APPENDIX

Summary of the Literature on Estimating Announcement Effects on the Conditional Mean of Exchange Rate Returns

Reference	Abstract/Description*
Dornbusch (1980)	The main lessons that emerge from the analysis concern the inadequacy of the monetary approach as a complete theory of exchange rate determination, the central role of the current account in influencing exchange rates…and finally, the conclusion that an interest rate policy not oriented toward the external balance has aggravated exchange rate instability.
Frenkel (1981)	This paper…analyzes the efficiency of the foreign-exchange market and the volatility of exchange rates, as well as the relationships between exchange rates and interest rates. A key distinction is made between anticipated and unanticipated events, and it is shown that the key factor affecting exchange rates has been "news."
Cornell (1982)	This paper presents a test of the joint hypothesis that money supply announcements affect the real interest rate and that changes in the real interest rate affect the exchange rate in the short run. The test results are consistent with the joint hypothesis. For example, it is found that announcement of an unexpected jump in the money supply is accompanied by an increase in interest rates and an appreciation of the dollar. If the rise in interest rates was entirely due to higher inflationary expectations, the dollar should not appreciate.
Edwards (1982a)	A multi-currency model is established to investigate the relationship between spot rates, forward rates, and new information. In a world with more than two countries, the error term will be correlated across rates. Exchange rates can be expressed as a function of factors known in advance, and "news."
Edwards (1982b)	This paper uses a multi-currency approach to analyze the relationship between forward exchange rates, future spot rates and new information. The empirical results tend to support the hypothesis that the exchange rate can be expressed as a function of factors known in advance and "news."
Cornell (1983)	…[M]oney supply announcements have an impact on the real rate, but they do not allow us to conclude that monetary shocks affect the real rate. This apparent paradox arises because the announcements also function as signals which reveal information about real variables such as expected future output and risk preferences. Further tests, using data in addition to money supply announcements, are required to separate those hypotheses that rely on the signaling effect from those which assume that money affects the real rate.

NOTE: *Excerpts are directly from the original sources. Unless stated otherwise, announcements are for the United States.

Asset	Moment/Effect	Sample	Data frequency	Macro announcement(s)
USD/JPY USD/DEM USD/TW index	Conditional mean	July 1973– December 1979	Monthly	U.S.: CA, GDP Canada: CA, GDP France: CA, GDP Germany: CA, GDP Japan: CA, GDP U.K.: CA, GDP
USD/GBP USD/FRF USD/DEM	Conditional mean and volatility	June 1973–July 1979	Monthly	Changes in interest rates proxy for news
USD/GBP USD/CAD USD/DEM USD/JPY USD/CHF	Conditional mean	October 1979– December 1981	Daily	M1
USD/GBP USD/FFR USD/DEM USD/ITL	Conditional mean	July 1973– September 1979	Monthly	U.S.: CPI, M1, IP U.K.: CPI, M1, IP France: CPI, M1, IP Germany: CPI, M1, IP Italy: CPI, M1, IP
USD/GBP USD/FRF USD/DEM USD/ITL	Conditional mean	June 1973– September 1979	Monthly	U.S.: GDP, M1 U.K.: GDP, M1 France: GDP, M1 Germany: GDP, M1 Italy: GDP, M1
USD/DEM	Conditional mean	January 1978– December 1981	Daily	M1

The following abbreviations are used for announcements: BI, Business Inventories; CA, Current Account; CC, Consumer Credit; CCI, Consumer Confidence Index; CPI, Consumer Price Index; CS, Construction Spending; CU, Capacity Utilization; DG, Durable Goods Order; FB, Federal Budget; FF, Federal Funds Target; FI, Factory Inventories; FO, Factory Orders; FOMC, Federal Open Market Committee; GB; Government budget; GD, Government Deficit; GDP, Gross Domestic Product; GNP, Gross National Product; HS, Housing Starts; IC, Installment Credit; Ifo Index; Ifo Business Climate Institute; INSEE, French International Institute for Statistics and Economic Studies; IP, Industrial Production; ISM, Institute for Supply Management Manufacturing index; IUC, Initial Unemployment Claims; LI, Index of Leading Indicators; M1; M2; M3; M4; MI, Michigan Sentiment; MO, Manufacturing Orders; MPC, Monetary Policy Committee (UK); MTB, Merchandise Trade Balance; NAPM, National Association of Purchasing Managers Survey; NFP, Nonfarm Payroll Employment; NHS, New Home Sales; PCE, Personal Consumption Expenditures; PI, Personal Income; PMI, Chicago Purchasing Managers' Index; PPI, Producer Price Index; RPIX, Retail Prices Index excluding mortgage interest payments; RS, Retail Sales, TANKAN, quarterly poll of business confidence reported by the Bank of Japan; TB, Trade Balance; UR, Unemployment Rate; WPI, Wholesale Price Index. The following abbreviations are used for currencies: ARS, Argentinean nuevo peso; AUD, Australian dollar; CAD, Canadian dollar; CHF, Swiss franc; DEM, Deutsche Mark; EUR, euro; FRF, French franc; GBP, British pound sterling; ITL, Italian lira; JPY, Japanese yen; TW, trade-weighted; USD, U.S. dollar.

Cont'd

APPENDIX, cont'd

Summary of the Literature on Estimating Announcement Effects on the Conditional Mean of Exchange Rate Returns

Reference	Abstract/Description*
Engel and Frankel (1984)	When the Fed announces a money supply greater than had been expected, interest rates rise. Why? One explanation is that the market raises its estimate of the future rates of money growth and inflation, and bids up nominal interest rates. We offer contrary evidence: on such days the dollar appreciates, not depreciates. An alternative explanation is that the market perceives the change in the money stock as a transitory fluctuation that the Fed will reverse in the future. The anticipated future tightening raises today's real interest rate, causes a capital inflow, and appreciates the dollar, the result in fact observed.
Hardouvelis (1984)	…[T]he Fed did gain credibility [after October 1979], but was unable to establish full credibility. The market reactions are consistent with the hypothesis that market participants attached a positive probability to the event that the Fed may at some point in the future abandon its money stock targets.
Doukas (1985)	The aim of this paper is to determine if the observed volatility in the exchange rate of Canadian and U.S dollars (C$/US$) is consistent with the information content of weekly money supply announcements… The results obtained support the hypothesis that money supply announcements do contain important new information for the foreign exchange market and that it is only the unanticipated component of the money supply changes which affects the exchange rate immediately after the announcements. The most interesting finding is that the current exchange rate is more sensitive to U.S. than Canadian money supply announcements.
Hakkio and Pearce (1985)	The results indicate that exchange rates are systematically related to unexpected money announcements after the October 1979 switch in Federal Reserve operating procedures but not before. This response does not appear to have changed, however, after the October 1982 Federal Reserve regime change. Short-run exchange rate movements are not systematically related to news on inflation or real activity.
Ito and Roley (1987)	The results indicate that the dollar tended to appreciate in the New York segment and depreciate in the European segment…The volatility of the exchange rate also differed across markets. Finally, in examining the relative effects of news from the United States and Japan explicitly, U.S. money announcement surprises had the most consistent effects.
Tandon and Urich (1987)	This paper presents empirical evidence relating the announcement effects of U.S. money supply and inflation (CPI and PPI) to Eurocurrency interest rates and the foreign currency markets (both spot and forward) for seven industrial countries over the period 1977-82…unanticipated components of announced changes in money supply have a significant positive effect on Eurocurrency interest rates and a negative effect (implying dollar appreciation) on the spot exchange rates…Unanticipated changes in PPI have a positive significant effect on interest rates, a small surprisingly negative impact on spot exchange rates, and a positive effect on gold prices. The CPI has no effect on either market.
Deravi, Gregorowicz, and Hegji (1988)	We believe three conclusions clearly emerge…First, during the early subsample, that is prior to 1985, there is little evidence of response in foreign exchange markets to the monthly balance of trade announcement. Second, during the post-1985 period there is strong evidence of market response to trade deficit announcements. The response was a depreciation of the dollar in both the spot and forward markets. Finally, the widening of the forward premiums in response to the trade deficit announcements in the post-1985 period suggests that part of the market reaction to these announcements is an anticipation of changing U.S. foreign interest rate differentials

See NOTE on pp. 446-47.

Asset	Moment/Effect	Sample	Data frequency	Macro announcement(s)
USD/DEM	Conditional mean	October 1979–August 1981	Daily	M1
USD/GBP USD/CAD USD/DEM USD/JPY USD/CHF USD/FRF	Conditional mean	October 1977–October 1979 and February 1980–June 1982	Daily	M1
USD/CAD	Conditional mean	January 1974–December 1978	Daily	US: M1 Canada: M1
USD/DEM USD/GBP USD/FRF USD/CHF USD/CAD USD/ITL USD/JPY	Conditional mean	September 1977–March 1984	3 Prices per day	M1, CPI, PPI, UR, IP
USD/JPY	Conditional mean	January 1980–September 1985	5 Prices per day	Japan: Augmented M2, IP, Wholesale Price Index US: M1, IP, PPI
USD/GBP USD/CAD USD/DEM USD/FRF USD/JPY USD/CHF	Conditional mean	July 1977–December 1982	Daily	M1, CPI, PPI
USD/FRF USD/GBP USD/DEM USD/CAD USD/JPY USD/CHF	Conditional mean	February 1980–July 1987	Daily	MTB

Cont'd

APPENDIX, cont'd

Summary of the Literature on Estimating Announcement Effects on the Conditional Mean of Exchange Rate Returns

Reference	Abstract/Description*
Hardouvelis (1988)	Markets respond primarily to monetary news, but also to news about the trade deficit, domestic inflation, and variables that reflect the state of the business cycle. For all fifteen macroeconomic variables, an increase (decrease) in interest rates is accompanied by an appreciation (depreciation) of the dollar, which is consistent with models that stress price rigidity and absence of purchasing power parity.
MacDonald and Torrance (1988)	The main aim of this paper was to test whether the policy anticipation or the Fisher hypothesis held sway for the U.K.'s experience with monetary targeting in the period 1981-1985. The evidence fairly convincingly suggested that the policy anticipation hypothesis was the dominant market belief about monetary overshoots for this period: excess monetary growth was expected to be reversed in the future. This finding concurs with the U.S. experience with monetary targeting over roughly the same period of time.
Deravi, Gregorowicz, and Hegji (1989)	…[T]here is a general lack of response in financial markets to the Treasury's debt funding announcements… the Treasury's immediate financing needs over the post announcement quarter may not provide as much important information to market participants as other types of announcements, e.g., money supply announcements or the announcements of the Federal government budget projections. Monetary announcements provide information about future monetary policy, while Federal budget projections provide information about anticipated new issues of Treasury debt over the next one- or two-year horizon. Both types of information are linked to possible future policy moves that might signal large market adjustments.
Irwin (1989)	The effect of U.S. trade deficit announcements on the dollar exchange rate from 1980-1988 is examined. The announcement is found to affect the dollar only after mid-1984. Central bank intervention does not appear to have had a consistent impact on the dollar on the day of the announcement.
Hogan, Melvin, and Roberts (1991)	Contrary to earlier studies, surprisingly large US trade deficits are shown to have a significant effect on exchange rates throughout the 1980s. Three possible reasons for the time-varying effect are considered. The evidence presented yields the following inference: deficit news is likely to have changed expectations of Fed intervention that moved exchange rates; deficit news probably has an effect on revisions of future deficit expectations and exchange rates change as a result; and deficit news may change expectations regarding US trade policy that is reflected in exchange rates.
Klein, Mizrach, and Murphy (1991)	…[W]e analyze daily data on U.S. dollar exchange rates vis-à-vis the West German deutsche mark and the Japanese yen over the period 1980 to 1988. We employ an event-study methodology in order to determine the response of exchange rates to unexpected movements in the U.S. trade balance…[P]rior to the Plaza Agreement (September 1985) there is no systematic response of dollar exchange rates to unexpected movements in the trade balance, whereas following the Agreement there is a strong contemporaneous response. This evidence…supports the conclusions of Dominguez (1989) and Obstfeld (1988) that the period following the Plaza Agreement has represented a shift in the policy regime among the industrial countries.
Aggarwal and Schirm (1992)	…[P]rior to the 1985 "Plaza Agreement" for international economic cooperation, information in trade balance announcements seem to have influenced only interest rates. However, in the 1985- 87 period such announcements also influenced stock prices and currency values. These influences intensify further in the 1987-88 period. Thus, asset prices are sensitive to news in trade balance announcements and this sensitivity seems to have increased significantly in recent years.

See NOTE on pp. 446-47.

Asset	Moment/Effect	Sample	Data frequency	Macro announcement(s)
USD/DEM USD/JPY USD/CHF USD/GBP USD/FRF USD/CAD USD/ITL	Conditional mean	October 1979– August 1984	Daily	M1, Bank Reserves, FF, Fed Surcharge Rate, PPI, CPI, UR, IP, PI, DG, RS, LI, CC, HS, TB
GBP/DEM GBP/FRF GBP/JPY GBP/CHF GBP/USD	Conditional mean	October 1981– August 1985	Daily	UK: M3
USD/JPY USD/DEM USD/CHF USD/FRF USD/GBP USD/ITL USD/CAD	Conditional mean	July 1975– September 1985	Daily	Treasury Debt Issues
USD/TW index	Conditional mean	January 1980– June 1988	Daily	TB
USD/GBP USD/JPY USD/DEM	Conditional mean	February 1980 –March 1989	3 Prices per day	TB
USD/JPY USD/DEM	Conditional mean	January 1980– April 1988	Daily	TB
USD/CAD USD/DEM USD/JPY	Conditional mean	February 1980– December 1988	Daily	TB

Cont'd

APPENDIX, cont'd

Summary of the Literature on Estimating Announcement Effects on the Conditional Mean of Exchange Rate Returns

Reference	Abstract/Description*
Beck (1993)	…Conclusive evidence of a relationship between large budget deficits and high interest rates has not been found. Two competing explanations are tested by examining the impact of government budget announcements on foreign exchange rates. The Ricardian equivalence proposition that deficits have no crowding-out effects is compared to the conventional open economy hypothesis that capital mobility transfers these effects to foreign exchange rates. The results support the open economy hypothesis over the Ricardian equivalence proposition.
Ederington and Lee (1993)	…[A]nnouncements are responsible for most of the observed time-of-day and day-of-the-week volatility patterns in these markets. While the bulk of the price adjustment to a major announcement occurs within the first minute, volatility remains substantially higher than normal for roughly fifteen minutes and slightly elevated for several hours.
Ederington and Lee (1994)	We find that these announcements are responsible for most intraday and day-of-the-week volatility patterns in this market and we identify the most important announcements. The initial reaction to a major 8:30 announcement begins around 8:30:10 and lasts until about 8:30:50. A partial price correction is normally observed between 8:31 and 8:32. Price movements after 8:32 are basically independent of those observed earlier although volatility continues to be higher than normal until about 8:55.
Sultan (1994)	The objective of this study is to analyze the effects of trade deficit announcements on the joint distribution of the spot and futures price changes. In addition, this study examines whether or not trade deficits and trade surpluses have asymmetric effects on the currency price changes and volatility.
Ederington and Lee (1995)	We examine how prices in interest rate and foreign exchange futures markets adjust to the new information contained in scheduled macroeconomic news releases in the very short run. Using 10-second returns and tick-by-tick data, we find that prices adjust in a series of numerous small, but rapid, price changes that begin within 10 seconds of the news release and are basically completed within 40 seconds of the release. There is some evidence that prices overreact in the first 40 seconds but that this is corrected in the second or third minute after the release. While volatility tends to be higher than normal just before the news release, there is no evidence of information leakage.
Harris and Zabka (1995)	Specifically, we compare the data announced in the report to the consensus forecasts of market practitioners and quantify how surprises in the report affect the major exchange markets over the trading day.
Karfakis and Kim (1995)	[T]he Australian dollar depreciated and interest rates rose as a result of an announcement of a larger than expected current account deficit…[M]arket participants expected a foreign exchange market intervention sale of the Australian dollar by the Reserve Bank of Australia…In addition, significant structural breaks were found.
Moorthy (1995)	1) [E]xchange rates display a large response to the unanticipated component of the [monthly employment] news 2) [T]here is evidence of delay in the exchange rate response after a news release, although not strong enough to suggest a violation of market efficiency
Puffer (1995)	A surprisingly large trade deficit is associated with expectations of larger future trade deficits. Unexpected bilateral trade balances and revisions of previous overall balances which are released at the same time as the overall trade deficit significantly influence the Canadian dollar.

See NOTE on pp. 446-47.

Asset	Moment/Effect	Sample	Data frequency	Macro announcement(s)
USD/DEM USD/GBP USD/CAD USD/JPY USD/CHF USD/FRF USD/ITL	Conditional mean	January 1980– July 1990	Daily	GD, M1
USD/DEM	Conditional mean and volatility	November 1988– November 1991	5-minute	CPI, DG, NFP, GNP, HS, MTB, LI, PPI, RS, IP, CU, BI, CS, FI, NAPM, NHS, PI, FB, IC
USD/JPY	Conditional mean and volatility	November 1988– June 1993	10-second, 5-minute, 30-minute	CPI, DG, NFP, GNP, HS, LI, MTB, PPI, RS, IP, CU, BI, CS, FI, NAPM, NHS, PI, Summary of International Transactions, U.S. Import and Export Price Indexes, FB, IC
USD/CHF USD/CAD USD/DEM USD/JPY USD/GBP	Conditional mean and volatility	February 1980– April 1989	Daily	TB
USD/DEM	Conditional mean and volatility	November 1988– October 1992	10-second	CPI, DG, NFP, UR, GNP, HS, LI, MTB, PPI, RS, IP, CU, BI, CS, FI, NAPM, NHS, PI, PCE, FB
USD/DEM USD/GBP USD/FRF USD/ITL USD/CAD USD/JPY	Conditional mean	January 1986– March 1995	Daily	NFP, UR
AUD/USD AUD/DEM AUD/JPY AUD/GBP AUD/CHF	Conditional mean	July 1985– December 1992	Daily	Australia: CA
USD/DEM USD/JPY	Conditional mean	January 1985– September 1992	Daily	NFP, UR
USD/CAD USD/DEM USD/JPY USD/GBP	Conditional mean	February 1980– December 1992	Daily	TB

Cont'd

APPENDIX, cont'd

Summary of the Literature on Estimating Announcement Effects on the Conditional Mean of Exchange Rate Returns

Reference	Abstract/Description*
Sheehan and Wohar (1995)	…[W]e extend and update the prior literature by examining whether recent money supply announcements have an impact on exchange rates and whether recent impacts differ from those found through 1985. The results suggest the impact of money announcements may have diminished marginally. Third, we extend the analysis to exchange rate currency futures. Comparing the reactions of spot and futures rates yields further evidence on the "policy anticipation" versus the "expected inflation" effects. And fourth…we test for asymmetry of money announcement effects.
Edison (1996)	The results suggest that dollar exchange rates systematically react to news about real economic activity—a surprise of 100,000 on non-farm payroll employment leads to a 0.2 percent appreciation of the exchange rate. In general, exchange rates do not react systematically to news on inflation.
Kitchen (1996)	This study examines the response of domestic and international financial variables to announced changes in Federal deficit projections over the 1981-94 period…The exchange value of the dollar tends to be positively related to announced changes in deficit projections, but that result appears to be related to the degree of insulation of foreign financial markets from US financial markets…Taken together the results suggest that higher projected deficits raise real interest rates in part because of an increase in an inflation risk premium.
Tanner (1997)	The market's reaction to the 8:30 am trade deficit announcement was complete by 9 am, but the market's response to the CPI announcement was not as immediate. No significant reaction had occurred by 9 am, and the spot price did not fully digest the information until 1 pm.
Almeida, Goodhart, and Payne (1998)	This paper studies the high frequency reaction of the DEM/USD exchange rate to publicly announced macroeconomic information emanating from Germany and the U.S.…The direction of the exchange rate response…are driven by the likely operations of monetary authorities in domestic money markets. Further, we detect influences of German monetary policy decisions on the reaction of the exchange rate, and also differences between U.S. and German announcements in the exchange rate reaction time pattern.
Kim (1998)	A higher than expected Australian current account deficit announcement depreciated the AUD while an unexpectedly higher Australian GDP growth rate appreciated it on the announcement day during the Australian market trading…The US announcements, in general, had little effect during the US market trading, however.
Aggarwal and Schirm (1998)	This study documents significant asymmetrical impact of information in trade balance announcements on prices of assets such as equities and foreign exchange rates. Interestingly, foreign exchange rates and equity prices were less responsive to large surprises in the trade balance but more responsive to surprises within one standard deviation of the average. This asymmetry in market reaction to trade balance news seems consistent with the asymmetric nature of central bank intervention policy commitments during the late 1980s.
Evans and Lyons (2002)	This paper addresses whether currency trades have greater price impact when public information is flowing rapidly. We develop an optimizing model to account for why public news should increase the price impact of trades. Using transaction data made available by electronic trading, we test whether trades following macroeconomic news have higher price impact. They do: price impact per dollar traded is about 10 percent higher per news announcement in the previous hour.
Andersen et al. (2003)	Announcement surprises produce conditional mean jumps; hence high-frequency exchange-rate dynamics are linked to fundamentals. The details of the linkage are intriguing and include announcement timing and sign effects. The sign effect refers to the fact that the market reacts to news in an asymmetric fashion: bad news has greater impact than good news.

See NOTE on pp. 446-47.

Asset	Moment/Effect	Sample	Data frequency	Macro announcement(s)
USD/CAD USD/JPY USD/DEM USD/CHF USD/GBP	Conditional mean	December 1980–August 1990	Daily	M1
USD/DEM USD/JPY	Conditional mean	February 1980–February 1995	Daily	CPI, PPI, IP, RS, UR, NFP
USD/CAD USD/DEM USD/JPY USD/GBP	Conditional mean	March 1981–July 1994	Daily	GD
USD/DEM	Conditional mean	October 1987–November 1991	Daily, hourly	M1, TB, UR, CPI, PPI, IP
USD/DEM	Conditional mean	January 1992–December 1994	5-minute	U.S.: NFP, UR, MTB, PPI, CPI, RS, DG, CCI, LI, NAPM, IP, CU Germany: CPI, Industrial output, M3, Industrial orders, PPI, RS, TB, UR, WPI
USD/AUD	Conditional mean and volatility	February 1985–April 1995	Daily	Australia: CPI, GDP, UR, RS, CA US: CPI, GDP, UR, RS, TB
USD/CAD USD/FRF USD/GBP USD/JPY USD/DEM	Conditional mean	October 1985-November 1993	Daily	MTB
USD/DEM	Conditional mean and order flow	May 1996–August 1996	Hourly	Reuters Money Market Headline News
USD/CHF USD/DEM USD/EUR USD/JPY USD/GBP	Conditional mean, volatility, and jumps	January 1992–December 1998	5-minute	US: GDP, NFP, RS, IP, CU, PI, CC, PCE, NHS, DG, CS, FO, BI, GD, TB, PPI, CPI, CCI, NAPM, HS, LI, FF, IUC, M1, M2, M3 Germany: NFP, RS, IP, Manufacturing Output, Manufacturing Orders, TB, CA, CPI, Producer Prices, Wholesale Price Index, Import Prices, M3

Cont'd

APPENDIX, cont'd

Summary of the Literature on Estimating Announcement Effects on the Conditional Mean of Exchange Rate Returns

Reference	Abstract/Description*
Galati and Ho (2003)	…[M]acroeconomic news has a statistically significant correlation with daily movements of the euro against the dollar. However, this relationship exhibits considerable time variation. There are indications of asymmetric response, but to different extents at different times. Our results also provide evidence that the market seemed to ignore good news and remain fixated on bad news from the euro area, as often claimed in market commentaries, but only for some time.
Cagliesi and Tivegna (2005)	Coefficient stability tests suggested to divide our 1999-2004 sample into three sub-periods roughly corresponding to the three phases of recent Euro history. The main finding of our analysis is the rejection of the semi-strong EMH once we move from the estimation over the entire sample to the three sub-periods. Here we find many lagged news variables to be significant, contrary to what EMH posits. The distribution of lagged news across time zones (ETZ [European time zone] and ATZ [American time zone]) and among the three sub-periods, indicates a substantial heterogeneity in the way news are decoded by market participants in the two trading zones and that exchange rates in ATZ react almost exclusively to American news…Scheduled news play a much bigger role in ATZ than in ETZ, especially the creation of new jobs in the US (the Non-farm Payroll). Exchange rate dynamics in ETZ is determined mostly by unscheduled news.
Ehrmann and Fratzscher (2005)	We find that economic news in the United States, Germany and the euro area have been a driving force behind daily US dollar–euro/DEM exchange rate developments in the period 1993–2003. The larger importance of US macroeconomic news is at least partly explained by their earlier release time compared to corresponding German and euro area news. The exchange rate is also shown to respond more strongly to news in periods of large market uncertainty and when negative or large shocks occur.
Evans and Lyons (2005)	News arrivals induce subsequent changes in trading in all of the major end-user segments. These induced changes remain significant for days. Induced trades also have persistent effects on prices. Currency markets are not responding to news instantaneously.
Simpson, Ramchander, and Chaudhry (2005)	This paper evaluates the effects of surprises in 23 types of macroeconomic announcements on foreign exchange rates, and on the forward premium…[A]nnouncements that convey a decline in consumer demand increase foreign exchange rates…[T]he PPP hypothesis is rejected in favor of portfolio balance effects in determining exchange rates…[E]xchange rates respond to announcements related to consumer demand, inflation, and interest rates, but not to the announcements directly related to the general strength of the economy...[S]urprises in the Treasury budget, trade balance and capacity utilization have the strongest influence in the currency market.
Carlson and Lo (2006)	…A surprise announcement of an increase in German interest rates coupled with concurrent transactions data enables us to study in detail dealers' reactions. The patterns observed are consistent with dealers' practice to book targeted profits immediately if possible in the face of uncertainty. Evidence also shows that the speculative activity by traders in initial reaction to the news destabilized the market for the next 2 hours.
Savaser (2006)	I find that price-contingent orders can enhance our ability to explain post-release exchange-rate returns by half. Furthermore, the estimated effect of orders is orthogonal to the news surprises.

See NOTE on pp. 446-47.

Asset	Moment/Effect	Sample	Data frequency	Macro announcement(s)
USD/EUR	Conditional mean	January 1999–December 2000	Daily	US: NFP, UR, Employment Cost Index, DG, NAPM, RS, IP, CPI Germany: UR, IP, CPI Europe: Ifo index, PPI, INSEE Industrial Trends
USD/EUR	Conditional mean	January 1999–April 2004	2 Prices per day	Europe: European Central Bank's Statements and Forex Interventions, Miscellaneous Unscheduled News and Events Relating to Politics, Monetary and Fiscal Policy and/or Market Events, German Business Confidence Index US: Federal Reserve Board of Governors' Statements, Miscellaneous unscheduled news and events relating to politics, monetary and fiscal policy, and/or market events, 9/11, GDP, ISM, NFP
USD/EUR	Conditional mean	January 1993–February 2003	Daily	US: Monetary Policy, NAPM, NFP, IP, GDP, CCI, RS, CPI, UR, HS, PPI, TB, Average Workweek Germany/euro area: Monetary Policy, CPI, M3, UR, Ifo Business Climate, IP, MO, RS, PPI, GDP, TB, Business Confidence
USD/EUR	Conditional mean, volatility, and order flow	April 1993–June 1999	Daily	US: BI, CU, IUC, CCI, CS, CPI, CC, DG, FO, FF, GDP, Earnings, HS, IP, LI, M1, M2, M3, NAPM, NHS, NFP, PCE, PI, PPI, RS, GB, TB, UR Germany: GDP, NFP, RS, IP, Manufacturing Output, Manufacturing Orders, TB, Current account, Cost of Living, WPI, PPI, Import Prices, M3
USD/CAD USD/DEM USD/JPY USD/CHF USD/GBP	Conditional mean	January 1990–September 2000	Daily	Auto Sales, BI, CU, PCE, PI, RS, TB, CPI, Hourly Earnings, NFP, PPI, UR, CC, FB, CS, DG, FO, HS, IP, LI, NHS, GDP, NAPM
USD/DEM	Conditional mean	October 1997	Tick-by-tick	Bundesbank Interest Rate Hike
USD/GBP	Conditional mean, volatility, order flow, and jumps	September 1999–April 2000 and June 2001–September 2002	5-minute	GDP, NFP, RS, DG, BI, TB, PPI, CPI, HS, LI, PCE, PI, IUC

Cont'd

APPENDIX, cont'd

Summary of the Literature on Estimating Announcement Effects on the Conditional Mean of Exchange Rate Returns

Reference	Abstract/Description*
Faust et al. (2007)	The joint movements of exchange rates and U.S. and foreign term structures over short-time windows around macro announcements are studied using a 14-year span of high-frequency data. For several real macro announcements, a stronger than expected release appreciates the dollar today, and must either (i) lower the risk premium for holding foreign currency rather than dollars, or (ii) imply net expected dollar depreciation over the ensuing decade.
Pearce and Solakoglu (2007)	This paper examines the relationship between macroeconomic news and the dollar-Mark and dollar-Yen exchange rates…We examine the linearity and symmetry of the responses to news and also allow the effects of the news announcements to vary across states of the economy…news indicating a stronger U.S. economy causes an appreciation of the U.S. dollar, that the responses are essentially complete within 5 min, and that measuring the responses over 6-h intervals eliminates the statistical significance of the news. The effects of news appear linear and symmetric but there is some evidence that the effects depend on the state of the economy.
Andersen et al. (2007)	...We characterize the response of U.S., German and British stock, bond and foreign exchange markets to real-time U.S. macroeconomic news…[N]ews produces conditional mean jumps; hence high-frequency stock, bond and exchange rate dynamics are linked to fundamentals…when conditioning on the state of the economy, the equity and foreign exchange markets appear equally responsive…[W]e also document important contemporaneous links across all markets and countries, even after controlling for the effects of macroeconomic news.
Bartolini, Goldberg, and Sacarny (2008)	…[O]nly a few announcements—the nonfarm payroll numbers, the GDP advance release, and a private sector manufacturing report—generate price responses that are economically significant and measurably persistent…The authors' analysis of the direction of these effects suggests that news of stronger-than-expected growth and inflation generally prompts a rise in bond yields and the exchange value of the dollar.
Evans and Lyons (2008)	Macro news can affect currency prices directly and indirectly via order flow. Past research shows that the direct effects of scheduled macro news account for less than 10% of daily price variance. This paper shows that the arrival of macro news can account for more than 30% of daily price variance. Two features of our analysis account for this finding: (1) We consider the broad spectrum of macro news…not just scheduled announcements. (2) We allow the arrival of news to affect prices indirectly via…order flow. Our analysis shows that order flow variations contribute more to currency price dynamics following the arrival of public macro news than at other times. This is not consistent with news effects being common knowledge that is impounded in price directly. Roughly two-thirds of the total effect of macro news on the DM/$ exchange rate is transmitted via order flow.
Hayo and Neuenkirch (2008)	Argentine markets have become less dependent on U.S. news after the abandonment of the currency board…[T]he currency board was not completely credible…U.S. central bank communication helps to reduce money market volatility during the financial crisis in Argentina.
Hayo, Kutan, and Neuenkirch (2008)	This paper studies the effects of FOMC communication on U.S. financial markets' returns and volatility using a GARCH model over the period from 1998 to 2006. We build a new data set that includes information on all FOMC speeches, post-meeting statements, monetary policy reports and testimonies…We show that central bank communication has a significant impact on financial market returns, in particular on bond markets and much less so on stock and foreign exchange markets, which are affected rather unsystematically.
Love and Payne (2008)	The main result of the paper is that even information that is publicly and simultaneously released to all market participants is partially impounded into prices via the key micro-level price determinant—order flow. We...find that nearly one third of price relevant information is incorporated into prices via the trading process.

See NOTE on pp. 446-47.

Asset	Moment/Effect	Sample	Data frequency	Macro announcement(s)
USD/GBP USD/EUR	Conditional mean	January 1987– December 2002	5-minute	CPI , FF, GDP, HS, IUC, NFP, PPI, RS, TB, UR
USD/DEM USD/JPY	Conditional mean and volatility	December 1986– December 1996	5-minute	CPI, PPI, M2, TB, UR, IP, CCI, DG, NAPM, RS, NFP
USD/GBP USD/JPY USD/EUR	Conditional mean and volatility	January 1992– December 2002	5-minute	GDP, NFP, RS, IP, CU, PI, CC, NHS, PCE, DG, FO, CS, BI, FB, TB, PPI, CPI, CCI, NAPM, HS, LI, FF, IUC
USD/EUR USD/JPY	Conditional mean	January 1998– July 2007	30-minute and daily	NFP, UR, CPI, PI, PCE, GDP, ISM, HS, CCI, MI, RS
USD/DEM	Conditional mean and order flow	May 1996–August 1996	5-minute and daily	Reuters Money Market Headline News
USD/ARS	Conditional mean and volatility	January 1998– December 2006	Daily	Federal Reserve Board of Governors' Statements, GDP, IP, TB, ISM, CCI, HS, NFP, UR, RS, CPI, PPI
USD/EUR	Conditional mean and volatility	January 1998– December 2006	Daily	Speeches, congressional hearings, FOMC post-meeting statements, and monetary policy reports from the Federal Reserve
USD/EUR USD/GBP GBP/EUR	Conditional mean and order flow	September 1999– July 2000	1-minute	US: CPI, PPI, UR, TB Europe: IP, M3 UK: RPIX, RS, Global Trade, M4

Cont'd

APPENDIX, cont'd

Summary of the Literature on Estimating Announcement Effects on the Conditional Mean of Exchange Rate Returns

Reference	Abstract/Description*
Gradojevic and Neely (2009)	Several types of U.S. macroeconomic announcements—GDP, housing starts, PCE, CPI, and trade balance—influence the CAD/USD exchange rate or trading flows to a statistically significant degree. There are strong patterns in the reduced form responses to macro surprises. Surprises that raise foreign financial trading flows also tend to raise the CAD/USD but reduce commercial trading flow. This pattern might arise because announcement surprises substantially drive exchange rate responses through their effect on foreign financial trading flows and elicit a liquidity provision response from commercial order flow.
Hayo and Neuenkirch (2009)	Canadian and U.S. price shocks and monetary policy news are less important than shocks relating to the real economy…Canadian central bank communication is more relevant than its U.S. counterpart, whereas in the case of macro news that originating from the United States dominates…[T]he impact of Canadian news reaches its maximum when the Canadian target rate departs from the Federal Funds target rate (2002–2004) and thereafter.
Lahaye, Laurent, and Neely (2009)	Nonfarm payroll and federal funds target announcements are the most important news across asset classes. Trade balance shocks are important for foreign exchange jumps. We relate the size, frequency and timing of jumps across asset classes to the likely sources of shocks and the relation of asset prices to fundamentals in the respective classes.
Melvin et al. (2009)	We find evidence for non-linear regime switching between a high-volatility, informed-trading state and a low-volatility, liquidity-trading state. MPC surprise announcements are shown significantly to affect the probability that the market enters and remains within the informed trading regime.
Fatum, Hutchison, and Wu (2010)	…We investigate whether the 5-minute intraday JPY/USD exchange rate response to macroeconomic news announcements depends on the state of the business cycle. Our analysis employs a broad set of comparable news surprises from both the U.S. and Japan…[T]he state of the business cycle is important when assessing the impact of news on exchange rates. We also demonstrate the importance of distinguishing between "good" versus "bad" news. Lastly, we show that while the JPY/USD exchange rate responds to both U.S. and Japanese news, a different set of U.S. than Japanese news moves the exchange rate.
Rime, Sarno, and Sojli (2010)	Using one year of high frequency data for three major exchange rates, we demonstrate that order flow is intimately related to a broad set of current and expected macroeconomic fundamentals. More importantly, we find that order flow is a powerful predictor of daily movements in exchange rates in an out-of-sample exercise.

See NOTE on pp. 446-47.

Asset	Moment/Effect	Sample	Data frequency	Macro announcement(s)
USD/CAD	Conditional mean and order flow	January 1990–December 2004	Daily	BI, CU, CCI, CS, CPI, CC, DG, FO, FF, GDP, HS, IUC, IP, LI, manufacturing composite index, NFP, NHS, PCE, PI, PPI, RS, TB, GD
USD/CAD CAD/EUR	Conditional mean and volatility	January 1998–December 2006	Daily	US: Federal Reserve Board of Governors' Statements, GDP, IP, TB, ISM, CCI, HS, NFP, UR, CPI, PPI, RS, FF Canada: Canadian Governing Council's Statements, GDP, CU, CA, MTB, Ivey Purchasing Managers Index, HS, NFP, UR, RS, CPI, Industrial Product Price Index, Raw Materials Price Index, Central Bank Target Interest Rates
USD/EUR USD/GBP USD/JPY USD/CHF	Conditional mean and jumps	January 1987–October 2004	5-minute	GDP, NFP, RS, IP, CU, CC, PI, PPI, CPI, DG, BI, CS, FO, PCE, NHS, TB, GD, Manufacturing Composite Index, HS, CCI, LI, FF
USD/GBP	Conditional mean and volatility	June 1997–October 2007	Daily, 5-minute	MPC Meeting
USD/JPY	Conditional mean	January 1999–October 2006	5-minute	US: GDP, NFP, IP, CU, PI, CC, PCE, NHS, DG, FO, BI, TB, PPI, CPI, CCI, NAPM, HS, LI, FF Japan: GDP, IP, CU, Construction Orders, Overall Spending, Large Retail Sales, TB, CA, Retail Trade, CPI, CCI, TANKAN Large Manufacturing Index, TANKAN Non-Manufacturing Index, Leading Economic Index, M1
USD/GBP USD/EUR USD/JPY	Conditional mean and order flow	February 2004–February 2005	Daily	US: CA, GDP, BI, CU, PMI, CS, CCI, CC, CPI, DG, FO, HS, LI, IP, ISM, MI, NHS, NFP, PCE, PI, Philadelphia Fed Index, PPI, RS, TB, UR, IUC Europe: GDP, Labor Costs, Business Climate Index, Consumer Confidence Balance, CPI, CA, Industrial Confidence Balance, IP, M3, PMI, PPI, RS, Sentiment Index, TB, UR UK: CA, GDP, Average Earnings, Budget Deficit, CC, CPI, IP, Manufacturing Output, Manufacturing Wages, Producer Input Price Index, Producer Output Price Index, Retail Price Index, RS, TB

Cont'd

APPENDIX, cont'd

Summary of the Literature on Estimating Announcement Effects on the Conditional Mean of Exchange Rate Returns

Reference	Abstract/Description*
Conrad and Lamla (forthcoming)	We investigate the impact of the European Central Bank's monetary policy communication during the press conference held after the monthly Governing Council meeting on the EUR-USD exchange rate in high-frequency. Based on the method of Content Analysis we construct communication indicators for the introductory statement and find that communication with respect to future price developments is most relevant. In response to statements about increasing risks to price stability the EUR appreciates on impact. To the contrary, communication about economic activity and monetary aggregates does not generate significant exchange rate reactions.
Neely (2010a)	The Federal Reserve's large scale asset purchases (LSAP) of agency debt, MBSs and long-term U.S. Treasuries not only reduced long-term U.S. bond yields but also significantly reduced long-term foreign bond yields and the spot value of the dollar. These changes were much too large to have been generated by chance and they closely followed LSAP announcement times. These changes in U.S. and foreign bond yields are roughly consistent with a simple portfolio choice model. Likewise, the exchange rate responses to LSAP announcements are roughly consistent with a UIP-PPP based model. The success of the LSAP in reducing long-term interest rates and the value of the dollar shows that central banks are not toothless when short rates hit the zero bound.

See NOTE on pp. 446-47.

Asset	Moment/Effect	Sample	Data frequency	Macro announcement(s)
USD/EUR	Conditional mean and volatility	January 1999–October 2006	5-minute	European Central Bank Press Releases
USD/AUD USD/CAD USD/GBP USD/EUR USD/JPY	Conditional mean	November 25, 2008 – November 4, 2009	10-minute	8 large-scale asset purchase announcements by the Federal Reserve, along with 13 FOMC announcements used as controls