An Analysis of the Impact of Macroeconomic Surprises on Foreign Exchange Returns

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Introduction

There is no simple equation that explains the complete relationship between economic fundamentals and financial markets. However, the two are clearly linked, and a significant amount of research has been done to determine the impact of macroeconomic news releases on various asset classes. Much of this work focuses on domestic announcements and their effect on domestic markets, but we are more interested in the consequences of a news surprise as it reverberates through the global economy to different countries. We see this impact manifest in the foreign currency market and will seek to examine the impact of different types of macroeconomic news originating from different countries on currency prices.

Many papers before this have attempted to improve the model for foreign exchange price-discovery since Meese and Rogoff published their 1981 work analyzing random walk models for determining price (Meese and Rogoff, 1981). The efficient market hypothesis would hold that asset prices should already incorporate all available information and any news releases should be incorporated instantaneously. Our work adds a new perspective to the extant body of research. Most published papers focus primarily on the news released in the United States and look solely at the relationship between the U.S. and an assortment of countries from that view. Several others have approached the issue from the other side of the exchange rate. but not as a main focus. Anderson, Bollerslev, Diebold, and Vega (2001), Almeida, Goodhart, and Payne (1996), and Dominguez and Panthaki (2006) all look at macro events from at least one other country. However, we see opportunities to extend their work, given their country choice and data set. We focus on an issue that several of these papers touch but do not address extensively; how much does the impact of a macroeconomic news release vary across different announcement classes and countries?

Our work not only looks at the price impact coming from different countries but also from different types of news releases. Along with the source country, we will determine which category of macroeconomic indicator impacts the foreign exchange market the largest and see if it remains constant across the countries we look at. With more time and we resources, we would have liked to add more countries and news types to our analysis, but we feel that our research points in a new direction for macroeconomic price-discovery that has yet to be completely explored. In Section 1, we will discuss the existing literature on the topic and some of its flaws. After that, we move on to our data acquisition process and a brief analysis in Section 2. Section 3 will detail our econometric methodology, and Section 4 will present our results. Section 5 will consist of a discussion of our findings, and we conclude in Section 6 with a summary and several direction in which our research could be extended to new areas.

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Literature Review

One of the primary sources of inspiration for this paper was the work of Anderson, Bollerslev, Diebold, and Vega (2001). In their 2001 paper, they explore the relationship between U.S. and German macroeconomic announcements and six currencies. Their 2007 paper, which focused on a wider variety of asset classes but drops all pretext of an international perspective, looks solely at American news releases. After reading through a variety of papers on similar topics, we found that the only other publication that dealt with any international news announcements was a 1996 paper by Almeida, Goodhart, and Payne which also used German news. In the intervening twenty years since the data had been collected, many factors have changed that could impact their results. The data set covers 1992 to 2002 in the case of ABDV and just 1992 to 1994 in the AGP paper. During this time period, German announcements were unscheduled meaning that the markets had dual elements of uncertainty: what the value of the release would be as well as the exact timing of the release. Almeida, Goodhart, and Payne found that the maximum impact of the announcements occurred after fifteen minutes for American releases and three hours for German releases. The European Union and European Central Bank were established during this period. Germany along with many other countries adopted a scheduled announcement structure. The internet has developed to facilitate a much faster movement of information. All of these factors point towards a second look at their conclusions from a more recent perspective to see if the conclusions still hold even after including different countries aside from Germany. The final publication that we are aware of that looks at foreign announcements as well as domestic is Dominguez and Panthaki (2006) who use news from the United Kingdom and the Euro area. They draw their announcement data over a ten month period from 1992 to 1993. Their paper focused more on what events can be considered news from a statistically significant perspective rather than the magnitude of the impact, so we decided to extend their work by looking at that explicitly.

Our return specification pulls from several different sources. Omrane and Hafner (2011) found that macroeconomic news releases maintain a significant factor in the volatility of foreign currency for two hours after looking at the USD cross-rates with the Euro, Pound Sterling, and the Yen. That was the primary reason for our return window being two hours prior and after the announcement time. We looked toward Adams, McQueen, and Wood (1999) as precedent for modeling the foreign exchange returns linearly just as they did with equities returns. ABDV (2007) and Ehrmann and Fratzscher (2004) showed that foreign currency exhibits asymmetrical responses to macroeconomic releases, so we included that aspect in our analysis. While normalizing the surprise component, we followed the lead of ABDV (2007) and Faust, Rogers, Wang, and Wright (2003) in doing so to facilitate the comparison between different release types and countries. Dominguez and Panthaki (2006) also demonstrated the significance of trailing returns which is what led us to also use a lagged term to control at least partially for momentum.

Data

1. Macroeconomic New Release Data

Our paper focuses on three different countries: the United States, Canada, and Switzerland. We gathered data on GDP, CPI, the unemployment rate, and in the case of the United States, consumer confidence. The other two countries did not have an available measure of consumer confidence. The release time series as well as the consensus survey estimate was

gathered from a Bloomberg Professional Service Terminal. **Table 1** shows the details of the releases. When available, the highest frequency data was chosen to obtain the maximum amount

Table 1

Country	Release Type	Schedule	Release Time[1]	Total N
United States	GDP (SAAR)	Quarterly	8:30	71
United States	Unemployment (NSA)	Monthly	8:30	206
United States	CPI (NSA)	Monthly	8:30	206
United States	Consumer Confidence[2]	Monthly	10:10	195
Canada	GDP	Monthly	8:30	137
Canada	Unemployment (SA)	Monthly	8:30	140
Canada	CPI (NSA)	Monthly	8:30	139
Switzerland	GDP	Quarterly	1:45	45
Switzerland	Unemployment (SA)	Monthly	1:45	145
Switzerland	CPI (NSA)	Monthly	3:15	152

1. Eastern Standard Time
2. The University of Michigan Consumer Sentiment Survey

of data points. In the event of a primary release and multiple revisions, the primary release was always chosen in order to keep the data as consistent and comparable as possible. The rationale behind the choice was that the first release would be the most likely to have a surprise component as future revisions would have the first estimate as given information, so the first release would be as independent of an explanatory variable that could be obtained in this situation.

The consensus survey estimate also merits discussion. Most of the existing literature uses the MMS International survey to obtain expert estimates in order to derive the surprise component of a given macroeconomic announcement. However, this survey of economists no longer exists. Instead, we use the mean survey value that Bloomberg reports from a number of economists that varies between countries, releases and over time. A disadvantage to this is that the MMS survey has already been shown by several papers to be unbiased in many cases (Schirm 2003). Unbiasedness in a macroeconomic predictor is important as the market would be aware that estimates published by Bloomberg must be adjusted to serve as an accurate estimate on average. **Table 2** shows the mean surprise value for each indicator and whether or not it is an unbiased estimator. The t-value reported was a test on the probability that average surprise value was equal to zero which is the necessary condition for an unbiased estimator. Only four out of the eleven macroeconomic releases serve as unbiased

Table 2						
Country	**Release Type**	**N**	**Avg. Surprise**	**Std. Dev**	**T-value**	**Unbiased**
United States	GDP	71	0.009859	0.74223	0.1119	Yes
United States	Unemployment	206	-0.026611	0.14798	2.5810	No
United States	CPI	206	-0.007766	0.15567	0.7160	No
United States	Consumer Confidence	195	-0.598561	3.80266	2.1980	No
Canada	GDP	137	-0.547445	0.17019	37.650	No
Canada	Unemployment	140	-0.032142	0.13795	2.7569	No
Canada	CPI	139	-0.010071	0.19974	0.5944	Yes
Switzerland	GDP	45	0.093333	0.29573	2.1171	No
Switzerland	Unemployment	145	-0.004138	0.06110	0.8155	Yes
Switzerland	CPI	152	-0.019736	0.24758	0.9828	Yes

estimators of the true release value. This was not ideal for our purposes, but given our financial and time constraints for this paper, we were unable to obtain a better estimator for the news releases. One other interesting thing to note is that eight out of the ten indicators have a negative bias. This would seem to indicate that the experts surveyed by Bloomberg consistently give estimates greater than the true value.

Table 3 shows the four moments of each macroeconomic data release. Table 3 shows the four moments of the Surprise Value for each macro event release. **Table 4** shows the same descriptive statistics but for the Returns.

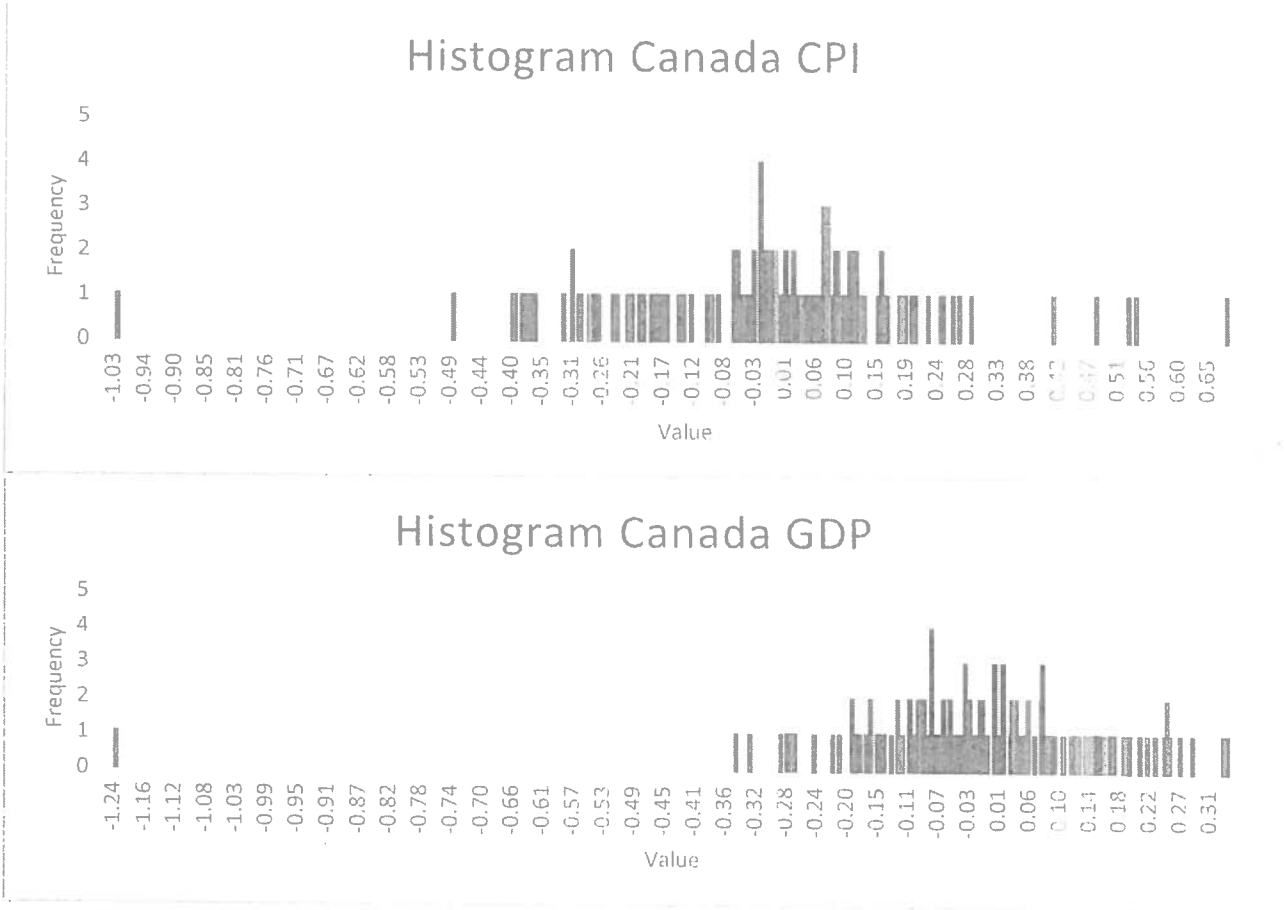
Table 3										
	CA CPI	CA GDP	CA UR	SWI CPI	SWI GDP	SWI UR	US CC	US CPI	US GDP	US UR
Mean	-0.02606	-0.19495	-0.04500	-0.07672	0.27000	-0.01265	-0.07126	-0.02734	-0.07427	-0.01753
Variance	0.26704	0.36733	0.03730	0.21528	0.57431	0.01879	0.10708	0.18081	0.09565	0.00673
Skewness	0.40639	-0.20818	0.11325	-0.03293	0.10879	-0.90884	0.05775	-1.62139	0.27913	0.06208
Kurtosis	0.39112	0.06601	0.43887	-0.01457	-0.63414	5.95860	-0.22840	10.84605	0.42742	0.72151

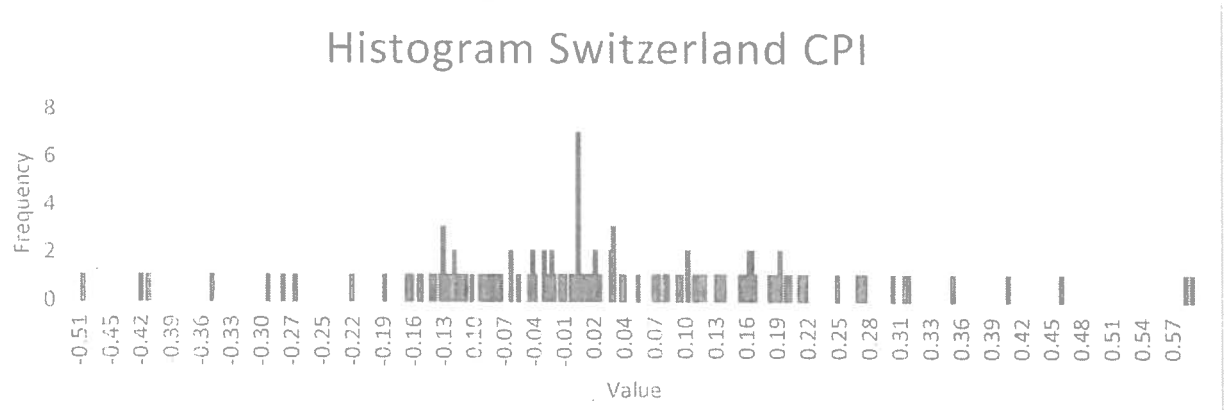
Table 4										
	CA CPI	CA GDP	CA UR	SWI CPI	SWI GDP	SWI UR	US CC	US CPI	US GDP	US UR
Mean	-0.01757	-0.01320	-0.00104	0.02172	-0.03625	0.00685	0.00148	0.15116	-0.04332	-0.00102
Variance	0.04434	0.02908	0.04048	0.03049	0.02992	0.03481	0.03793	0.04398	0.03687	0.03165
Skewness	-0.35682	-2.33550	-0.67113	0.30781	-1.06975	0.07561	-1.41652	-0.13932	-0.70448	-0.94420
Kurtosis	3.33886	16.03878	3.47485	1.49068	2.24090	1.91283	11.44677	3.27609	3.47331	4.58266

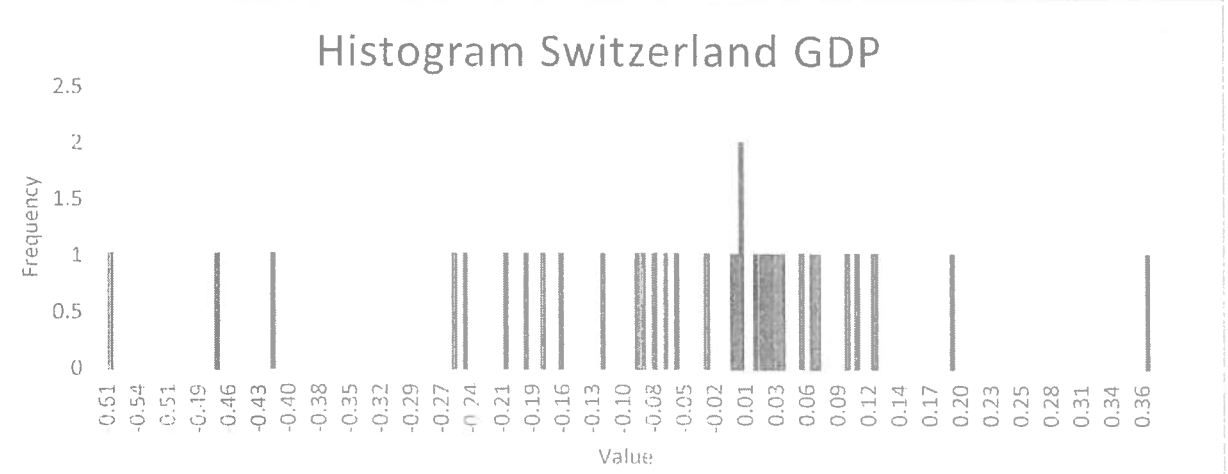
Two final minor issues with using the Bloomberg survey data are the change in experts surveyed over time and the reality that news is not always released to the public exactly at the scheduled time. The releases tend to gather more experts surveyed over time. The count varies from the mid to high single digits for Swiss releases in the early 2000s to between forty and fifty for contemporary American releases. Having a wider standard deviation in the early years of Bloomberg's record keeping due to a smaller sample size would cause those years to potentially cause the whole series to appear biased even though perhaps the predictions have gotten better with more experts surveyed. We rejected the idea of trying to find a point at which the release

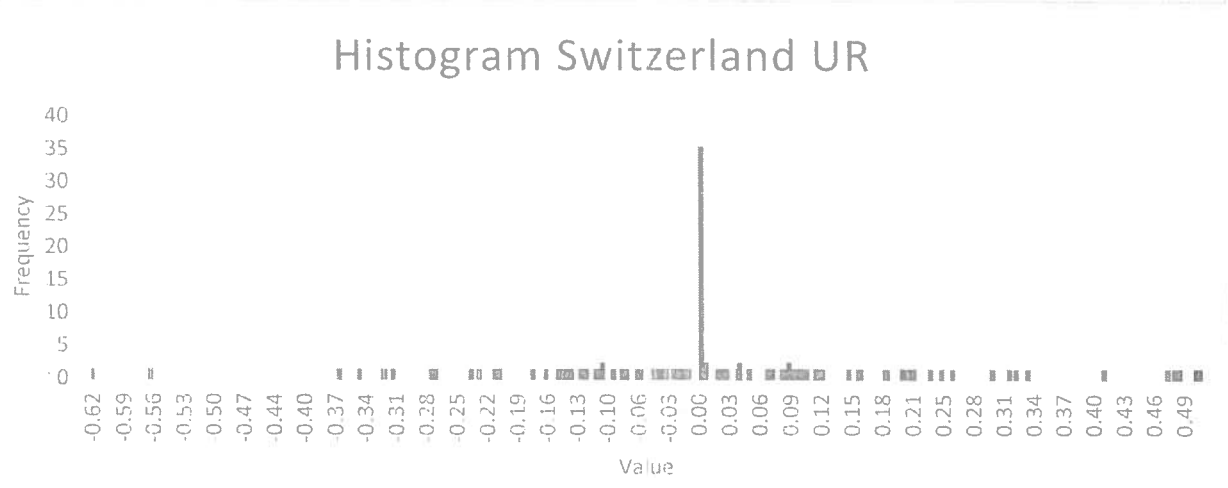
predictions became unbiased in favor of having more data points and in the interest of time. Anderson et. al. (2007) mention the MMS database containing the true value for the release time of the news and implied that many times, it was slightly different than the announced time. As already mentioned, the MMS survey no longer exists, so we could not take advantage of the more accurate release times and could not find another purveyor of more accurate information than Bloomberg. However, given that we chose to calculate our returns over a fixed two-hour window, a few minutes off of the scheduled release time would have a minor impact on our results.

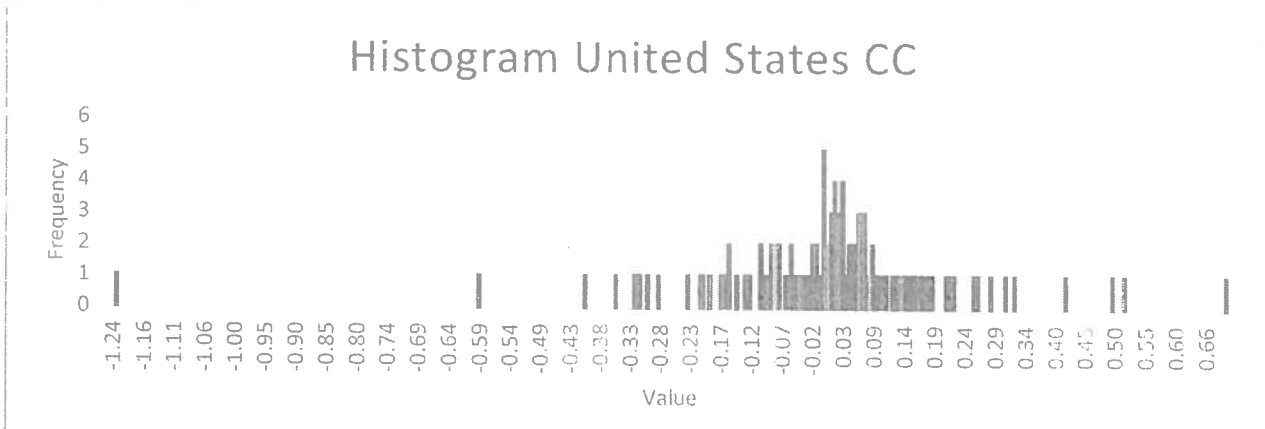
The final set of charts are the histograms of the returns for all ten sets of macroeconomic event announcements.

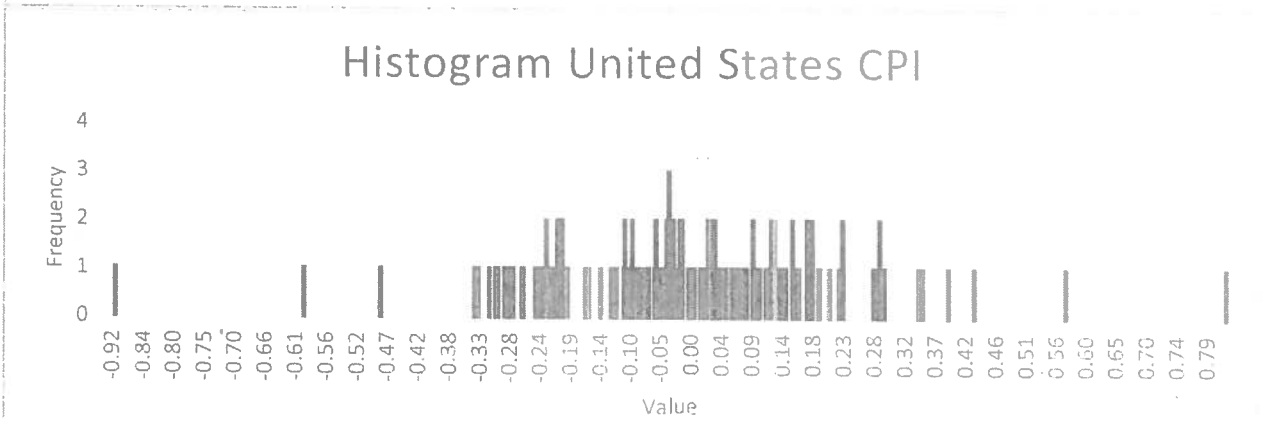



Histogram Switzerland CPI
Frequency
Value

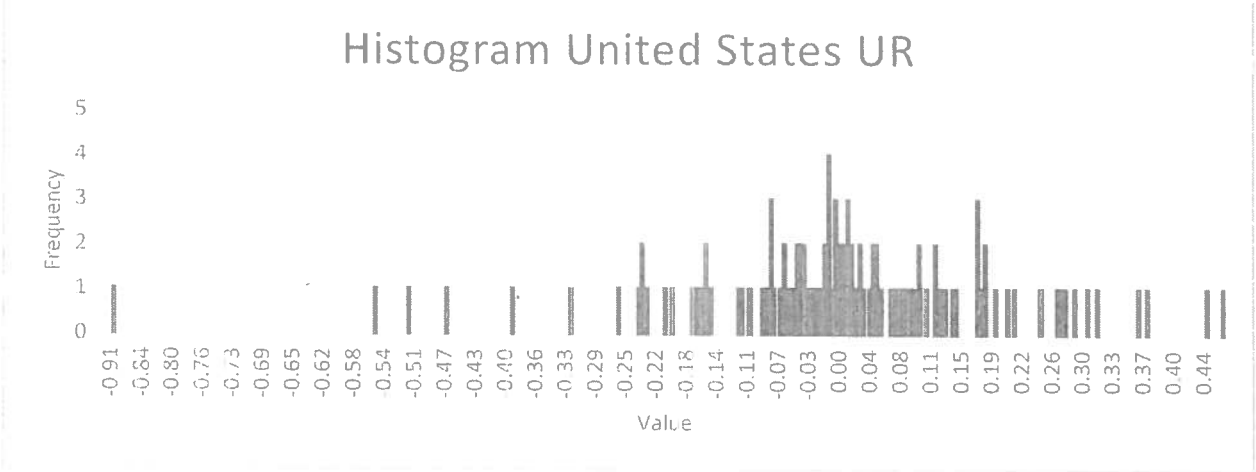

Histogram Switzerland GDP
Frequency
Value


Histogram Switzerland UR
Frequency
Value


Histogram United States CC
Frequency
Value


Histogram United States CPI
Frequency
Value


Histogram US GDP
Frequency
Value



2. Foreign Exchange Rate Data

The exchange rate data was collected through Dukascopy[1], a Swiss bank that offers a large amount of time series on their website. The tick data was pulled in the form of three points: two hours before the release, the exact release time, and then two hours after the release. We used the closing number for each of the three times. The returns over period t and t-1 were then calculated by taking the natural logarithm between each set of two points. The currency data on the website went back to 1998 for the United States, 2004 for Canada, and 2003 for Switzerland. These date ranges as well as those for the Bloomberg survey values were the major limiting factor preventing us from obtaining more data points.

Methodology

The end result of our analysis was a series of ordinary least squares regressions to determine the whether the release of macroeconomic data hold significant impact on the results of trading foreign currencies. The model we estimated was designed to assign a beta value to several variables which we will generate. The dataset acquired from Dukascopy was now cleaned, but dummy variables and a few other variables had to be generated. The first variables generated were the Returns and Returns in t-1. For the purposes of creating these variables, Returns were based off of the two hour period from the announcement of the even to the time two hours later. The two hour period was determined after consulting literature previously released upon the subject. In existing literature it was seen that the effects of a macro economic data release were added or subtracted to the cross rate after two hours. For returns we used the natural log of the quantity exchange rate two hours after the event divided by the exchange rate at the time the macro data announcement occurred. This quantity was then multiplied by one hundred to make the return value a percent rather than a decimal. For the Returns in t-1 variable, a similar procedure was followed; however, for the creation of that variable the exchange rate two hours before the announcement was the denominator and the exchange rate at the announcement was the numerator of the fraction. We then took the natural logarithm of that

[1] Pulled from dukascopy.com/swiss/english/marketwatch/historical/

fraction and multiplied by one hundred. This same method was used to generate a Returns and a Returns in t-1 variable for all of the data announcements and all of the cross rates.

The next variable created was the S value variable. This variable served to proxy the surprise in the announcement. This value was created by taking the actual data value in the announcement and subtracting it from the value of the expected value of the macro data announcement as determined by a survey accessed through Bloomberg. This difference was then divided by the sample standard deviation of that events' actual values for the entire sample which we used. The event type in this case was the country specific macro data type announcement rather than only the macro data type, such as US GDP rather than just GDP. This standardized the surprise and enabled us to easily compare the surprise generated from each event despite that event's type producing differences which were quite different in magnitude.

Based off of this S value two additional variables were created, S+ and S-. For S+ it was set equal to the S value for all events where the S value was positive, otherwise it was equal to 0. A similar procedure was followed for the S- variable, except it was equal to the absolute value of the S value for all events which had a negative S value, else it was set equal to 0. These led to the creation of two dummy variables; S+ dum and S- dum. These were set equal to one whenever their respective numeric variable had a non-zero value. The S value was used to create three other dummy variables, Sbig, Smed and Ssm. The Sbig variable was equal to one if the absolute value of the S value was greater than 0.75, otherwise Sbig was equal to zero. Similarly, the Smed was set equal to one if the S value was between 0.25 and 0.75, otherwise it was zero. The Ssm variable was equal to one if the S value was less than 0.25, otherwise it was set equal to zero. The demarcations between Sbig, Smed and Ssm were slightly arbitrary but were determined based off of the distribution of the S values after they were generated.

The final set of dummy variables created were for the country where the event occurred (Switzerland, Canada or the US) and for the event type (CPI, UR, GDP or CC). These were all dummy variables which were set equal to one when the event was of that country or of that type, else they were calibrated to zero. The next set of dummy variables created were for each specific event such as US GDP and SWI UR. Again, in this case the variables were set equal to one when the event was of the specific type in question but otherwise were set equal to zero. All of the procedures listed in this section were followed for all three cross-rates.

After all the dummy variables were created the data set was complete and we then performed a series of linear regressions upon the data. We used the program Stata 13 to perform these regressions. Each cross-rate went through the same six sets of regressions. In our models, returns were always the dependent variable and while the independent variables were changed to search for significant results. The first regression used the S value as the only independent variable. The second set of regressions used with the S value and the event type as the independent variables. For this series of regressions, both non-specific event dummy variables and country specific event type dummy variables were used as independent variables. The third set of regressions used the S+ and S- variables as dependent variables. This regression set was run with both the numeric S+ and S- variables and then the dummy variables. The fourth set of regressions used Sbig, Smed and Ssm as independent variables. To avoid errors of collinearity, one of these had to be omitted to run the regression so we ran a regression on all three combinations of two of these dummy variables. The fifth regression set used the S value and

Returns in t-1 as independent variables. With this regression we also used an F-Test to make sure the model was not adding additional errors. The sixth, and final, regression used the country where the event occurred as the independent variable.

Results

All of the models used returns as the dependent variable and the first set of models used the S value as the independent variable. The table below shows the sample statistics solely looking at the surprise level of a macroeconomic release and its impact on a given cross rate using the equation:

$$Returns_t = \beta_0 + \beta_1 S_t + \varepsilon_t$$

Cross Rate	Independent Variable	Coefficient	Std Error	t-value	P>|t|
CHF-CAD	S Value	0.041437	0.028221	1.47	0.143
CAD-USD	S Value	-0.008229	0.016409	-0.5	0.616
CHF-USD	S Value	0.026071	0.026349	0.99	0.323

From this regression we were unable to get any results which were significant at the 5% confidence level. However, we do see the largest relationship between the returns and the S value for the Swiss Franc-Canadian Dollar cross rate. Another interesting result despite its insignificance is the association of a positive S Value with a devaluation in the CAD-USD. Although the collection of all types of releases prove to not have a significant result, we wanted to break down the results more to see if there were any significant impacts among the different categories of news releases.

The second set of models used returns as the dependent variable and the event types as the independent variables. The model also includes the interactions between the event type and the S value as independent variables as shown in the following equations:

Without country specific events:

$$Returns_t = \beta_0 + \beta_1 S_t + \beta_2 CPI_t + \beta_3 GDP_t + \beta_4 UR_t + \beta_5 S_t CPI_t + \beta_6 S_t GDP_t + \beta_7 S_t UR_t + \varepsilon_t$$

With country specific events[2]:

$$Returns_t = \beta_0 + \beta_1 Svalue_t + \beta_2 USCPI_t + \beta_3 USGDP_t + \beta_4 USUR_t + \beta_5 USCC_t + \beta_6 S_t USCPI_t + \beta_7 S_t USGDP_t + \beta_8 S_t USUR_t + \beta_9 USCC_t S_t + \varepsilon_t$$

[2] Note that the CC and its interaction terms were not used in all regressions as well as the variables for country specific events, an example is shown here for the USD-CAD model.

Cross Rate	Independent Variable	Coefficient	Std Error	t-value	P>|t|
CHF-CAD	SCPI	0.016655	0.057961	0.29	0.774
CHF-CAD	SUR	0.283033	0.130132	2.17	0.03
CAD-USD	SGDP	0.047433	0.056757	0.84	0.404
CAD-USD	SCPI	-0.008879	0.056074	-0.16	0.874
CAD-USD	SUR	0.154448	0.092972	1.66	0.097
CHF-USD	SGDP	-0.111569	0.084084	-1.33	0.185
CHF-USD	SCPI	-0.086324	0.078438	-1.1	0.271
CHF-USD	SUR	-0.268418	0.160459	-1.67	0.095
CHF-CAD	S Value	0.040317	0.028255	1.43	0.154
CHF-CAD	CPI	0.032623	0.033278	0.98	0.327
CHF-CAD	UR	0.035436	0.033256	1.07	0.287
CAD-USD	S Value	-0.010394	0.016572	-0.63	0.531
CAD-USD	GDP	-0.023344	0.021866	-1.07	0.286
CAD-USD	CPI	-0.10407	0.020169	-0.52	0.606
CAD-USD	UR	-0.00074	0.020142	-0.1	0.917
CHF-USD	S Value	0.032442	0.026635	1.22	0.224
CHF-USD	GDP	-0.046957	0.036909	-1.27	0.204
CHF-USD	CPI	0.01302	0.02834	0.46	0.646
CHF-USD	UR	0.006079	0.028345	0.21	0.83

Cross Rate	Independent Variable	Coefficient	Std Error	t-value	P>|t|
CHF-CAD	SSWI GDP	0.000546	0.081122	0.01	0.995
CHF-CAD	SSWI CPI	-0.029347	0.074852	-0.39	0.695
CHF-CAD	SSWI UR	0.109495	0.210563	0.52	0.603
CAD-USD	SUS GDP	-0.107593	0.094842	-1.13	0.257
CAD-USD	SUS CPI	0.028552	0.043775	0.65	0.514
CAD-USD	SUS UR	-0.315536	0.202073	-1.56	0.119
CAD-USD	SUS CC	-0.026359	0.054234	-0.49	0.627
CHF-USD	SUS GDP	0.123323	0.136453	0.9	0.366
CHF-USD	SUS CPI	0.088847	0.065681	1.35	0.177
CHF-USD	SUS UR	-0.284774	0.282781	-1.01	0.314
CHF-USD	SUS CC	0.138271	0.077186	1.79	0.074
CHF-CAD	S Value	0.038506	0.028586	1.35	0.179
CHF-CAD	SWI GDP	0.030869	0.056742	0.54	0.587
CHF-CAD	SWI CPI	0.055114	0.034814	1.58	0.114
CHF-CAD	SWI UR	0.072764	0.034852	2.09	0.037
CAD-USD	S Value	-0.009083	0.016468	-0.55	0.581
CAD-USD	US GDP	-0.032627	0.029935	-1.09	0.276
CAD-USD	US CPI	0.009918	0.019084	0.52	0.603
CAD-USD	US UR	0.010192	0.019042	0.54	0.593
CAD-USD	US CC	0.012205	0.190082	-1.18	0.239
CHF-USD	S Value	0.024094	0.026432	0.91	0.362
CHF-USD	US GDP	-0.076132	0.042694	-1.78	0.075
CHF-USD	US CPI	-0.025598	0.027748	-0.92	0.357
CHF-USD	US UR	-0.02236	0.027658	-0.81	0.419
CHF-USD	US CC	-0.01775	0.027728	-0.64	0.522

Cross Rate	Independent Variable	Coefficient	Std Error	t-value	P>|t|
CHF-CAD	SCA GDP	-0.036744	0.068396	-0.54	0.591
CHF-CAD	SCA CPI	0.027416	0.071252	0.38	0.701
CHF-CAD	SCA UR	0.334902	0.161398	2.08	0.038
CAD-USD	SCA GDP	0.04377	0.039642	1.1	0.27
CAD-USD	SCA CPI	-0.069727	0.042869	-1.63	0.104
CAD-USD	SCA UR	0.218006	0.089645	2.43	0.015
CHF-USD	SSWI GDP	-0.099141	0.067479	-1.47	0.142
CHF-USD	SSWI CPI	-0.074788	0.064583	-1.16	0.308
CHF-USD	SSWI UR	-0.177591	0.173934	-1.02	0.308
CHF-CAD	S Value	0.034859	0.02844	1.23	0.221
CHF-CAD	CA GDP	-0.070571	0.035776	-1.97	0.049
CHF-CAD	CA CPI	-0.048948	0.035244	-1.39	0.165
CHF-CAD	CA UR	-0.059335	0.035158	-1.69	0.092
CAD-USD	S Value	-0.009094	0.016597	-0.55	0.584
CAD-USD	CA GDP	-0.010001	0.01908	-0.52	0.6
CAD-USD	CA CPI	-0.012835	0.018807	-0.68	0.495
CAD-USD	CA UR	0.003523	0.018754	0.19	0.851
CHF-USD	S Value	0.031631	0.026905	1.18	0.24
CHF-USD	SWI GDP	-0.024869	0.043096	-0.58	0.564
CHF-USD	SWI CPI	0.044069	0.026433	1.67	0.096
CHF-USD	SWI UR	0.027172	0.026352	1.03	0.303

The first table shows us that when the independent variables are only the event types, there is one statistically significant relationship within the interaction between the events type and the S value. This statistically significant relationship is the interaction between the S value and event type of unemployment rate. The second and third table show three significant relationships between within the Swiss Franc-Canadian Dollar cross-rate. Within the three statistically significant relationships, there is one interaction which is significant. The interaction between the S value and the Canadian Unemployment Rate announcement has a significant impact on the returns made via this cross-rate. The two event types which significantly affect returns made via trading the Swiss Franc-US Dollar exchange rate are the Swiss Unemployment Rate announcement and the Canadian GDP announcement. The third table also shows one significant relationship within the Canadian Dollar-US Dollar. This relationship is the interaction between the S value and the Canadian Unemployment Rate announcement. Through this breakdown, we were able to uncover several significant relationship; however, we expected to find many more. Given that much of the literature does find significant results in more cases than we did, it seems likely that the returns window that we adopted from the results of Omrane and Hafner (2003) is not extendable to the set of currencies that we used. Our finding of a significant impact of a Canadian news release on the USD-CAD cross rate does show some evidence for our hypothesis that there exist aspects of the relationship between foreign macroeconomic announcements and exchange rates that have gone unstudied to a large extent.

The third model uses the S+ and S- variables as independent variables. This set also includes another group of models that include the positive and negative dummy proxies.

Cross Rate	Independent Variable	Coefficient	Std Error	t-value	P>|t|
CHF-CAD	S+	-0.007233	0.049796	-0.15	0.885
CHF-CAD	S-	-0.084328	0.045865	-1.84	0.066
CAD-USD	S+	-0.079894	0.032278	-2.48	0.014
CAD-USD	S-	-0.038209	0.024345	-1.57	0.117
CHF-USD	S+	0.022737	0.043629	0.52	0.602
CHF-USD	S-	-0.029281	0.042604	-0.69	0.492
Cross Rate	Independent Variable	Coefficient	Std Error	t-value	P>|t|
CHF-CAD	S+ Dum	0.032785	0.033039	0.99	0.321
CHF-CAD	S- Dum	-0.015911	0.031427	-0.51	0.613
CAD-USD	S+ Dum	-0.039622	0.018505	-2.14	0.033
CAD-USD	S- Dum	-0.020229	0.017366	-1.16	0.244
CHF-USD	S+ Dum	0.011729	0.025348	0.46	0.644
CHF-USD	S- Dum	0.003954	0.023687	0.17	0.867

This version of the model with equations displayed below

For numeric variables:

$$Returns_t = \beta_0 + \beta_1 S +_t + \beta_2 S -_t + \varepsilon_t$$

For dummy variables:

$$Returns_t = \beta_0 + \beta_1 S + dum_t + \beta_2 S - dum_t + \varepsilon_t$$

shows only one statistically significant relationship, but that relationship appears in both the numeric data regression and the dummy proxy of the numeric variable. The Canadian Dollar-USD cross-rate sees the S+ numeric variable and the S+ dummy variable show that when the events effecting the CAD-US Dollar cross rate come in above survey expectations, then there is a significant impact upon the returns that can be made from returning using that cross-rate. Looking at the results from the dummy variables does show that a positive surprise value does tend to have a more significant impact on the exchange rate.

The fourth model used the size of the surprise as the independent variable as detailed in the previous section.

Cross Rate	Independent Variable	Coefficient	Std Error	t-value	P>|t|
CHF-CAD	S Big	-0.047622	0.042846	-1.11	0.267
CHF-CAD	S Med	0.046073	0.027286	1.69	0.092
CAD-USD	S Big	-0.05697	0.026464	-2.15	0.032
CAD-USD	S Med	-0.010071	0.013602	-0.74	0.459
CHF-USD	S Big	0.025774	0.038433	0.67	0.503
CHF-USD	S Med	0.022322	0.020957	1.07	0.287

Cross Rate	Independent Variable	Coefficient	Std Error	t-value	P>|t|
CHF-CAD	S Med	0.093696	0.042913	2.18	0.029
CHF-CAD	S Sm	0.047622	0.042846	1.11	0.267
CAD-USD	S Med	0.044899	0.026798	1.75	0.08
CAD-USD	S Sm	0.05697	0.026464	2.15	0.032
CHF-USD	S Med	-0.003452	0.039928	-0.09	0.931
CHF-USD	S Sm	-0.025774	0.038433	-0.67	0.503
Cross Rate	Independent Variable	Coefficient	Std Error	t-value	P>|t|
CHF-CAD	S Big	-0.093696	0.042913	-2.18	0.029
CHF-CAD	S Sm	-0.046073	0.027286	-1.69	0.092
CAD-USD	S Big	-0.046899	0.026798	-1.75	0.08
CAD-USD	S Sm	0.010071	0.013602	0.74	0.459
CHF-USD	S Big	0.003452	0.039928	0.09	0.931
CHF-USD	S Sm	-0.022322	0.020957	-1.07	0.287

This version of the model below shows four statistically significant relationships for two

$$Returns_t = \beta_0 + \beta_1 Sbig_t + \beta_2 Smed_t + \varepsilon_t$$

exchange cross-rates. These four relationships simplify to two relationships once we remove logical redundancies which occur due to the necessity of a base case to eliminate collinearity. These two relationships affect the Swiss Franc-Canadian Dollar and Canadian Dollar-US Dollar cross-rates. The Swiss Franc-Canadian Dollar cross-rate's return is significantly affected when the surprise factor is medium, between 0.25 and 0.75, compared to when it is large, greater than 0.75. This suggests that when the survey estimates for the American or Canadian macro data are off by a large margin compared to a smaller margin, the returns are significantly affected.

The fifth set of regressions included the S value and the returns in the previous two hour period as the independent variables. This was modeled according to the following equation:

$$Returns_t = \beta_0 + \beta_1 S_t + \beta_2 Ret_{t-1} + \varepsilon_t$$

Cross Rate	Independent Variable	Coefficient	Std Error	t-value	P>|t|
CHF-CAD	S Value	0.041656	0.028255	1.47	0.141
CHF-CAD	Ret t-1	0.016248	0.059281	0.27	0.784
CAD-USD	S Value	-0.006477	0.016058	-0.4	0.687
CAD-USD	Ret t-1	-0.215311	0.033978	-6.34	0
CHF-USD	S Value	0.024719	0.02626	0.94	0.687
CHF-USD	Ret t-1	-0.102452	0.041071	-2.49	0.013

This version demonstrates that the Canadian Dollar-US Dollar and Swiss Franc-US Dollar returns in the previous two hour period before the event announcement occurred have a significant impact on the returns in the two hours following the event announcement. This relationship is not seen in the Swiss Franc-Canadian Dollar cross-rate, but rather the more

significant impact for that cross-rate seems to be the surprise in the announcement itself. The data seem to confirm previous findings that momentum is a significant determiner of price in the next period although the absence of this affect in the Swiss Franc-Canadian Dollar exchange rate is an interesting finding.

The sixth and final group of models used the S value and the country of event origin as

$$Returns_t = \beta_0 + \beta_1 S_t + \beta_2 CA_t + \beta_3 S_t CA_t + \varepsilon_t$$

independent variables; the SCA and SUS variables indicate the interaction between the surprise value and the country variables.

Cross Rate	Independent Variable	Coefficient	Std Error	t-value	P>|t|
CHF-CAD	S Value	0.036497	0.028205	1.29	0.196
CHF-CAD	CA	-0.059436	0.026146	-2.27	0.023
CHF-CAD	SCA	0.014275	0.058158	0.25	0.806
CAD-USD	S Value	-0.008686	0.016443	-0.53	0.597
CAD-USD	US	0.006378	0.013136	0.49	0.627
CAD-USD	SUS	-0.008662	0.035123	-0.25	0.805
CHF-USD	S Value	0.023941	0.022677	0.91	0.364
CHF-USD	US	-0.027375	0.019788	-1.38	0.167
CHF-USD	SUS	0.100831	0.053341	1.89	0.059

The only significant relationship that comes from this regression set is the country variable for the Swiss Franc-Canadian Dollar cross-rate. This means that the country of origin of the event significantly affects the returns on trading via this cross-rate; however, the size of the surprise and the country of origin do not have any significant interactions. The interaction is almost significant for the Swiss Franc-US Dollar cross-rate so there is limited evidence of a relationship but nothing that is statistically significant at the 95% confidence level given our use of a two-hour return window.

Conclusions and Extensions

Most of our results have shown that macroeconomic news releases do not have a significant impact on currency prices within a two-hour time frame. Some notable exceptions were the findings that Canadian unemployment announcements drive a change in the USD-CAD exchange rate, that the CHF-CAD exchange rate does not experience a significant effect of momentum in the period surrounding news releases, and that Canadian news releases impact the CHF-CAD beyond the surprise value as indicated by the significance of the interaction term. Our conclusions point toward some interesting directions for future research. Many of the significant results that we did uncover came from Canadian news releases. This by itself points towards the value of more extensive research into the nature of the impact of non-American economic fundamentals on currency prices. Which aspects of a report have a significant effect vary between just the three countries at which we looked. Specifically, the finding that momentum from the previous period does not have a significant impact on the current currency price in the case of the Canadian Dollar-Swiss Franc cross rate shows that there may be relationships

between other countries' currencies that differ fundamentally from the way the American Dollar interacts with foreign currencies.

Another track that we would like to take in the future would be to examine the same data but in the context of an uncovered interest rate parity model. Faust, Rogers, Wang, and Wright (2003) take this approach by using bond futures to construct a real-time yield curve and tracing the impact of news announcements through interest rates and into exchange rates. They additionally used more state of nature variables to represent expansionary and recessionary economic periods. Given more time, we would have also calibrated the parameters of the model more precisely. We used Omrane and Hafner's (2003) two hour time frame on returns, but testing different time windows could have possibly yield more statistically significant results. Additionally, Dominguez and Panthaki (2006) showed that a variable number of significant lags exist depending on which type of announcement is under observation. Our results from looking at just a single lagged period confirm their results, and more research into how much the number of lags varies across different countries might prove fruitful. Putting more countries and their exchange rates under examination would also reveal additional relationships, but using the United States, Canada, and Switzerland is just a beginning.

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