Price Drift before U.S. Macroeconomic News:

Private Information about Public Announcements?

INTERNET APPENDIX

Alexander Kurov[y]   Alessio Sancetta[z]   Georg Strasser[x]

Marketa Halova Wolfe[{]

First Draft: June 15, 2014
This Draft: November 1, 2017

[y]Professor, Department of Finance, College of Business and Economics, West Virginia University, P.O. Box 6025, Morgantown, WV 26506, Phone: +1-304-293-7892, Email: alkurov@mail.wvu.edu

[z]Professor, Department of Economics, Royal Holloway, University of London, Egham Hill, Egham, Surrey, TW20 0EX, United Kingdom, Phone: +44-1784-276394, Email: Alessio.Sancetta@rhul.ac.uk

[x]Senior Economist, DGR Monetary Policy Research, European Central Bank, Sonnemannstra e 22, 60314 Frankfurt am Main, Germany, Phone: +49-69-1344-1416, Email: Georg.Strasser@ecb.europa.eu

[{]Assistant Professor, Department of Economics, Skidmore College, Saratoga Springs, NY 12866, Phone: +1-518-580-8374, Email: mwolfe@skidmore.edu

Contents

1 Overview

This Internet Appendix presents additional details and robustness checks for the \Price Drift before U.S. Macroeconomic News: Private Information about Public Announcements?" paper. Section 2 shows summary statistics for the announcements listed in Table 1 in the paper.

## Table B1: Macroeconomic Announcements - Summary Statistics

Announcement	Unit	Mean	Median	Min	Max	Std
GDP advance	%	1.44	2	-6.1	5.7	2.39
GDP preliminary	%	1.40	2	-6.2	5.9	2.62
GDP nal	%	1.40	1.9	-6.3	5.6	2.58
Personal income	%	0.25	0.3	-3.6	2.6	0.66
ADP employment	Number of jobs (1,000)	13.39	93	-742	325	240.56
Initial jobless claims	Number of claims (1,000)	421.95	399.5	292	669	85.16
Non-farm employment	Number of jobs (1,000)	-4.97	69	-663	431	234.83
Factory orders	%	0.09	0.6	-5.2	4.8	1.99
Industrial production	%	0.07	0.1	-2.8	1.3	0.76
Construction spending	%	-0.13	0	-3.3	2.7	1.01
Durable goods orders	%	-0.04	0.05	-13.2	9.9	3.60
Wholesale inventories	%	0.32	0.5	-1.7	1.9	0.86
Advance retail sales	%	0.18	0.3	-2.8	2.7	0.86
Consumer credit	USD (Billion)	4.99	6.35	-21.6	21.36	10.50
Personal consumption	%	0.26	0.3	-1	1.3	0.36
Building permits	Number of permits (1,000)	737.12	680	494	1091	179.20
Existing home sales	Number of homes (Million, Annual rate)	4.93	4.91	3.83	6.54	0.41
Housing starts	Number of homes (1,000)	720.73	658	458	1066	175.90
New home sales	Number of homes (1,000)	383.15	368	250	604	83.09
Pending home sales	%	0.37	0.25	-30	10.4	6.08
Government budget	USD (Billion)	-88.29	-94.3	-237.2	159.3	89.95
Trade balance	USD (Billion)	-44.04	-42.9	-63.1	-26	9.02
Consumer price index	%	0.14	0.1	-1.7	1.1	0.39
Producer price index	%	0.20	0.2	-2.8	1.8	0.88
CB Consumer con dence index	Index	59.60	59.6	25	87.9	13.37
Index of leading indicators	%	0.31	0.3	-0.8	1.4	0.45
ISM Manufacturing index	Index	51.56	52.5	32.4	61.4	6.30
ISM Non-manufacturing index	Index	51.96	53	37.3	59.7	4.53
UM Consumer sentiment - Final	Index	71.23	72.5	55.3	85.1	7.67
UM Consumer sentiment - Prel	Index	70.39	71.8	54.9	84.9	7.73

The sample period covers January 1, 2008 to March 31, 2014. The columns show the mean, median, minimum, maximum and standard deviation values for each announcement listed in Table 1 in the paper.

Figure B1: Cumulative Average Returns for Individual Announcements

E-mini S&P 500   10-year Treasury Note
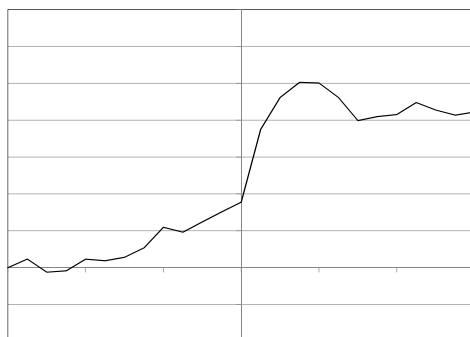
The sample period is from January 1, 2008 through March 31, 2014. We classify each event as \good" or \bad" news based on whether the announcement surprise has a positive or negative e ect on the stock and bond markets using the coe cients in Table 3 in the paper. Cumulative average returns (CARs) are then calculated in the $[t \quad 60min; t + 60min]$ window. Only announcements showing evidence of pre-announcement drift in each market in Table 2 in the paper are included (four in the E-mini S&P 500 market and nine in the 10-year Treasury note market).

4 Cumulative Average Returns for $[t \quad 180min; t + 60min]$ Window

Figure 1 in the paper presents CARs for the $[t \quad 60min; t + 60min]$ window. Figure B2 presents CARs in the expanded $[t \quad 180min; t + 60min]$ window. The CARs during the $[t \quad 180min; t \quad 60min]$ window hover around zero similarly to the $[t \quad 60min; t \quad 30min]$ window.

5 Robustness Check: Multiple Hypotheses Testing and Data Snooping

Table 2 in Section 4.1 in the paper presents results showing the pre-announcement price drift. In that table, we test multiple hypotheses. Increasing the number of hypotheses leads to the rejection of an increasing number of hypotheses with probability one, irrespective of the sample size. Failure to adjust the *p*-values can be viewed as data snooping. To rule out this possibility, we use the Holm (1979) step-down procedure. This procedure adjusts the

Figure B2: Cumulative Average Returns for $[t - 180min; t + 60min]$ Window

E-mini S&P 500   10-year Treasury Note

The sample period is from January 1, 2008 through March 31, 2014. We classify each event as \good" or \bad" news based on whether the announcement surprise has a positive or negative effect on the stock and bond markets using the coefficients in Table 3 in the paper. Following Bernile, Hu, and Tang (2016), we invert the sign of returns for negative surprises. Cumulative average returns (CARs) are then calculated in the $[t - 180min; t + 60min]$ window for the \drift" category based on Table 2 in the paper. In the stock market, there are four drift announcements. In the bond market, there are nine drift announcements. The solid line shows the mean CAR. Dashed lines mark two-standard-error bands (standard error of the mean).

hypothesis rejection criteria to control the probability of encountering one or more type I errors, the familywise error rate (see, for example, Romano and Wolf (2005)). Denote the hypotheses by $H_1, ..., H_M$, one for each of the $M = 30$ announcements in Table 2. Denote the corresponding p-values by $p_1, ..., p_M$. Consider the significance level of 0.05. The procedure orders the Table 2 joint test p-values from the lowest to the highest. Denoting the ordered hypotheses by $k = 1...30$, it computes $\frac{0.05}{M+1-k}$ for each k and compares this computed value to the Table 2 p-value. The null hypothesis of no drift is rejected if $\frac{0.05}{M+1-k}$ exceeds the p-value in Table 2. Based on this *conservative* approach, four announcements ranked at the top of Table 2 (ISM Manufacturing, Pending Home Sales, ISM Non-Manufacturing and CB Consumer Confidence Index) show a statistically significant drift.

6   Robustness Check: Conditioning on Sign of Post-Announcement Return

The results in Section 4 in the paper show that the pre-announcement drift is in the direction of the *surprise*. In this section, we focus instead on returns and show that the pre-announcement drift exists also conditional on the sign of the post-announcement *return*.

Table B2: Holm's Step-down Procedure

Announcement	Table 2 Joint Test p-value	$\frac{0.05}{M+1-k}$	Null Hypothesis of No Drift Rejected
ISM Non-manufacturing index	8.033E-11	0.0017	Yes
Pending home sales	7.560E-08	0.0017	Yes
ISM Manufacturing index	0.150E-05	0.0018	Yes
CB Consumer con dence index	0.109E-04	0.0019	Yes
Existing home sales	0.012	0.0019	No
Advance retail sales	0.016	0.0020	No
GDP preliminary	0.018	0.0021	No
Initial jobless claims	0.020	0.0022	No
GDP advance	0.049	0.0023	No
Factory orders	0.060	0.0024	No
Industrial production	0.203	0.0025	No
Trade balance	0.219	0.0026	No
Construction spending	0.226	0.0028	No
Consumer credit	0.238	0.0029	No
Building permits	0.244	0.0031	No
Personal income	0.296	0.0033	No
Government budget	0.333	0.0036	No
Personal consumption	0.433	0.0038	No
New home sales	0.456	0.0042	No
Wholesale inventories	0.539	0.0045	No
Durable goods orders	0.644	0.0050	No
Consumer price index	0.648	0.0056	No
UM Consumer sentim. - Prel	0.671	0.0063	No
Index of leading indicators	0.678	0.0071	No
Non-farm employment	0.686	0.0083	No
Housing starts	0.704	0.0100	No
Producer price index	0.858	0.0125	No
ADP employment	0.859	0.0167	No
UM Consumer sentim. - Final	0.895	0.0250	No
GDP nal	0.978	0.0500	No

correlation is not significant with values of -0.01 and -0.02 in the stock and bond markets, respectively.

We show CARs conditioned on the sign of the returns in the [$5sec; 1min$

7.1 OLS Regression

Let $R_t^{t+\tau}$ denote the continuously compounded asset return around the official release time t of announcement m, defined as the first difference between the log prices at the beginning and at the end of the intraday event window $[t - \tau; t + \tau]$. Let S_{mt} denote the unexpected component of news announcements (\the surprise") as in the paper. The effect of news announcements on asset prices can then be analyzed by standard event study methodology (Balduzzi, Elton, & Green, 2001). The reaction of asset returns to the surprise is captured by the ordinary least squares regression

$$R_t^{t+\tau} = \beta_0 + \beta_m S_{mt} + \varepsilon_t; \tag{1}$$

announcements.

Table B3: Announcement Surprise Impact During $[t - 5sec; t + 5min]$ Using Event Study Methodology

| Announcement | E-mini S&P 500 Futures | | 10-year Treasury Note Futures | | Joint Test |
	m	R^2	m	R^2	p-value
GDP advance	0.171 (0.052)***	0.22	-0.028 (0.026)	0.04	0.002
GDP preliminary	0.113 (0.051)**	0.15	-0.056 (0.015)***	0.25	<0.001
GDP final	0.053 (0.039)	0.06	-0.042 (0.018) **	0.17	0.025
Personal income	0.020 (0.012)	0.01	0.000 (0.012)	0.00	0.253
ADP employment	0.178 (0.023)***	0.59	-0.093 (0.017)***	0.49	<0.001
Initial jobless claims	-0.115 (0.013)***	0.23	0.043 (0.006)***	0.19	<0.001
Non-farm employment	0.420 (0.046)***	0.50	-0.261 (0.043)***	0.43	<0.001
Factory orders	0.035 (0.026)	0.04	-0.017 (0.009)*	0.07	0.060
Industrial production	0.043 (0.013)***	0.17	-0.008 (0.004)*	0.04	0.001
Construction spending	-0.005 (0.039)	0.00	0.007 (0.013)	0.00	0.863
Durable goods orders	0.096 (0.020)***	0.23	-0.045 (0.012)***	0.20	<0.001
Wholesale inventories	-0.033 (0.021)	0.04	0.005 (0.007)	0.01	0.239
Advance retail sales	0.161 (0.024)***	0.42	-0.073 (0.015)***	0.27	<0.001
Consumer credit	0.036 (0.015)**	0.07	-0.004 (0.003)	0.03	0.019
Personal consumption	0.007 (0.014)	0.00	-0.015 (0.008)*	0.02	0.147
Building permits	0.045 (0.022)**	0.06	-0.020 (0.013)	0.04	0.037
Existing home sales	0.120 (0.030)***	0.20	-0.038 (0.010)***	0.17	<0.001
Housing starts	0.050 (0.024)**	0.08	-0.039 (0.015)***	0.17	0.003
New home sales	0.122 (0.026)***	0.25	-0.044 (0.006)***	0.39	0.001
Pending home sales	0.087 (0.032)***	0.11	-0.032 (0.008)***	0.18	<0.001
Government budget	0.013 (0.013)	0.02	0.001 (0.007)	0.00	0.612
Trade balance	0.024 (0.016)	0.01	-0.003(0.007)	0.00	

Table B4: Announcement Surprise Impact During $[t - 30min; t - 5sec]$ Using Event Study Methodology

Announcement	E-mini S&P 500 Futures		10-year Treasury Note Futures		Joint Test
	m	R^2	m	R^2	p-value
ISM Non-manufacturing index	0.139 (0.030)***	0.19	-0.058 (0.011)***	0.30	<0.0001
Pending home sales	0.154 (0.083)*	0.09	-0.035 (0.010)***	0.16	0.001
ISM Manufacturing index	0.091 (0.036)**	0.06	-0.027 (0.009)***	0.09	0.001
Existing home sales	0.113 (0.040)***	0.10	-0.019 (0.009)**	0.04	0.002
CB Consumer con dence index	0.035 (0.052)	0.01	-0.031 (0.010)***	0.12	0.007
Industrial production	0.066 (0.023)***	0.15	-0.007 (0.008)	0.01	0.013
GDP preliminary	0.146 (0.068)**	0.15	-0.022 (0.011)*	0.08	0.013
Housing starts	0.000 (0.021)	0.00	-0.020 (0.010)**	0.05	0.112
Non-farm employment	0.040 (0.021)*	0.07	-0.009 (0.010)	0.01	0.123
Advance retail sales	0.009 (0.029)	0.00	-0.020 (0.011)*	0.06	0.190
Consumer credit	-0.072 (0.051)	0.03	0.007 (0.009)	0.01	0.271
ADP employment	0.035 (0.027)	0.03	-0.006 (0.007)	0.01	0.291
UM Consumer sentiment - Final	-0.055 (0.042)	0.04	-0.007 (0.014)	0.00	0.361
Initial jobless claims	-0.009 (0.012)	0.00	0.007 (0.006)	0.01	0.369
New home sales	0.030 (0.033)	0.01	-0.005 (0.009)	0.01	0.539
Building permits	-0.023 (0.025)	0.02			

Table B5: Announcement Surprise Impact During $[t - 30min; t - 5sec]$
Using Event Study Methodology and Robust Regression

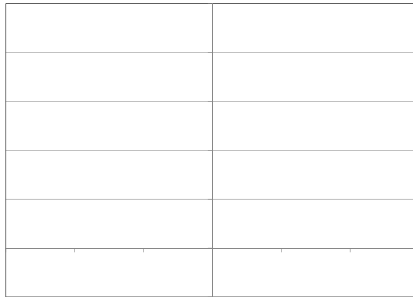| Announcement	E-mini S&P 500		10-year Treasury Note	
	m	R^2	m	R^2
Strong Evidence of Pre-Announcement Drift				
CB Consumer confidence index	0.023 (0.035)	0.01	-0.036 (0.009)***	0.14

Figure B4: Cumulative Average Returns

E-mini S&P 500   10-year Treasury Note

(a) Announcements with no evidence of drift

(b) Announcements with some evidence of drift
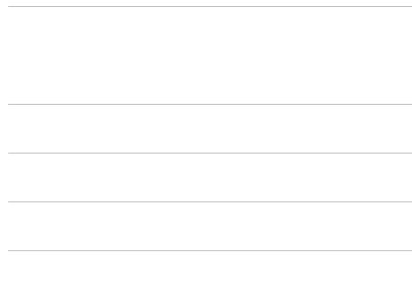
(c) Announcements with strong evidence of drift

The sample period is from January 1, 2008 through March 31, 2014. We classify each event as "good" or "bad" news based on whether the announcement surprise has a positive or negative effect on the stock and bond markets using the coefficients in Table B3. Following Bernile et al. (2016), we invert the sign of returns for negative surprises. Cumulative average returns (CARs) are then calculated in the $[t - 60min; t + 60min]$ window for each of the "strong drift", "some drift" and "no drift" categories defined in Table B5. For each category the solid line shows the mean CAR. Dashed lines mark two-standard-error bands (standard error of the mean).

Table B7: Announcement Surprise Impact During $[t - 30min; t - 5sec]$ by Decile

Surprise Size	Surprise Decile	n	E-mini S&P 500	R^2	10-year Treasury Note	R^2	Joint Test p-value
1	5 and 6	96	-0.269 (0.234)	0.01	-0.164 (0.061)***	0.06	0.015
2	4 and 7	95	0.228 (0.093)**	0.06	-0.055 (0.029)*	0.03	0.009
3	3 and 8	95	0.063 (0.051)	0.01	0.001 (0.014)	0.00	0.464
4	2 and 9	96	0.075 (0.030)**	0.06	-0.031 (0.009)***	0.11	0.000
5	1 and 10	94	0.115 (0.027)***	0.16	-0.030 (0.005)***	0.26	<0.0001
All		476	0.102 (0.020)***	0.08	-0.029 (0.004)***	0.09	<0.0001

The sample period is from January 1, 2008 through March 31, 2014. Only the announcements classi ed as

equation (1) with $[t_{-}; t_{-} + 5 sec]$ for various $\tau \in [5min; 120min]$. Figure B5 plots estimates of the corresponding α_m

7.5   Eﬀect of Order Flows

that the impact of order flow on returns on announcement days with drift is the same as on other days involves a t-test on the estimated coefficient for b_2. The results in Table B8 show that this is the case because the t-statistic is insignificant. We conclude that order flow impact on announcement days with drift is no different from its impact on other days.

Table B8: Order Flow Analysis

	E-mini S&P 500 Futures	10-year Treasury Note Futures
b_0	1.282 (0.067)***	0.037 (0.002)***
b_1	0.069 (0.117)	0.004 (0.003)
b_2	-0.178 (0.137)	-0.003 (0.004)
R^2	0.321	0.219

The sample period is from January 1, 2008 through March 31, 2014. The reported response coefficients b_0, b_1 and b_2 are the ordinary least squares estimates of equation (4). Standard errors are shown in parentheses.

Table B9: Announcement Surprise Impact During $[t - 30min; t - 5sec]$ for E-mini Dow and 30-year Treasury Bond Futures

Announcement	E-mini Dow		30-year Treasury Bond		Joint Test
	m	R^2	m	R^2	p-value
ISM Non-manufacturing index	0.105 (0.025)***	0.15	-0.079 (0.016)***	0.25	<0.0001
Pending home sales	0.148 (0.063)**	0.11	-0.073 (0.029)**	0.15	0.002
ISM Manufacturing index	0.074 (0.035)**	0.04	-0.041 (0.015)***	0.08	0.003
Existing home sales	0.092 (0.038)**	0.07	-0.043 (0.015)***	0.07	0.001
CB Consumer confidence index	0.021 (0.054)	0.00	-0.061 (0.016)***	0.17	0.001
Industrial production	0.047 (0.018)**	0.10	-0.016 (0.016)	0.01	

Industrial production

Table B10: Predicting CPI surprises with State Street PriceStats data

imply that the forecasts have superior predictive power for *returns*. To explore this, we estimate equation (1) using the prediction, P_{mt}, instead of the surprise, S_{mt}. Table B14 Panel (a) shows the slope coefficients for predicting the pre-announcement return during the $[t - 30min; t - 5sec]$ window using the surprise prediction for the E-mini S&P 500 and 10-year Treasury note futures markets. The reported p-values are for a two-sided test. Similarly, Table B14 Panel (b) reports the results for the $[t - 5sec; t + 5min]$ window. P_{mt} is a useful predictor of returns only for a handful of announcements.

Table B13: Regression of Unstandardized Surprise, $\hat{S}_{mt}$, on a Constant and Prediction, P_{mt}

	Slope Coefficient	s.e.	p-value	R^2
ADP employment	0.173	0.371	0.320	0.02
Advance retail sales	1.096	0.724	0.065	0.07
CB Consumer confidence index	1.188	0.586	0.021	0.06
Construction spending	-0.004	0.002	0.984	0.08
Consumer price index	0.961	0.113	<0.001	0.35
Durable goods orders	1.946	0.468	<0.001	0.17
Existing home sales	1.621	0.767	0.017	0.09
GDP advance	1.371	0.784	0.040	0.17
GDP final				

Table B14: Regression of Returns on Prediction

a) $[t - 30min; t - 5sec]$ **Window**

	E-mini S&P 500			10-year Treasury Note			Wald	
	m	s.e.	R^2	m	s.e.	R^2	Test	p-value
ADP employment	0.030	0.015	0.03	-0.019	0.007	0.09	11.108	0.004
Advance retail sales	0.002	0.019	0.01	-0.009	0.010	0.02	0.781	0.677
CB Consumer con dence idx	-0.004	0.039	0.01	-0.019	0.007	0.06	7.788	0.020
Construction spending	-0.008	0.053	0.01	-0.009	0.012	0.02	0.592	0.744
Consumer price index	0.001	0.022	0.01	-0.002	0.009	0.01	0.050	0.975
Durable goods orders	0.019	0.013	0.03	-0.007	0.007	0.03	3.334	0.189
Existing home sales	0.014	0.065	0.01	-0.021	0.018	0.05	1.424	0.491
GDP advance	0.087	0.055	0.19	-0.016	0.016	0.07	3.495	0.174
GDP preliminary	0.005	0.044	0.04	-0.007	0.013	0.05	0.278	0.870
GDP nal	-0.001	0.028	0.04	-0.022	0.013	0.12	3.088	0.214
Housing starts	0.006	0.016	0.01	-0.015	0.006	0.04	6.959	0.031
Industrial production	0.012	0.020	0.02	-0.002	0.005	0.07	19.136	<0.001
Initial jobless claims	-0.025	0.010	0.02	0.006	0.005	0.01	7.340	0.025
ISM Manufacturing index	-0.010	0.070	0.01	0.004	0.014	0.02	0.113	0.945
ISM Non-manufacturing index	0.012	0.032	0.01	-0.009	0.017	0.02	0.384	0.825
New home sales	-0.015	0.030	0.02	-0.008	0.006	0.03	2.167	0.338
Non-farm employment	0.009	0.019	0.02	-0.006	0.011	0.02	0.514	0.774
Pending home sales	-0.023	0.032	0.02	-0.012	0.007	0.03	3.649	0.161
Producer price index	-0.027	0.022	0.03	0.013	0.009	0.04	3.691	0.158
UM Consumer sentim. - Prel	-0.076	0.036	0.04	0.001	0.009	0.01	4.561	0.102

b) $[t \ldots t + 5min]$ **Window**

	E-mini S&P 500		10-year Treasury Note		Wald	p-value
	m	R^2	m	R^2	Test	
ADP employment	-0.001			0.03	2.028	
Advance retail sales	0.043			0.03	3.947	
CB Consumer con dence idx	**0.016**	**0.037**	0.010	0.01	0.214	.899
Construction spending	-0.037	0.032	0.02	0.039	0.014	0.08	9.063	0.011
Consumer price index	-0.040	0.035	0.03	-0.006	0.012	0.02	1.541	0.463

References

Almgren, R., Thum, C., Hauptmann, E., & Li, H. (2005). Equity market impact. *Risk*, *July*, 57{62.

Balduzzi, P., Elton, E. J., & Green, T. C. (2001). Economic news and bond prices: Evidence from the U.S. Treasury market. *Journal of Financial and Quantitative Analysis*, *36*, 523{543.