



**Monetary Policy Uncertainty and stock market returns.
Influence of limits to arbitrage and the economic cycle**

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| Journal: | <i>Studies in Economics and Finance</i> |
| Manuscript ID | SEF-04-2020-0102.R1 |
| Manuscript Type: | Research Paper |
| Keywords: | Monetary Policy Uncertainty, Stock market returns, Limited arbitrage, Economic cycle, Behavioral Finance |
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Monetary Policy Uncertainty and stock market returns. Influence of limits to arbitrage and the economic cycle

Abstract

Purpose - This paper examines the impact that Monetary Policy Uncertainty (MPU) has on stock markets returns by taking into account limits to arbitrage and the economic cycle.

Design/methodology/approach - Using three news-based MPU measures, regression models have been applied in this study over a sample period from January 1985 to March 2020. The limits to arbitrage have been considered by taking Russell 1000 Value, Russell 1000 Growth, Russell 2000 Value and Russell 2000 Growth indices, and business cycles were established following the NBER.

Findings –A negative MPU impact on stock returns has been found. In particular, the most subjective and difficult to arbitrate stocks have been more sensitive to MPU. However, it could not be concluded that MPU has a greater or lesser impact on stock returns depending on the economic cycle.

Practical implications - The findings obtained are particularly useful for monetary policy makers showing the importance and need for greater control over the transparency of their decisions to maintain the stability of financial markets. The findings obtained are also useful for investors when selecting their investment assets at times of the highest MPU.

Originality/value - This is one of the few studies investigating the effect of MPU on stock market returns, and the first to analyze this relationship taking into account the economic cycle and limits to arbitrage.

Keywords Monetary Policy Uncertainty, Stock market returns, Limited arbitrage, Economic cycle and Behavioral Finance.

Paper type Research paper

1. Introduction

Information uncertainty has shown to be behind several findings that contradict the equilibrium theory in financial markets (Jiang *et al.*, 2005). Several authors have documented that uncertainty regarding social, political or economic conditions has a significant influence on investor sentiment (Knight, 1921; Shiller, 2005).

The impact that Economic Policy Uncertainty (EPU) may have on the economy has been one of the topics that has generated the most interest in recent years. Events such as the Great Recession, Brexit, political disputes in different countries and currently the Covid-19 crisis, have focused attention on the importance that the uncertainty generated by economic policy makers has on several economic and financial fundamentals.

An issue that arises is that if EPU has significant impacts on economic fundamentals, real impacts on stock markets can be expected (Li *et al.*, 2016). Along these lines, several studies have shown negative effects of EPU on stock markets. (Brogaard and Detzel, 2015; Arouri *et al.*, 2016; Paule-Vianez *et al.*, 2020a). However, few studies have linked the uncertainty generated by central banks regarding the monetary policies they will carry out and stock markets.

In this paper, it is proposed to evaluate the impact that Monetary Policy Uncertainty (MPU) has on the stock market returns, taking into consideration the limits to arbitrage and the economic cycle. Even though there are some studies, although few, that have related MPU and stock returns (Kurov and Stan, 2018; Paule-Vianez *et al.*, 2020a), no studies have been found that analyse this relationship considering the effect of MPU on different types of stocks and considering the moment of the economic cycle. For this reason, this study is one of the first to take into account the limits to arbitrage and the economic cycle on the impact of MPU on stock market returns.

Taking the MPU measurements from Husted *et al.* (2016) and Baker *et al.* (2016) for the period from 01/1985 to 03/2020, it is shown how MPU has a negative impact on stock market returns, especially in small-cap growth stocks. However, when distinguishing by economic cycle, the results differ, and it cannot be concluded that MPU has a greater or lesser impact on stock market returns in times of expansion or recession.

From here the paper is structured as follows: Section 2 addresses the theoretical framework that the study involved and explains the hypotheses to be tested. Section 3

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3 explains the data and methodology used in the study. Section 4 analyses and discusses
4 the results obtained. And finally, Section 5 shows the conclusions obtained.
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9 **2. Theoretical framework**

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11 The possible impact of uncertainty on the behaviour of economic agents has been a
12 prominent topic in economic-financial research. Since Keynes (1936) proposed that
13 uncertainty could be a key element in the economy, several economists have focused on
14 the investigation of the impact of this concept (Friedman, 1968; Bernanke, 1983).
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19 Several authors have argued that uncertainty about the future policy affects agents'
20 expectations, causing these changes perceived, real effects on the economy (Mumtaz
21 and Zanetti, 2013). Focusing on MPU, there are several studies that have evaluated the
22 uncertainty regarding monetary policies that will be carried out on several
23 macroeconomic fundamentals. Thus, there are studies that have analysed the impact of
24 MPU on interest rates (Stulz, 1986; Mumtaz and Zanetti, 2013), economic growth
25 (Samani and Asadi, 2018; Husted *et al.*, 2019), types of change (Benigno *et al.*, 2012;
26 Mueller *et al.*, 2017), inflation (Binder, 2017; Samani and Asadi, 2018), demand for
27 money (Ongan and Gocet, 2019), commodity prices (Gospodinov and Jamali, 2017;
28 Kurov and Stan, 2018), employment (Samani and Asadi, 2018) and foreign investment
29 (Albulescu and Ionescu, 2017), among others.
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38 Specifically, in capital markets, an extensive literature that analyses the effects of
39 MPU on bond yields stands out. For example, Koeda and Kato (2015) examined the role
40 of MPU and the uncertainty of inflation with respect to several macrovariables in
41 determining the risk premia of bond yields. They found that high MPU in the early
42 1980s partly explained the slow behaviour of interest rates during periods when
43 inflation fell much more rapidly than nominal interest rates. Jiang and Tong (2016)
44 determined that MPU increases the uncertainty of the future evolution of bond yields,
45 showing how this uncertainty is not diversifiable, which is associated with a risk
46 premium in the US Treasury bond market. The result obtained by Jiang and Tong
47 (2016) is in line with studies such as Pástor and Veronesi (2013) and Brogaard and
48 Detzel (2015), who illustrate that high EPU raises risk premium in equity markets.
49 Husted *et al.* (2019), in this line, showed how positive MPU shocks increase the excess
50 premium of bonds.
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3 Regarding the influence of uncertainty regarding the economic policies that will be
4 carried out and the stock markets, several studies have found a negative link between
5 EPU and stock returns (Brogaard and Detzel, 2015; Arouri *et al.*, 2016; Paule-Vianez
6 *et al.*, 2020a). The approach that justifies this link, following Arouri *et al.* (2016), is
7 found in four issues: (1) EPU can change or delay important decisions taken by firms
8 and other economic agents such as employment, investment, consumption and savings
9 decisions (Bernanke, 1983; Gulen and Ion, 2016); (2) EPU can increase financing and
10 production costs and intensify disinvestment and economic contraction (July, 2002); (3)
11 EPU can increase risks in financial markets by reducing the protections provided by the
12 government for these markets (Pástor and Veronesi, 2012); and (4) EPU can also affect
13 inflation, interest rate and expected risk premiums (Pástor and Veronesi, 2013).
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23 Although extensive literature has analysed the impact of EPU on stock markets, few
24 studies have specifically related MPU to stock markets. Studies such as the one by
25 Bernanke and Kuttner (2005) have shown that unforeseen changes by the Fed in the
26 general fund rate are responsible for a small part of the general variability of stock
27 prices, showing that a hypothetical unanticipated 25-basis-point cut in the rate would be
28 related to a 1% increase in stock indices (Cai, 2018). This approach is supported by
29 Sinha (2016), who argues that a greater uncertainty regarding interest rates has
30 significant implications for economic agents' decision making, acting as a negative
31 shock in the demand. Another study that shows signs of a possible relationship between
32 MPU and stock returns is that by Albulescu and Ionescu (2017). These authors consider
33 that MPU provides signs about the efficiency of the macroeconomic policy and about
34 the confidence of the private sector in policymakers' decisions. They find that MPU
35 increases make access to finance more difficult, making it difficult for investors to
36 estimate their investment costs accurately. More recently, Kurov and Stan (2018)
37 analysed the influence of MPU on the reaction of the equity, treasury security, foreign
38 exchange, crude oil and interest rate markets to US macroeconomic announcements.
39 They found that in times of high MPU, macroeconomic announcements impact
40 financial markets through the expected reaction of the monetary policy. Thus, focusing
41 on equity markets, these authors find that in times of higher MPU, the reactions of
42 stocks to macroeconomic news become weaker. Kaminska and Roberts-Sklar (2018)
43 point out that asset pricing models assume that the risk-free rate is a key factor for stock
44 prices and along these same lines, when they analyse the influence of MPU on stock
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3 volatility, Gupta and Wohar (2019) argue that since the variation in stock prices is
4 directly related to conditional variations in future discount rates, investors' views about
5 the evolution of monetary policy rates may be embedded in the variation of stock prices.
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7 Finally, Paule-Vianez *et al.* (2020a) carried out a preliminary study of the influence of
8 EPU and MPU on the return, volatility and liquidity of stock markets, finding that MPU
9 increases reduce the return and liquidity, and increase the stock volatility.
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14 Given the paucity of studies that directly analyse the influence of MPU on stock
15 market returns, and the previously stated justifications for the possible existence of this
16 relationship, in this study the first hypothesis that is proposed to be tested is the
17 following:
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21 *H.1. MPU affects stock market returns negatively.*
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24 Another issue to be addressed in this study is whether all stocks are similarly
25 affected by MPU.
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28 Within the Behavioural Finance literature, it has been shown that when investors are
29 in uncertain situations, they tend to take mental shortcuts, known as biases, that allow
30 them to judge different assets (Paule-Vianez *et al.*, 2020b). Along these lines, several
31 studies have found that the most subjective and difficult to arbitrate stocks are those that
32 are most affected by biases. Benchmark is the study by Baker and Wurgler (2006), who
33 demonstrated that investor sentiment has cross-sectional effects on equity returns. They
34 demonstrated how stocks that have subjective valuations and that are difficult to
35 arbitrate are mainly affected by investor sentiment (younger stocks, small stocks,
36 unprofitable stocks, non-dividend-paying stocks, high volatility stocks, extreme growth
37 stocks, and struggling stocks). According to Baker and Wurgler (2006), Waggle and
38 Agrawal (2015), growth stocks are more sensitive to changes in investor confidence,
39 demonstrating how the bullish sentiment of investors drives up stock prices, which leads
40 to this growth producing higher valuations followed by lower returns. Wu *et al.* (2016)
41 also concluded that growth stocks are more affected by extreme pessimism or optimism
42 than value stocks. However, they determined that the sentiment in less extreme values
43 affects value stock returns more. Finally, another study that analyses this issue was that
44 by Smales (2017), who determined that stocks that are more subjective to value or that
45 face limits to arbitrage, such as small-cap stocks or those of industries in the technology
46 or telecommunications sector, which are more affected by sentiment.
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3 Looking more specifically at political uncertainty, some studies have been found
4 that have distinguished the impact of EPU on different types of stocks based on their
5 limits to arbitration. Chen *et al.* (2017) investigated the impact of EPU on the change in
6 expected returns of the Chinese stock market and concluded that EPU predicts future
7 stock market returns negatively, especially for small-cap and lower value portfolios.
8 These authors argue that these findings are consistent with behavioural asset price
9 models, in which an increase in uncertainty increases behavioural biases and generates
10 speculative price errors under short sales restrictions. Hu *et al.* (2018), in their study in
11 which they analysed the effect of EPU on the cross-section of stock returns, found that
12 small and growth stocks are more sensitive to EPU shocks, when EPU decreases, the
13 return of these stocks increases.
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16 To the best of our knowledge, no study has differentiated the possible effects of
17 MPU on stock returns considering limits to arbitrage. For this reason, based on the
18 relationships found between investor sentiment and EPU, both measures related (see
19 Rehman and Apergis, 2019), with the return of the most subjective and difficult to
20 arbitrate stocks, the second hypothesis that is proposed to test in this study is the
21 following:
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24 *H.2. MPU affects small-cap growth stock returns more.*
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27 Finally, another issue that we try to discover with this study is the possible influence
28 of the economic cycle on the impact of MPU on stock market returns.
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31 Within the studies that evaluate the impact of EPU on stock markets, there are
32 several studies that differentiate the impact of this uncertainty on these markets
33 depending on the economic cycle. Following Baker *et al.* (2016), when the economy
34 contracts, investors expect governments to take faster measures than during periods of
35 expansion, influencing this speed their investment risk perception. In this line, several
36 authors defend a greater influence of EPU during periods of recession than expansion
37 (Pástor and Veronesi, 2012; Baker *et al.*, 2016; Adjei and Adjei, 2017). However, no
38 study was found to analyse this impact of the economic cycle on the relationship
39 between MPU and stock returns.
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42 In relation to monetary policy, it is well known that the effects of monetary policy
43 on the real economy differ between the phases of the economic cycle (Tenreyro and
44 Thwaites, 2016). Balcilar *et al.* (2017) argue that if central banks continually warn about
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3 an expansionary cycle, firms and consumers might cut back or hold out on consumption
4 and investment decisions due to possible increases in interest rates. Regarding fixed-
5 income securities, Andreasen *et al.* (2016) find a greater prediction of structural
6 variables regarding the risk premium in times of expansion, being largely absent during
7 recession. However, Jiang and Tong (2016) do not find in their study that in times of
8 recession or expansion, the impact of MPU may be greater or lesser on bond yield.
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11 In line with the above and following the argument of Balcilar *et al.* (2017), in this
12 study we consider that, due to increases in MPU in times of expansion, investors may
13 generate expectations regarding the application of future contractionary policies. Thus,
14 if investors foresee, for example, possible increases in interest rates, they will be
15 discouraged from investing in equities, with the consequent reduction in the returns of
16 these assets.
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19 Therefore, the third and last hypothesis that is intended to be tested in this study is
20 the following:
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23 *H.3. MPU affects stock returns more during periods of expansion than recession.*
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25 26 27 28 29 30 31 32 33 **3. Data and methodology**

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35 To evaluate the influence of MPU on the stock markets, monthly data has been used for
36 the period from January 1985 to March 2020. Selecting this long period avoids the
37 problem related to sample selection bias by capturing the longest possible evolution of
38 the stock market and MPU.
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41 As US MPU proxies we have selected the MPU index proposed by Husted *et al.*
42 (2016) (available at <https://www.federalreserve.gov/>) and the two MPU indices
43 proposed by Baker *et al.* (2016) (available at <https://www.policyuncertainty.com/>). The
44 selection of these three measures to assess the influence of MPU in the stock markets
45 allows to reduce the sensitivity of the results to the MPU proxy used and, in turn,
46 provide greater robustness to the study.
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49 The MPU index for US by Husted *et al.* (2016) was developed following a news-
50 based search approach of Baker *et al.* (2016) for the development of their EPU index.
51 Using the ProQuest Newsstand and historical archives, Husted *et al.* (2016) capture the
52 degree of uncertainty that the public perceives about Federal Reserve policy actions and
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3 their consequences. Their approach to building the MPU index is to track the frequency
4 of newspaper articles that contain the following keywords: “uncertainty” or “uncertain”,
5 “monetary policy(ies)” or “interest rate(s)” or “Federal fund(s) rate” or “Fed fund(s)
6 rate”, and “Federal Reserve” or “the Fed” or “Federal Open Market Committee” or
7 “FOMC”. They do this for everyday issues of the Washington Post, the Wall Street
8 Journal, and the New York Times. This index has been used as a proxy for MPU by Cai
9 (2018), Husted *et al.* (2019) and Paule-Vianez *et al.* (2020a).

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16 The MPU indices of Baker *et al.* (2016) have been constructed by identifying
17 newspaper articles that contain one or more terms (singular or plural) in each of the
18 following sets:

- 19 • E: economic, economy.
- 20 • P: congress, legislation, white house, regulation, federal reserve, deficit.
- 21 • U: uncertain, uncertainty.
- 22 • M: federal reserve, the fed, money supply, open market operations, quantitative
23 easing, monetary policy, fed funds rate, overnight lending rate, Bernanke,
24 Volker, Greenspan, central bank, interest rates, fed chairman, fed chair, lender of
25 last resort, discount window, European Central Bank, ECB, Bank of England,
26 Bank of Japan, BOJ, Bank of China, Bundesbank, Bank of France, Bank of Italy.

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36 Under this basis, there are two MPU indices for US constructed by Baker *et al.*
37 (2016). One is built using hundreds of daily newspapers covered by Access World
38 News, and the other is based on 10 major newspapers, such as: USA Today, the Miami
39 Herald, the Chicago Tribune, the Washington Post, the Los Angeles Times, the Boston
40 Globe, the San Francisco Chronicle, the Dallas Morning News, the Houston Chronicle,
41 and the Wall Street Journal. This index has been used as a proxy for Jiang and Tong
42 (2016), Binder (2017) and Ongan and Gocer (2019).

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53 The assumption behind the development of these indices is that increased newspaper
54 coverage on monetary policy and uncertainty indicates that the public perceives more
55 uncertainty about central bank actions (Jiang and Tong, 2016).

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Figure 1 shows the evolution of these MPU measurements in the period studied.

[Insert Figure 1 near here]

It is found as MPU highs have been around events such as Black Monday of 1987,
the Gulf Wars, Dotcom Bubble, Sept 11 Terrorist Attack, Iraq Invasion, Great

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3 Recession, the announcements of QE I and II, Taper Tantrum, Brexit, US election and
4 the Covid-19 crisis, at which point MPU has reached all-time highs since records of this
5 measure are available. This fact highlights the special importance of analysing at this
6 time, the possible impacts of MPU on macroeconomic variables and financial markets.
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10 In this study, to assess the influence of MPU on the return of large and small-cap
11 growth and value stocks in the United States, the variation rate of the different selected
12 measures has been taken. Hereinafter, the variation of the MPU index of Husted *et al.*
13 (2016) will be called MPU₁ and the variation of the MPU index built by using hundreds
14 of daily newspapers covered by Access World News and the MPU index based on 10
15 major newspapers by Baker *et al.* (2016), will be called MPU₂ and MPU₃, respectively.
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21 To study the effect of this uncertainty on investment returns of value and growth
22 stocks of higher and lower capitalization, we selected the following indices: Russell
23 1000 Value, Russell 1000 Growth, Russell 2000 Value and Russell 2000 Growth. The
24 quoted prices of these indices were taken from the Datastream database. From these
25 data, we developed the returns of these indices as the rate of change of the quotation
26 prices at different moments of time:
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$$R_{it} = \frac{P_{it} - P_{i,t-1}}{P_{i,t-1}}, \quad t = 1, \dots, T. \quad (1)$$

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37 Where R_{it} represents the return of index i in month t , and P_{it} represents the points of
38 index i in month t . Therefore, we will study:
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- 41 • Investment returns of large-cap value stocks (Return of Russell 1000 Value
42 index): $R_{\text{Large_Value}}$.
- 43 • Investment returns of large-cap growth stocks (Return of Russell 1000 Growth
44 index): $R_{\text{Large - Growth}}$.
- 45 • Investment returns of small-cap value stocks (Return of Russell 2000 Value
46 index): $R_{\text{Small - Value}}$.
- 47 • Investment returns of small-cap growth stocks (Return of Russell 2000 Growth
48 index): $R_{\text{Small - Growth}}$.
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56 For macroeconomic conditioning variables, we have included economic variables
57 that have been shown to be associated with stock markets and political uncertainty. The
58 following have been selected: the growth rate of the consumer price index (Inflation)
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(Arouri *et al.*, 2016; Chen *et al.*, 2017), the growth of the industrial production index (IPI) (Arouri *et al.*, 2016; Chen *et al.*, 2017), the term spread between the yield to maturity of a 10-year Treasury note and the three-month Treasury bill (Term Spread) (Brogaard and Detzel, 2015; Adjei and Adjei, 2017), the default spread between yields of BAA-rated bonds and AAA-rated bonds (Default Spread) (Brogaard and Detzel, 2015; Arouri *et al.*, 2016; Adjei and Adjei, 2017) and the growth of the normalized gross domestic product index (GDP) (Kurov and Stan, 2018; Ahmad and Sharma; 2018). The data for economic variables are obtained from the FRED database of the Federal Reserve Bank of St. Louis (available at <http://research.stlouisfed.org/fred2/>).

In line with the hypotheses proposed, we distinguish the impact of MPU by economic cycle, determining periods of recession and expansion, following the National Bureau of Economic Research (available at <https://www.nber.org/>). Studies such as those of Jiang and Tong (2016) and Gospodinov and Jamali (2017) have used this separation for periods of expansion and recession.

Table I shows the periods of recession and expansion included in the sample.

[Insert Table I near here]

Table II shows the descriptive statistics of the variables used in the study.

[Insert Table II near here]

It is observed how the stocks that show the highest average return are large-cap stocks. However, it is shown how the returns of small-cap stocks have a greater standard deviation, especially $R_{\text{Small} - \text{Growth}}$. Distinguishing by economic cycle, it is observed how the return means of the different stocks studied has a higher value in times of expansion than in times of recession. However, this difference is only significant for $R_{\text{Large_Value}}$ with a significance level of less than 5%, showing how the return of these shares is more affected by economic cycles.

When looking at the MPU measures, there are discrepancies between the measure elaborated by Husted *et al.* (2016) and those elaborated by Baker *et al.* (2016). Thus, while MPU_1 shows a higher value in times of expansion, MPU_2 and MPU_3 do so in times of recession, even though in none of the cases the difference in means of these measures between periods is significant.

With respect to the selected control variables, it is shown that Inflation, IPI and GDP have higher mean values in times of expansion, with this difference being significant for IPI and GDP. In contrast, both Term Spread and Default Spread show higher values in times of recession than in expansion, with significant differences in the three cases.

Table III presents the bivariate correlations of the variables under study.

[Insert Table III near here]

It is observed, as expected, that the returns of the different types of stocks studied are highly correlated. Likewise, the three MPU measures are significantly correlated, especially MPU₂ y MPU₃.

Regarding the correlation between MPU measures and returns, it is shown how the three measures are negatively and significantly correlated with the returns of the different types of stocks, except MPU₁ with R_{Large_Value}. It is shown how MPU₁ and MPU₃ have a higher correlation with respect to R_{Small – Growth}, however, MPU₃ is more correlated with R_{Small – Value}, being slightly higher than the correlation with R_{Small – Growth}. Therefore, these data show that movements in returns on stocks that are more difficult to value are more associated with changes in MPU.

Finally, when analysing the control variables, it is found that GDP is positively and significantly correlated with the return of all types of stocks. However, Default Spread is negatively and significantly correlated only with R_{Large_Value} and R_{Large_Growth}. Regarding its correlation with MPU, only IPI is negatively and significantly correlated with MPU₃ and GDP with MPU₂.

With these data, to test the hypotheses raised, we proposed applying linear regression models with ordinary least squares (Chen *et al.*, 2017; Paule-Vianez *et al.*, 2020a).

Thus, the proposed models are:

$$R_{it} = \alpha + \beta_1 MPU_{1t} + \beta_2 Inflation_t + \beta_3 IPI_t + \beta_4 Term\ Spread_t + \beta_5 Default\ Spread_t + \beta_6 GDP_t + \varepsilon_{it}, \quad t = 1, \dots, T. \quad (2)$$

$$R_{it} = \alpha + \beta_1 MPU_{2t} + \beta_2 Inflation_t + \beta_3 IPI_t + \beta_4 Term\ Spread_t + \beta_5 Default\ Spread_t + \beta_6 GDP_t + \varepsilon_{it}, \quad t = 1, \dots, T. \quad (3)$$

$$R_{it} = \alpha + \beta_1 MPU_{3t} + \beta_2 Inflation_t + \beta_3 IPI_t + \beta_4 Term\ Spread_t + \beta_5 Default\ Spread_t + \beta_6 GDP_t + \varepsilon_{it}, \quad t = 1, \dots, T. \quad (4)$$

Where R_{it} represents the stock index i return in month t , α the independent parameter, β_k represents the influence of explanatory variable k on the stock index i return, and ε_{it} represents the error term.

These models will be applied for a full sample, and for periods of recession and expansion.

4. Results and discussion

The results obtained are shown and discussed below.

Table IV shows the impact of MPU on the return of large and small-cap growth and value stocks for a full sample. It is observed that for the three measures and all the stocks, MPU shows a negative impact on stock returns, this impact being significant in all cases except for MPU_1 in R_{Large_Value} . In this line, it is shown that not all the MPU measures have the same impact on stock returns, finding that the Baker *et al.* (2016) (MPU_2 and MPU_3) have a greater influence on stock returns and provide a greater explanatory capacity to the model. These results allow to accept H.1. and support the arguments and results obtained by Bernanke and Kuttner (2005), Sinha (2016), Albulescu and Ionescu (2017), Kaminska and Roberts-Sklar (2018) and Gupta and Wohar (2019) by showing that MPU has real implications for economic agents' decision making. In turn, these results are in agreement with those obtained by Kurov and Stan (2018) and Paule-Vianez *et al.* (2020a). They also coincide with what was found regarding the impact of EPU on stock returns (Brogaard and Detzel, 2015; Arouri *et al.*, 2016; Paule-Vianez *et al.*, 2020a), which shows that both uncertainty generated by governments as that generated by central banks have negative impacts on stock markets.

By type of stocks, it is shown how the return of small-cap growth stocks is the most affected by changes in MPU for the three MPU measures. It is shown how upward variations of 1% in the different MPU measures cause reductions in the return of these stocks around 0.016% and 0.038% (considering the control variables as fixed). In contrast, MPU has less impact on the return of large-cap value stocks. An MPU increase

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3 of 1% considering the measures of Baker *et al.* (2016), have associated reductions of
4 0.015% and 0.02% in the return of large-cap value stocks. Therefore, these results allow
5 to accept H.2. by showing that the returns on stocks that are more subjective and
6 difficult to arbitrate, as they are considered small-cap growth stocks, are those that are
7 most affected by changes in MPU. Despite the fact that no studies have been found that
8 analyse this issue, based on the fact that investors in uncertain situations tend to take
9 mental shortcuts (Paule-Vianez *et al.*, 2020b), being influenced by their feelings and
10 expectations, our results support what was obtained by Baker and Wurgler (2006),
11 Waggle and Agrawal (2015) and Smales (2017), by showing that the stocks that are the
12 most subjective and difficult to value are more sensitive to changes in investor
13 sentiment. Likewise, our results are also in agreement with those obtained by Chen *et al.*
14 (2017) and Hu *et al.* (2018) by demonstrating that small-cap growth stocks are the most
15 sensitive to changes in political uncertainty.
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26 [Insert Table IV near here]
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28 Table V shows the effect that MPU produces on the return of large-cap growth and
29 value stocks during periods of recession and expansion. By observing MPU₁, this
30 measure only shows significant impacts on the return of large-cap stocks in times of
31 expansion, especially on growth stocks (-0.009 vs. -0.005). However, considering MPU₂
32 and MPU₃, it is found that MPU has significant impacts on the return of large-cap
33 stocks in all cases, with greater influence in times of recession and on growth stocks. It
34 is shown that an increase of 1% in the measures proposed by Baker *et al.* (2016) in
35 times of recession causes a reduction in the returns of large-cap growth stocks of
36 0.041% and 0.043%, respectively. In this way, based on these results, it would not be
37 possible to accept H.3., Therefore, although when using the MPU₁ measure, it is shown
38 that in times of expansion the impact of this uncertainty is greater on the return of large-
39 cap stocks, with MPU₂ and MPU₃ we find just the opposite. This issue highlights the
40 need for further deepening of MPU uptake by the proposed measures for a better
41 understanding of these discrepancies. Thus, what was obtained using MPU₂ and MPU₃
42 coincides with the effect found in the stock markets by several studies regarding EPU
43 (Pástor and Veronesi, 2012; Baker *et al.*, 2016; Adjei and Adjei, 2017). However, what
44 was obtained using MPU₁ is more in line with the arguments of Balcilar *et al.* (2017).
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58 [Insert Table V near here]
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3 Finally, regarding the impact of MPU on small-cap stocks (Table VI), it is shown,
4 similar to that observed in Table V, that MPU₁ only reduces the return of small-cap
5 stocks in times of expansion, especially in growth stocks (-0.016 vs. -0.010). However,
6 MPU₂ and MPU₃ continue to show a greater impact in times of recession and on growth
7 stocks, reaching a 0.061% reduction in the return of these stocks when there are
8 increases in MPU₃.
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14 [Insert Table VI near here]
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16 Therefore, with all of the above, we can accept that MPU reduces stock returns and
17 does it to a greater extent in the stocks that are the most difficult to arbitrate, such as
18 small-cap growth stocks. However, regarding the economic cycle, the results are not
19 conclusive.
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26 5. Conclusions

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28 In recent years, especially since the Great Recession of 2008, the study of the
29 uncertainty generated by economic policy makers has been a subject that has generated
30 great interest in the academic field.
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34 In this study we have focused on the uncertainty generated by central banks
35 regarding the monetary policy measures they will carry out, analysing the effect that this
36 uncertainty causes on stock returns considering the limits to arbitrage and the economic
37 cycle.
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41 Therefore, this study a GAP found in the literature, being one of the few
42 investigations that have related MPU and stock market returns and, to the best of our
43 knowledge, the first to do so considering this effect based on subjectivity and difficulty
44 to value those stocks, as well as the economic cycle.
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48 Taking the MPU measurements from Husted *et al.* (2016) and Baker *et al.* (2016) in
49 this study, it is shown how increases in MPU cause reductions in stock returns,
50 especially in small-cap growth stocks. However, when considering the economic cycle,
51 discrepancies have been found between the different measures used. When using the
52 measure of Husted *et al.* (2016), MPU only reduces stock returns in times of expansion,
53 by applying the two measures elaborated by Baker *et al.* (2016), MPU is found to have
54 a greater impact in times of recession.
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3 The findings obtained have important implications, especially in these moments in
4 which the Covid-19 crisis has led to historical highs for MPU, as records are available.
5 For central banks, the importance and need for greater control over the transparency of
6 their decisions to maintain the stability of financial markets is shown. A high
7 predictability of the monetary policies that are carried out and their consequences could
8 avoid the damages that MPU has in stock markets. In turn, the results obtained are
9 useful for investors, showing them the importance of considering MPU when selecting
10 their investments.
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17 The little research available that relates MPU and stock market returns justifies the
18 need for future research in this line. In particular, and due to what was found in this
19 study when considering the economic cycle, it is suggested for future studies to go
20 deeply into the impact of MPU on stock markets in times of recession and expansion.
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25 26 27 **References**

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Table I. Periods of recession and expansion in the sample.

| Period | Economic cycle |
|--------------------------------|----------------|
| January 1985 to July 1990 | Expansion |
| August 1990 to March 1991 | Recession |
| April 1991 to March 2001 | Expansion |
| April 2001 to November 2001 | Recession |
| December 2001 to December 2007 | Expansion |
| January 2008 to June 2009 | Recession |
| July 2009 to February 2020 | Expansion |
| March 2020 | Recession |

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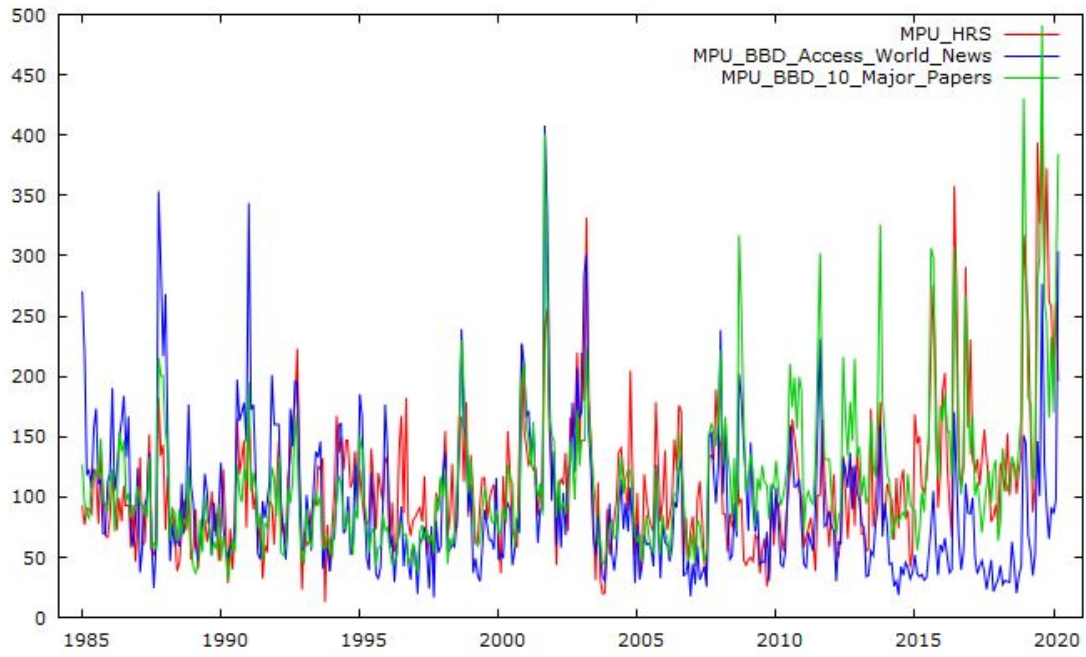


Figure 1. US MPU. 1/1985-3/2020 period.

Submission to Studies in Economics and Finance

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Table II. Descriptive statistics of MPU and returns of large and small-cap growth and value stocks.

| Variable | Full Sample N=422 | | | Recession N=35 | | | Expansion N=387 | | | T-test mean difference (p value) |
|---------------------------|----------------------|--------|-------|-------------------|--------|-------|--------------------|--------|-------|---|
| | Mean | Median | STD | Mean | Median | STD | Mean | Median | STD | |
| R _{Large-Value} | 0.009 | 0.014 | 0.043 | -0.016 | -0.007 | 0.070 | 0.011 | 0.014 | 0.039 | -2.22** (0.03) |
| R _{Large-Growth} | 0.010 | 0.013 | 0.048 | -0.008 | -0.006 | 0.072 | 0.011 | 0.014 | 0.045 | -1.51 (0.14) |
| R _{Small-Value} | 0.009 | 0.015 | 0.051 | -0.012 | 0.022 | 0.092 | 0.011 | 0.015 | 0.046 | -1.40 (0.17) |
| R _{Small-Growth} | 0.008 | 0.016 | 0.063 | -0.009 | 0.023 | 0.097 | 0.010 | 0.015 | 0.059 | -1.13 (0.27) |
| MPU ₁ | 0.138 | 0.003 | 0.664 | 0.035 | -0.044 | 0.440 | 0.147 | 0.009 | 0.680 | -0.95 (0.34) |
| MPU ₂ | 0.154 | -0.004 | 0.714 | 0.258 | -0.100 | 0.913 | 0.145 | -0.004 | 0.694 | 0.72 (0.48) |
| MPU ₃ | 0.075 | -0.039 | 0.466 | 0.212 | -0.089 | 0.930 | 0.062 | -0.028 | 0.399 | 0.95 (0.35) |
| Inflation | 0.002 | 0.002 | 0.003 | 0.002 | 0.003 | 0.006 | 0.002 | 0.002 | 0.003 | -0.24 (0.82) |
| IPI | 0.002 | 0.002 | 0.007 | -0.009 | -0.006 | 0.011 | 0.002 | 0.002 | 0.005 | -5.84*** (0.00) |
| Term Spread | 0.017 | 0.017 | 0.011 | 0.020 | 0.021 | 0.007 | 0.017 | 0.017 | 0.012 | 2.46** (0.02) |
| Default Spread | 0.010 | 0.009 | 0.004 | 0.016 | 0.014 | 0.008 | 0.009 | 0.009 | 0.003 | 4.94*** (0.00) |
| GDP | 0.000 | 0.000 | 0.003 | -0.004 | -0.002 | 0.008 | 0.000 | 0.000 | 0.001 | -2.79*** (0.01) |

Note: *** Indicate significance at the 1% level. ** indicate significance at the 5% level. and * indicate significance at the 10%.

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Table III. Matrix of correlations of MPU and returns of large and small-cap growth and value stocks.

| Variable | R _{Large-Value} | R _{Large-Growth} | R _{Small-Value} | R _{Small-Growth} | MPU ₁ | MPU ₂ | MPU ₃ | Inflation | IPI | Term Spread | Default Spread | GDP |
|---------------------------|--------------------------|---------------------------|--------------------------|---------------------------|-------------------|--------------------|-------------------|--------------------|--------------------|-------------------|--------------------|-----|
| R _{Large-Value} | 1 | | | | | | | | | | | |
| R _{Large-Growth} | 0.84*** (0.00) | 1 | | | | | | | | | | |
| R _{Small-Value} | 0.86*** (0.00) | 0.74*** (0.00) | 1 | | | | | | | | | |
| R _{Small-Growth} | 0.74*** (0.00) | 0.85*** (0.00) | 0.87*** (0.00) | 1 | | | | | | | | |
| MPU ₁ | -0.07 (0.17) | -0.12** (0.02) | -0.12** (0.02) | -0.16*** (0.00) | 1 | | | | | | | |
| MPU ₂ | -0.28*** (0.00) | -0.28*** (0.00) | -0.31*** (0.00) | -0.30*** (0.00) | 0.49*** (0.00) | 1 | | | | | | |
| MPU ₃ | -0.22*** (0.00) | -0.26*** (0.00) | -0.25*** (0.00) | -0.28*** (0.00) | 0.43*** (0.00) | 0.70*** (0.00) | 1 | | | | | |
| Inflation | 0.01 (0.82) | 0.01 (0.89) | -0.00 (0.94) | 0.01 (0.87) | 0.06 (0.19) | 0.00 (0.95) | 0.03 (0.56) | 1 | | | | |
| IPI | 0.04 (0.45) | -0.01 (0.89) | 0.02 (0.66) | -0.01 (0.86) | 0.05 (0.29) | -0.03 (0.51) | -0.10** (0.04) | 0.05 (0.34) | 1 | | | |
| Term Spread | -0.02 (0.69) | -0.05 (0.34) | 0.04 (0.40) | 0.01 (0.89) | 0.01 (0.83) | -0.06 (0.26) | -0.03 (0.61) | -0.05 (0.32) | 0.06 (0.19) | 1 | | |
| Default Spread | -0.09* (0.07) | -0.06 (0.20) | -0.06 (0.20) | -0.04 (0.40) | -0.04 (0.47) | -0.04 (0.40) | -0.02 (0.71) | -0.19*** (0.00) | -0.38*** (0.00) | 0.26*** (0.00) | 1 | |
| GDP | 0.25*** (0.00) | 0.17*** (0.00) | 0.20*** (0.00) | 0.20*** (0.00) | 0.05 (0.36) | -0.13*** (0.01) | -0.07 (0.17) | 0.50** (0.03) | 0.50*** (0.00) | 0.09* (0.08) | -0.22*** (0.00) | 1 |

Note: *** Indicate significance at the 1% level. ** indicate significance at the 5% level. and * indicate significance at the 10%.

Table IV. Impact of MPU on the return of large and small-cap growth and value stocks.

| Variable | R _{Large-Value} | | | R _{Large-Growth} | | | R _{Small-Value} | | | R _{Small-Growth} | | |
|---------------------|--------------------------|---------------------|---------------------|---------------------------|---------------------|---------------------|--------------------------|---------------------|---------------------|---------------------------|---------------------|---------------------|
| | Coef. (p value) | Coef. (p value) | Coef. (p value) | Coef. (p value) | Coef. (p value) | Coef. (p value) | Coef. (p value) | Coef. (p value) | Coef. (p value) | Coef. (p value) | Coef. (p value) | Coef. (p value) |
| Const | 0.022*** (0.00) | 0.026*** (0.00) | 0.025*** (0.00) | 0.024*** (0.00) | 0.028*** (0.00) | 0.027*** (0.00) | 0.021*** (0.01) | 0.026*** (0.00) | 0.024*** (0.00) | 0.022** (0.04) | 0.027** (0.01) | 0.026** (0.01) |
| MPU ₁ | -0.005 (0.11) | | | -0.009** (0.01) | | | -0.010*** (0.01) | | | -0.016*** (0.00) | | |
| MPU ₂ | | -0.015*** (0.00) | | | -0.018*** (0.00) | | | -0.020*** (0.00) | | | -0.024*** (0.00) | |
| MPU ₃ | | | -0.020*** (0.00) | | | -0.028*** (0.00) | | | -0.027*** (0.00) | | | -0.038*** (0.00) |
| Inflation | -0.352 (0.59) | -0.390 (0.53) | -0.338 (0.59) | -0.273 (0.71) | -0.355 (0.62) | -0.279 (0.70) | -0.608 (0.43) | -0.698 (0.35) | -0.627 (0.40) | -0.255 (0.79) | -0.414 (0.66) | -0.307 (0.74) |
| IPI | -0.946** (0.01) | -0.922*** (0.01) | -1.119*** (0.00) | -1.040** (0.02) | -1.024*** (0.02) | -1.285*** (0.00) | -1.422*** (0.00) | -1.404*** (0.00) | -1.664*** (0.00) | -1.538*** (0.01) | -1.530*** (0.01) | -1.893*** (0.00) |
| Term Spread | -0.071 (0.71) | -0.101 (0.58) | -0.073 (0.69) | -0.182 (0.40) | -0.221 (0.29) | -0.188 (0.37) | 0.183 (0.41) | 0.140 (0.51) | 0.177 (0.41) | 0.037 (0.89) | 0.018 (0.95) | 0.028 (0.92) |
| Default Spread | -0.878 (0.16) | -1.032* (0.09) | -1.021* (0.09) | -0.764 (0.28) | -0.938 (0.18) | -0.956 (0.17) | -1.031 (0.16) | -1.224* (0.08) | -1.216* (0.09) | -0.848 (0.36) | -1.081 (0.23) | -1.109 (0.22) |
| GDP | 5.227*** (0.00) | 4.571*** (0.00) | 5.101*** (0.00) | 4.500*** (0.00) | 3.717*** (0.00) | 4.317*** (0.00) | 7.092*** (0.00) | 6.223*** (0.00) | 6.909*** (0.00) | 6.818*** (0.00) | 5.721*** (0.00) | 6.547*** (0.00) |
| R ² | 0.086 | 0.143 | 0.128 | 0.062 | 0.114 | 0.117 | 0.116 | 0.174 | 0.159 | 0.085 | 0.132 | 0.137 |
| R ² adj. | 0.073 | 0.131 | 0.116 | 0.048 | 0.101 | 0.104 | 0.103 | 0.162 | 0.147 | 0.072 | 0.119 | 0.124 |

Note: *** Indicate significance at the 1% level, ** indicate significance at the 5% level, and * indicate significance at the 10%.

Table V. Impact of MPU on the return of large-cap growth and value stocks during periods of recession and expansion.

| Variable | Recession | | | | | | Expansion | | | | | |
|---------------------|--------------------------|--------------------|--------------------|---------------------------|---------------------|---------------------|--------------------------|---------------------|---------------------|---------------------------|---------------------|---------------------|
| | R _{Large-Value} | | | R _{Large-Growth} | | | R _{Large-Value} | | | R _{Large-Growth} | | |
| | Coef. (p value) | Coef. (p value) | Coef. (p value) | Coef. (p value) | Coef. (p value) | Coef. (p value) | Coef. (p value) | Coef. (p value) | Coef. (p value) | Coef. (p value) | Coef. (p value) | Coef. (p value) |
| Const | 0.024 (0.59) | 0.029 (0.48) | 0.024 (0.54) | 0.010 (0.84) | 0.015 (0.72) | 0.009 (0.83) | 0.012 (0.15) | 0.015* (0.07) | 0.014* (0.10) | 0.017* (0.07) | 0.020** (0.03) | 0.019** (0.05) |
| MPU ₁ | -0.007 (0.79) | | | -0.021 (0.50) | | | -0.005* (0.09) | | | -0.009*** (0.01) | | |
| MPU ₂ | | -0.029** (0.04) | | | -0.041*** (0.01) | | | -0.014*** (0.00) | | | -0.016*** (0.00) | |
| MPU ₃ | | | -0.030** (0.02) | | | -0.043*** (0.00) | | | -0.019*** (0.00) | | | -0.025*** (0.00) |
| Inflation | 0.249 (0.91) | 0.894 (0.66) | 1.030 (0.60) | 1.590 (0.51) | 2.405 (0.26) | 2.572 (0.22) | -0.540 (0.45) | -0.686 (0.33) | -0.667 (0.35) | -0.751 (0.37) | -0.953 (0.24) | -0.942 (0.25) |
| IPI | -1.859 (0.20) | -2.329* (0.09) | -3.255** (0.03) | -1.357 (0.39) | -2.102 (0.14) | -3.417** (0.03) | -0.996** (0.02) | -0.908** (0.03) | -0.949** (0.02) | -1.256*** (0.01) | -1.163** (0.01) | -1.201** (0.01) |
| Term Spread | -1.002 (0.66) | -0.826 (0.70) | -0.310 (0.88) | -0.723 (0.78) | -0.345 (0.88) | 0.394 (0.86) | -0.032 (0.86) | -0.078 (0.54) | -0.054 (0.76) | -0.256 (0.23) | -0.310 (0.14) | -0.286 (0.17) |
| Default Spread | -0.904 (0.66) | 1.568 (0.41) | -2.165 (0.27) | -0.188 (0.94) | -1.241 (0.54) | -2.077 (0.31) | 0.359 (0.67) | 0.272 (0.74) | 0.316 (0.71) | 0.257 (0.79) | 0.155 (0.87) | 0.199 (0.84) |
| GDP | 5.842*** (0.01) | 4.881** (0.02) | 6.479*** (0.00) | 3.849** (0.10) | 2.404 (0.25) | 4.738** (0.02) | 2.388*** (0.42) | 2.428*** (0.39) | 1.966*** (0.50) | 9.460*** (0.01) | 9.409*** (0.01) | 8.842*** (0.01) |
| R ² | 0.261 | 0.365 | 0.385 | 0.134 | 0.336 | 0.364 | 0.025 | 0.079 | 0.057 | 0.051 | 0.091 | 0.081 |
| R ² adj. | 0.103 | 0.229 | 0.253 | -0.051 | 0.194 | 0.228 | 0.010 | 0.064 | 0.042 | 0.036 | 0.076 | 0.067 |

Note: *** Indicate significance at the 1% level. ** indicate significance at the 5% level. and * indicate significance at the 10%.

Table VI. Impact of MPU on the return of small-cap growth and value stocks during periods of recession and expansion.

| Variable | Recession | | | | | | Expansion | | | | | |
|---------------------|--------------------------|--------------------|---------------------|---------------------------|---------------------|---------------------|--------------------------|---------------------|---------------------|---------------------------|---------------------|---------------------|
| | R _{Small-Value} | | | R _{Small-Growth} | | | R _{Small-Value} | | | R _{Small-Growth} | | |
| | Coef. (p value) | Coef. (p value) | Coef. (p value) | Coef. (p value) | Coef. (p value) | Coef. (p value) | Coef. (p value) | Coef. (p value) | Coef. (p value) | Coef. (p value) | Coef. (p value) | Coef. (p value) |
| Const | 0.037 (0.50) | 0.045 (0.38) | 0.039 (0.42) | 0.010 (0.88) | 0.018 (0.74) | 0.009 (0.86) | 0.010 (0.29) | 0.014 (0.14) | 0.012 (0.21) | 0.014 (0.26) | 0.018 (0.14) | 0.017 (0.19) |
| MPU ₁ | -0.006 (0.86) | | | -0.027 (0.49) | | | -0.010*** (0.00) | | | -0.016*** (0.00) | | |
| MPU ₂ | | -0.037** (0.03) | | | -0.057*** (0.00) | | | -0.018*** (0.00) | | | -0.021*** (0.00) | |
| MPU ₃ | | | -0.042** (0.01) | | | -0.061*** (0.00) | | | -0.026*** (0.00) | | | -0.035*** (0.00) |
| Inflation | -0.125 (0.96) | 0.770 (0.76) | 1.024 (0.67) | 1.941 (0.54) | 3.077 (0.25) | 3.341 (0.20) | -0.875 (0.32) | -1.105 (0.18) | -1.084 (0.19) | -0.879 (0.42) | -1.201 (0.26) | -1.191 (0.27) |
| IPI | -2.896 (0.11) | -3.497** (0.04) | -4.829*** (0.01) | -2.304 (0.26) | -3.325* (0.07) | -5.187*** (0.01) | -1.217** (0.01) | -1.108** (0.02) | -1.159** (0.02) | -1.602** (0.01) | -1.480** (0.02) | -1.528** (0.01) |
| Term Spread | -0.578 (0.84) | -0.387 (0.88) | 0.343 (0.89) | -0.323 (0.92) | 0.184 (0.95) | 1.225 (0.65) | 0.215 (0.32) | 0.152 (0.47) | 0.182 (0.39) | 0.031 (0.91) | -0.107 (0.67) | -0.076 (0.78) |
| Default Spread | -1.984 (0.44) | -2.831 (0.24) | -3.718 (0.12) | -0.738 (0.80) | -2.181 (0.39) | -3.378 (0.18) | 0.232 (0.82) | 0.114 (0.91) | 0.170 (0.86) | 0.205 (0.87) | -0.060 (0.96) | 0.118 (0.93) |
| GDP | 8.512*** (0.00) | 7.256*** (0.01) | 9.413*** (0.00) | 6.653** (0.03) | 4.665* (0.08) | 7.905** (0.00) | 3.219*** (0.35) | 3.171*** (0.34) | 2.547*** (0.45) | 10.479** (0.02) | 10.297** (0.02) | 9.495*** (0.03) |
| R ² | 0.328 | 0.433 | 0.470 | 0.211 | 0.423 | 0.461 | 0.043 | 0.098 | 0.075 | 0.059 | 0.089 | 0.083 |
| R ² adj. | 0.184 | 0.311 | 0.355 | 0.041 | 0.299 | 0.346 | 0.028 | 0.083 | 0.061 | 0.044 | 0.075 | 0.069 |

Note: *** Indicate significance at the 1% level. ** indicate significance at the 5% level. and * indicate significance at the 10%.