespective of the level of inflation. Based on this, I reject hypothesis H2.

Even though the results of model 1 in Table 5.1 suggested that the absolute fund flows of dividend paying mutual funds are positively associated with the level of inflation, we can also see, in model 1 of Table 5.2, that the coefficient of the current level of inflation is positively associated with the fund flows of all US domestic equity mutual fund flows. Thus, the positive relationship between the level of inflation and the flow of all equity mutual funds may trump the positive relationship between the level of inflation and the flows of the dividend paying mutual funds, making the interaction effect insignificant. Nevertheless, because the absolute fund flows of dividend paying funds are still positively associated with the level of inflation (as the fund flows of all equity mutual funds are positively associated) I decided to reject hypothesis H1.

It is also interesting to note the coefficients of the inflation lags, it seems that from period to period, the sign of the coefficient changes, indicating a cyclical nature of the association of inflation with the flows of all US domestic equity mutual funds. A possible explanation for this is explored in Section 6.

Nevertheless, the result of Table 5.2 may be affected by other time-varying variables that were not controlled for. Therefore, to ensure that robustness of these results, a time-fixed effects regression was also carried out in Section 5.3, which also provided a more parsimonious model for the relationship of inflation with the preference for dividend paying funds.

5.3 – Time-fixed effects regression for all US domestic equity mutual funds

Table 5.3: Time – fixed effects regression between the mutual fund flows of all US domestic equity mutual funds and an interaction effect between the dividend paying funds dummy and the US inflation level between the years 1961 to 2021

	Model 1: Model with lags Fund flow	Model 2: Model without lags Fund flow	Model 3: Model without lags on sample of model 1 Fund flow
First lag of fund flow (%)	.144***		
	(.009)		
Second lag of fund flow (%)	.037***		
	(.004)		

Third lag of fund flow (%)	.016***		
	(.003)		
CAPM alpha (%)	10.456***	18.433***	10.82***
	(.532)	(.702)	(.521)
First lag of CAPM alpha (%)	5.99***		
	(.386)		
Second lag of CAPM alpha (%)	1.183***		
	(.363)		
Dividend yield (%)	-1.739***	-1.811***	-.666***
	(.519)	(.425)	(.239)
First lag of dividend yield (%)	-.14		
	(.241)		
Second lag of dividend yield (%)	.655		
	(.543)		
Third lag of dividend yield (%)	2.256***		
	(.474)		
Institutional fund dummy	4.666***	12.049***	6.482***
	(.541)	(.879)	(.645)
Years of fund operation	-.349***	-1.729***	-.518***
	(.025)	(.085)	(.032)
Inflation – dividend paying fund dummy interaction effect (%)	.234	-.8	-.293
	(.402)	(.549)	(.361)
Lag with inflation – dividend paying fund dummy interaction effect (%)	-.542		
	(.452)		
Dividend paying fund dummy	1.412	5.973***	2.468**
	(1.086)	(1.583)	(1.092)
Constant	4.385***	38.354***	8.549***
	(.603)	(1.261)	(.698)
Observations	70401	96293	70401
R-squared	.08	.067	.037
BIC	780765.9	1174736.0	783897.7

Note: Three time-fixed effects regression models for the relationship between the interaction effect of the dividend fund dummy and inflation against equity mutual funds flows are developed. The first model controls for the lags of mutual fund flows, CAPM alphas, dividend yields and the interaction effect. The second model does not control for any lags and the third model is the same as the second model, but this is applied to the sample of the first model to ensure that the first model indeed fits the data better, following the BIC. Variables that are not seen here but are in the pooled OLS regression were omitted due to perfect multicollinearity with the time-fixed effects Standard errors and units of variables are in parentheses
**** p<.01, ** p<.05, * p<.1*

Once again, the results of Table 5.3, show an insignificant coefficient of the interaction effect between the dividend paying fund dummy and the level of inflation for all three models. As

well, this is also the case when controlling for the lagged interaction effect, as can be seen in model 1. Therefore, it was once again concluded that there is no significant relationship between the preference of investors for dividend paying funds and the level of inflation, confirming the rejection of hypothesis H2.

Additionally, the results regarding the dividend paying fund dummy discussed in Section 5.2 were also confirmed in the results of Table 5.3, in model 2 the coefficient is positive and significant but when controlling for lags, in model 1, it becomes insignificant. Thus, I once again conclude that there does not seem to be any preference for dividend paying funds even irrespective of the level of inflation.

As well, in accordance with the results in model 1 of both Tables 5.1 and 5.2, the current CAPM alpha seems to be the variable that is the most strongly associated with the fund flows of all equity dividend paying funds. Using the coefficient in model 1 of Table 5.3, a one percent increase in the CAPM alpha is associated, on average, with a 10.456 percent increase in the mutual fund flows, ceteris paribus. This suggests that the current performance of a fund is the factor that is most associated with higher fund flows. As well, good past performance is also associated with higher fund flows as can be seen by the positive and significant coefficient of the lags of the CAPM alpha.

Additionally, Table 5.3 shows that higher past fund flows seem to be positively associated with the current fund flows of a fund, as can be seen by the positive and significant coefficient of the fund flow lags. These results are also found to be true in Tables 5.1 and 5.2.

Moreover, across all three models in Tables 5.1, 5.2 and 5.3 the dividend yield is negatively associated with the fund flows. Using the coefficient in model 1 of Table 3, we can see that a one percent increase in the current level of dividend yield is, on average, associated with a 1.739 percent decrease in the mutual fund flows, ceteris paribus. A possible explanation for this is covered in Section 6.

Nevertheless, in Table C.1 we can see the cumulative frequency of fund-years, we see that the observations before the year 1991 only comprises 3.16 percent of all fund-years. Looking at Figure D.1 and Table D.2 in Appendix D, we can see that the variance and average level of inflation appears to be much higher before the year 1991. Thus, it may be the case that the relationship between inflation and the preference for dividend paying funds is different in this period of higher inflation and higher inflation volatility. However, because the observations in this period comprise a very small percentage of all observations, this different relationship could remain unnoticed when considering all observations between the years

1961 to 2021 in the same regression. Thus, to test whether the relationship is indeed different, a split sample regression was carried out in Section 5.4.

5.4 Split sample regressions with time-fixed effects

Table 5.4: Time – fixed effect regressions considering two different periods of time, between 1961 to 1990 and between 1991 to 2021, between all US domestic equity mutual fund flows against the interaction effect of the dividend paying funds dummy and the US inflation level controlling for several variables and lags

	Model 1 Fund flow	Model 2 Fund flow
First lag of fund flow (%)	.11***	.144***
	(.036)	(.009)
Second lag of fund flow (%)		.038***
		(.004)
Third lag of fund flow (%)		.016***
		(.003)
CAPM alpha (%)	9.597***	10.562***
	(1.628)	(.547)
First lag of CAPM alpha (%)	9.817***	5.931***
	(1.107)	(.394)
Second lag of CAPM alpha (%)		1.146***
		(.371)
Dividend yield (%)	-.146	-2.71***
	(.179)	(.411)
Institutional fund dummy	-1.359	4.666***
	(1.568)	(.541)
Years of fund operation (Years)	-.338***	-.355***
	(.056)	(.026)
Inflation – dividend fund dummy interaction effect (%)	2.141**	.443
	(.985)	(.473)
Lag of inflation – dividend fund dummy interaction effect (%)	-2.09**	-.106
	(.815)	(.573)
Dividend paying fund dummy	-4.465	.262
	(3.697)	(1.539)
First lag of dividend yield (%)		-.179
		(.371)
Second lag of dividend yield (%)		1.335**
		(.637)
Third lag of dividend yield (%)		2.362***
		(.531)
Constant	9.437***	4.479***
	(1.654)	(.62)

Observations	2775	68063
R-squared	.223	.079

Note: Time-fixed effects regression, controlling for lags based on the BIC values, considering two different time periods. In model 1 the time period is 1961 to 1990 and in model 2 the time period is 1991 to 2021.
Standard errors and units of variables are in parentheses
**** p<.01, ** p<.05, * p<.1*

The results of Table 5.4 show a very different relationship between the level of inflation and the preference for dividend paying funds in the different time periods.

Before the year 1991, the coefficient of the current interaction effect of the level of inflation with the dividend paying fund dummy is positive and significant at a five percent level. After the year 1990 the current coefficient is still positive but not significant. However, surprisingly, the lagged interaction effect has a negative coefficient in both time periods and in the period before 1991 the coefficient is significant. Thus, this suggests that before the year 1991, an increase in the current level of inflation of one percent was, on average, associated with a 2.141 percent increase in the fund flows of US domestic equity dividend paying mutual funds as compared to US non-dividend paying equity mutual funds, ceteris paribus. At the same time, the results of this period suggest that a one percent increase in inflation in the previous year was, on average, associated with a 2.09 percent decrease in the current fund flows of US domestic equity dividend paying mutual funds as compared to US non-dividend paying equity mutual funds, ceteris paribus. Nevertheless, as the coefficient of the current interaction effect is higher than that of its lag, it appears that the overall relationship of inflation on the preference towards dividend paying mutual funds is positive. Thus, this provides evidence in favour of the third hypothesis, so I decided not to reject it. An explanation for the opposite signs of the coefficient of the current interaction effect and its lag is explored in Section 6.

However, it is important to note that Model 1 in table 5.4 was developed with a very small sample of observations as compared to Model 2, thus, the statistical power of this model is significantly lower, increasing the probability of a type II error in the regression. Moreover, from these results one cannot conclude that the relationship between the level of inflation and the preference for dividend paying funds is more significant due to the higher volatility or average level of inflation as this could also just be due to the different period. Nevertheless, based on the information available I still do not reject hypothesis H3.

Section 6 - Explanation and discussion

As mentioned in Section 5, Table 5.1 seems to suggest that the absolute fund flow of dividend paying equity mutual funds in the US is significantly positively associated with the level of inflation. Nevertheless, we found that when controlling for the relationship of inflation with the fund flows of all equity mutual funds, this was no longer the case, as the interaction effect between the dividend paying fund dummy and the level of inflation was not found to be significant, both in Tables 5.2 and 5.3.

As mentioned before, it appears that the positive relationship between the fund flows of all equity mutual funds and the level of inflation, overpowers the positive relationship between the fund flows of dividend paying mutual funds and the level of inflation. This also helps to explain the main result of this paper which is that the level of inflation is not related to the preference for dividend paying funds, as highlighted by the significance of the coefficient of the interaction effect in Model 1 of tables 5.2 and 5.3.

Additionally, based on the lags of the level of inflation presented in Model 1 of Table 5.2, it appears that the relationship of inflation with the flows of all equity mutual funds has a cyclical nature, where inflation in the previous period is negatively associated with fund flows in this period but the inflation in this period is positively associated.

Krishnamurthy et al. (2018) presented a negative association between the current equity mutual fund flows and the current level of inflation, as well as presenting a negative association between the lag of the level of inflation and the current equity mutual fund flows. The explanation provided for this is that investors fall in the inflation illusion hypothesis, and thus, discount real cash flows at the nominal rate, depressing equity prices and leading to outflows. Nevertheless, the results of Table 5.2 differ from this and I believe this is due to the fact that Krishnamurthy et al. (2018) used aggregate instead of individual equity mutual fund flows and therefore the relationships that held at an aggregate level might not hold when considering individual funds, especially considering that controls for fund-specific attributes were introduced. Moreover, while in the analysis of Krishnamurthy et al. (2018), observations on the effect of inflation were generally evenly spread across all years, observations in this paper are very highly concentrated towards the latter years of the sample, where inflation levels were lower. Thus, considering this very different sample the findings of Krishnamurthy et al. (2018) were not likely to hold here as well, so, the cyclical nature of the relationship of inflation with the flows of individual equity mutual funds likely cannot be explained with the inflation illusion hypothesis.

Instead, I consider an alternative explanation for this. As we are studying fund flows of individual funds, it is possible that individual funds are faster in responding to higher levels of inflation than the aggregate fund flows. Thus, individual fund managers are better able to diversify their investments into sectors that benefit from higher inflation. If we assume that funds with more experience, that have operated for more years, are those with the best ability to deal with inflation, then as in Table 5.2 we are dealing with a Pooled OLS regression, the bulk of observations will be driven by funds with more years of operation and therefore those with a better ability to respond to inflation. These funds may deal with inflation better by investing part of their portfolios into sectors that have better performance during inflationary periods. Thus, we would also assume that funds that are worse at dealing with inflation do not invest or invest much less into those sectors whose returns are positively related to inflation. At the same time, as can be seen in Table C.1, over 96 percent of all observations are from the period after the year 1990, where inflation had a lower volatility than before, and in general periods of higher inflation were followed by periods of lower inflation, as can be seen in Figure D.1.

Thus, let us assume a starting period where inflation is going up. As mentioned, funds with a better ability to deal with higher inflation might have a better relative performance than funds that do not, leading to higher fund inflows. Additionally, as these funds represent the bulk of observations, this will lead to there being a positive association between the current level of inflation and the current mutual fund flows. In the next period, if inflation goes down, funds that are better able to deal with inflation may perform worse, relative to other funds, because the larger part of their portfolios which invest in sectors whose performance is positively related with inflation is likely to underperform. In contrast, the funds with a lower ability to deal with inflation may perform better as they invested less of their funds into those sectors that benefit from higher inflation. Thus, funds with a better ability to deal with inflation will experience outflows while the opposite will be true for those that do not. And once again, as the former represent the bulk of observations, in average, fund flows will be going down along with the level of inflation. So, in this period fund flows are still positively associated with inflation while now they are negatively associated with the lag of inflation. This cycle will then continue to repeat, explaining the cyclical nature described in Model 1 of Table 5.2.

Moreover, this explanation is also supported by the fact that the coefficient of the years of fund operation is consistently negative throughout the results. Meaning that more years of fund operation is negatively associated with fund flows. If we consider that the bulk of observations is concentrated after the year 1990, where the inflation was in general lower, then funds that concentrate more in dealing with inflation, which are assumed to be those

with more years of fund operation, would be expected to obtain lower fund flows possibly due to poorer performance. Thus, the negative coefficient in the years of fund operations supports this.

Nevertheless, I consider another explanation when evaluating the reason why the lag of the interaction effect between the level of inflation and the dividend paying fund dummy has a negative coefficient while the current interaction effect has a positive coefficient, as seen in Model 1 of Table 5.4. Using another explanation is appropriate as the level of inflation in the period considered in this regression (1961-1990), on average, was much higher as can be seen in Table D.2. Moreover, the volatility in inflation was also much higher as pointed out by the standard deviation in Table D.2. Looking at Figure D.1, we can see that, in general, there were longer periods of continuously increasing inflation followed by longer period of continuously decreasing inflation, as compared to the period after 1990.

Following this, I assume that dividend paying funds are generally better in dealing with inflation because funds that focus on paying dividends to investors will invest in sectors that pay higher dividend yields like the Energy and Industrials sector. At the same time, these sectors will also perform better during inflation, as seen in Bampinas & Panagiotidis (2016). Thus, assuming an initial period where inflation is going up, the increasing inflation will generate more preference for dividend paying funds, due to the sectors in which they invest in, leading to higher fund inflows for them. Thus, in the current period the association between the level of inflation and the preference towards dividend paying funds will be positive. Nevertheless, in the next period, because dividend paying funds experience more inflows in the last period, it is probable that their valuations are now higher, which reduces the expected return of investing in them. Thus, even if inflation continues to go up, attracting investment towards dividend paying funds, the reduced expected returns because of the higher inflation in the last period will reduce the amount of inflows that dividend paying funds received. Thus, in the current period the association between inflation and the preference of dividend paying funds will still be positive but the association between the lag of inflation and the current preference for dividend paying funds will be negative, explaining the change in the sign. The opposite holds true when inflation is going down, lower inflation in one period is associated with outflows in dividend paying funds in the current period, lowering their valuation, leading to less outflows in the next period if inflation continues to go down.

Moving on, in Section 5.3 it was discussed that the current dividend yield across all models in Tables 5.1.1, 5.2 and 5.3 had a negative relationship with the fund flows. Hartzmark & Solomon (2019) could possibly help to explain this. This paper finds that investors are much more responsive to price changes in stocks than to dividends. This may help to explain why

funds with higher dividend yields tend to experience lower fund flows, because they pay higher dividends, their performance in terms of price may be worse as price drops tend to occur after each dividend payment. Thus, as investors seem to be more responsive to price changes, they are less likely to invest into funds that pay higher dividend yields and perform worse when it comes to capital gains. Nevertheless, it is important to note that Hartzmark & Solomon (2019) does show that investors that focus on dividends are less likely to sell stocks that pay more dividends, by showing that investors are less likely to sell stock that pay more dividends. Thus, the lower fund flows of funds that pay higher dividend yields is likely not due to these funds experiencing large outflows but because they experience less inflows than other funds that pay lower dividend yields.

This also provides an alternative explanation to the main result of this paper which is that there is not a significant relationship between the preference for dividend paying funds and the level of inflation. As Hartzmark & Solomon (2019) showed, investors evaluate performance mostly based on price changes and not on dividends, this suggests that the capital gains component of returns is much more important to investors than the dividend payments. Thus, even if dividend paying funds perform better in terms of overall returns because of the level of inflation (which would predict higher inflows based on the consistently positive and significant coefficient of the CAPM alphas in the results) if most of the returns come from dividends and not capital gains, investors may not display a clear preference for dividend paying funds. Nevertheless, there could be some investors that do put a bigger emphasis on returns based on dividends as compared to capital gains, which do exhibit a preference for dividend paying funds during inflationary periods. However, because these investors appear to be a minority in the sample, their increased preference for dividend paying funds is not strong enough to generate a significant and positive relationship between the level of inflation and the interaction effect of inflation on the dividend paying fund dummy. This last point is supported by the fact that the coefficient of the interaction effect is found to be positive in Model 1 of tables 5.2 and 5.3, yet insignificant.

This could also suggest that investors in the period from 1961 to 1990 (which is not covered that much in Hartzmark & Solomon (2019)) placed more importance in the returns that came from dividends, as compared to the period after 1990. Thus, this helps to explain why in this period the coefficient of the interaction effect is indeed positive and significant. Nevertheless, as also cautioned in Section 5, the findings in this period are based on much lower levels of observations, meaning that a probability of a Type II error is indeed significantly higher.

Finally, I would also like to reconciliate some of the other results found in this paper with the mutual fund literature. Jank (2012) showed an ability of mutual funds to predict real economic

activity as measured by GDP growth, consumption growth, industrial production growth and labor income growth. This paper found that mutual fund flows help to predict economic activity growth, but the opposite does not hold true. The unclear relationship of GDP growth with mutual fund flows (where the current and first lag of GDP growth are insignificant while the second and third lags are significant but have opposite signs), as seen in Model 1 of Table 5.2, supports this as it shows that GDP growth is a poor predictor of mutual funds flows. As well, across all the regressions, I found that the factor that was most strongly associated with the mutual fund flows was the CAPM alpha, this goes in agreement with the results of Barber et al. (2016) which also found the CAPM alpha to be the most relevant factor. Moreover, the positive association of performance with fund flows agrees with the findings of Berk et al. (2004).

Section 7 - Conclusion

In conclusion, the main result of this paper is that between the years 1961 to 2021, the level of inflation in the US does not have a clear significant relationship with the preference for US dividend paying equity mutual funds, as illustrated by the fund flows. The results find that even though inflation is positively associated with the fund flows of all domestic equity mutual funds, the fund flows of just the dividend paying mutual funds do not appear to have a stronger association with the level of inflation when compared to the association of the non-dividend paying mutual funds. Thus, I conclude that investors do not appear to have an increased demand for dividends during inflationary periods, rejecting the theory presented in Basse & Reddemann (2011). Thus, this entails that managers should not raise dividends based on the believe that higher inflation relates to more dividend demand.

Nevertheless, this paper does find some evidence that before the year 1991, there was a significant and positive association between the level of inflation and the preference for dividend paying funds. In this period it could be the case that the demand for dividends increased when there were higher levels of inflation, which could entail that the theory presented in Basse & Reddemann (2011) would not be rejected in that time. Nevertheless, it is still not clear whether this is due to the higher average levels of inflation and inflation volatility or just due to the time period. I leave this to be answered by future research and additionally, future researchers could also focus on studying whether the results found in this paper can also be found in other countries apart from the United States.

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Appendices

Appendix A

Table A.1: Regression results of forecasted inflation against inflation

	Inflation
Forecasted inflation	1.004***
	(0)
Observations	108235
R-squared	1

Standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*

Appendix B

Table B.1: Descriptive statistic of main variables

Variable	Observations	Mean	Standard Deviation.	Min	Max
Mutual fund flow (%)	96296	26.039	393.411	-1426.762	75972.109
Transformed fund flow (%)	96296	19.807	111.646	-101.795	1249.895
CAPM alpha (%)	106577	-.032	1.344	-38.951	153.819
Transformed CAPM alpha (%)	106577	-.041	.892	-5.624	5.659
Dividend yield (%)	108235	.605	1.938	0	528.571
Institutional fund dummy	108235	.374	.484	0	1
Short-term interest rate (%)	108085	2.097	2.252	.114	15.911
Long-term interest rate (%)	108235	3.439	1.805	.894	13.911
Years of fund operation	108235	12.038	10.756	0	97
Inflation (%)	108235	2.287	1.366	-.356	13.549
GDP growth (%)	107685	4.205	2.695	-2.24	12.958
S&P 500 yearly return (%)	108235	9.697	16.69	-38.486	34.111

Appendix C

Table C.1: Table showing the frequency and cumulative frequency of fund-years by year

Year	Frequency	Frequency (%)	Cumulative Frequency (%)
1961	37	0.03	0.03
1962	36	0.03	0.07
1963	38	0.04	0.10
1964	39	0.04	0.14
1965	42	0.04	0.18
1966	44	0.04	0.22
1967	55	0.05	0.27
1968	75	0.07	0.34
1969	90	0.08	0.42
1970	94	0.09	0.51
1971	99	0.09	0.60
1972	103	0.10	0.69
1973	99	0.09	0.79
1974	98	0.09	0.88

1975	99	0.09	0.97
1976	105	0.10	1.07
1977	104	0.10	1.16
1978	107	0.10	1.26
1979	112	0.10	1.36
1980	113	0.10	1.47
1981	115	0.11	1.57
1982	125	0.12	1.69
1983	144	0.13	1.82
1984	150	0.14	1.96
1985	167	0.15	2.12
1986	177	0.16	2.28
1987	187	0.17	2.45
1988	200	0.18	2.64
1989	222	0.21	2.84
1990	347	0.32	3.16
1991	389	0.36	3.52
1992	570	0.53	4.05
1993	714	0.66	4.71
1994	872	0.81	5.51
1995	1067	0.99	6.50
1996	1268	1.17	7.67
1997	1625	1.50	9.17
1998	1914	1.77	10.94
1999	2149	1.99	12.93
2000	2284	2.11	15.04
2001	2637	2.44	17.47
2002	2825	2.61	20.08
2003	3001	2.77	22.86
2004	3145	2.91	25.76
2005	3155	2.91	28.68
2006	3357	3.10	31.78
2007	3685	3.40	35.18
2008	4676	4.32	39.50
2009	4684	4.33	43.83
2010	4786	4.42	48.25
2011	4807	4.44	52.69
2012	4848	4.48	57.17
2013	4959	4.58	61.75
2014	5037	4.65	66.41
2015	5111	4.72	71.13
2016	5154	4.76	75.89
2017	5237	4.84	80.73
2018	5238	4.84	85.57
2019	5254	4.85	90.42
2020	5190	4.80	95.22
2021	5174	4.78	100.00
Total	108235	100.00	

Appendix D

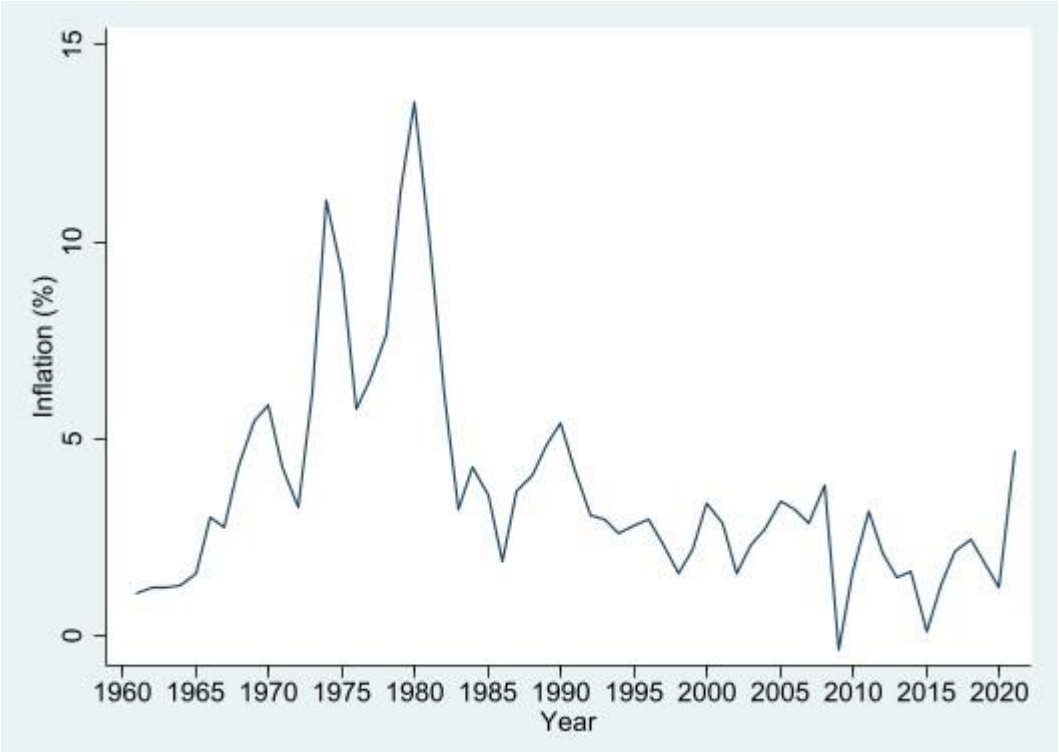

Figure D.1: Time series plot of inflation in the US between the years 1961 to 2021

Table D.2: Table showing summary of inflation before the after the year 1990 and before the year 1991

Year	Observations	Average	Standard Deviation	Min	Max
After 1990	104812	2.184	1.149	-0.356	4.698
Before 1991	3423	5.427	2.894	1.071	13.549

Appendix E

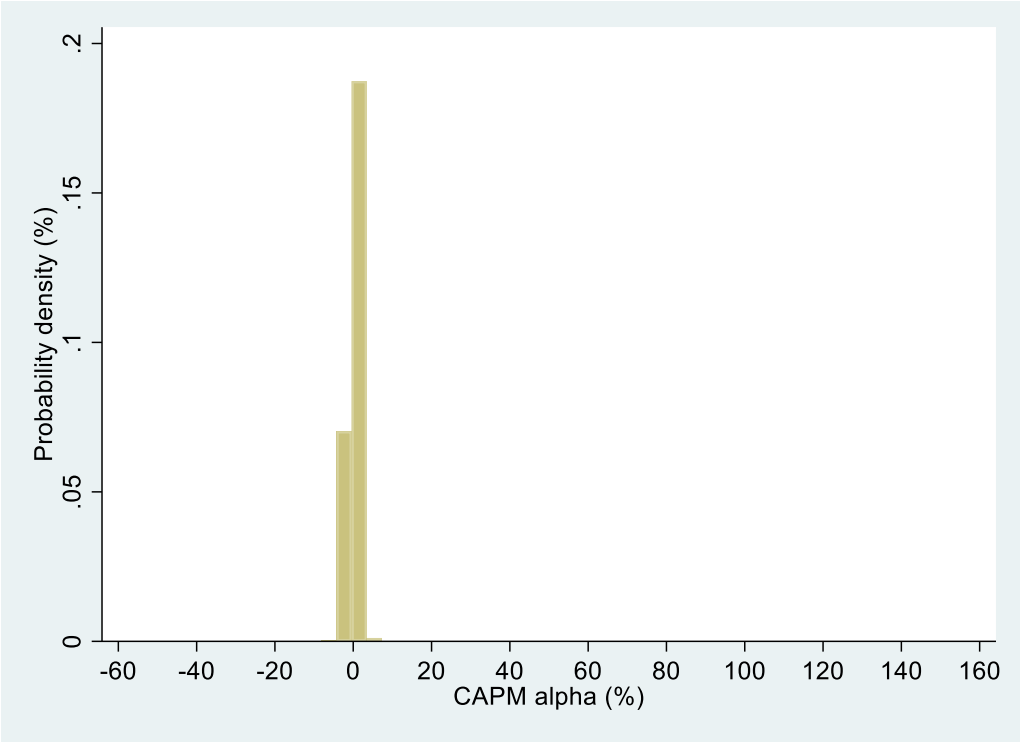

Figure E.1: Distribution of CAPM alphas

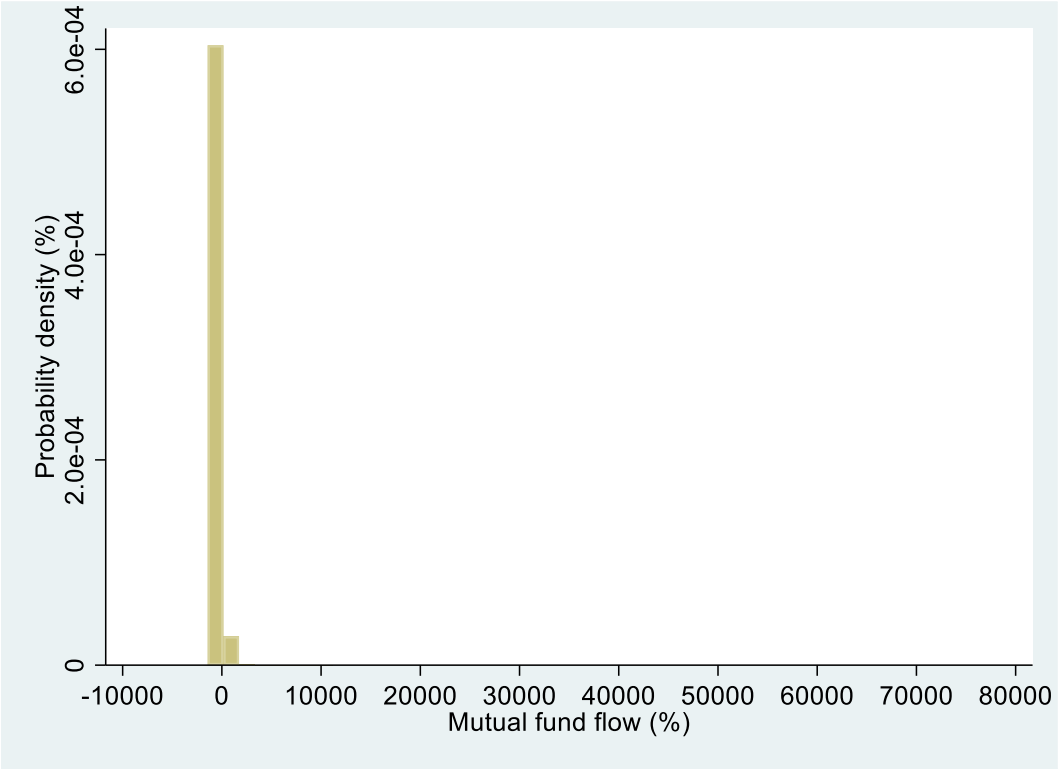

Figure E.2: Distribution of mutual fund flows

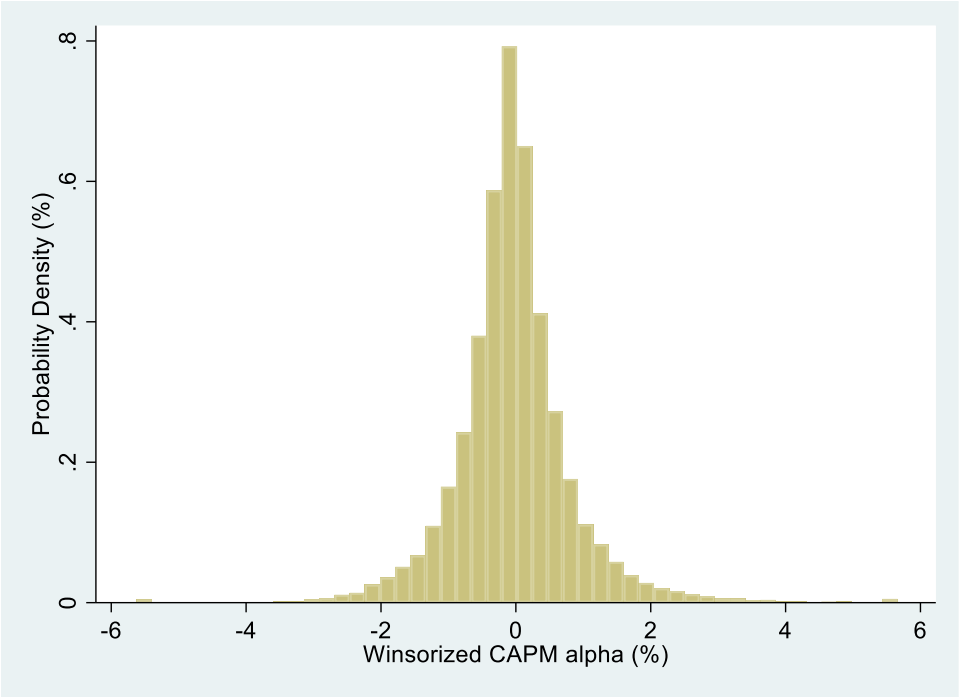

Figure E.3: Graph showing the distribution of the CAPM alphas after being winsorized

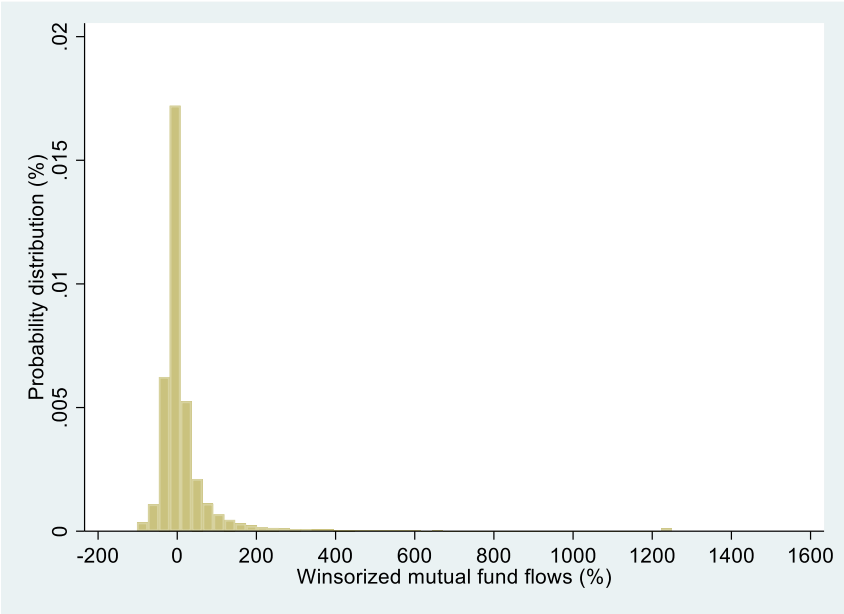

Figure E.4: Graph showing the distribution of mutual fund flows after being winsorized