High Frequency Analysis of Macro News Releases on the Foreign Exchange Market: A Survey of Literature ☆

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A B S T R A C T

Most previous literature focuses on proving market impacts of macro news and price discovery process of the FX market. In general, the literature is divided into two camps. The first one attempts to explain directions of exchange-rate changes (the first moments). The second one attempts to explain exchange rate volatility (the second moments). There are many studies addressing the first camp of research, while there is a limited number of studies addressing the second camp of research. In the future, researchers may further investigate the following issues regarding the release of macro news: (a) their impacts on FX volatility; (b) their impacts on FX derivatives; (c) profitability of trading strategies arising from news releases; (d) price patterns associated with selected news announcements, non-scheduled news and selected headline news; and (e) machine learning on the impacts with advanced computer technologies.

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1. Introduction

Asset prices are affected by arrivals of new information. This is one of the accepted cornerstones of modern finance theory and provides a foundation for a rich literature on the role of information in financial markets [1,19]. One stream of the literature focuses on effects of macroeconomic data announcements on various markets including equities, bonds, and currencies. Macroeconomic data announcements are always used to test market efficiency and rational expectations hypotheses and, more recently, to investigate the microstructure of financial markets and the role of information in the formation of asset prices. Many related studies confirm that macroeconomic data announcements have significant impacts on financial markets, although their impacts vary across markets and types of announcements. There is a growing interest in studying market impacts of economic data releases in the last decade, both among academics and professional market participants. In particular, it interests those monitoring financial markets, such as central banks using asset prices to gauge investors' macroeconomic expectations, and fund managers and traders exploring trading opportunities from prices fluctuations. Among all asset classes, foreign exchange (thereafter "FX') has much stronger association with macroeconomic news announcements than oth-

ers. One reason is that FX prices are mostly driven by fundamental factors of an economy and economic policies of governments.

This paper aims to survey literature on the impacts of macroeconomic news release on the FX market from both academic and industry participants' point of view. This is the first survey paper on this subject in the FX market. Although Menkhoff [21] provides very good literature review on high-frequency analysis of macro news intervention from mid-1990s to 2008, the paper focuses on the central bank interventions rather than impacts of macro news. Its review covers studies ending in 2008. Almost all the papers we review are published after 2000, especially after the 2008 crisis. The FX market has undergone remarkable changes in its microstructure after the financial crisis in 2008. Our survey on literature after 2008 in this regard can provide researchers up-to-date insights about the subject matter.

There are several fundamental microstructure changes in the FX market after 2008. First, daily trading volume of the FX market has increased substantially from 1.9 trillion USD to 5.3 trillion USD since 2009. Second, many institutional investors now focus on algorithmic trading strategies that rely heavily on big data analysis and/or high-speed trading technologies. A recent survey shown about 48% investment strategies are algorithmic trading strategies. About 30% are traditional discretionary strategies and the last about 22% are purely "buy and hold". Third, with easy access to online trading platforms, retail investors play an increasing role in the FX market. Today around 30% daily volumes come from retail investors who tend to have their investment behavior different from institutional investors. Therefore, research papers before the 2008 crisis may have little reference value to the FX market.

Both financial news analysis and high frequency trading data analysis are now required to deal with massive amount of both structured and unstructured data on real time basis. Financial news in global media has huge coverage both in depth and breadth included. New publications include online editions of newspapers, journals and trade magazines, specialist financial news sites, trading platforms and blogs. All these mean that investors applying news analytics to enhance returns and to manage risk from systematic or discretionary applications encounter big data issues. Theories and methodologies regarding big data analysis can be intensively applied to research on this subject matter.

Overall speaking, if one wants to study short-horizon price behavior, to conduct big data analysis on the FX market, and to develop algorithmic trading strategies for FX, this literature review will be a good reference. Also, those surveyed findings of this paper can provide researchers insights for future study in big data analysis and financial research.

The remaining of the paper is organized as follows. The next section will review selected research papers one by one in two categories: macro news impact on FX rates only and macro news impact not only on FX rates but also volatility (or volatility only). Contributions and limitations of each paper will be discussed. The last section will provide summary and future research directions. For making easy search and reference, we list all the papers reviewed in Table 1 at the end of this paper, which summarizes more details of the papers, such as data period and frequency, FX pairs, types of news, and models.

2. The literature

As mentioned before, Menkhoff [21] surveys literature on high-frequency analysis of macro news intervention from the mid-1990s to 2008. This paper summarizes evidence for the debate on transmission channels of intervention: the portfolio balance channel and the signaling channel. The signaling channel regards interventions as a tool to signal information to market participants. The volume of government interventions may not matter on price changes. The paper seems to confirm that macro news has greater impact in the FX market than central bank interventions. This paper applies high-frequency data and allows better identification of the impacts from interventions. Intraday data focuses on a narrow time window which may contain less noise. In other words, there may be less influence from other news on exchange rates during the day. Such an approach can mitigate the endogeneity problem of interventions.

This literature has two branches. The first addresses the direction of exchange-rate changes (the first moments) and the second, later branch addresses exchange-rate volatility (the second moments).

2.1. Impacts on FX rates

Andersen, Bollerslev, Diebold and Vega [2] focus mainly on intraday FX prices and studies how fundamental news is incorporated into FX prices. It shows that conditional mean adjustments of exchange rates to news occur quickly, effectively amounting to "jumps," in contrast to conditional variance adjustments, which are much more gradual, and that an announcement's impact depends on its timing relative to other related announcements, and on whether the announcement time is known in advance. It also finds that adjustment responses are characterized by a sign effect: bad news show greater impact than good news. The study provides insights on the association between news announcements, price discovery and asset volatility.

Andersen, Bollerslev, Diebold and Vega [3] further investigate the above-mentioned issues and find that announcement surprises

produce conditional mean jumps and supports the argument that high-frequency stock, bond and exchange rate dynamics are all linked to fundamentals. The paper documents highly-significant contemporaneous cross-market and cross-country linkages are not fully explained by the macroeconomic announcement effects by using a "structural GARCH" estimation approach. This paper studies tick-by-tick FX futures return data and estimates a system of equations using the two five-minute returns before each announcement and eighteen five-minute returns in the one-and-a-half-hour immediately following each announcement. Its conclusions are very enlightening because of limited number of research papers studying tick-by-tick data.

Ehrmann and Fratzscher [10] argue that standard or fundamentals-based models of the exchange rate usually have their shortcomings of not studying the true information that market participants get access to and make trading decisions with. This paper analyzes the link between economic fundamentals and exchange rates using a linear regression model. It finds that the importance of US macroeconomic news is partly explained by their earlier release time than that of the news relating to German and euro area. It shows that exchange rates respond more strongly to news in periods of higher market uncertainty and when negative or large shocks occur. Overall, the model of the paper, which is based on real-time data, explains around 75% of monthly directional changes of the USD/EUR exchange rate, although it does not explain adequately the magnitude of the exchange rate returns. This paper differs from others in a way that it does not use high frequency data. It mainly studies daily FX prices. The results may be more valuable to most investors such as mutual funds, pension funds, and retail investors because they mostly do not apply high-frequency trading strategies. The paper provides two reasons why it does not choose high-frequency data but choose daily data. First, there is evidence that some German releases are "leaked" to the markets prior to their official release time. A second reason is that the full reaction of asset prices to news may not occur immediately. For instance, the news may be incorporated gradually into FX prices over subsequent minutes or even hours. This implies that permanent effect of news on exchange rates may be different from initial and immediate price reactions. However, the real-time data model of the paper does a good job in explaining the direction of FX price change but not their magnitude. Their results may be explained by their use of daily data because the biggest jumps always happen right after news releases and the market prices may then revert. With daily data alone, the paper may have missed all the biggest price jumps.

In the period of 2003–2007, trading volume involving algorithmic grows by 60 percent for euro–dollar and dollar–yen trading, and to about 80 percent for euro–yen trading. Strategies designed to automatically react to news and data releases are still under-developed in the FX market before 2008. Chaboud, Chiquoine, Hjalmarsson and Vega [8] analyze effects of algorithmic (computer) trades and non-algorithmic (human) trades on the informational efficiency of FX prices. This is the first publicly-known empirical study on this subject in the FX market. Both the reduced-form and structural-form VAR estimations of the paper show that algorithmic trading activity causes a reduction in the number of triangular arbitrage opportunities and foreign exchange price discovery. This result is consistent with the view that algorithmic trading improves informational efficiency by speeding up price discovery, but that, at the same time, it may increase the adverse selection costs to slower traders. The paper also finds evidence that algorithmic traders do not trade with each other as much as a random matching model would predict. This may be due to the fact that many algorithmic trading strategies are highly correlated. Overall speaking, this paper makes remarkable contribution to this research topic and provides useful results and future research directions. However, the paper makes a couple of implausible assumptions