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Replication Report: Market-Based Monetary Policy Uncertainty*

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Abstract

This report replicates and examines Bauer et al.'s (2021) paper on monetary policy transmission to financial markets. The paper introduces novel measures of monetary policy uncertainty and analyses its drivers. It also investigates the impact of uncertainty changes on interest rates and financial asset prices. We assess reproducibility, consolidate market uncertainty measures using PCA and Factor Analysis, and rigorously test the reduction of uncertainty after Federal Market Open Committee (FOMC) announcements. Our findings support the paper's claim of reduced uncertainty on meeting days. Additionally, we explore the implications of the uncertainty channel on various financial assets, such as Gold, the Swiss Franc, European stock indexes, and Bitcoin.

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1 Introduction

Bauer et al. (2021) (referred to as "the paper" henceforth) examines the transmission of monetary policy to financial markets. The paper makes several significant contributions to the standing literature in three distinct ways. Firstly, it introduces an innovative measure of monetary policy uncertainty pertaining to future short rates. Secondly, it analyses the factors that drive changes in monetary policy uncertainty. Lastly, the paper investigates the impact of these uncertainty changes on interest rates and financial asset prices ("the uncertainty channel" henceforth).

In this report, our focus will primarily be on replicating and examining the various contributions of the paper. We first assess the reproducibility of the paper, detecting minor issues related to outdated Matlab code. Subsequently, we proceed with several avenues of replication. For the first contribution, we consolidate various market uncertainty measures mentioned in the paper, including the new measure, into a single series. To achieve this, we will employ two distinct methods: Principal Component Analysis (PCA) and Factor Analysis. By utilising these techniques, we seek to identify underlying commonalities among the measures and simplify the dataset while retaining its essential structure.

Secondly, one of the primary findings of the paper is to document what the authors call the 'FOMC uncertainty cycle', in which uncertainty falls on FOMC meeting days, and after this it ramps up again (especially during the first two weeks). We conduct an additional statistical analysis to examine the slope of the uncertainty measure both before and after these announcements. The results confirm the decrease in uncertainty on meeting days and the posterior recovery in the following days, and, interestingly, seem to indicate that uncertainty tends to decrease prior to the meetings. The latter result provides empirical support to the hypotheses that either agents acquire more information before a meeting or that policymakers manage to disclose information regarding the direction of the announcement before its occurrence to mitigate its impact.

Lastly, as part of our exploration into the uncertainty channel, we analyse the effects on various significant financial assets, such as Gold, the Swiss Franc, European stock indexes, and Bitcoin. By examining the impact on these assets, we aim to gain valuable insights into the broader implications of monetary policy uncertainty on the financial markets.

The remainder of this report will be structured in the following manner: Section 2 will go through the reproducibility of the paper and the coding change needed to reproduce and replicate the paper's results. Section 3 will discuss the replication of the paper. Section 4 will conclude.

2 Reproducibility

The authors code and data for replicating the paper is available via the Economics Journal repository, and can be found at the following link (https://zenodo.org/record/5566246)

We found that when attempting to reproduce the paper from its replication package, the code as downloaded within the replication package would encounter an error. This

was found to be due to an outdated code in auxiliary coding files 'ols_rob.m' and 'ols_rob_nodisp.m' wherein the 'hac' command had seen changes to input and output formats within recent additions, meaning that in its current form the code would not in Matlab software past version 2022a (with the papers code having been written in 2021a). We changed input formats for the code within these auxiliary files and were then able to run and reproduce the paper's results.

3 Replication

The paper asserts that Federal Market Open Committee (FOMC) announcements lead to a reduction in monetary policy uncertainty. To further examine this assertion, in this section, we will proceed with several avenues of replication.

First, we consolidate various market uncertainty measures mentioned in the paper, including the new measure (Short-rate Uncertainty, "SRU" henceforth), into a single series. By employing two analytical techniques, we aim to identify underlying commonalities among the measures and simplify the dataset while retaining its essential structure.

As a second replicating exercise, we conduct a statistical analysis by testing the slope of the uncertainty measure before and after the announcement. Furthermore, in relation to the uncertainty channel, we explore the impact on other relevant financial assets, including Gold, the Swiss Franc, European stock indexes, and the price of Bitcoin.

3.1 Synthesizing Measures

Various alternative uncertainty measures are compared with the proposed SRU in this paper, as illustrated in Table 1 and Figure A.2. The objective here is to amalgamate a set of alternative measures referenced in the paper and to visually contrast the proposed SRU with the synthesized measure.

For synthesis, we employ Principal Component Analysis (PCA) and Factor Analysis (FA). As a demonstration, we select BP vol, Bundick, and Swanson as the components. However, our approach can be easily generalized to incorporate other measures.

Principal Component Analysis (PCA)

PCA is a method that highlights prominent patterns in a dataset by representing similar data points through a set of new variables, known as principal components. These components are linear combinations of the original variables and are arranged such that the first principal component accounts for the most variance in the data, the second component explains the majority of the remaining variance, and so forth.

In our study, we choose the first principal component as it captures the most shared variance among the series.

Factor Analysis (FA)

Unlike PCA, which is a purely mathematical approach aimed at explaining as much variance as possible, factor analysis adopts a model-based perspective. It posits that the observed variables are a linear blend of certain underlying latent factors, in addition to noise. These latent factors, which might not be directly observable, are what the model seeks to discern and quantify. Such factors assist in elucidating the common sources of variance within the data.

For our purposes, we deployed factor analysis to pinpoint a shared factor among the three economic series.

The Visualization Results

Figure 1 offers a visual comparison of the PCA and FA series alongside their three components. It reveals that while the PCA series (depicted by the blue line) appears effective in maintaining stability as a synthesis of the three series, the FA series turns out to be notably more volatile than its individual components. In Figure 2, the PCA and FA series are juxtaposed with the proposed SRU series discussed in the paper. The illustration indicates that both synthetic series exhibit excessive volatility when contrasted with the SRU, let alone the seesaw pattern elaborated upon in the paper.

3.2 Trend analysis

The paper presents evidence suggesting that FOMC meetings effectively resolves market uncertainty regarding the future funds rate. We find this result both interesting and compelling, as it indicates that a monetary policy announcement provides information to market participants regarding the future level of the funds rate, consequently reducing uncertainty.

While various factors could contribute to uncertainty, the factors influencing uncertainty prior to a pre-scheduled FOMC meeting may differ compared to an unscheduled meeting. The existence of pre-scheduled FOMC meetings introduces an additional layer of uncertainty compared to times when agents are not expecting an FOMC announcement. Intuitively, prior to a meeting, agents are aware that the forthcoming announcement will impact the market, yet they remain uncertain about what the specific changes will be. In contrast, this effect on uncertainty is not present prior to unscheduled FOMC meetings, as agents do not anticipate them. However, even if agents anticipate that there will be an announcement at a certain date, this doesn't necessarily imply that we would observe lower uncertainty before an unscheduled FOMC meeting compared to a scheduled meeting. This can be for several reasons. First, there is a selection bias, since unplanned meetings occur in response to significant shocks (i.e. the event on September 9th, 2001) which can also trigger uncertainty. Additionally, higher uncertainty might incentivise agents to seek and process more information, while policymakers attempt to anchor expectations.

We examine these hypotheses by testing for an upward trend in the uncertainty measure leading up to a meeting. It is important to note that observing an upward trend alone

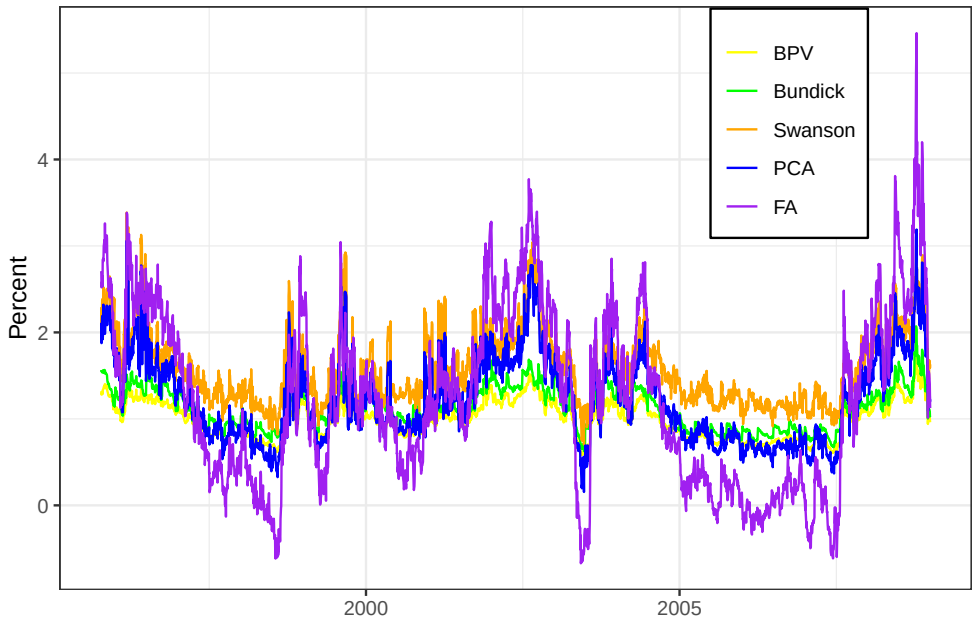

Figure 1: PCA, FA and the three components

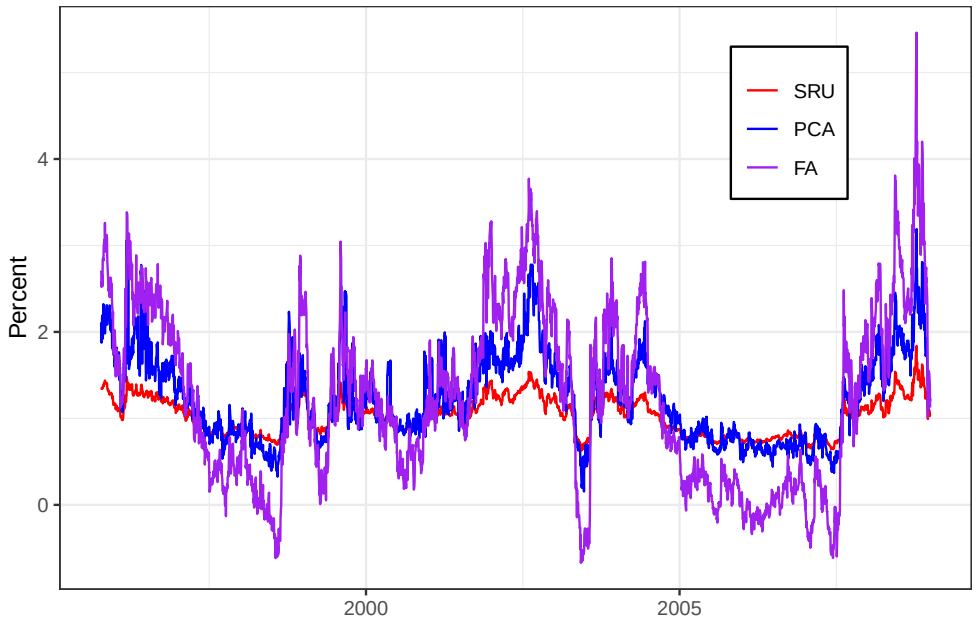

Figure 2: PCA, FA and SRU

does not necessarily support the first idea that the anticipation of an announcement that will affect the market raises uncertainty, as we might expect such a trend between meetings, considering that uncertainty tends to revert to its natural market level after an announcement. But if we observe a downward trend this gives some support that agents, through seeking more information, and policymakers, through signalling the direction of the announcement before it happens, succeed in reducing market uncertainty even before the announcement.

The study of the change in uncertainty before and after the announcement is shown in Figure 3 of the paper. The plot shows the average change in uncertainty according to the days to or from an FOMC meeting (zero being the day before a meeting day). First, for each observation up to 15 days before or after a meeting, they calculate the difference in the uncertainty level of this observation and the one in the meeting day. Second, these changes are averaged across all meeting events for each time span.

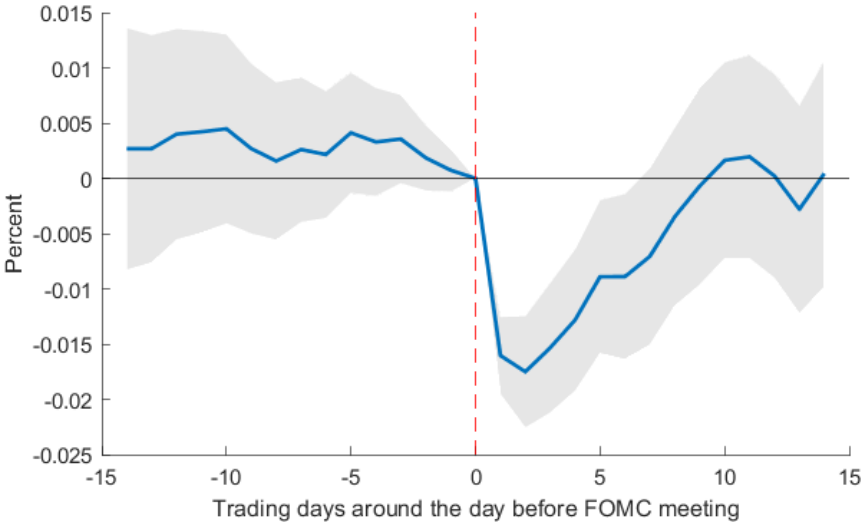

Figure 3: Figure 3 of the paper.

To further support their findings, we conducted a replication study by statistically testing the slope of uncertainty changes before and after the meeting using the following regression specification:

$$MPU = \alpha_0 + \alpha_1 M + \alpha_2 PreM + \alpha_3 PostM + \epsilon, \quad \epsilon \sim \mathcal{N}(0, \sigma)$$

Here MPU represents the daily change in the level of uncertainty, M (which stands for Meeting) equals 1 on the day of an announcement, and PreM (resp. PostM) equals 1 when the observation is up to d days before (resp. after) a meeting, where d is the bandwidth (we show the results for $d = 5$ and $d = 10$). The coefficient α_2 (resp. α_3) correspond to the average change, or trend, in MPU in the days preceding (resp. following) a meeting.

In line with their results, we find a statistically significant decrease in uncertainty on meeting days, as indicated by the coefficient of the dummy variable M. This result remains robust across all specifications using 5-day windows (Table 1) and 10-day windows

(Table 2), including an analysis of only studying scheduled meetings (column 2), only scheduled but excluding the day after the meeting (column 3) and to unscheduled meetings (column 4).[1]
Additionally, we observe that, if anything, uncertainty tends to decrease just prior to a meeting. This pattern is particularly evident in scheduled meetings, which aligns with the hypothesis that either agents acquire more information before a meeting attempting to anticipate the outcome or policymakers manage to disclose information regarding the announcement's direction before its occurrence to mitigate its impact.

Table 1: Regression results using 5-day windows

	All meetings	Only scheduled meetings	Only sched. meetings (skip day 1)	Only unscheduled meetings
	Dependent variable: Change in Uncertainty			
Dummy meeting	-0.0184***	-0.0183***	-0.0182***	-0.0183***
S.E.	(0.0018)	(0.0018)	(0.0018)	(0.0018)
p-value	*0.000*	*0.000*	*0.000*	*0.000*
Pre Metting	-0.0014**	-0.0015**	-0.0013**	0.0007
S.E.	(0.0006)	(0.0006)	(0.0006)	(0.0023)
p-value	*0.034*	*0.021*	*0.038*	*0.754*
Post Meeting	0.0011	0.0013*	0.0027***	-0.0009
S.E.	(0.0007)	(0.0007)	(0.0007)	(0.0027)
p-value	*0.129*	*0.054*	*0.000*	*0.750*
Constant	0.0006*	0.0005*	0.0004	0.0005**
S.E.	(0.0003)	(0.0003)	(0.0003)	(0.0003)
p-value	*0.082*	*0.097*	*0.235*	*0.046*
Observations	7,755	7,755	7,755	7,755
R-squared	0.0233	0.0235	0.0246	0.0223

Note: Robust standard errors in parenthesis. *** p<0.01, ** p<0.05, * p<0.1.

[1]The average change on meeting days could be obtained by summing the intercept and the dummy variable.

Table 2: Regression results using 10-day windows

	All meetings	Only scheduled meetings	Only sched. meetings (skip day 1)	Only unscheduled meetings
Dependent variable: Change in uncertainty				
Dummy meeting	-0.0181***	-0.0181***	-0.0179***	-0.0183***
S.E.	*(0.0018)*	*(0.0018)*	*(0.0018)*	*(0.0018)*
p-value	*0.000*	*0.000*	*0.000*	*0.000*
Pre Metting	-0.0005	-0.0009	-0.0007	0.0041**
S.E.	*(0.0006)*	*(0.0006)*	*(0.0006)*	*(0.0018)*
p-value	*0.465*	*0.132*	*0.276*	*0.026*
Post Meeting	0.0013**	0.0016**	0.0024***	-0.0025
S.E.	*(0.0006)*	*(0.0006)*	*(0.0006)*	*(0.0018)*
p-value	*0.047*	*0.015*	*0.000*	*0.152*
Constant	0.0002	0.0003	0.0000	0.0005*
S.E.	*(0.0005)*	*(0.0005)*	*(0.0004)*	*(0.0003)*
p-value	*0.627*	*0.498*	*0.937*	*0.077*
Observations	7,755	7,755	7,755	7,755
R-squared	0.0233	0.0242	0.0252	0.0238

Note: Robust standard errors in parenthesis. *** p<0.01, ** p<0.05, * p<0.1.

3.3 Uncertainty channel

We further investigate the transmissions of monetary policy into asset prices by exploring a series of assets not included in the original paper's scope. These are the daily returns in Gold, the FTSE100 and DAX30 stock indexes, the daily return of the cryptocurrency Bitcoin, and the change in the daily spot rate of the Swiss Franc. Along with the spot price, we also construct a portfolio which is long the Dollar and short the Swiss Franc, following the original authors and Lustig et al. (2011).

These assets were chosen to provide a wide range of assets, while also having potential relevance to US monetary policy. Both Gold and the Swiss Franc have been found to act as safe haven assets within the literature, and both the UK and European markets have been found to have both short and long term links with the US stock market. The inclusion of Bitcoin is due to the cryptocurrency being a particularly popular speculative investment since its creation in 2008. All asset data except the price of Bitcoin is sourced via the Refinitiv Eikon data Terminal. The Bitcoin Price is sourced via CoinMarketCap.com, a price-tracking and reference site for many cryptocurrencies.

The findings regarding the impact of uncertainty on the examined assets in the paper are consistent with the expected outcomes as predicted by the risk premium hypothesis. According to this hypothesis, when risk increases, asset holders require a higher return. Table 3 shows the following connections between increased uncertainty and how assets perform, with the results analysed in standard deviation changes to monetary policy uncertainty, in line with the paper (with the standard deviation of monetary policy uncertainty within the 197 event sample being a movement of 0.252). We find mixed sta-

tistical significance, with only two of the six added assets showing statistical sginificance, however as the full range of results are in line with previous literature, all results will be discussed.

We begin by examining the results of the change in price of Gold. Prior to running the study, we have two main hypothesis on the impact of monetary policy uncertainty upon the price of gold. First, in the face of rising uncertainty, agents may anticipate unstable economic conditions and seek safety in assets like gold, driving up its price. Second, agents who do not alter their perceptions regarding the economic conditions might pursue higher returns by investing in bonds, which would potentially decrease the price of gold. When exploring the effect of monetary policy uncertainty in relation to Gold, we find that a one standard deviation increase in uncertainty results in a 0.3% reduction in the daily return of the commodity. This would suggest that either our latter hypothesis may be correct and those agents that are active during the event study may not be altering perceptions and exploring other asset opportunities, or that gold may not be of interest to investors as a safe haven asset in regards to monetary policy uncertainty, and may be more applicable to extreme events.

Next, we examine the effects of monetary policy uncertainty on foreign equity indexes, the FTSE100 and DAX30. According to the "standard asset pricing theory", an increase in short-rate uncertainty coinciding with higher uncertainty in stock returns leads to elevated expected excess returns or risk premia, consequently reducing asset prices. However, for foreign investment, the financial linkages between different markets, along with differences in exchange rates and market size, may result in movements of wealth between markets as agents react to any uncertainty and potentially any subsequent shocks. Our results show mixed statistical significance, with the effect on the Dax being significant at the 5% level, and the effect on the Ftse not being significant at any standard le vel. we found that a standard deviation increase in uncertainty increases stock prices by 0.07% and 0.4% respectively. This would be in line with other literature, such as Hausman and Wongswan (2011) who find an average of a 1% increase in foreign indexes for a 25bps reduction in the federal funds target rate.

When analysing the effects of uncertainty on Bitcoin, we are unable to find a significant effect, with a negative coefficient. Given the high volatility and reputation for intense trading in response to events, one might expect the cryptocurrency Bitcoin to experience a price increase amid monetary uncertainty, however this negative effect, while not statistically significant, aligns with findings from various studies in the literature, such as the work of Panagiotidis et al. (2018), though mixed results have been reported.

Utilising the MPS (Monetary Policy Surprise), the paper demonstrates that a contractionary policy surprise results in the appreciation of the Dollar. This finding aligns with the notion that a tighter Federal Reserve policy makes fixed-income investments in the Dollar more appealing, thereby increasing the demand for US dollars. Our aim for examining specifically the USD-CHF rate is to see how this relationship between monetary policy uncertainty and currencies would act specifically for a safe-haven currency. While the USD-CHF rate was included in the currency portfolio used within the paper, the effects were combined with several other relevant currencies, and therefore the results for the individual currency are masked. Due to data availability, only 94 observations are

available after employing the Lustig et al. (2011) methodology. For both the portfolio return and the spot rate, we are unable to find statistical significance at any standard level. When examining the CHF Portfolio, we found that a standard deviation increase in uncertainty leads to an appreciation of 0.01%. Furthermore, when examining the change in the USD-CHF spot rate, we find that a standard deviation increase in uncertainty would correspond to a 0.03% decrease. These results, while not found to be statistically significant, would align with the paper's results, showing a smaller but similar effect. This lack of significance for the portfolio could be due to the lack of a full testing sample.

The paper also explores the effects of unconventional FOMC announcements within the Appendix (with results of these shown in table F1). These announcements primarily refer to unconventional policy introduction such as quantitative easing (QE), and the usage of forward guidance (FG) among others. Key dates were chosen were chosen to examine these announcements, stemming from those identified in the literature (In particular, following Bauer and Neely (2014), Kuttner (2018), and Swanson (2021)), as well as two dates related to Federal Reserve responses regarding to the pandemic. As with the paper, we conduct an event study for these dates, examining the effect of the changes in monetary policy uncertainty. Due to several missing dates, and increased interest only taking place in the latter half of the 2010's, Bitcoin is not included.

As noted in the paper, the results pertaining to 2008-2011 generally resulted in larger reductions of monetary policy uncertainty compared to that of the whole sample. Within these dates, we also find substantial shifts within assets, with primarily increases for Gold, primarily negative changes for the USD-CHF spot rate, and a mixed reaction for the European stock indexes and the USD-CHF portfolio.

Similarly for the post 2011 forward guidance announcements, we see a reduction in monetary policy uncertainty, with increases in gold, and strong mixed effects for the indexes. We do however now see a primarily negative reaction for the USD-CHF portfolio, and a positive set of changes for the USD-CHF spot rate.

Finally for the "Taper Tantrum" of June 2013 regarding the ending of QE and comments made by then Chairman Bernanke, shows the only included post 2011 increase in MPU. Here, we see strong negative movements for Gold and the two indexes, with a negligible effect on the currency portfolio and a negative effect on the USD-CHF spot rate. While the movements of the commodity and currency assets are in line with previous results from the main paper, the strong reduction in the two indexes at a time when the US domestic market was also dropping may show some differences in effect.

3.4 Python Code with ChatGPT

Last but not the least, we translate the six files of R code in the paper to Python with the help of ChatGPT-4. (Even the below statement has been polished by the ChatGPT-4).

The contribution of ChatGPT-4 has indeed been remarkable in assisting researchers unfamiliar with specific language syntaxes in their quest to translate code from one language to another. However, one must be cautious, as it is not entirely foolproof to simply copy

and paste. As of the current version available in July 2023, ChatGPT-4 cannot completely comprehend the user's requirements without comprehensive descriptions. Code translation necessitates significant interaction with ChatGPT-4 to rectify various runtime errors. This process aids ChatGPT-4 in better understanding the context and refining its output.

In our study, a significant portion of the R code was dedicated to handling data frames. Several challenges surfaced during our attempt to smoothly translate this code from R to Python:

Reading .Rdata files; Managing date-time formats; Merging two files based on common columns. The performance of ChatGPT-4 was not up to the mark in its default mode, and further conversations were necessary for it to generate accurate code. We invite you to review our code to see how we have navigated these challenges.

4 Conclusion

In this report, we have presented the results from a replication of Bauer, Lakdawala, and Mueller (2021). We first tested the computational reproducibility, finding minor issues due to version related changes in Matlab commands. We also present several replications of the various contributions of the paper. These include attempting several synthetic measures of market uncertainty, an statistical testing of the slope changes before and after FOMC meetings, and the examining the transmission of uncertainty to several alternate asset prices.

Based on our reproduction and various replications, we conclude that the main results of the paper are reproducible, and that our replications are in line with results. There is also the potential of further robustness testing and analysis of replications.

Appendix A: References

Bauer, Michael D, Aeimit Lakdawala, and Philippe Mueller. "Market-based monetary policy uncertainty". *The Economic Journal* 132, no. 644 (2022): 1290–1308.

Bauer, Michael D, and Christopher J Neely. "International channels of the Fed's unconventional monetary policy". *Journal of International Money and Finance* 44 (2014): 24–46.

Hausman, Joshua, and Jon Wongswan. "Global asset prices and FOMC announcements". *Journal of International Money and Finance* 30, no. 3 (2011): 547–571.

Kuttner, Kenneth N. "Outside the box: Unconventional monetary policy in the great recession and beyond". *Journal of Economic Perspectives* 32, no. 4 (2018): 121–146.

Lustig, Hanno, Nikolai Roussanov, and Adrien Verdelhan. "Common risk factors in currency markets". *The Review of Financial Studies* 24, no. 11 (2011): 3731–3777.

Panagiotidis, Theodore, Thanasis Stengos, and Orestis Vravosinos. "On the determinants of bitcoin returns: A LASSO approach". *Finance Research Letters* 27 (2018): 235–240.

Swanson, Eric T. "Measuring the effects of federal reserve forward guidance and asset purchases on financial markets". *Journal of Monetary Economics* 118 (2021): 32–53.

5 Appendix B: Tables and Figures

Table 3: Uncertainty Channel Asset Additions

		Gold			Ftse			Dax	
MPS	-3.14***	-1.015	-11.883***	-1.505	-1.589	-1.53866	-2.556	-4.612	6.265
S.E.	(-2.997)	(-0.821)	(-2.869)	(-1.266)	(-1.201)	(-0.367)	(-1.368)	(-1.951)	(1.132)
p-value	*0.00308*	*0.412*	*0.00457*	*0.207*	*0.739*	*0.714*	*0.173*	*0.0525*	*0.259*
MPU		-10.784***	-12.129***		0.426	2.935		10.392	15.872**
S.E.		(-2.833)	(-3.365)		(0.0864)	(0.606)		(1.487)	(2.459)
p-value		*0.00510*	*0.0009*		*0.231*	*0.545*		*0.139*	*0.0149*
$MPSXSRU_{-1}$			9.872***			-0.02**			-9.831**
S.E.			(3.183)			(-0.005)			(-2.157)
p-value			*0.0017*			*0.0224*			*0.032*
$R\hat{2}$	0.0323	0.0718	0.106	0.00831	0.00838	0.0363	0.0119	0.0323	0.084
		BTC			CHF_Port			CHF_Spot	
MPS	-0.739	8.862	22.782	0.334	0.247	-0.994	0.178	0.395	3.919
S.E.	(-0.074)	(0.773)	(0.332)	(0.349)	(0.233)	(-0.434)	(0.190)	(0.365)	(1.137)
p-value	*0.941*	*0.442*	*0.741*	*0.728*	*0.864*	*0.665*	*0.849*	*0.566*	*0.257*
MPU		-37.28	-30.98		0.362	0.228		-1.0993	-1.0832
S.E.		(-1.528)	(-1.306)		(0.241)	(0.153)		(-0.497)	(-0.508)
p-value		*0.131*	*0.1955*		*0.81*	*0.879*		*0.62*	*0.612*
$MPSXSRU_{-1}$			-23.491			1.861			-3.206
S.E.			(-0.215)			(0.666)			(-1.183)
p-value			*0.471*			*0.995*			*0.372*
$R\hat{2}$	1.70E-05	0.0119	0.0187	0.00189	0.00242	0.00584	0.000306	0.00151	0.015

Sample: 197 scheduled FOMC announcements from Jan 1994 to Sept 2020, excluding June 2007 to June 2009 (Global Financial Crisis). BTC Sample begins in Aug 2010 due to availability. CHF-Port sample begins in 2006.
Note: Robust standard errors in parenthesis. *** p<0.01, ** p<0.05, * p<0.1.

Table 4: Table F1 (Appendix) Additions

Date	Event	mpu	MPS	Gold	Ftse	Dax	CHF_Port	CHF_Spot
25-Nov-08	QE1	-0.0961	-0.156	-1.139	-0.445	0.00175	-0.00699	1.664
16-Dec-08	QE1/FG	-0.1337	-0.252	1.0039	0.351	-0.455	0.0187	-4.145
18-Mar-09	QE1/FG	-0.0806	-0.189	1.990	0.314	1.180	0.0068	-1.431
03-Nov-10	QE2	-0.0339	-0.00056	3.310	1.980	1.766	0.00527	-1.144
09-Aug-11	FG	-0.137	-0.0318	2.931	-3.0545	-5.132	-0.0018	0.526
21-Sep-11	MEP	-0.00105	0.0502	-2.580	-4.667	-4.961	-0.00363	0.889
25-Jan-12	FG	-0.0168	0.000449	0.540	1.262	1.838	0.000854	-0.131
13-Sep-12	QE3/FG	-0.02346	0.00645	0.322	1.643	1.393	0.0041	-0.856
12-Dec-12	FG	0.000812	0.0108	-0.868	-0.273	-0.431	0.00165	-0.3024
19-Jun-13	Taper Tantrum	0.00746	0.0353	-5.427	-2.982	-3.277	0.000895	-0.119
17-Dec-14	FG	-0.00784	0.0279	0.795	2.044	2.794	-0.00293	0.7196
18-Mar-15	FG	-0.0375	-0.0587	0.3557	0.247	-0.196	-0.0051	1.196
17-Sep-15	FG	-0.0385	-0.0764	0.690	-1.340	-3.064	-0.00333	0.959
16-Mar-20	FG	-0.0341	-0.0466	0.949	2.792	2.252	-0.00591	1.479
16-Sep-20	FG	-0.00669	0.0152	-0.853	-0.470	-0.357	0.000706	-0.099
St.Dev (Full Sample)		0.0289	0.0753	1.427	1.18	1.591	0.0035	0.768

Changes in asset prices on selected days with major FOMC announcements about unconventional monetary policy, including the three large-scale asset purchase programs, or quantitative easing (QE), the maturity extension program (MEP), and forward guidance (FG).MPU are daily changes in monetary policy uncertainty, MPS is the monetary policy surprise based on changes in Eurodollar futures rates.