Monetary Policy and the Profitability Premium: The Role of Information Precision*

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Abstract

This study examines how monetary policy announcements impact stock returns with different profitability, thereby generating the profitability premium. By categorizing monetary policy as hawkish or dovish, representing different policy objectives and rules, I find that the profitability premium is higher during hawkish periods. Additionally, I highlight a declining profitability premium since 1980, influenced by the long-term decrease in real interest rates and stickier firm owners' inflation expectations. Through mediation analysis, the study compares the effects of transitioning to a hawkish regime on the profitability premium, finding a stronger impact through inflation expectations. These findings suggest that monetary policy conduct drives the profitability premium, providing insights into stock return predictability.

Keywords: monetary non-neutrality, profitability premium, sticky expectation

JEL Codes: E42, E44, E52, G11, G12

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1 Introduction

Bianchi et al. (2022) investigate the joint switching process between asset valuations and the conduct of monetary policy. They argue that the conduct of monetary policy can affect asset valuations through the channel of sticky expectations from the household. They find that the components of deliberate changes in the monetary policy rules in announcements have persistent effects on the real interest rate and the equity premium, while the usual monetary policy shocks that most literature focuses on do not. They explain the existence of long-term monetary non-neutrality that is absent in the prior theoretical framework.

Building on this research, I investigate the impact of monetary policy announcements on stock returns with different firm profitability and how these effects differ across hawkish and dovish monetary policy regimes. Implicitly inducted from the result in Coibion et al. (2020b), firm owners with different levels of profitability may have different levels of responsiveness to monetary policy announcements, which may create a joint switching process between the profitability premium and the conduct of monetary policy. In particular, more profitable firms may be more sensitive to central bank information shocks, as they can update their expectations about future economic fundamentals more quickly, allowing them to make better production or employment decisions and earn higher profits. As a result, the stock returns may be more responsive to the aggregate risk. This difference in responsiveness could create a profitability premium between more and less profitable firms, which may vary depending on the stance of monetary policy.

Specifically, in hawkish regimes when the central bank focuses more on controlling inflation than promoting economic growth, agents may pay closer attention to monetary policy announcements when there is high inflation, leading to higher expected returns for more profitable firms. The Federal Reserve adjusts the nominal interest rate in response to inflation, but the natural rate of interest is beyond its control. Consequently, the difference between the real interest rate and the natural rate of interest serves as a gauge of the monetary policy stance. A hawkish regime arises when the real interest rate surpasses the natural rate of interest, prompting the Fed to raise interest rates to lower inflation. Conversely, a dovish regime arises when the opposite scenario plays out. This research helps to shed light on the effect of monetary policy on different firms, a field that is still in its early stage.

I uncover a persistent relationship between the profitability premium, the valuation of the long-short profitability portfolio, and monetary policy regimes. This discovery supports my belief that monetary policy impacts the discount rate that influences the profitability premium. In my study, the first hawkish regime emerged at the end of 1980 when Paul Volcker took over as Chair. Following 1980, the real interest rate declined, and people became less concerned with inflation-related news. Additionally, I observe that the declining profitability premium after 1980 is tied to movements in the real interest rate and people's sticky expectations toward the macroeconomic fundamentals.

The primary empirical analysis in this version of the study comprises three key segments. The first part employs a Markov-switching model to illustrate the correlation between the profitability premium, valuation, and monetary policy regimes. Monetary policy is regime-switching since each Chair of the Federal Reserve has a distinct stance on the conduct of monetary policy that seldom changes. To further validate this approach, the break test proposed by Bai and Perron (2003) reveals that the breakpoints in the valuation for the long-short profitability portfolio overlap with regime-switching dates. My findings indicate that hawkish regimes with high monetary policy correspond to a low valuation of the long-short profitability portfolio and a high profitability premium, while the opposite scenario plays out in dovish regimes. These results lend credence to my belief that the conduct of monetary policy has a bearing on the valuation at the cross-sectional level.

In the second segment of the study, I aim to establish a link between the profitability premium and the concept of sticky expectations, drawing inspiration from the works of Bouchaud et al. (2019) and Bianchi et al. (2022). If agents' expectations are rational, they will adjust their expectations immediately following the announcement of a new inflation target by the Federal Reserve. Consequently, inflation and the real interest rate may not be persistent and may not align with the dynamics of the profitability premium. To test the sticky expectation hypothesis, I gauge the degree of information stickiness and inflation expectation volatility. I find that if people have stickier inflation expectations, the profitability premium tends to be lower. Additionally, I observe a decline in the real interest rate and profitability premium since 1980, which is consistent with the emerging literature indicating that low real interest rates reduce the risk premium. In a related study, Kekre and Lenel (2022) established that expansionary monetary policy reduces the equity premium since more risk-tolerant individuals hold wealth. My research reveals that the profitability premium has also remained low in the last decade, aligning with the downward trend in the real interest rate.

In the final part of this study, I employ a mediation analysis to investigate the causal impact of the hawkish regime switch announcements on the valuation ratio of the long-short operating profitability portfolio and the profitability premium. The two different channels are compared, i.e., the impact on agents' inflation expectations and changes in the real interest rate. The findings indicate that both channels have a significant causal impact on the valuation ratio and the profitability premium. However, the causal effect of affecting agents' inflation expectations is more robust.

1.1 Related Literature

In this subsection, I outline the related literature and lay out the intended contribution of this paper.

The first intended contribution of this paper is to analyze how monetary policy affects different firms by analyzing how the valuation varies across time, and this paper differs by considering the firm owners' expectations toward inflation, which is an area that is still in its early stage. While previous research on monetary policy has primarily focused on its aggregate effects on the economy, this paper takes a different approach by examining the impacts of monetary policy on the cross-section of firms. The focus on firms' rather than households' expectations further differentiates this paper from most literature on monetary policy transmission.

This paper diverges from most monetary policy literature that concentrates on high-frequency identification (e.g., Nakamura and Steinsson (2018); Jarocinski and Karadi (2020)) in several ways. First, I examine the effects of monetary policy shocks on persistent asset valuation patterns, which cannot be generated by these shocks alone. Second, this study highlights the effectiveness of the information channel in altering real outcomes by shaping agents' expectations. This effectiveness may depend on how agents respond to central bank actions, which are determined by their differing expectations. In this study, the expectations of firm owners are emphasized because the literature lacks a clear understanding of how they form diverse expectations about the fundamentals.

Apart from the macroeconomic literature, recent research on stock return predictability has also emphasized the role of sticky expectations. For instance, Katz et al. (2017) find that domestic stock investors' nominal discount rates react sluggishly to inflation. Similarly, Farmer et al. (2023) demonstrate that market return predictability concentrates on a narrow time interval, which they attribute to sticky expectations. Furthermore, sticky expectations generate factor momentum that focuses on factors with more macroeconomic news, as per Ehsani and Linnainmaa (2022). Farmer et al. (2023) extend Ehsani and Linnainmaa (2022)'s analysis to the SMB and HML factors and find similar patterns for short-horizon predictability. Since the profitability premium should also incorporate substantial aggregate news, my research contributes to the literature by presenting a mechanism through which monetary policy impacts the profitability premium.

The second intended contribution is to explain the profitability premium, a significant firm characteristic that explains the cross-section of stock returns, yet lacks a clear theoretical framework to explain its existence and to characterize the time series pattern.

The literature on the difference in stock returns between high and low-profitability firms has approached the issue from various perspectives, such as risk, behavior, and macroeconomics. Despite some unique patterns that differentiate the profitability premium, many models fail to reconcile its co-existence. For example, while book-to-market sorting is based on the permanent component of productivity shocks, profitability sorting primarily relies on the transitory component (Ai et al., 2022). Dou et al. (2021) explain that in industries with lower turnover rates of market leaders, profit margins are higher but more sensitive to discount rate movements, leading to a profitability premium that loads on discount rate risks. This pattern differs from the size and value premiums, which mainly stem from cash flow risks (Campbell and Vuolteenaho, 2004). Furthermore, persistence is another pattern of the profitability signal, which Bouchaud et al. (2019) link to analysts' sticky expectations of future earnings.

In this context, my analysis contributes to the literature by providing a mechanism through which monetary policy affects the profitability premium. My framework assumes that agents have sticky expectations of inflation, which is closer to Bouchaud et al. (2019). However, my approach differs by focusing on expectations toward monetary policy announcements.

Finally, this paper reveals a source for the time-varying premium and the interaction between asset pricing and macroeconomics. Using two analyses, I contribute to the time-varying premium literature. First, why is there a regime-switching pattern in the profitability premium over the past 70 years (Smith and Timmermann (2022))? Second, why may the time-series pattern for the profitability premium differ from the size or value premium? To connect asset pricing and macroeconomics, I focus on the low-frequency monetary policy regimes that persistently affect the firm owners' inflation expectations and real interest rates. Monetary policy regimes then generate persistent movement in valuation and premium.

Section 2 discusses the data source, including the firm characteristics, monetary policy instruments, and inflation expectations. Section 3 presents empirical results on the monetary policy and profitability premium. Section 4 concludes the paper.

2 Data

I use several types of data described below. They are the profitability premium, expectations of inflation, and monetary policy instruments. The sample spans from July 1963 to December 2020.

- **Profitability premium and valuation:**

The data of firm characteristics and portfolio returns are available from the 'Open Source Asset Pricing' data repository maintained by Andrew Chen and Tom Zimmermann. [1] The P/E ratio is the 6-month lagged market value divided by income before extraordinary items (IB). The P/E (B/M) ratio for each leg is the value-weighted P/E (B/M) of firms within that portfolio, and the P/E of the long-short portfolio is the log of long-leg P/E (B/M) minus the log of short-leg P/E. I winsorize the P/E at the 1st and 99th percentiles before computing the portfolio P/E, and the P/E series is available from the 'Open Source Asset Pricing' data repository. I construct the annual book value with the technique of Lochstoer and Tetlock (2020), then I follow Asness and Frazzini (2013) to merge it with the monthly market value to construct the monthly firm-level B/M.

The Ball et al. (2016) operating profitability is (REVT − COGS − XSGA + XRD) / AT. REVT is the total revenue. COGS is the cost of goods sold. XSGA is the selling and general administrative expenses. XRD is the R&D expenses, and AT is the total asset. I exclude negative observations during the construction. Among the measures of profitability, I select operating profitability for two reasons. First, according to Ball et al. (2015), if we have the consistent denominator to compute the profitability, then the gross profitability and net income have identical predictive power for the cross-section of stock return. Further, the operating profitability explains the cross-section of stock returns better than the other two measures. Second, Morlacco and Zeke (2021) find that monetary policy shocks significantly

[1] https://www.openassetpricing.com/data/. Relevant paper refers to Chen and Zimmermann (Forthcoming). I thank Andrew Chen and Tom Zimmermann for maintaining the database.

affect XSGA, which is an important part of the operating profitability and can explain the cross-sections of stock returns (see Eisfeldt and Papanikolaou (2013)).

- **Expectations of inflation:**

The quarterly data are available from Survey of Professional Forecasters (SPF) in the website of the Federal Reserves Bank of Philadelphia. [2] I obtain the mean responses of CPI annualized inflation that starts in 1981Q3, and the specification of expectation updating follows that in Coibion and Gorodnichenko (2015),

$$F_t\pi_{t+h,t} = (1-\lambda_\pi)E_t\pi_{t+h,t} + \lambda_\pi F_{t-1}\pi_{t+h,t} \tag{1}$$

π_t is the inflation rate in quarter t. $F_t\pi_{t+h,t}$ is the subjective expectation towards the h-quarter ahead inflation. E is the objective expectation. $\lambda_\pi \in [0,1]$ is the probability of not acquiring new information in each period, interpreted as the degree of information stickiness. Coibion and Gorodnichenko (2015) provides the following handy specification to map the forecast error to forecast revisions, [3]

$$\pi_{t+1,t} - F_t\pi_{t+1,t} = c + \beta(F_t\pi_{t+1,t} - F_{t-1}\pi_{t+1,t}) + \epsilon_t \tag{2}$$

$\pi_{t+1,t}$ is the inflation rate in quarter t. $F_t\pi_{t+1,t}$ is the quarter-t one-quarter ahead survey expectations. $F_{t-1}\pi_{t+1,t}$ is the survey done in quarter $t-1$, and $\lambda_\pi = \frac{\beta}{1+\beta}$ is the degree of information stickiness.

I run OLS to estimate equation (2) from 1981Q3 to 2020Q4 to obtain $\hat{\beta} \approx 1.11$ (s.e. = 0.09), which is close to the estimate from Coibion and Gorodnichenko (2015). $\hat{\lambda}_\pi = \frac{1.11}{2.11} =$

[2] https://www.philadelphiafed.org/surveys-and-data/cpi-spf

[3] The full-information rational expectations is

$$E_t\pi_{t+1,t} = \pi_{t+1,t} + \nu_{t+1,t}$$

in which $\nu_{t+1,t}$ is the full-information rational expectations error and is uncorrelated with information dated t or earlier. By plugging $E_t\pi_{t+1,t}$ in equation (1) and make arrangements, we have equation (2).

0.53 suggests that agents update their information sets every one or two months on average for the quarterly forecasts, which is a significant magnitude in terms of the forecasting horizon.

From equation (2), I construct the quarterly time-series of λ_π with the rolling regression. After I merge λ_π with the monthly data, I fill in missing values with the previous observation.

- **Monetary policy instruments:**

I use the real federal funds effective rate and the natural rate of interest (r^*) to compute the monetary policy spread. The data is from the Federal Reserve Bank of New York. [4] The monetary policy spread is

$$\text{mps}_t = \text{FFR}_t - \pi_t - r_t^*$$

FFR_t is the federal funds effective rate in month t, π_t is the 12-month rolling average annualized inflation in month t, and r^* is available at the quarterly frequency. I compute π_t according to Bianchi et al. (2022) to proxy for the inflation expectation. Similar to the quarterly time-series of λ_π, I fill in missing values of the previous r^* after merging with the monthly observations.

The monetary policy spread measures the monetary policy stance based on monetary policy rules (Laubach and Williams (2003)). r^* is the level of long-run real interest rate at which the output reaches its maximum potential level and unemployment reaches its minimum potential level. The economy is at equilibrium and expected to prevail over the next several years. If the real interest rate is above its natural level, then inflation is above the central bank's desired target. Hence, the central bank needs to raise the nominal interest rate to contract the money supply and dampen economic activity, and the monetary policy becomes hawkish. The opposite scenario happens in a dovish regime.

I also estimate the volatility of the inflation expectation by the GARCH(1,1) specification. By Reis (2006) and Coibion and Gorodnichenko (2015), people pay more attention

[4] https://www.newyorkfed.org/research/policy/rstar, and I take the one-sided, filtered estimate proposed by Laubach and Williams (2003).

to inflation news if inflation is more volatile. Also, inflation highly correlates with inflation expectations. Therefore, the inflation expectation volatility is an inverse proxy for the degree of information stickiness toward inflation.

3 Empirical Results

3.1 Monetary Policy and Valuation of the Long-Short Portfolio

Table 1 displays the returns, CAPM-α, and beta of the monetary policy spread. Table 1 indicates the existence of the profitability premium that loads on the monetary policy spread. The results in Panel A indicate the presence of the operating profitability premium, with the long-short portfolio generating an average annualized return of 4.6% and a standard error of 1.99%. In Panel B, the portfolio's outperformance over the CAPM is highlighted, with an annualized CAPM-α of 7.13% and a standard error of 1.87%. Finally, Panel C demonstrates that portfolios with higher profitability have a higher beta of the monetary policy spread, with the long-short portfolio exhibiting a beta of 2.37. These findings suggest that market risk alone cannot account for the profitability premium and that monetary policy may play a role in explaining it.

To further demonstrate my thought, Figure 1 documents a robust relationship between the long-short operating profitability portfolio valuation and the monetary policy spread. The figure finds two patterns. First, the monetary policy spread and valuation ratio seem to co-move in a regime-switching pattern. When the monetary policy spread is high, the valuation is low. Second, the valuation ratio starts to co-move in the opposite direction after 1980: There is a downward trend in the interest rate during an upward trend in the valuation.

Table 1 and Figure 1 indicate that monetary policy spread and valuation move together. Motivated by these results, I invoke the Markov-switching model to estimate the mean of mps with the following specification,

$$\text{mps}_t = r_{s,t} + \epsilon_{s,t} \tag{3}$$

In equation (3), $s = \{H, D\}$ are two states that stand for hawkish/dovish regimes, and $\epsilon \sim \mathcal{N}(0, \sigma_{s,t}^2)$ is a zero-mean error term. I assume that both the mean and variance of the residual are regime-switching.

Figure 2 depicts the smoothed probability of the hawkish regime, while Table 2 explicitly shows the periods of hawkish regimes. A regime is classified as hawkish if the smoothed probability for a hawkish regime reaches 0.5. The first estimated hawkish regime begins in October 1980, two months after Paul Volcker takes over as Chair of the Federal Reserve. During this regime, Volcker actively raised the federal funds rate to combat the 1970s Great Inflation. From 1980 to 2000, the only dovish monetary policy occurred from September 1990 to May 1994. This regime started about six months after the early-1990 recession, caused by the late-1980 interest rate hikes and the 1990 oil-price shock, when Alan Greenspan became the Chair. The policy then returned to a hawkish stance in mid-1994 when the Fed decided to increase the interest rate. After the onset of the eight-month recession in March 2001, the estimated monetary policy regime is dovish, except for the following four one-year periods:

a) September 2006 – September 2007, when Ben Bernanke, the Chair of the Federal Reserve at that time, finds sizable inflationary pressure and decides to keep the target for the federal funds rate at 5.25%. [5]

b) December 2008 – October 2009, the financial crisis and the zero lower bound (ZLB) period begins. I interpret this period as a "weakly" dovish regime for three reasons. First, the Fed announces to initiation of the large-scale asset purchase program in

[5]The March 2007 FOMC statement mentions that "In these circumstances, the Committee's predominant policy concern remains the risk that inflation will fail to moderate as expected. Future policy adjustments will depend on the evolution of the outlook for both inflation and economic growth, as implied by incoming information.". See the following link for details, https://www.federalreserve.gov/newsevents/pressreleases/monetary20070321a.htm.

agency debts, mortgage-backed securities, and long-term treasury bonds in November 2008. They aim to put downward pressure on the long-term interest rate to boost the recovery from the Great Recession. [6] Second, the monetary policy spread in my data is positive between April 2009 and September 2009, peaking at 1.05% in July 2009. Besides, the average monetary policy spread during this period is 0.06%. Finally, Figure 1 indicates that the natural rate of interest drops significantly from 2.07% in April 2008 to 0.64% in March 2009 and recovers to 1.05% in July. However, the short-term real interest rate increases from -1.56% to 2.11% in the same period, which increases faster than the natural rate of interest. This phenomenon may lead to the seemingly estimated hawkish regime, and it arises because of the speedy recovery from the Great Recession that stimulates economic activities.

c) December 2014 – December 2015. As in period b), this period is also more precisely the "weakly" dovish regime than a hawkish regime. The monetary policy spread in my sample is 0.031% in January 2015 and 0.047% in February 2015, while negative for the other months. The monetary policy stance has been accommodative since late 2009, especially when Janet Yellen becomes the Chair in 2014.

d) November 2018 – October 2019. The monetary policy spread in this period is negative, but the estimated regime is hawkish. The Fed raises the interest rate 4 times after Jerome Powell becomes the Chair in February 2018, and he maintains in the December 2018 FOMC statement that future increases in the interest rate are appropriate. Thus, the market believes that the monetary policy stance will no longer be accommodative.[7]

The smoothed probability of the hawkish regime is presented in Figure 2, and I use this to identify periods of hawkish monetary policy in Table 2. The estimated hawkish regime

[6] https://www.federalreserve.gov/newsevents/pressreleases/monetary20081125b.htm.

[7] The December 2018 FOMC statement mentions that "The Committee judges that some further gradual increases in the target range for the federal funds rate will be consistent with sustained expansion of economic activity, strong labor market conditions, and inflation near the Committee's symmetric 2 percent objective over the medium term.". See the following link for details, https://www.federalreserve.gov/newsevents/pressreleases/monetary20181219a.htm.

starts in October 1980, shortly after Paul Volcker became Chair of the Federal Reserve and began raising interest rates to combat the high inflation of the 1970s. The only dovish monetary policy between 1980 and 2000 occurred from September 1990 to May 1994, after the early-1990 recession caused by interest rate hikes and the 1990 oil price shock. Monetary policy became hawkish again in mid-1994 when the Fed raised interest rates. Since March 2001, the estimated monetary policy regime has been dovish, with only four one-year periods of hawkish policy.

In Panel A of Table 2, I replicate the regime sequence estimated by Bianchi et al. (2022), but my sample period extends until December 2020, which leads to some differences in estimation results. For example, I capture the hawkish monetary policy statement made by Jerome Powell in late 2018 and early 2019. Additionally, I estimate a dovish monetary policy regime in the early 1990s when there was a mild recession and the monetary policy spread was lower than in the 1980s.

Panel B in Table 2 suggests that both hawkish and dovish monetary policy regimes are highly persistent. The probability of staying in either regime is close to unity, reflecting the fixed stance of each Chair of the Federal Reserve. To more rigorously model a common regime-switching pattern between monetary policy spread and valuation, as shown in Figure 1, I estimate the breakpoints of the monetary policy spread and the P/E of the long-short operating profitability portfolio using the Bai and Perron (2003) method, and I present the results in Appendix A.

After I show the joint regime-switching pattern, I examine the evolution, and the results are in Table 3. I assume that P/E and M/B follow the Markov-switching process that I estimate by equation (3). I compare the valuation for the long-short profitability portfolio across the hawkish and dovish regimes. The results show that the hawkish (dovish) regimes are associated with a low (high) valuation in the long-short operating profitability portfolio across all percentiles. To examine if the mean of the monetary policy spread and valuation significantly differ across two regimes, I invoke the t-test, and the results of the t-test in

Panel C strengthen my findings in Panels A and B.

I also plot the relationship between the monetary policy regimes and the P/E ratio of the long-short operating profitability portfolio in Figure 3. The figure shows that hawkish regimes correspond to low valuation for the long-short profitability portfolio. This pattern resembles the market return documented in Bianchi et al. (2022), but I show that monetary policy also has long-lived effects at the cross-sectional level. Finally, I examine the long and short sides of the operating profitability portfolio in Appendix A, and the results largely emerge from the short side (i.e., low-profitability stocks) in dovish regimes.

Figure 3 also shows a notable trend of decreasing monetary policy spread and increasing valuation ratio since the 1980s, which is the early period of the first hawkish regime. This trend is consistent with recent studies such as Hanson and Stein (2015) and Nakamura and Steinsson (2018), which argue that monetary policy can also affect long-term interest rates, contradicting earlier comments made by Ben Bernanke. [8] The declining trend in the monetary policy spread and the increasing valuation ratio since the 1980s can be attributed to multiple factors. First, the declining inflation expectations and the natural rate of interest have reduced the short-term interest rate (Bauer and Rudebusch (2020)). Second, the tightening stance on monetary policy since the 1980s has led to a prolonged decline in the real interest rate, contributing to an increase in the valuation ratio. These findings are consistent with recent literature that has argued that monetary policy can impact the long-term interest rate, contrary to earlier beliefs (Hanson and Stein (2015); Nakamura and Steinsson (2018)). Furthermore, while Bianchi et al. (2022) have discovered that monetary policy regimes lead to a persistent increasing trend in the consumption-wealth ratio since the 1980s, my results suggest that a similar pattern also emerges for the P/E ratio at the cross-sectional level.

[8] In the speech "Why are interest rates so low? "Ben Bernanke argues that "The Fed's ability to affect real rates of return, especially longer-term real rates, is transitory and limited. Except in the short run, real interest rates are determined by a wide range of economic factors, including prospects for economic growth—not by the Fed. " See https://www.brookings.edu/blog/ben-bernanke/2015/03/30/why-are-interest-rates-so-low/.

3.2 The Profitability Premium

So far, I provide evidence that the conduct of monetary policy affects the profitability and discount rate of the long-short operating profitability portfolio. This subsection further examines how the profitability premium evolves across the monetary policy regime. The formula of Vuolteenaho (2002) implies that the value spread of the long-short portfolio is a proxy for the risk premium:

$$\sum_{j=0}^{\infty} \rho^j E\left[r_{t+1+j}\right] = \theta_L - \theta_S + \sum_{j=0}^{\infty} \rho^j E\left[e_{L,t+1+j} - e_{S,t+1+j}\right] \tag{4}$$

In Equation (4), r_{t+1+j} is the log return on the long-short operating profitability portfolio, $\theta_L - \theta_S$ is the value spread between the long and short legs of the operating profitability portfolio, and $e_{L,t+1+j} - e_{S,t+1+j}$ is the difference between the log E/P ratio of the long and short legs of the operating profitability portfolio. I choose $\rho = 0.95$ to compute the discounted profitability premium by summing the value spread and the discounted sum of the earning difference. I then take the exponential on the calculated annual profitability premium.

In Figure 4, the evolution of the profitability premium in the data is presented, and the summary statistics of the profitability premium are shown in Table 4. The average annual profitability premium over the full sample period is 5.1%, which is close to the annual average return of 4.6% on the long-short portfolio reported in Table 1. There are three noteworthy time-series patterns in the present discounted profitability premium that are associated with monetary policy. First, the profitability premium is higher in hawkish regimes than in dovish regimes, with a difference in the mean of 6.8% annually. This finding supports the similar pattern observed in the market level documented in Bianchi et al. (2022), indicating that the conduct of monetary policy has a long-lasting effect not just on the valuation or discount rate, but also on the profitability premium. Second, a secular downward trend in the profitability premium is observed after 1980, the first hawkish monetary policy regime, as shown in Panel

B. The decline in the profitability premium is caused by the prolonged decline in both the short-term and long-term interest rates due to monetary policy. This decline leads to an increase in the valuation ratio and a decrease in the discount rate, as depicted in Figure 3 and Table 3. Finally, the profitability premium is persistent for both hawkish and dovish regimes.[9]

In conclusion, the regime-switching monetary policy stance has significant impacts on the operating profitability, valuation of the long-short operating profitability portfolio, and the operating profitability premium. Additionally, a counterfactual analysis in Appendix A separates the sample by expansionary and recessionary periods and shows that the results presented in this section do not hold during these periods. This finding suggests that the observed effects do not come from fundamental fluctuations.

3.3 Sticky Expectations Toward Inflation

In this subsection, I argue that the findings of Bianchi et al. (2022) regarding the role of sticky expectations in the equity premium also apply to the long-short operating profitability portfolio. Persistent departures from full-information rational expectations are necessary for monetary policy regimes to have a lasting impact on asset valuation. If agents are slow to update their beliefs about inflation, their expectations will persist, and this will lead to persistently high or low actual inflation rates (Milani, 2007). The sluggishness in inflation expectations means that inflation will not immediately adjust to the new target set by the central bank to stabilize the economy. As a result, with persistent movements in inflation expectations and changes in the short-term nominal interest rate by the central bank, the real interest rate will also persist. Hawkish monetary policy has a persistent positive (negative) effect on the profitability premium (P/E) due to the persistent movement in the real interest rate.

[9] There may be some concerns about spurious regressions due to the unit root. To address this problem, I have run the Dickey-Fuller test on the monetary policy spread, the P/E ratio, and the profitability premium, and the p-values are 0.0085, 0.0374, and 0.0002, respectively. The results indicate that the unit root is not a problem in this paper.

However, how does the argument of sticky expectations apply to the cross-sectional level? There are two potential explanations.

The first explanation is rational inattention, as proposed by Sims (2003). As inflation is not a significant driver of individual stock returns, investors may not frequently update their discount rate based on inflation. Consequently, stock returns may be sluggishly reactive to changes in inflation (Katz et al. (2017)). Moreover, from the firm owners' perspective, even firms that are more informed about inflation forecasts may earn only slightly higher profits than uninformed firms. Thus, they may rationally choose not to pay much attention to inflation information (Coibion et al. (2020b)). As a result, when inflation or interest rates impact profit, the cash flow or cost of firms that fail to immediately incorporate the information generates persistent profits or earnings momentum, as argued by Bouchaud et al. (2019).

The second explanation is the central bank's credibility in its communication. This factor explains why firm owners' expectations may not align with the actual value, even if they regularly receive surveys on the outlook of inflation or economic activity outcomes. The central bank's communications often fail to reach their target for two reasons. First, past successful monetary policies, such as the Volcker disinflation in the 1980s, have resulted in stable, low, and tranquil inflation, leading to widespread inattention to monetary policy. According to a survey conducted in April 2018, 55% of US manufacturing and services firms reported that they did not know their point forecasts for inflation over the next twelve months, as reported by Coibion et al. (2020a). Second, even when the public pays attention to monetary policy announcements, they may not understand the message and interpret it in the way the central bank desires (Haldane and McMahon (2018); Candia et al. (2020)).

Based on the two pieces of evidence presented, it appears that sticky information about inflation may weaken the profitability premium. When inflation is low and tranquil, firms may not pay close attention to news on inflation, resulting in an increased degree of information stickiness towards inflation among firm owners. As Coibion et al. (2020b) found that firms with more information on inflation can gain a higher profit, there is an information asymmetry between the two groups of firms. Profitable firms may demand lower compensation over time, resulting in a decrease in the profitability premium.

In order to investigate the relationship between information stickiness towards inflation and the profitability premium, I conducted a regression analysis. Specifically, I regressed the P/E ratio of the long-short operating profitability portfolio and the profitability premium on the degree of information stickiness towards inflation. The results are presented in Table 5.

In Column 1, I found that the P/E of the long-short operating profitability slightly increases as firm owners become more sticky toward inflation. However, when adding the monetary policy spread as a control variable in Column 2, the relationship between the degree of information stickiness and P/E becomes insignificant. As in Section 3, Column 2 also shows a negative relationship between the monetary policy spread and P/E.

To further investigate the impact of information stickiness on the profitability premium, Columns 3 and 4 confirm that a higher degree of information stickiness towards inflation drives down the profitability premium.

I also examined the relationship between inflation volatility and information stickiness in Columns 5 and 6. As expected, Column 5 shows that if the standard deviation of inflation expectation increases by 1%, then the probability that a person fails to receive inflation information immediately reduces by 1.2%. Column 6 compares the information stickiness toward inflation between the hawkish and dovish regimes. It reveals that people have less sticky expectations of inflation in a hawkish regime because hawkish regimes indicate a higher inflationary pressure. I confirm this thought by showing that the probability that a firm owner fails to receive inflation news immediately is 3% lower in a hawkish regime than in a dovish regime.

The result of this study is related to Bouchaud et al. (2019), who propose that the profitability premium exists because of analysts' sticky expectations of future profits. However, there are two key differences between their work and mine. First, I find that the degree of information stickiness towards variables that differ in firm dynamics also affects the profitability premium. Second, I find a negative time-series relationship between the degree of information stickiness towards inflation and the profitability premium, whereas Bouchaud et al. (2019) find a positive cross-sectional relationship between the profitability premium and the degree of information stickiness towards profitability.

In addition to persistent signals about future profits, such as those discussed by Bouchaud et al. (2019), I argue that monetary policy regimes are also a persistent signal. Suppose the Fed raises the short-term interest rate to meet its inflation target in a hawkish regime, but firm owners' expectations towards inflation are sticky. In that case, they will not immediately adjust their expectations. This means that the Fed can persistently affect the real interest rate, as sticky expectations towards inflation generate persistent inflation and lead to a persistent real interest rate. As Bauer and Rudebusch (2020) have discussed the equilibrium dynamics between long-term trends and the short-term interest rate, such a persistent relationship should hold in equilibrium. The persistent path of the real interest rate, therefore, triggers the persistent movement of output and costs.

3.4 Relations to the Declining Real Interest Rate

Figure 1 depicts a clear downward trend of the real interest rate after 1980, which may also indicate the impact of monetary policy regimes on the profitability premium. This finding is consistent with recent research highlighting the significant influence of monetary policy on long-term real interest rates, as evidenced in studies by Hanson and Stein (2015), Nakamura and Steinsson (2018), and Bianchi et al. (2022). However, the declining real interest rate could also result from secular stagnation (Summers (2014)) or decreasing productivity growth (Gordon (2017)), which may lead to a lack of investment opportunities and lower demand for capital. It is worth considering whether monetary policy affects productivity growth by altering the real interest rate.

3.5 Mediation Analysis: Which Effect is Stronger?

In this subsection, I aim to examine the causal effect of monetary policy regimes on the valuation ratio and the profitability premium by considering the mediation of agents' inflation expectations and fluctuations in real interest rates, which were discussed in the previous two subsections. The results presented so far have only focused on the relationship between the valuation ratio and monetary policy regimes. Therefore, in Table 6, I present the results of the mediation analysis to shed light on this causal relationship.

In the first two columns of the table, I investigate the effects of the Fed's announcement of switching to a hawkish monetary regime on the valuation ratio and the profitability premium by considering the effect of altering agents' inflation expectations. Consistent with the previous findings, the results suggest that a switch from a dovish to a hawkish monetary policy regime causes a drop in the P/E ratio of the long-short operating profitability portfolio and an increase in the profitability premium. Similarly, in the last two columns, I examine the effects of hawkish regimes on the valuation ratio and the profitability premium through the effect of altering the real interest rate, and I observe a similar pattern.

Comparing the effects of switching to hawkish regimes on the P/E ratio through two different channels (columns 1 and 3 in Table 6), I argue that the channel through affecting agents' inflation expectations is stronger than through the real interest rate. Similarly, by comparing the effects of hawkish regimes on the profitability premium through different channels (columns 2 and 4), I find that the channel through agents' inflation expectations is also stronger.

Overall, the mediation analysis provides further evidence to support the idea that monetary policy regimes affect the valuation ratio and the profitability premium through the mediation of agents' inflation expectations. The results also support the important role that inflation expectations play in conducting monetary policy.

4 Conclusion

I find a connection between the valuation of the long-short profitability portfolio, the profitability premium, and monetary policy stances. This finding supports recent evidence of long-lived monetary non-neutrality and reveals a potential source of the time-varying premium. This paper also contributes to the literature on expectation-based business cycles by arguing the roles of different levels of responsiveness to monetary policy announcements can play in generating the premium. In particular, the profitability premium negatively relates to the degree of information stickiness toward inflation. Finally, I explore how monetary policy relates to the declining real interest rate associated with an overall profitability decline across various industries, affecting the profitability premium.

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Table 1: **Summary Statistics of the Operating Profitability Portfolios**

Panel A shows the annualized time-series average of the portfolios sorted on operating profitability proposed by Ball et al. (2016). Panel B displays the annualized CAPM-alpha for each portfolio. Panel C presents the monetary policy beta of each portfolio. The monetary policy spread is the nominal interest rate minus the 12-month rolling average of the inflation rate and the natural rate of interest. A higher monetary policy spread indicates a more hawkish monetary policy stance. I multiply the monthly return by 12 to obtain the annualized return. The sample spans the period of 1963:7 - 2020:12.

Panel A: Return	Q1 (low)	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10 (high)	10-1
	7.94**	9.47***	10.78***	11.83***	11.33***	10.95***	11.53***	13.05***	12.33***	12.54***	4.60**
	(3.16)	(2.70)	(2.44)	(2.38)	(2.19)	(2.10)	(2.15)	(2.19)	(2.12)	(2.19)	(1.99)
Panel B: CAPM-α	Q1 (low)	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10 (high)	10-1
	-1.30	1.22	3.36***	4.59***	4.63***	4.56***	4.81***	6.16***	5.63***	5.83***	7.13***
	(1.56)	(1.11)	(1.00)	(1.00)	(0.87)	(0.88)	(0.78)	(0.73)	(0.70)	(0.89)	(1.87)
Panel C: Beta	Q1 (low)	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10 (high)	10-1
mps	-1.36**	-0.81*	-0.40	0.65*	-0.27	0.052	0.94***	0.015	0.18	1.01***	2.37***
	(0.62)	(0.44)	(0.41)	(0.38)	(0.35)	(0.35)	(0.33)	(0.31)	(0.30)	(0.36)	(0.79)
Mkt-RF	1.36***	1.21***	1.09***	1.06***	0.98***	0.94***	0.98***	1.01***	0.98***	0.98***	-0.37***
	(0.032)	(0.025)	(0.025)	(0.028)	(0.019)	(0.021)	(0.017)	(0.016)	(0.017)	(0.019)	(0.039)
cons	-3.48*	-0.079	2.71**	5.63***	4.20***	4.64***	6.33***	6.18***	5.92***	7.45***	10.9***
	(1.88)	(1.31)	(1.18)	(1.10)	(1.02)	(1.12)	(0.93)	(0.87)	(0.89)	(1.06)	(2.19)
Observations	690	690	690	690	690	690	690	690	690	690	690
R-squared	0.77	0.84	0.83	0.83	0.84	0.83	0.87	0.89	0.89	0.84	0.16

Standard errors in parentheses. * $p<.10$, ** $p<.05$, *** $p<.01$

Table 2: **Estimated Sequence of Monetary Policy Regimes**

This table reports the estimated monetary policy regimes by estimating the regime-switching model of equation (1) on the monetary policy spread. I assume that the mean and variance of the monetary policy spread are regime-switching. The sample spans the period of 1963:7 – 2020:12.

Panel A: Period and Most Likely Regime	
1963.7 - 1980.10	Dovish
1980.11 - 1990.8	Hawkish
1990.9 - 1994.4	Dovish
1994.5 - 2001.2	Hawkish
2001.3 - 2006.8	Dovish
2006.9 - 2007.9	Hawkish
2007.10 - 2008.11	Dovish
2008.12 - 2009.10	Hawkish
2009.11 - 2014.11	Dovish
2014.12 - 2015.12	Hawkish
2016.1 - 2018.10	Dovish
2018.11 - 2019.10	Hawkish
2019.11 - 2020.12	Dovish
Panel B: Regime Transition Probabilities	
p_{HH}	0.99
p_{DD}	0.97

Table 3: **Monetary Policy and Valuation across Estimated Regimes**

This table reports the summary statistics of the monetary policy spread and the valuation ratio of the long-short operating profitability portfolio. mps is the monetary policy spread, which is the real federal funds rate minus the natural rate of interest. Positive (negative) monetary policy spread refers to the hawkish (dovish) regime. P/E is the logarithm of the P/E for the long-leg minus that for the short-leg of the operating profitability portfolio. M/B is the logarithm of the M/B of the operating profitability portfolio. Panel A reports the summary statistics of the hawkish regime estimated by the Markov-switching model on mps. Panel B reports the summary statistics for the dovish regime. I assume that the valuation ratio is subject to the same regime as mps. Finally, Panel C tests if the average of each variable is higher or lower in the hawkish regime than in the dovish regime. The sample spans the period of 1963:7 – 2020:12.

Panel A: Hawkish	N	Mean	Std	Min	P10	P50	P90	Max
mps	249	0.82	1.32	−1.13	−0.59	0.57	2.57	5.90
P/E	249	−1.27	0.41	−2.09	−1.72	−1.32	−0.79	0.08
M/B	249	0.50	0.13	0.12	0.34	0.48	0.66	0.82
Panel B: Dovish	N	Mean	Std	Min	P10	P50	P90	Max
mps	441	−2.98	1.41	−9.27	−4.72	−2.68	−1.51	0.14
P/E	441	−0.76	0.36	−1.70	−1.14	−0.81	−0.27	0.39
M/B	441	0.78	0.29	0.25	0.47	0.73	1.17	1.72
Panel C: t-stats								
$\text{mps}_H - \text{mps}_D$	35.41							
$\text{P/E}_H - \text{P/E}_D$	−16.30							
$\text{M/B}_H - \text{M/B}_D$	−17.71							

Table 4: **The Profitability Premium**

Panel A shows the summary statistics of the profitability premium in the hawkish and dovish regimes. t(Hawk - Dove) tests if the mean profitability premium in the hawkish regime is higher than in the dovish regime. Panel B shows a comparison before and after 1980 by regressing the profitability premium on the linear time trend. Coef is the slope coefficient. t-stat is the t-statistics. R^2 is the R-squared, and 1st ACF is the first-order autocorrelation coefficient. The profitability premium is the sum of the value spread and the discounted sum of the E/P ratio of the long-short operating profitability portfolio, following the formula in Vuolteenaho (2002), and taking the exponential. The sample spans the period of 1963:7 - 2020:12.

Panel A	N	Mean	Std	Min	P10	P50	P90	Max	1st ACF
Full	690	5.11	5.53	0.21	0.89	3.27	11.40	41.39	0.97
Hawkish	249	9.46	6.87	0.66	3.35	7.84	18.31	41.39	0.95
Dovish	441	2.65	2.12	0.21	0.63	2.23	4.83	14.86	0.97
t(Hawk - Dove)	15.23								
Panel B	N	Coef	t-stat	R^2					
Post-1980	492	-16.11	-12.30	0.30					
Pre-1980	198	9.14	22.54	0.61					

Table 5: **Profitability Premium and the Degree of Information Stickiness**

This table presents the regression taking the degree of information stickiness towards inflation estimated with the Coibion and Gorodnichenko (2015) method as the main explanatory variable, which I denote as λ_π. The dependent variable in Columns 1 and 2 is the P/E of the long-short operating profitability portfolio. The dependent variable from Columns 3 to 4 is the profitability premium. The dependent variable from Columns 5 to 6 is λ_π. Voleinf in Column 5 is inflation expectation volatility estimated by GARCH (1,1), and hawk in Column 6 is the indicator that equals 1 if the estimated monetary policy regime is hawkish. The sample spans the period of 1982:4 - 2020:12.

	P/E	P/E	premium	premium	λ_π	λ_π
λ_π	0.31*	0.21	-9.26***	-7.91***		
	(0.17)	(0.14)	(2.55)	(2.15)		
mps		-0.13***		1.74***		
		(0.01)		(0.13)		
Voleinf					-0.012*	
					(0.007)	
hawk						-0.03***
						(0.011)
cons	-1.19***	-1.26***	10.96***	11.83***	0.49***	0.49***
	(0.09)	(0.07)	(1.38)	(1.21)	(0.01)	(0.01)
Observations	465	465	465	465	465	465
R-squared	0.01	0.28	0.03	0.32	0.01	0.01

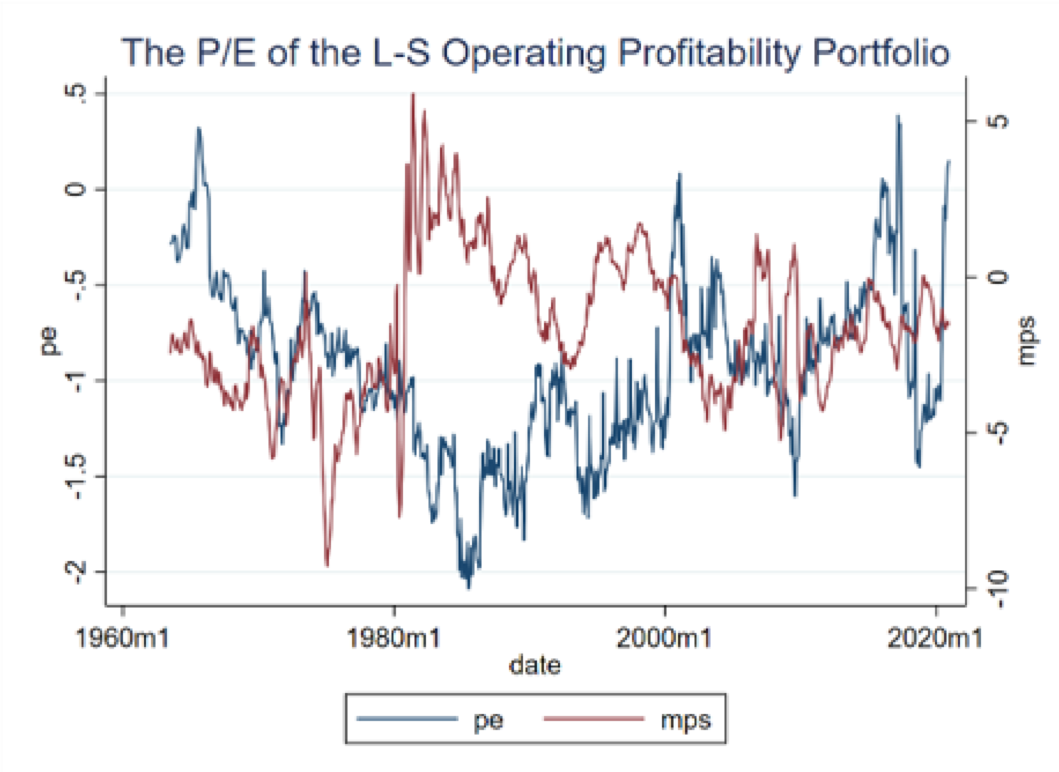
Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Table 6: **Mediation Analysis: The Effect of Switching to Hawkish Regimes**

This table presents the results of the mediation analysis on the impact of transitioning to hawkish monetary policy regimes on the P/E ratio of the long-short operating profitability portfolio and the profitability premium. The table reports the estimates of two mediation variables: inflation expectations (einf) in the first two columns and the real interest rate (r_r) in the last two columns. The analysis covers the period from July 1963 to December 2020.

Panel A: Estimated Coefficients	P/E	premia	P/E	premia
Hawk	-0.57***	1.39***	-0.18***	0.73***
	(0.05)	(0.10)	(0.05)	(0.10)
einf	-0.04***	0.06		
	(0.006)	(0.01)		
Hawk × einf	0.008	-0.02		
	(0.01)	(0.02)		
r_r			0.03***	-0.13***
			(0.01)	(0.02)
Hawk × r_r			-0.12***	0.29***
			(0.02)	(0.03)
cons	-0.60***	0.45***	-0.77***	0.71***
	(0.03)	(0.06)	(0.02)	(0.03)
obs	690	690	690	690
R^2	0.35	0.42	0.36	0.46
Panel B: Estimated Effects				
Controlled Direct Effect	-0.56***	1.38***	-0.31***	1.02***
	(0.04)	(0.09)	(0.04)	(0.09)
Natural Direct Effect	-0.53***	1.33***	-0.19***	0.75***
	(0.03)	(0.06)	(0.05)	(0.10)
Natural Indirect Effect	0.02	-0.04	-0.32***	0.54***
	(0.01)	(0.02)	(0.04)	(0.09)
Marginal Total Effect	-0.51***	1.30***	-0.51***	1.30***
	(0.03)	(0.06)	(0.03)	(0.06)

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01



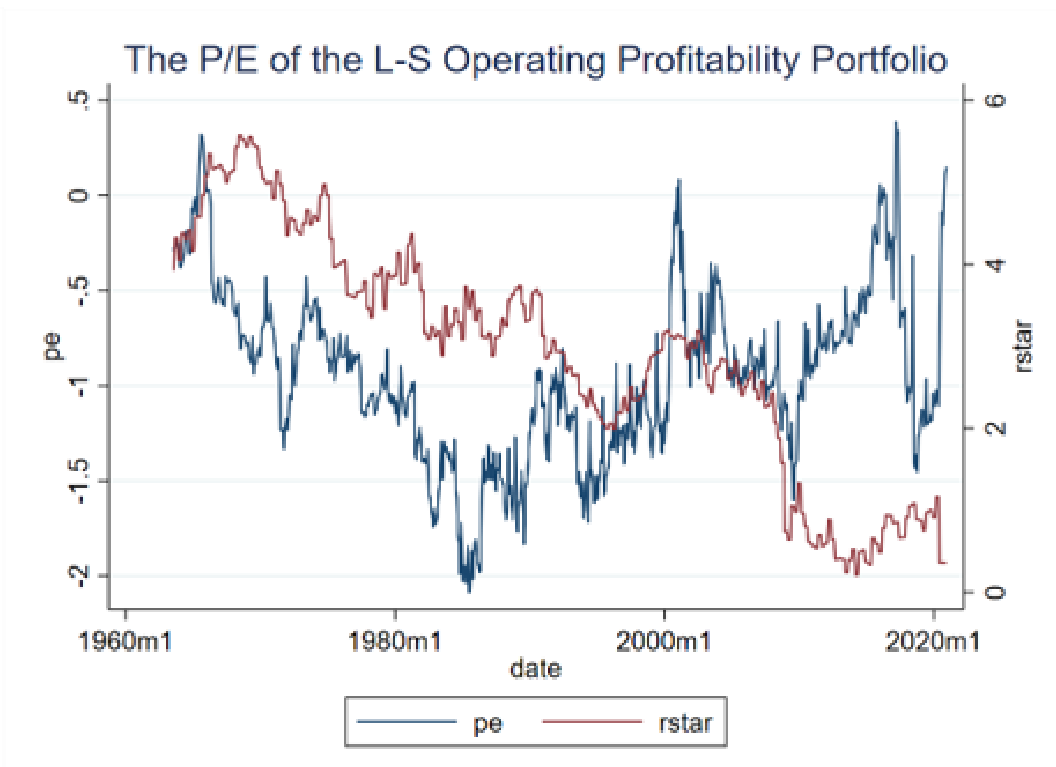


Figure 1: **Monetary Policy and Valuation** This figure shows the P/E ratio of the long-short portfolio constructed from the Ball et al. (2016) operating profitability, monetary policy spread, and the natural rate of interest. The sample spans the period of 1963:7 – 2020:12.

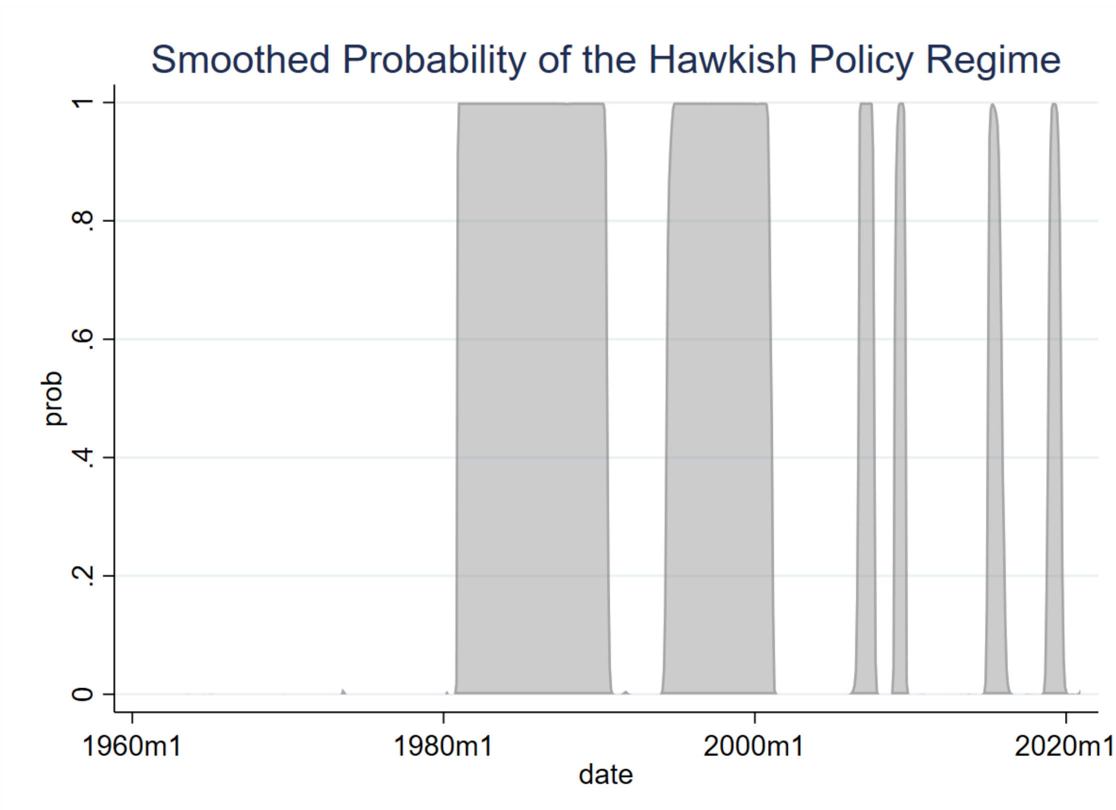


Figure 2: **The Probability of the Hawkish Monetary Policy Regime.** This figure shows the smoothed probability for the hawkish monetary policy regime. The sample spans the period of 1963:7 – 2020:12.

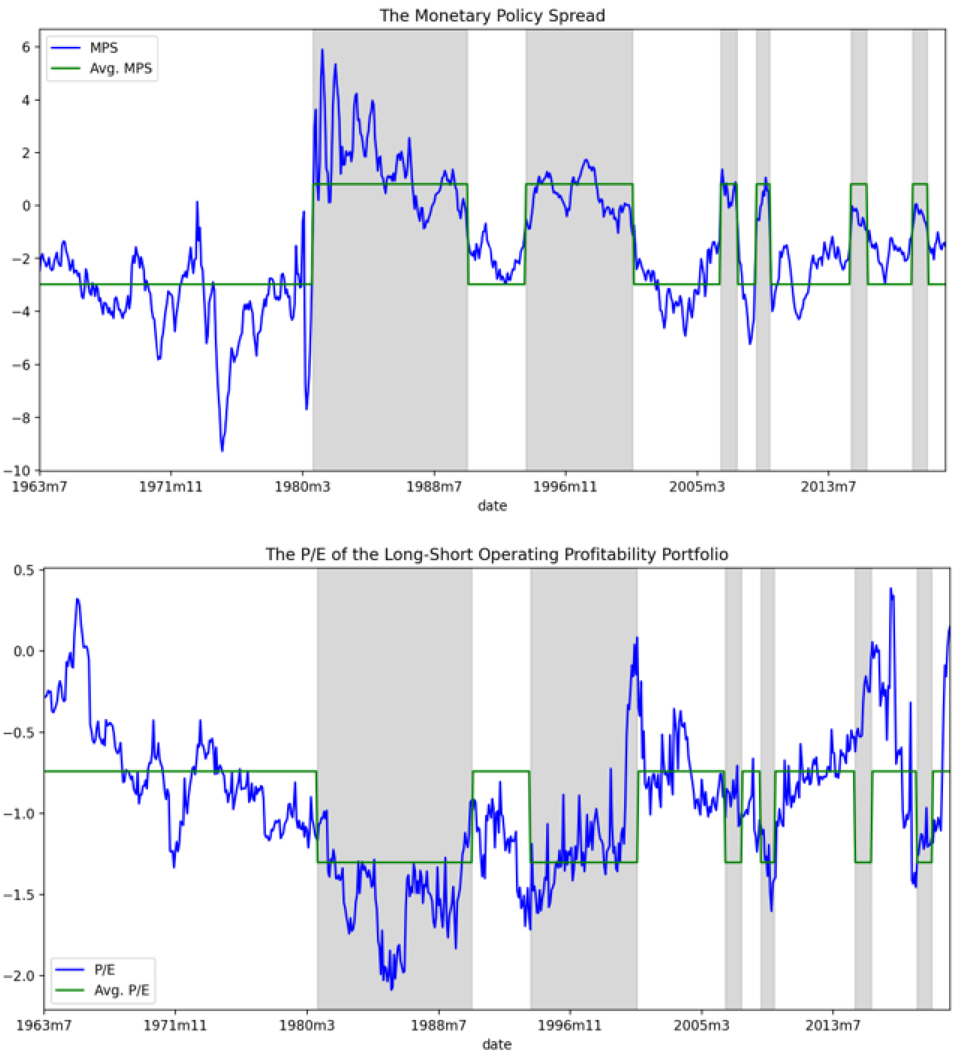


Figure 3: **Regime-Average Monetary Policy Spread and P/E.** The blue lines are the monetary policy spread and the P/E of the long-short operating portfolio. The green lines are the regime-average monetary policy spread and the P/E. The monetary policy regime is hawkish if the smoothed probability of a hawkish regime exceeds 0.5, which I indicate as the gray shaded area. The P/E of the long-short operating portfolio is the logarithm of the P/E for the long-leg minus that for the short-leg. The profitability premium is the return on the long-short operating profitability portfolio. The sample spans the period of 1963:7 – 2020:12.

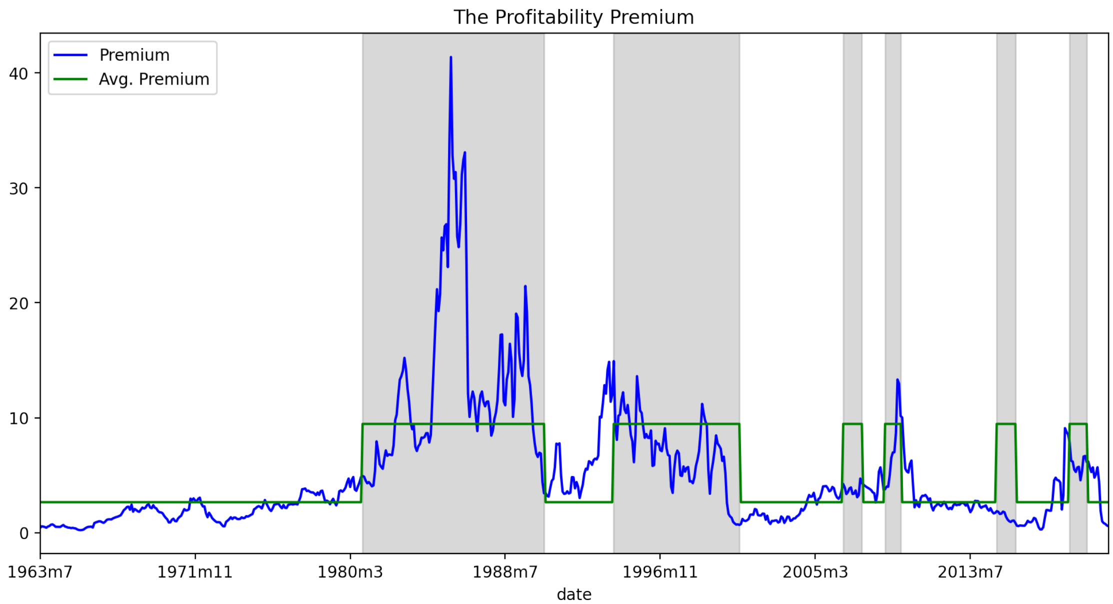


Figure 4: **Evolution of the Profitability Premium.** This figure shows the evolution of the profitability premium in the data. I take Vuolteenaho (2002) to proxy by the sum of the value spread and the E/P ratio of the long-short operating profitability portfolio, then take the exponential. The gray shaded area indicated the estimated hawkish monetary policy regimes. The sample spans the period of 1963:7 – 2020:12.

A Robustness Checks

In the first robustness check, I demonstrate a joint regime-switching pattern between the valuation ratio and the monetary policy spread.

Panels A and B of Table A1 estimate the unknown breakpoints and assume that the maximum number of breakpoints is 4. Panel A shows that the breakpoints largely coincide with the dates in Table 2 that the monetary policy regime switches from hawkish to dovish or vice versa. This result confirms that a change in the conduct of monetary policy causes a structural shift in the monetary policy spread. I further test the breakpoints of the P/E ratio in Panel B and examine if the confidence interval overlaps with the confidence interval of the breakpoints of the monetary policy spread. It turns out that two estimated break points in the monetary policy spread are consistent with a breakpoint of the P/E ratio. One breakpoint is in November 1989, which largely corresponds to the end of the first hawkish regime, and another one is in March 2003, which is roughly the end of the second hawkish regime.

Panel C of Table A1 further tests if a monetary policy regime-switching date in Table 2 corresponds to a breakpoint in the P/E ratio with the Bai and Perron (2003) technique. The null hypothesis is that the regime-switching date is not a breakpoint in the P/E ratio. The result shows that the only two estimated regime-switching dates that fail to reject the null at the 5% significance level are September 1990 and November 2019. However, the difference between the former estimated regime-switching date and the closest estimated breakpoint in the P/E ratio is only two months. The result confirms the argument that there is a joint regime-switching pattern between the monetary policy spread and the valuation of the long-short operating profitability portfolio.

The second robustness check focuses on the long and short sides of the Ball et al. (2016) operating profitability portfolios in this section. I examine if the effect of monetary policy regimes on the valuation and profitability premium mainly comes from the long side or the short side.

The top panel in Figure A1 examines how the P/E ratio of the long side relates to the monetary policy spread and the short-term real interest rate. On the contrary, the bottom panel examines the P/E ratio of the short side. Loosely speaking, there are close relationships between the P/E of both sides and the monetary policy spread and short-term real interest rate before 1980. After 1980, such a relationship is stronger on the short side. Therefore, the results of the P/E ratio of the long-short portfolio are mainly from the short side.

I explicitly show the relationship between the valuation for each side of the operating profitability portfolio and the monetary policy in Table A2. Panel A shows that across the entire sample period, the P/E ratio for the short side is more sensitive to the conduct of monetary policy than that for the long side. Similar results hold for the real interest rate. This result may not be surprising, as the short side with lower profitability firms have a longer duration than the long side with higher profitability, and longer-duration stocks are more sensitive to interest rate movements.

However, if we analyze the results from the hawkish and dovish regimes, then the conclusion will be different. Panel B shows that in hawkish regimes, only the P/E for the long side is sensitive to the interest rate movements. On the other hand, Panel C shows that in dovish regimes, the P/E for the short side becomes sensitive to the real interest rate movements.

The final robustness check confirms that the fluctuations in the fundamentals do not drive my empirical results in Section 3. Figure A2 plots the hawkish and recessionary periods, which do not overlap very much. In addition, hawkish periods are longer than recessionary periods. Table A3 examines the monetary policy spread, valuation, and profitability premium across expansionary and recessionary periods. I show that my empirical results in Section 3 do not hold if I separate my sample based on expansionary and recessionary periods. I have three results in Table A3. First, the average monetary policy spread in expansionary and recessionary periods is negative. However, the average monetary policy spread in hawkish regimes is positive. Second, there is no significant difference in the P/E ratio between expansionary and recessionary periods, while the P/E ratio in hawkish regimes is significantly lower than in dovish regimes. Finally, although the average profitability premium is higher in expansionary periods according to the t-test, this result emerges from the maximum value. The profitability premium across most percentiles is, in fact, lower than in recessionary periods.

Table A1: **Estimated Break Points and Monetary Policy Regimes**

Panels A and B report the estimated breakpoints for the level estimate of the monetary policy spread and the P/E of the long-short operating profitability portfolio by the Bai and Perron (2003) technique. The trimming is 0.15, and I assume that the maximum number of breaks is 4. Overlap: PE in Panel A reports if the 95% confidence intervals of the break estimates for the monetary policy spread and the P/E ratio in Panel B overlap. Overlap: Regime in Panel A reports if the 95% confidence interval of the break estimate for the monetary policy spread overlaps for a regime-switching date estimated in Table 2. Finally, Panel C tests if the regime-switching dates estimated in Table 2 correspond to break dates of the P/E with the Bai and Perron (1998) technique, and the null hypothesis is no break. The sample spans the period of 1963:7 – 2020:12.

Panel A: MPS					
Break Point #	Estimate	95% CI		Overlap: PE	Overlap: Regime
1	1980.10	1980.9	1980.11	No	Yes
2	1989.11	1989.9	1990.1	Yes	No
3	2001.3	2001.1	2001.5	Yes	Yes
4	2012.5	2010.7	2014.3	No	No
Panel B: P/E					
Break Point #	Estimate	95% CI			
1	1972.1	1968.8	1975.6		
2	1981.6	1980.12	1981.12		
3	1990.1	1983.10	1996.4		
4	2000.4	1998.11	2001.9		
Panel C: P/E and Regimes					
Regime Dates	p-value				
1980.11	0.00				
1990.9	0.07				
1994.5	0.00				
2001.3	0.00				
2006.9	0.00				
2007.10	0.00				
2008.12	0.00				
2009.11	0.00				
2014.12	0.00				
2016.1	0.00				
2018.11	0.03				
2019.11	0.27				

Table A2: **The Long and Short Operating Profitability Portfolios**

This table presents the regression results of the P/E for the long and short sides on the monetary policy spread (mps) and the short-term real interest rate (r_r). P/E Long is the P/E ratio for the long side. The sample spans the period of 1963:7 - 2020:12.

Panel A: Full Sample	P/E Long	P/E Long	P/E Short	P/E Short
mps	0.04***		0.13***	
	(0.008)		(0.007)	
r_r		-0.01**		0.06***
		(0.007)		(0.007)
cons	3.21***	3.17***	4.31***	4.01***
	(0.018)	(0.020)	(0.020)	(0.022)
Observations	690	690	690	690
R-squared	0.06	0.01	0.32	0.09
Panel B: Hawkish	P/E Long	P/E Long	P/E Short	P/E Short
mps	-0.13***		-0.03	
	(0.012)		(0.018)	
r_r		-0.11***		-0.01
		(0.008)		(0.014)
cons	3.32***	3.58***	4.51***	4.53***
	(0.020)	(0.033)	(0.029)	(0.058)
Observations	249	249	249	249
R-squared	0.27	0.38	0.01	0.01
Panel C: Dovish	P/E Long	P/E Long	P/E Short	P/E Short
mps	0.16***		0.13***	
	(0.01)		(0.01)	
r_r		-0.01		-0.05***
		(0.012)		(0.014)
cons	3.59***	3.11***	4.26***	3.88***
	(0.033)	(0.020)	(0.048)	(0.023)
Observations	441	441	441	441
R-squared	0.31	0.003	0.14	0.02

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Table A3: **Valuation across Expansionary and Recessionary Periods**

This table reports the summary statistics of. mps is the monetary policy spread, which is the real federal funds rate minus the natural rate of interest. Positive (negative) monetary policy spread refers to the hawkish (dovish) regime. P/E is the logarithm of the P/E for the long-leg minus that for the short-leg of the operating profitability portfolio. M/B is the logarithm of the M/B of the operating profitability portfolio. The profitability premium is the sum of the value spread and the discounted sum of the E/P ratio of the long-short operating profitability portfolio, following the formula in Vuolteenaho (2002), and taking the exponential. The sample spans the period of 1963:7 – 2020:12.

Panel A: Expansions	N	Mean	Std	Min	P10	P50	P90	Max
mps	605	−1.52	2.12	−8.57	−3.99	−1.76	1.18	5.90
P/E	605	−0.94	0.47	−2.09	−1.52	−0.96	−0.29	0.39
M/B	605	0.66	0.29	0.12	0.38	0.58	1.08	1.72
premium	605	5.29	5.80	0.21	0.84	3.19	11.73	41.39
Panel B: Recessions	N	Mean	Std	Min	P10	P50	P90	Max
mps	85	−2.22	3.14	−9.27	−6.16	−2.41	1.58	5.35
P/E	85	−0.97	0.32	−1.74	−1.40	−0.93	−0.59	−0.19
M/B	85	0.81	0.21	0.41	0.56	0.76	1.12	1.22
premium	85	3.78	2.68	0.89	1.16	3.51	7.00	13.30
Panel C: t-stats								
$\text{mps}_E - \text{mps}_R$	1.99							
$\text{P/E}_E - \text{P/E}_R$	0.79							
$\text{M/B}_E - \text{M/B}_R$	−5.60							
$\text{premia}_E - \text{premia}_R$	4.04							
Panel D: Correlation	rec	hawk						
rec	1							
hawk	−0.06	1						

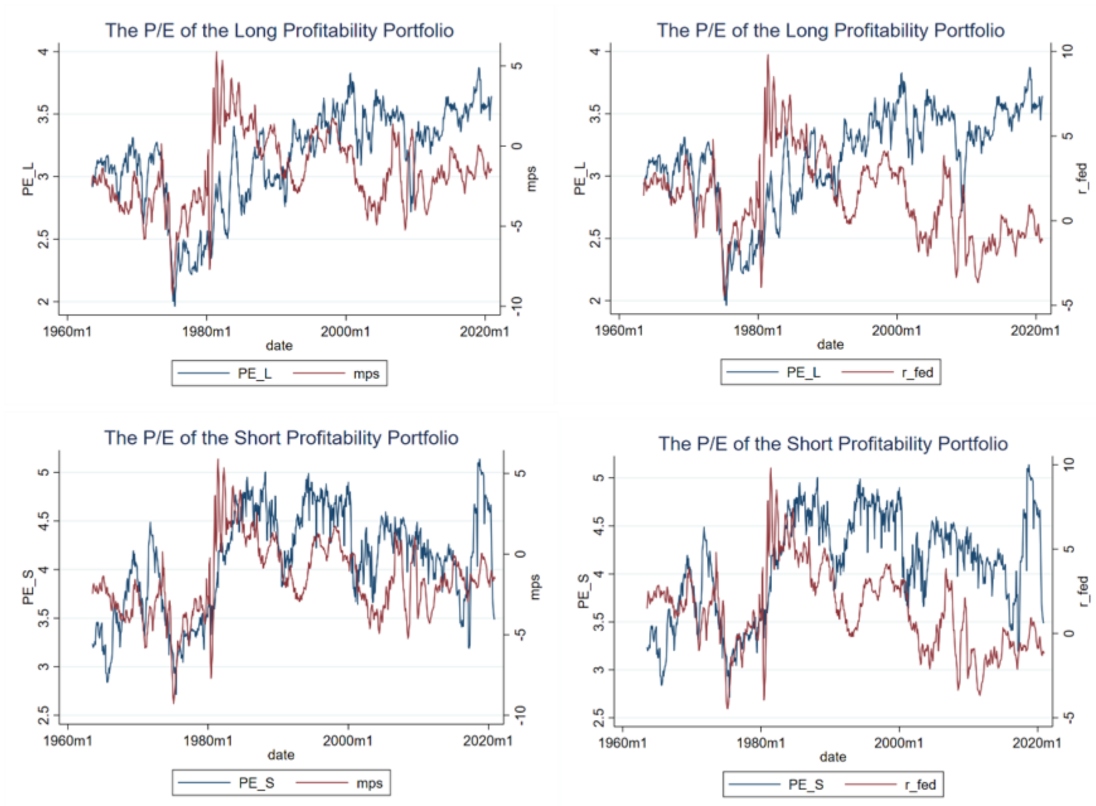


Figure A1: **The Valuation of the Long and Short Operating Profitability Portfolios.** The top panel shows the relationship between the P/E of the long side of the operating profitability portfolio, the monetary policy spread, and the real interest rate. The bottom panel shows the short side. The P/E ratio of each portfolio is the natural log of the market-value-weighted average of the P/E ratio for each firm. The sample spans the period of 1963:7 – 2020:12.

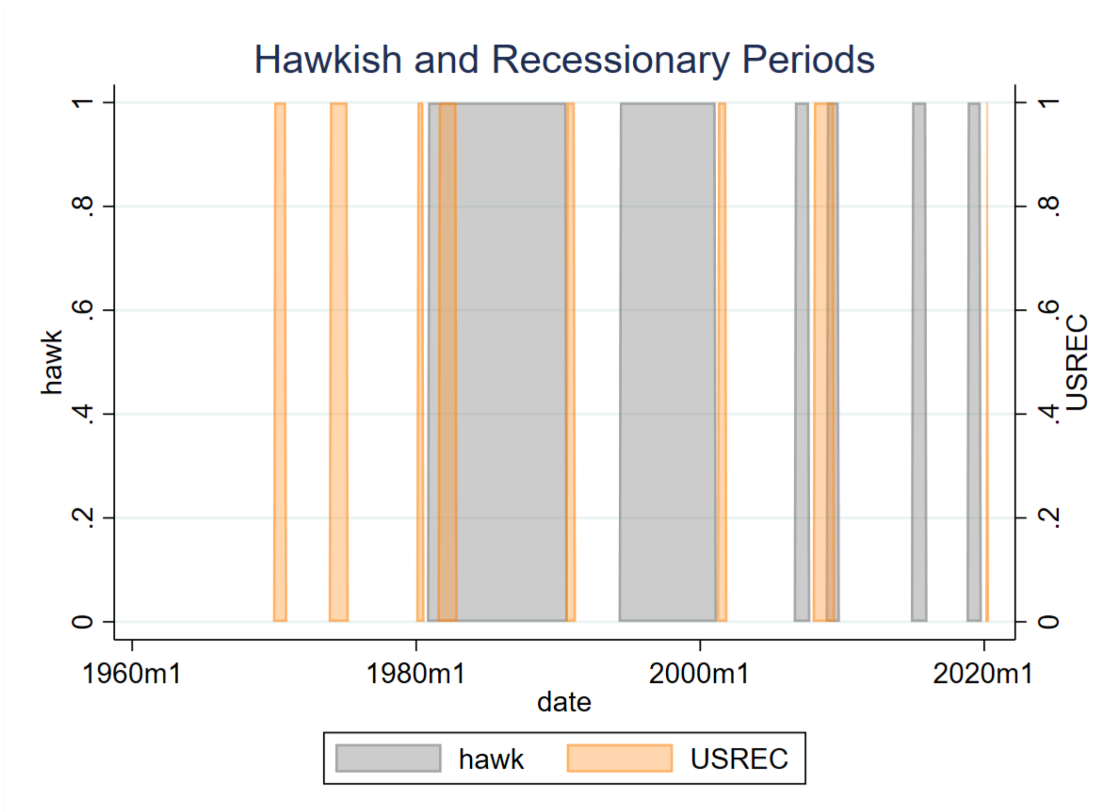


Figure A2: **Hawkish and Recessionary Periods.** The figure shows the hawkish and recessionary periods. The sample spans the period of 1963:7 – 2020:12.