Does FOMC News Increase Global FX Trading?*

Andreas M. Fischer[1]
Angelo Ranaldo[2]

September 2008

Abstract

Does global currency volume increase on Federal Open Market Committee (FOMC) days? To test the hypothesis of excess currency volume on FOMC days, we use a novel data set from the Continuous Linked Settlement (CLS) Bank. The CLS measure captures roughly half of the global trading volume in foreign exchange (FX) markets. We find strong evidence that trading volume increases in the order of 5% across currency areas on FOMC days during 2003 to 2007. This result holds irrespective of the size of price changes in currency markets and FOMC policy shocks.

Keywords: Trading volume, FOMC, Global linkages
JEL Classification Number: F31, G12

[1] Swiss National Bank and CEPR, Postfach, 8022 Zurich, Switzerland
telephone (+41 44) 631 32 94, FAX (+41 44) 631 81 72
e-mail: andreas.fischer@snb.ch

[2] Swiss National Bank, Postfach, 8022 Zurich, Switzerland
telephone (+41 44) 631 38 26, FAX (+41 44) 631 39 01
e-mail: angelo.ranaldo@snb.ch

* The authors thank Jürg Mägerle, and Andy Sturm for helpful discussions. Fatum Rasmus, Jim Hughes, and the SNB's IRTA unit offered helpful comments. The views expressed here are those of the authors and do not necessarily reflect the position of the Swiss National Bank.

"Market participants said that they would wait on the sidelines until after the FOMC meeting to see if and by how much U.S. interest rates will be cut."

FX reporter for Dow Jones Newswire, 27 June 2001

Introduction

Does global currency volume increase on Federal Open Market Committee (FOMC) days? Currency traders and analysts monitor FOMC meetings for information of imminent changes in the federal funds rate target, because interest rates are a fundamental determinant of exchange rates. Until now empirical research has focused on the price response to FOMC news. Ahn and Melvin (2007), Andersen et al. (2003), Faust et al. (2005), and Hausman and Wongswan (2006) show that foreign exchange (FX) quotes respond in a matter of minutes to public information (news) released by the FOMC.[1] While there is consensus in the literature about the currency price reaction to FOMC surprises, little is known about the volume response.

A difficult hurdle for studies on global FX turnover is measurement. The

[1]Other recent contributions of FX response to FOMC news include Chaboud et al. (2004), Evans and Lyons (2005), Fatum and Scholnick (2007) Faust et al. (2006) and Simpson et al. (2003). See also recent studies by Bernanke and Kuttner (2005), Ehrmann and Fratzscher (2004), Gürkaynak et al. (2005), and Kuttner (2001) that examine the price response of various financial assets to FOMC announcements.

FX market is borderless, spans different products, and many other market microstructure aspects such as multiple trading platforms and different trading venues (i.e., brokerage or interdealer market). Until now high frequency studies such as Cai et al. (2007) and Chaboud and LeBaron (2001) define FX volume behavior only for specific trading platforms or select markets or as in Melvin and Yin (2003) use price fluctuations as a crude measure of FX volume. Neither of these methods are representative of global FX volume.

Our solution to the measurement problem of global FX trading relies on settlement information from the Continuous Linked Settlement (CLS) Bank in New York. The main advantage of CLS volume data is that decentralized FX trades are centrally settled in New York. The novel data set captures turnover activity in the spot, forward, and futures markets. Since its introduction in September 2002, CLS Bank captures more than half of the FX volume across major currencies at high frequencies.

In testing the hypothesis of excess trading in global FX markets on FOMC days, we make two contributions to the growing literature on global financial linkages. First, we show that the spot and the derivatives markets compassed in CLS volume do not behave similarly on FOMC days. This new result means that studies focusing on a select market (i.e., Chaboud and

LeBaron (2001) for the futures market or Cai et al. (2007) for the EBS sport market) cannot be representative of global FX turnover. Second, we show that even controlling for FOMC policy surprises as defined in Kuttner (2005) many traders traders wait after the FOMC meeting to resume trading. This waiting result has implications for how central banks communicate. Blinder et al. (2007) argue that the objective of central bank communication is either to reduce market noise or to augment market volatility. Hence, focusing solely on price responses without knowing whether FX volumes rose or fell does not give a complete picture how FX markets respond to central bank communication.

The evidence in this paper shows an increase in FX turnover for the three largest currencies on 40 FOMC days from 2003 to 2007. Excess FX trading occurs two full days after the FOMC concludes its meeting. The two-day lag is consistent with FX settlement in the spot market. We also find that irrespective of the size of the price change in the exchange rate or the FOMC policy shock, CLS currency volume always increases on FOMC days.

The paper is organized as follows. Section 1 discusses measurement issues of global FX turnover and presents the CLS data. Section 2 motivates the empirical setup. The same section includes a discussion of the empirical

hypotheses, empirical estimation, and hypothesis testing. The empirical evidence for currency volume and FOMC days is presented in section 3. Section 4 offers conclusions.

1. Data Issues

This section addresses measurement issues of global FX turnover. First, the gains and limits of a settlement-based definition of FX turnover are discussed. Thereafter, we document the main properties of CLS currency volume.[2]

CLS Data and FX Trading Volume[3]

A serious drawback of empirical studies on FX volume is measurement. Data availability is problematic because the FX market is highly decentralized in terms of location, currency product, and trading platforms. Aggregation is further complicated because FX transactions span different national and legal jurisdictions, time zones, and domestic payments systems.

[2]The terms FX volume, FX trading activity, and FX turnover are used interchangeably in this paper. CLS data refer to currency volume and not number of transactions. The latter is often used as a measure of FX volume. However, since FX trades are standardized our results should hold for the number of transactions.

[3]This section relies heavily on McPortland (2006), Millar and Northcott (2002), and Saywer (2004). They provide further institutional discussions from the perspective of payments systems and infrastructure.

Previous empirical studies of international finance use three measures of trading volume. Each has its drawbacks. The first is the BIS Triennial Survey of global turnover in traditional product markets (i.e., spot, forward, and swap markets). The three-year frequency and the evolving coverage of the BIS survey on currency volume, however, represent a serious limitation for empirical research studying the dynamics of global FX turnover. A second method used by Goodhart and Figliuoli (1991), Melvin and Peiers Melvin (2003), and Melvin and Yin (2003) proxies FX volume with price movements, i.e., with indicative quotes or transactions data for specific currency markets. Although favored by empirical researchers because of its high frequency, FX volume remains a latent variable and is market specific. A third approach favored by Chaboud and LeBaron (2001), Chaboud et al. (2004), and Cai et al. (2007) measures transaction volume for select markets and trading platforms. While this latter approach represents a step forward in capturing FX volume at high frequencies, it is still product specific.[4]

Observing market activity at the back-end is a way out of the coverage-

[4]The BIS surveys, for example, mention repeatedly that the growth in the spot market does not move in tandem with the swap market. Table B.1 in BIS (2005) shows that the smaller currency markets, spot and outright forwards, grew faster between 2001 and 2004 (at 60%) than the larger swap market (40%).

frequency dilemma. Rather than measuring currency volume at transaction time, an alternative measure is at settlement time. The main advantage of such a back-end measure of FX volume is that roughly 55% of the currency transactions in traditional markets are settled in a centralized manner through the CLS Bank in New York.[5] Moreover, CLS coverage includes FX volume from customer dealers, brokered dealers, and direct dealers. CLS volume data are available at high frequencies and ensure a representative coverage of global FX turnover.

FX transactions always have a trade date and a settlement date.[6] The former is the date when both parties come together and define the terms of the trade. The latter, also known as the value date, is the day common to both countries in which the counter-parties of the transaction will pay the agreed currency amount.[7] The process of determining value dates for FX transactions is precise. FX trades settle following conventional settlement practices, i.e., spot transactions are settled two days after the trade date;

[5]See table 8 of the CPSS (2007) survey.

[6]For some FX products, such as swaps, the two legs of the operations are defined in advance.

[7]FX transactions through the CLS Bank can only be settled on business (banking) days common to both countries. European and North American banking holidays often coincide. This however is often not the case for Asia, Africa, and the Middle East.

forward transactions are settled 30, 60, or 90 calendar days after the trade date; and futures transactions are settled on the Wednesday following the third Monday of March, June, September, and December.[8]

Data Properties of CLS Volumes

The empirical sample based on CLS trading volume (unsigned gross flows) considers the top five most actively traded exchange rates: the U.S. dollar (USD), the euro (EUR), the Japanese yen (JPY), the British pound (GBP), and the Swiss franc (CHF).[9] The daily sample is from 1.10.2003 to 31.12.2007. The sample's size is restricted by CLS's introduction beginning in late September 2002. CLS currency volumes are denominated in U.S. dollar and are not corrected for double accounting.

CLS currency volumes are characterized by large swings and positive trends.[10] The CLS data were filtered in the following manner. To deal with

[8]These four dates are the International Monetary Market dates: the settlement dates for all FX futures contracts traded on the the International Monetary Market, a division of the Chicago Mercantile Exchange, and on the Financial Instrument Exchange division of the New York Board of Trade. Settlement for these instruments maybe same or next day.

[9]According to the most recent BIS Triennial Survey (2007), the five currencies account for 80.1% (84.5%) of the total turnover in 2007 (2004).

[10]Trading volume for example in the U.S. dollar fluctuated by more than 10% on days

the inherent trends, we follow Chaboud and LeBaron (2001) and create a detrended volume variable for each currency. The variable, $NVOL_t$, is the ratio of today's trading volume to a moving average of the previous 66 daily trading volumes

$$NVOL_t = \frac{vol_t}{\frac{1}{66}\sum_{i=1}^{66} vol_{t-i}} \quad (1)$$

Next, bank holidays and expiration dates of futures contracts are dropped from the sample to reduce the variance and the effects of potential outliers for the higher moments.

The trend correction in equation (1) does not eliminate daily and weekly effects (i.e., monthly effects were not detected). Following MacDonald and Marsh (1996) in their study on IMM futures volume, we filter the deterministic effects by regressing $ln(NVOL_t) = nvol_t$ on daily dummies and six lags:

$$nvol_t = = const + \sum_{k=1}^{4} \alpha_k Day_k + \sum_{j=1}^{6} \gamma_j nvol_{t-j}, \quad (2)$$

where Day_k is a dummy that captures day-of-the-week effects.[11]

following a bank holiday and grew 1032% over the sample. In contrast, the volume in the Japanese yen is subject to smaller daily fluctuations and grew less than a third as quick (317%).

[11]The lag order was checked with statistical tests.

Table 1 presents statistical information for the residuals from regression equation (2). The insignificant autocorrelation coefficients (AC) reveal that serial correlation is not a problem. Instead, the low p-values from the White and the ARCH(1) tests indicate that the filtered volume series are heteroskedastic. Information from the third and fourth moment shows that the distribution of the residuals is fat-tailed and subject to outliers.[12]

2. Hypothesis Tests and Empirical Setup

The excess volume hypothesis states that FX traders reshuffle their portfolios on FOMC days. Excess trading may stem from either new information released at the time of the FOMC meeting or from a market response to informed traders. Excess trading for five currencies (USD, EUR, JPY, GBP, and CHF) is first tested with the following equation:

$$nvol_t \quad = \quad const + \sum_{i=0}^{5} \beta_i FOMC_{t-i} + \sum_{k=1}^{4} \alpha_k Day_k + \sum_{j=1}^{6} \gamma_j nvol_{t-j}, \qquad (3)$$

where $FOMC_t$ is a dummy (i.e., $FOMC_t = 1$ when the FOMC meets, otherwise $FOMC_t = 0$). The direction criterion of $nvol_t > 0$ and $FOMC_t >$

[12] Although the property of kurtosis for CLS volume is not captured in the standard price-volume relation of Karpoff (1987), we do not filter it from the data. In the empirical section we consider the effect of non-normal distributions in a GARCH specification.

0 says that FX volume on FOMC days is larger than the 66-day moving average prior to the meeting.

The dummy variable, $FOMC_{t-i}$, enters $i = \{0, \cdots, 5\}$ to capture FX trading in different FX markets. The first case is for $i = 0$, 1, or 2. Such a volume response implies that FX trading (prior to the FOMC meeting) takes place in the derivatives market or possibly in the spot market.[13] For the pre-announcement effect, we assume that FX traders are either hedging or speculating on (scheduled) future interest rate decisions. The second case is for $i = 3$. FX traders respond to news after the FOMC discloses its decision at 2:15 EST and accounts for two-day settlement in the spot market. Since European (Japanese) markets are already closed (not yet open) when the FOMC concludes its deliberations, an international response occurs at $t + 1$ and spot market settlement two days later at $t + 3$. To capture the duration

[13]Numerous studies find that FX markets respond before released information. Peiers (1997) and Dominguez (2003), for example, show that exchange rates respond before central banks intervene in the FX market.

of excess FX volume, we also consider days further out (i.e., $i > 3$).[14]

To test whether large FOMC shocks generate greater FX trading, we add $FOMC_t{}^*|\epsilon_t^{FF}|$ and five lags along with $|\epsilon_t^{FF}|$ and five lags to equation (3):

$$\begin{aligned} nvol_t &= const + \sum_{i=0}^{5} \beta_i FOMC_{t-i} + \sum_{f=0}^{5} \kappa_f |\epsilon_{t-f}^{FF}| + \sum_{g=0}^{5} \omega_g FOMC_{t-g} * |\epsilon_{t-g}^{FF}| \\ &\quad + \sum_{h=0}^{5} \delta_h |\Delta s_{t-h}^{USD}| + \sum_{k=1}^{4} \alpha_k Day_k + \sum_{j=1}^{6} \gamma_j nvol_{t-j} \end{aligned} \tag{4}$$

The measure of (absolute) policy surprise, $|\epsilon_t^{FF}|$, follows Kuttner (2001). The surprise measure is based on price changes in the federal funds futures contracts (appropriately re-scaled).[15] Following standard practice, we construct our FOMC shock by working with a 30 minute window between 2:10 EST and 2:40 EST to capture the policy surprise before and after the release of the FOMC statement at 2:15 EST.

Equation (4) also controls for the interaction between absolute FX returns, FX volume, and FOMC events. Jones et al. (1994), Karpoff (1987),

[14]Endogeneity is not a problem in this context. The relation between trading volume and FOMC decisions can be interpreted as proof that information from FOMC meetings or anticipated news generate an increase in FX trading activity. This stems from the observation that high FX volume does not cause scheduled FOMC meetings.

[15]Numerous empirical studies find the federal funds futures contract an extremely efficient measure for market expectations of future monetary policy, see Kreuger and Kuttner (1996), Kuttner (2001), Piazzesi and Swanson (2004), Sack (2002), and Sack et al. (2004).

and others have identified a positive correlation between volume and absolute returns for prices of various assets. Higher price volatility is linked with higher turnover activity primarily in the tails of the distribution. To control for absolute returns for the dollar in the volume-FOMC relation, we construct a measure of absolute price returns. This is necessary, because the CLS Bank does not provide an average currency price for settled trades. We build a (daily) trade weighted variable under the assumption that the spot price at noon EST is a valid proxy for settled transactions with CLS Bank.[16] We denote the (daily) absolute dollar return as $|\Delta s_t^{USD}|$ and add this variable and five lags to equation (4).

Equation (4) is motivated by the asset market approach to exchange rates with homogenous agents, see Lyons (2001). Bonser-Neal et al. (1998) argue that FOMC news changes expectations, causing the exchange rate to jump to a new level. In our case, a significant coefficient for the cross product, $|\epsilon_t^{FF}|$ (i.e., $\omega_g > 0$ and $\beta_i = 0$) is consistent with the view that FOMC communication drives global FX volume proportionally to the size of the surprise. Alternatively, if $FOMC_t$ remains significant even in the

[16]The Federal Reserve Bank of New York records the spot rate at noon. The results presented in the next section are not sensitive to other daily spot rate quotes.

presence of $|\epsilon_t^{FF}|$, such evidence says that the excess trading pattern has a deterministic element. In other words, some traders prefer to wait and not to be wrong footed by a surprise FOMC decision and resume trading after the FOMC news is released.

3. Estimation Results

This section presents evidence of excess FX turnover on 40 scheduled FOMC days for the period 1.1.2003 to 31.12.2007.[17] First, the relationship between FX volume and FOMC meetings is established. Next, we show that our evidence on FX volume and FOMC meeting is contingent on FOMC news type. Last, evidence on FX returns, FOMC shocks, and FOMC meetings is presented.

Global FX Activity and FOMC Meetings

This subsection documents evidence of excess FX activity on FOMC days based on the variable of interest, $FOMC_{t-i}$ for $i = \{0, 1, \cdots, 5\}$, in equation (3). Table 2 summarizes the regressions for five currency volumes: USD, EUR, JPY, GBP, and CHF. The coefficient estimates for daily effects and

[17] The FOMC released a statement on 14.08.2007. We did not include this meeting as a scheduled FOMC meeting. The inclusion or exclusion of this observation has no bearing on our results.

lagged $nvol_{t-j}$ are not shown. Information from Table 2 highlights two observations about FOMC days. The first is that there is a (near) synchronous response for the five currencies. Currency volume increases on FOMC days at t; followed by a decline at $t-1$ and $t-2$; and thereafter with a rise at $t-3$ and $t-4$. The directional pattern is however not significant across currency volumes. The second observation is that only the major three currencies show significant evidence of an excess volume response following an FOMC meeting at the 5% level.[18] GBP volume does not respond significantly to FOMC meetings. The FOMC dummy is significant at $t-2$ for CHF volume; a time when global currency volume fell.

A closer look at the strongest volume response to FOMC days reveals that USD volume increases in the order of 5% at t, $t-3$, and $t-4$. This volume response on these days translates into a volume boost of $US 49 billion. For each of these dates, FX volume is significant. The strong USD volume response stems from the observation that cross-currency activity outside of the dollar is limited and that hedging possibilities are scarce in other currencies.

[18] All standard errors are corrected using White heteroskedastic-consistent stand errors. A GARCH setup revealed that our empirical results are not sensitive as to how we model the variance or whether SUR estimation is used.

The lagged effect for $FOMC_{t-3}$ and $FOMC_{t-4}$ is consistent with international portfolio reshuffling in the cash market after the FOMC concludes its deliberations. For the contemporaneous FOMC effect, it is not possible to identify which FX market is responsible for the (pre-announcement) impact.

Figure 1 shows the average change in USD volume 2 days before and 15 days after FOMC days. The figure shows the coefficient for $FOMC_t$ from 18 regressions specified by equation (2) with $FOMC_{t-i}$ for $i = \{$-2, -1, $\cdots$, 14, 15$\}$. The daily changes in USD volume swing between -4% and +5%. The average volume response is significant on FOMC days at the 5% level. FX volume increases following the FOMC meeting at $t-3$ and $t-4$ and then tappers off. During the 10-day period from $t-5$ to $T-14$, FX volume declines by an accumulated 20%.[19]

To understand whether the result of excess FX volume on FOMC days holds for other central bank meetings, Table 3 presents information on FX volume and scheduled central bank meetings by the European Central Bank (ECB), the Bank of Japan (BoJ), and the Bank of England (BoE).[20] FX

[19]Bomfim (2000) and Jones et al. (1998) claim FOMC days calm stock and bonds. Visually this can be seen in Figure 1, but it is not supported by empirical tests using a GARCH setup.

[20]Excess volume on Swiss National Bank days was not considered, because the number

volume is for USD volume and domestic currency volume. Unlike in the case of FOMC days, no congruous response pattern of excess volume emerges for either currency volume for ECB, BoJ, or BoE meetings. The central bank dummy is negatively significant for the ECB at t and for the BoE at $t-1$. The observation that FX activity responds stronger to FOMC meetings than other central bank meetings is consistent with studies by Almeida et al. (1998) that examine the price response of currencies to central bank news.[21] We interpret the timing evidence based on dummy variable analysis in Tables 2 and 3 as follows: USD volumes increase strongly after the FOMC concludes its meeting but not for other central bank meetings.

USD Volume and FOMC Actions

The previous subsection treated FOMC days as a deterministic effect irrespective of FOMC actions. In this subsection we present evidence on USD volume and information released after the FOMC meetings. First, we con-

of (non overlapping) observations is less than 10.

[21]The importance of news from FOMC meetings on FX markets versus news from other central banks has also been examined for money announcements by Ito and Roley (1987) and central bank interventions by Dominguez (2003). More recent comparative studies on central bank communication by Ehrmann and Fratzscher (2007) and De Haan and Jansen (2004) find that FX markets do not respond equally to central bank news.

sider whether days when the FOMC changed the federal funds rate target generated a stronger volume response than on days when the FOMC undertook no change in the target. Table 4 summarizes this information for USD volume. For comparative purposes, the results from $FOMC_{t-i}$ are presented in the first column. In columns (2) and (3) of Table 4, regression estimates for separate FOMC actions are presented: *change in FF* is a dummy for 18 FOMC days when a change in the federal funds rate target occurred and *no change in FF* is a dummy for 22 FOMC days when the federal funds rate target remained unchanged. Again, we used equation (3) as our baseline model and show the coefficient estimates for the FOMC dummy only. The regressions for federal funds rate changes or no changes show that the delayed volume response at $t-3$ and $t-4$ (attributed to two-day settlement in the cash market) holds. However, USD volumes respond stronger to FOMC days with a change in the federal funds rate target (column two) than when no change occurred (column three), suggesting that FOMC actions move markets. A null hypothesis of coefficient equality for the two FOMC days is rejected with a p-value of 0.001.

Next, we consider the influence of future interest rate leanings on FX volume. As in Pakko (2005) and Thornton and Wheelock (2000), we review

the FOMC statements and classify future FOMC leanings (i.e., future interest rate cuts or increases) into neutral and non-neutral categories. The latter group is when the FOMC statement states that if the current assessment of the balance of risks materializes then future changes in the federal funds rate target are warranted, while the former do not indicate a change in the future path of interest rates.[22] There are 21 neutral leanings versus 19 non-neutral leanings. Columns (5) and (6) in Table 4 show coefficient estimates for non neutral and neutral FOMC leanings from separate regressions. The coefficient estimates show that non neutral leanings with up to the fourth lag generate a larger reaction in USD volume than do neutral leanings. Imminent changes in FOMC policy heighten FX activity. USD volume does not react to our measure of neutral leanings. The null hypothesis that neutral and non-neutral leanings have the same effect on USD volume is rejected with a p-value of 0.006.

USD Volume and Federal Funds Futures

As an extension of the results in Table 2, we consider whether USD volume responds to policy surprises as defined by equation (4). Table 5 summarizes the expanded regressions for the cross product, $FOMC_t{}^*|\epsilon_t^{FF}|$. The main

[22] Our classification is available upon request.

result is that $FOMC_{t-3}{}^{*}|\epsilon_{t-3}^{FF}|$ is always significant for alternative specifications, upholding the earlier volume-FOMC relation for the spot market. Column (1) presents cross product coefficients from a regression of USD volume on the cross product and five lags with the day of the week dummy and six lags of USD volume. Only the coefficients for $FOMC_t{}^{*}|\epsilon_t^{FF}|$ are shown in Table 5. The variable, $FOMC_{t-3}{}^{*}|\epsilon_{t-3}^{FF}|$, has an extremely large coefficient. A 1% price change (within a half hour time span) in the federal funds futures contract will increase FX trading by more than 200% for an FOMC day.[23] The variable, $FOMC_{t-3}{}^{*}|\epsilon_{t-3}^{FF}|$, along with the pre-announcement effect for $FOMC_t{}^{*}|\epsilon_t^{FF}|$ are significant at the 5% level.[24]

Column (2) of Table 5 shows that the coefficient estimates for $FOMC_t{}^{*}|\epsilon_t^{FF}|$ are sensitive to the addition of $FOMC_t$ and five lags. Although the significance of $FOMC_t{}^{*}|\epsilon_t^{FF}|$ and $FOMC_{t-3}{}^{*}|\epsilon_{t-3}^{FF}|$ is upheld, the F-test of the

[23]This result (238/(48 30 minute sessions)) is consistent with the $FOMC_t$ results of 5% in Table 2.

[24]The significance at *t+3* is also reconfirmed with OIS rates for the USD. The volume response with OIS rates for other currencies (as conducted with dummies in Table 3) however is not significant. This result lends further support that FOMC surprises generate stronger volume responses than policy surprises from other central banks. We thank Michael King from the BIS for providing us the OIS data.

FOMC dummies in column (2) shows that these variables are significant. The significance of the FOMC dummies means that the strict version of the asset market approach to exchange rates is not fully capturing information related to FOMC days.

Columns (3) and (4) show that the significance of $FOMC_{t-3}{}^{*}|\epsilon_{t-3}^{FF}|$ holds when controlling for $|\epsilon_t^{FF}|$ and five lags in the specifications defined in columns (1) and (2). However, this is not true for the pre-announcement effect of $FOMC_t{}^{*}|\epsilon_t^{FF}|$. It is no longer significant at conventional levels. The p-value for an F-test for the the FOMC dummies shown in column (4) is 0.07. Again, this says that the FOMC dummies are capturing information around FOMC days that is not correlated with policy surprises, $|\epsilon_t^{FF}|$. An F-test for the (joint) null hypothesis that the coefficients for $|\epsilon_{t-f}^{FF}|$ for $f = \{0, \cdots, 5\}$ are zero cannot be rejected.[25]

The evidence of the return-volume relation on FOMC days is presented in columns (5) and (6) of Table 5. The main result is that the volume response to FOMC days holds even when we control for absolute returns. The variable,

[25]We experimented with different windows for $|\epsilon_t^{FF}|$. Regardless if the window is 30 minutes or open to close the results did not change. This result confirms the results in Gürkaynak et al. (2005) for monetary policy shocks and asset prices.

$FOMC_{t-3}{}^{*}|\epsilon_{t-3}^{FF}|$, remains significant at the 5% level regardless whether we control for $FOMC_t$ (see column 6). Unlike $|\epsilon_t^{FF}|$, $|\Delta s_t^{USD}|$ are found to be positively correlated with daily USD volume. The p-values of the F-test show that absolute price returns are significant at conventional levels, extending Karpoff's (1987) finding of return-volume relation for currency markets.[26] From the significant F-test for $FOMC_{t-g}$, it is possible to determine that large FX volume activity at the time of the FOMC meeting is associated with large exchange rate movements in prices.

We interpret the evidence in Tables 2 to 5 as follows. FOMC meetings are events that generate an increase in FX volume for the three largest currencies. Excess FX trading, particularly for the USD, is observed with a lag following the FOMC meeting and has a duration of two business days; a phenomenon which is longer than FX price responses to FOMC news, see Ahn and Melvin (2007), Andersen et al. (2003), Bonser et al. (1998), Faust et al. (2005), and Hausman and Wongswan (2006). The lagged response in FX turnover is consistent with two-day settlement in the FX spot market.

It is important to qualify our results in light of potential weaknesses.

[26]It is important to recall that, unlike $FOMC_{t-3}{}^{*}|\epsilon_{t-3}^{FF}|$, $|\Delta s_t^{USD}|$ should not be treated as a causal variable of FX volume.

First, Anderson et al. (2003) showed that FX markets respond to a range of newswire releases and financial market surveys. Our study focuses solely on FOMC meetings as a driver of FX volume, thus an open issue is the FX volume response to FOMC days relative to other forms of news. Second, our sample is dominated by low financial market volatility, see Panetta et al. (2006). Although we conjecture that excess FX trading on FOMC days should increase in a period of greater market turbulence with numerous unscheduled FOMC meetings (i.e., post July 2007), the paucity of observations do not allow us to test for this. Third, the analysis focused on the FX turnover response to 40 FOMC meetings. Event studies on FOMC days range between 10 (see, Ahn and Melvin, 2007) and 199 observations (see, Rudebusch, 1995). Despite working with the largest possible sample, it cannot be excluded that the study's empirical results are subject to a small sample bias.

4. Conclusions

The empirical result that excess FX trading occurs on FOMC days has important implications for how researchers view global financial linkages in currency markets. First, the observation that excess FX turnover is identified

in the spot market after the FOMC meets means that previous attempts to capture FX turnover in select FX markets such as the futures market cannot be representative of global FX trading. Second, the result that FOMC days generate excess FX trading even in the face of monetary policy surprises and absolute price changes says that FOMC meetings are (deterministic) events that unleash considerable portfolio reshuffling. Third, the evidence on excess trading shows that it is difficult to make statements about central bank transparency without knowing what happens to FX volume. Even if central banks communicate transparently (see Blinder et al. (2007)) and a small price response is observed, this should not be necessarily interpreted that international portfolio reshuffling is low.

References

Ahn, Seung Chan and Michael Melvin (2007) "Exchange Rates and FOMC Days," *Journal of Money Credit and Banking* 39(5), pp. 1245-1266.

Almeida, Alvaro, Charles Goodhart, and Richard Payne (1998) "The Effects of Macroeconoic News on High Frequency Exchange Rate Behavior," *Journal of Financial and Quantitative Analysis*, pp. 383-408.

Andersen, Torben G., Tim Bollerslev, Francis X. Diebold, and Clara Vega (2003) "Micro Effects of Macro Announcements: Real Time Price Discovery in Foreign Exchange," *American Economic Review* 93), pp. 38-62.

Bank for International Settlements (2007) "Triennial Central Bank Survey: Foreign Exchange and Derivatives Market Activity in 2007," Basel (preliminary draft).

Bank for International Settlements (2005) "Triennial Central Bank Survey: Foreign Exchange and Derivatives Market Activity in 2004," Basel (March).

Bernanke, Ben S. and Kenneth Kuttner (2005) "What Explains the Stock Market's Reaction to Federal Reserve Policy?," *Journal of Finance* 55, pp. 1221-1257.

Blinder, Alan S., Michael Ehrmann, Marcel Fratzscher, Jakob de Haan, and David-Jan Jansen (2007) "Central Bank Communication and Monetary Policy: A Survey of Theory and Evidence," *Journal of Economic Literature*, forthcoming.

Bomfim, Antulio (2000) "Pre-Announcement Effects, News, and Volatility: Monetary Policy and Stock Market," mimeo.

Bonser-Neal, Catherine, V. Vance Roley, and Gordon H. Sellon, Jr., (1998) "Monetary Policy Actions, Intervention, and Exchange Rates: A Reexamination of the Empirical Relationships Using Federal Funds Rate Target Data," *Journal of Business* 71, pp. 147-177.

Cai, Fang, Edward Howorka, and Jon Wongswan (2007) "International Linkages Across trading Regions: Evidence from Foreign Exchange Markets," *Journal of International Money and Finance*, forthcoming.

Chaboud, Alain, Sergey V. Chernenko, Edward Howorka, Raj S. Krishnasami Iyer, Daivd Liu, and Jonathan H. Wright (2004) "The High-Frequency Effects of U.S. Macroeconomic Data Releases on Prices and Trading Activity in the Global Interdealer Foreign Exchange Market," Board of Governors of the Federal Reserve System, International Finance Discussion Papers, No. 823.

Chaboud, Alain and Blake LeBaron (2001) "Foreign Exchange Market Trading Volume and Federal Reserve Intervention," *Journal of Futures Markets* 21(9), pp. 851-60.

CPSS (2007) "Progress in Reducing Foreign Exchange Settlement Risk," Committee on Payment and Settlement Systems, BIS Basel.

Dominguez, Kathryn M. E. (2003) "The Market Microstructure of Central Bank Intervention," *Journal of International Economics* 59(1), 25-45.

Ehrmann, Michael and Marcel Fratzscher (2005) "Equal Size, Equal Role? Interest Rate Interdependence between the Euro and United States," *Economic Journal* 115, pp. 930-950.

Ehrmann, Michael and Marcel Fratzscher (2004) "Taking Stock: Monetary Policy Transmission to Equity Markets," *Journal of Money, Credit, and Banking* 36, pp. 719-737.

Evans, Martin D.D. and Richard K. Lyons (2005) "Do Currency Markets Absorb News Quickly?' *Journal of International Money and Finance* 24, pp. 197-217.

Fatum, Rasmus and Barry Scholnick (2007) "Monetary Policy News an Exchange Rate Responses: Do Only Surprises Matter?," *Journal of Banking and Finance* forthcoming.

Faust, Jon, John Rogers, Jonathan Wright, and Shing-Yi Wang (2006) "The High-Frequency Response of Exchange Rates and Interest Rates to Macroeconomic Announcements," *Journal of Monetary Economics* 54(1), pp. 1051-11068.

Faust, Jon, John Rogers, Eric Swanson, and Jonathan H. Wright (2003) "Identifying the Effects of Monetary Policy Shocks on Exchange Rates Using High Frequency Data," *Journal of the European Economic Association* 1, pp. 1051-1068.

Goodhart, Charles and Luigi Figliuoli (1991) "Every Minute Counts in Financial Markets," *Journal of International Money and Finance* 10, pp. 23-52.

Gürkaynak, Refet, Brian Sack, Eric Swanson (2005) "Do Actions Speak Louder than Words? The Response of Asset Prices to Monetary Policy Actions and Statements," *International Journal of Central Banking* 1), pp. 55-93.

Hausman, Joshua and Jon Wongswan (2006) "Global Asset Prices and FOMC Announcements," International Finance Discussion Papers, Board of Governors of the Federral Reserve System, No. 886.

Ito, Takatoshi and V. Vance Roley (1987) "News from the U.S. and Japn Which Moves the yen/dollar Exchange Rate?," *Journal of Monetary Economics* 19(2), pp. 255-277.

Jansen, David-Jan and Jokob deHaan (2007) "Were Verbal Efforts to Support the Euro Effective? A High Frequency Analysis of ECB Statements," *European Journal of Political Economy* 23(1), pp. 245-259.

Jones, Charles M., Own Lamont, and Robin L. Lumsdaine (1998) "Macroeconomics News and Bond Market Volatility," *Journal of Financial Economics* 47, pp. 315-337.

Jones, C. M., G. Kaul, M. L. Lipson (1994) "Transactions, Volume and Volatility," *Review of Financial Studies* 7, 631-651.

Karpoff, J. M. (1987) "The Relation Between Price Changes and Trading Volume: A Survey," *Journal of Financial and Quantitative Analysis* 22, 109-126.

Krueger, Joel T., and Kenneth N. Kuttner (1996) "The Federal Funds Futures Rate as a Predictor of Federal Reserve policy," *Journal of Futures Markets* 16, pp. 865-879.

Kuttner, Kenneth N. (2001) "Monetary Policy Surprises and Interest rates: Evidence from teh the Fed Funds Futures Market," *Journal of Monetary Economics* 47, pp. 523-544.

Lyons, Richard K. (2001) "The Microstructure Approach to Exchange Rates," MIT Press.

MacDonald, Ronald and Ian W. Marsh (1996) "Currency Forecasters are Heterogeneous: Confirmation and Consequences," *Journal of International Money and Finance* 15(5), 665-685.

McPortland, John W. (2006) "Foreign Exchange Trading and Settlement: Past and Present," *Chicago Fed Letter* Number 225, February.

Melvin, Michael and Bettina Peiers Melvin (2003) "The Global Transmission of Volatility in the Foreign Exchange Market," *Review of Economics and Statistics* 85(3), pp. 670-679.

Melvin, Michael and Xixi Yin (2003) "Public Information Arrival, Exchange Rate Volatility and Quote Frequency," *Economic Journal* 110(July), pp. 644-661.

Millar, Paul and Carol Ann Northcott (2002) "CLS Bank: Managing Foreign Exchange Settlement Risk," *Bank of Canada Review*, (Autumn) pp. 13-25.

Pakko, Michael R. (2005) "On the Information Content of Asymmetric FOMC Policy Statements: Evidence from a Taylor-Rule Perspective," *Economic Inquiry* 43(3), pp. 558-569.

Panetta, Fabio, Paolo Angelini, Guiseppe Grande, Aviram Levy, Roberto Perli, Pinar Yesin, Stefan Gerlach, Srichander Ramaswamy, and Michela Sctigna (2006) "The Recent Behavior of Financial Market Volatility," *BIS Papers* No. 29, Bank for International Settlements.

Peiers, Betina (1997) "Informed Traders, Intervention, and Price Leadership: A Deeper View of the Microstructure of the Foreign Exchange Market," *Journal of Finance* 52(4), 1589-1614.

Piazzesi, Monika, and Eric T. Swanson (2005) "Futures Prices as Risk-Adjusted Forecasts of Monetary Policy," NBER Working Paper 10547.

Rudebusch, Glenn D. (1995) "Federal reserve Interest Rate Targeting, Rational Expectations, and the Term Structure," *Journal of Monetary Economics* 35(2), pp. 245-274.

Sack, Brian (2002) "Extracting the Expected Path of Monetary Policy from Futures Rates," *Journal of Futures Markets* 34, pp. 733-754.

Sack, Brian, Eric T. Swanson, and Refet S. Gürkaynak (2004) "Market-based Measures of Monetary Policy Expectations," Board of Governors of the Federal Reserve System FEDS WP 2002-40.

Saywer, David (2004) "Continuous Linked Settlement (CLS) and Foreign Exchange Settlement Risk," *Bank of England Financial Stability Review*, (December) pp. 86-92.

Simpson, Marc W., Sanjay Ramchanderaywer, and Mukesh Chaudry (2005) "The Impact of Macroeconomic Surprises on Spot and Forward Exchange Markets," *Journal of International Money and Finance*, (24 pp. 693-718.

Thornton, Daniel L. and David C. Wheelock (2000) "A History of the Asymmetric policy Directive," *Federal Reserve Bank of St. Louis Review* 82(5), pp. 1-16.

Table 1: Residual Properties of the (Filtered) CLS Series (2003-2007)

	CHF	EUR	GBP	JPY	USD
Mean	0.0000	0.0000	0.0000	0.0000	0.0000
Median	-0.0041	-0.0086	-0.0082	-0.0059	-0.0019
Maximum	0.8255	0.6812	0.7091	0.7314	0.6824
Minimum	-0.3899	-0.3804	-0.4282	-0.3711	-0.6525
Std. Dev.	0.1256	0.1220	0.1251	0.1294	0.1194
Skewness	0.7948	0.7676	0.9166	1.2677	0.4614
Kurtosis	7.1409	5.8413	7.0585	8.6141	9.4118
Jarque-Bera	534.4920	318.5398	574.3131	905.9700	1307.8420
Observations	652	733	695	573	745
AC1	0.0400	0.0040	-0.0090	-0.0090	-0.0020
AC2	0.0180	-0.0150	-0.0020	-0.0180	-0.0220
AC3	-0.0100	-0.0130	0.0020	-0.0160	0.0010
AC4	-0.0300	-0.0500	0.0170	-0.0290	-0.0540
AC5	-0.0010	0.0110	-0.0020	-0.0180	-0.0260
AC6	-0.0570	-0.0020	-0.0070	-0.0110	-0.0230
AC7	0.0130	-0.0180	-0.0180	0.0020	-0.0080
AC8	0.0030	0.0000	-0.0330	0.0080	0.0090
AC9	-0.0290	0.0200	0.0210	0.0080	0.0170
AC10	-0.0010	-0.0130	0.0350	0.0110	-0.0250
White test No cross terms	0.0590	0.1791	0.0610	0.0003	0.0098
Cross terms	0.0061	0.9734	0.0061	0.0003	0.0097
ARCH(1)	0.0566	0.0822	0.0089	0.0151	0.0265
ARCH(2)	0.1805	0.2188	0.0928	0.0430	0.1285
ARCH(5)	0.3626	0.1678	0.2562	0.2556	0.4160

Notes: FX volume in USD and filtered with a 66-day moving average trend excluding holidays, futures expiration dates, and seasonality. AC(x) denotes autocorrelation coefficient order x. White test gives the p-values. ARCH(x) p-values of an ARCH test order x. Bold numbers denotes significant at the 5

Table 2: FX Volume and FOMC Meetings

$$nvol_t = \text{const} + \sum_{i=0}^{5} \beta_i FOMC_{t-i} + \sum_{k=1}^{4} \alpha_k Day_k + \sum_{j=1}^{6} \gamma_j nvol_{t-j}$$

currency $nvol_t$	USD	EUR	JPY	GBP	CHF
$FOMC_t$	0.0535**	0.0421	0.0263	0.0219	0.0320
	(0.0207)	(0.0262)	(0.0242)	(0.0277)	(0.0208)
$FOMC_{t-1}$	-0.0009	-0.0003	0.0264	0.0162	0.0035
	(0.0328)	(0.0394)	(0.0437)	(0.0447)	(0.0272)
$FOMC_{t-2}$	-0.0243	-0.0278	-0.0148	-0.0320	-0.0469**
	(0.0286)	(0.0238)	(0.0238)	(0.0284)	(0.0234)
$FOMC_{t-3}$	0.0546**	0.0187	0.0479**	0.0022	0.0100
	(0.0203)	(0.0177)	(0.0239)	(0.0218)	(0.0271)
$FOMC_{t-4}$	0.0449**	0.0342*	0.0452**	-0.0108	0.0041
	(0.0197)	(0.0179)	(0.0213)	(0.0235)	(0.0202)
$FOMC_{t-5}$	-0.0300	-0.0461*	-0.0054	-0.0079	-0.0205
	(0.0221)	(0.0277)	(0.0274)	(0.0263)	(0.0252)
Number of Obs.	745	804	643	763	804
R^2	0.421	0.540	0.452	0.473	0.449

Notes: $nvol_t$ is FX volume for five currencies (USD, EUR, JPY, GBP, CHF), $FOMC_t$ is a dummy for FOMC days, and Day_k is a day-of-the-week dummy. Only the coefficients for $FOMC_t$ in the above regression are shown. * and ** denotes significance at the 10% and the 5% level. Standard errors are White heteroskedastic consistent standard errors. Sample is from 1.1.2003 to 31.12.2007.

Table 3: FX Volume and BoJ, ECB, and BoE Meetings

$$nvol_t = \text{const} + \sum_{i=0}^{5} \beta_i CB_{t-i} + \sum_{k=1}^{4} \alpha_k Day_k + \sum_{j=1}^{6} \gamma_j nvol_{t-j}$$

currency $nvol_t$	USD	USD	USD	EUR	JPY	GBP
Central Bank Meeting CB_t	ECB	BoJ	BoE	ECB	BoJ	BoE
CB_t	-0.0709**	0.0198	-0.0213	-0.0624*	-0.0248	0.0054
	(0.0299)	(0.0230)	(0.0214)	(0.0329)	(0.0308)	(0.0218)
CB_{t-1}	0.0161	0.0322	-0.0421**	-0.0120	0.0317	-0.0543**
	(0.0267)	(0.0238)	(0.0179)	(0.0305)	(0.0351)	(0.0189)
CB_{t-2}	-0.0169	0.0253	0.0241	0.0159	-0.0047	0.0396
	(0.0316)	(0.0251)	(0.0238)	(0.0218)	(0.0380)	(0.0286)
CB_{t-3}	-0.0073	-0.0344	0.0251	-0.0126	-0.0038	-0.0233
	(0.0163)	(0.0282)	(0.0239)	(0.0208)	(0.0334)	(0.0300)
CB_{t-4}	-0.0060	-0.0375	0.0250	0.0058	-0.0342	0.0078
	(0.0197)	(0.0272)	(0.0213)	(0.0214)	(0.0318)	(0.0346)
CB_{t-5}	-0.0192	-0.0424	-0.0028	-0.0403	-0.0141	0.0156
	(0.0191)	(0.0324)	(0.0274)	(0.0259)	(0.0319)	(0.0214)
Number of Obs.	745	810	810	768	643	760
Number of CB meetings	55	38	52	55	38	52
R^2	0.452	0.447	0.452	0.549	0.452	0.474

Notes: $nvol_t$ is FX volume for four currencies (USD, EUR, JPY, GBP), CB_t is a dummy for three central bank meetings (ECB, BoJ, BoE) and Day_k is a day-of-the-week dummy. Only the coefficients for CB_t in the above regression are shown. * and ** denotes significance at the 10% and the 5% level. Standard errors are White heteroskedastic consistent standard errors. Sample is from 1.1.2003 to 31.12.2007.

Table 4: USD Volume and FOMC Type

$$nvol_t = \text{const} + \sum_{i=0}^{5} \beta_i FOMC^*_{t-i} + \sum_{k=1}^{4} \alpha_k Day_k + \sum_{j=1}^{6} \gamma_j nvol_{t-j}$$

	(1)	(2)	(3)	(4)	(5)
$FOMC^*_t$	All ($FOMC_{t-i}$)	Change in FF	No Change in FF	non neutral leanings	neutral leanings
$FOMC^*_t$	0.0535**	0.0809**	0.0227	0.0806**	0.0202
	(0.0207)	(0.0262)	(0.0287)	(0.0257)	(0.0346)
$FOMC^*_{t-1}$	-0.0009	0.03989	-0.0068	0.0404	0.0092
	(0.0328)	(0.0588)	(0.0258)	(0.0510)	(0.0358))
$FOMC^*_{t-2}$	-0.0243	-0.0586	0.0353	-0.0291	-0.0430
	(0.0286)	(0.0429)	(0.0272)	(0.0491)	(0.0360)
$FOMC^*_{t-3}$	0.0546**	0.0721**	0.0476**	0.0737**	-0.0243
	(0.0203)	(0.0177)	(0.0209)	(0.0345)	(0.0362)
$FOMC^*_{t-4}$	0.0449**	0.0647**	0.0675**	0.1001**	0.0217
	(0.0197)	(0.0179)	(0.0265)	(0.0296)	(0.0411)
$FOMC^*_{t-5}$	-0.0300	0.0148	0.0004	0.0301	0.0815**
	(0.0221)	(0.0255)	(0.0306)	(0.0283)	(0.0416)
Number of Obs.	745	745	745	745	745
Number of FOMC meetings	40	18	22	19	21
R^2	0.421	0.417	0.406	0.417	0.413

Notes: $nvol_t$ is USD volume only, $FOMC^*_t$ is a dummy for FOMC days and the following conditions (FOMC day, change in the federal funds rate target (FF), no change in the federal funds rate target, non neutral leaning, neutral leaning) and Day_k is a day-of-the-week dummy. Only the coefficients for $FOMC^*_t$ in the above regression are shown. * and ** denotes significance at the 10% and the 5% level. Standard errors are White heteroskedastic consistent standard errors. Sample is from 1.1.2003 to 31.12.2007.

Table 5: USD Volume and FOMC Shocks

$$nvol_t = \text{const} + \sum_{i=0}^{5} \omega_i FOMC_{t-i}{}^*|\epsilon_{t-i}^{FF}| + \sum_{f=0}^{5} \kappa_f |\epsilon_{t-f}^{FF}| + \sum_{g=0}^{5} \beta_g FOMC_{t-g} + \sum_{h=0}^{5} \delta_h |\Delta s_{t-h}^{USD}| + \sum_{k=1}^{4} \alpha_k Day_k + \sum_{j=1}^{6} \gamma_j nvol_{t-j}$$

	(1)	(2)	(3)	(4)	(5)	(6)
restrictions in (4)	$\delta_h = \beta_g = \kappa_f = 0$	$\delta_h = \kappa_f = 0$	$\delta_h = \beta_g = 0$	$\delta_h = 0$	$\beta_g = 0$	none
$FOMC_t{}^*\|\epsilon_t^{FF}\|$	0.4554**	0.3070**	0.8330	0.6454	1.0642*	0.8403
	(0.1577)	(0.1089)	(0.6154)	(0.5975)	(0.6005)	(0.5827)
$FOMC_{t-1}{}^*\|\epsilon_{t-1}^{FF}\|$	0.6765	0.8708	1.1243	1.4632	1.3032	1.5819
	(1.3754)	(1.3572)	(1.5095)	(1.4856)	(1.5391)	(1.5171)
$FOMC_{t-2}{}^*\|\epsilon_{t-2}^{FF}\|$	1.1447	1.7143	1.8773	2.0417	1.7391	1.8860
	(1.1835)	(1.3882)	(1.3337)	(1.3328)	(1.2564)	(1.2594)
$FOMC_{t-3}{}^*\|\epsilon_{t-3}^{FF}\|$	2.3689**	2.0502**	1.9988**	1.9303**	2.0571**	1.9303**
	(0.5606)	(0.5974)	(0.83332)	(0.8541)	(0.8321)	(0.8527)
$FOMC_{t-4}{}^*\|\epsilon_{t-4}^{FF}\|$	1.2539	0.6123	1.3207	1.3750	1.0528	1.0989
	(0.7832)	(0.7081)	(0.9928)	(0.9610)	(0.9074)	(0.8918)
$FOMC_{t-5}{}^*\|\epsilon_{t-5}^{FF}\|$	-0.0571	-0.0037	0.0252	0.0935	0.2653	0.3050
	(0.4309)	(0.4916)	(0.6374)	(0.6181)	(0.6348)	(0.6138)
Sig. Test (p-value)						
$\Sigma_{f=0}^{5} \kappa_f \|\epsilon_{t-f}^{FF}\|$			0.813	0.918		
$\Sigma_{h=0}^{5} \delta_h \|\Delta s_{t-h}^{USD}\|$					0.090	0.016
$\Sigma_{g=0}^{5} \omega_g FOMC_{t-g}$		0.050		0.070		0.012
Number of Obs.	745	745	745	745	745	745
R^2	0.412	0.422	0.414	0.428	0.423	0.436

Notes: $nvol_t$ is USD volume, $FOMC_t$ is a dummy for FOMC days, $|\epsilon_t^{FF}|$ is the absolute value of federal funds rate shock defined by Kuttner (2001), $|\Delta s_t^{USD}|$ is the absolute daily price change in (trade weighted) US dollar, and Day_k is a day of the week dummy. Only the coefficients for $FOMC_t{}^*|\epsilon_t^{FF}|$ in the above regression are shown. Sig. Test is an F-test for the significance of the listed variables and their lags (p-values are shown). * and ** denotes significance at the 10% and the 5% level. Standard errors are White heteroskedastic consistent standard errors. Sample is from 1.1.2003 to 31.12.2007.

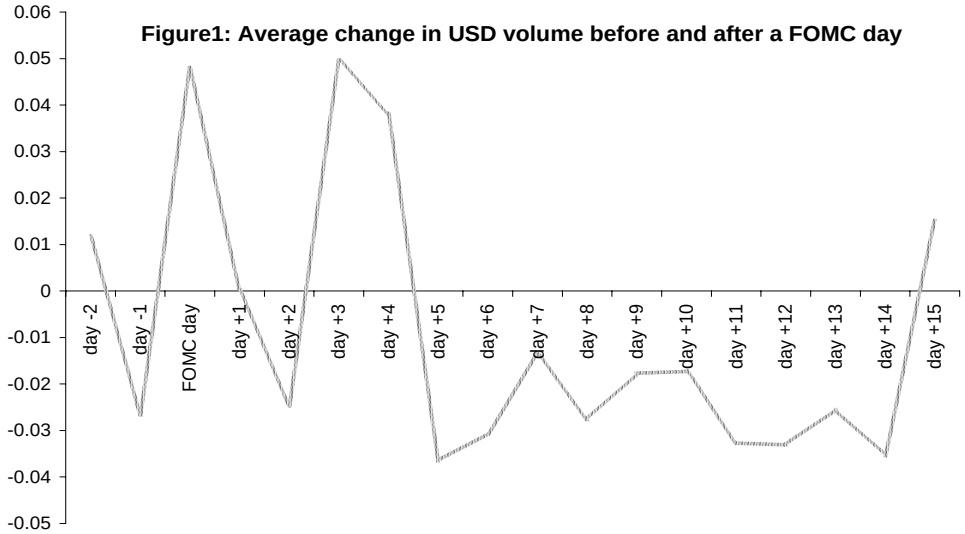
Figure1: Average change in USD volume before and after a FOMC day
0.06
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
-0.05
day -2
day -1
FOMC day
day +1
day +2
day +3
day +4
day +5
day +6
day +7
day +8
day +9
day +10
day +11
day +12
day +13
day +14
day +15