Morten Bech

morten.bech@bis.org

FX volume during the financial crisis and now[1]

This special feature looks at trading activity in the foreign exchange (FX) market. By using information from surveys conducted by FX committees around the world as well as settlement data from CLS Bank, I analyse how global FX market activity was affected by the recent financial crisis. I show that FX activity continued to grow during the first year of the crisis but experienced a sharp drop after the Lehman bankruptcy, from which it recovered only slowly. I estimate that global FX activity was around $4.7 trillion a day on average in October 2011, compared with $4.0 trillion reported by the latest triennial central bank survey of foreign exchange activity conducted in April 2010.

JEL classification: C82, F31, G15.

FX trading activity stood at $4.0 trillion per day in April 2010

The authoritative source on global FX market activity is the Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity published by the BIS ("the Triennial").[2] By the latest account, FX trading activity averaged $4.0 trillion a day in April 2010. However, as the survey is conducted only every three years, it provides little information on market trends that occur at a higher frequency. Moreover, due to the timing of the Triennial, the FX market was not surveyed during the height of the recent financial crisis. The last two surveys, in April 2007 and April 2010, bracketed most of the turmoil. The next survey is scheduled for April 2013, with expected publication of preliminary results about four months later.

Fortunately, the Triennial is not the only source of information on FX activity. A number of central bank-sponsored industry groups, known as foreign exchange committees, have for the last half-decade or so conducted semiannual surveys on FX activity in their respective markets. In addition, electronic trading platforms and settlement systems provide alternative gauges of FX activity at even higher frequencies.

[1] The views expressed in this article are those of the author and do not necessarily reflect those of the BIS. I am grateful to Claudio Borio, Stephen Cecchetti, Corrinne Ho, Bob McCauley, Andreas Schrimpf and Christian Upper for useful comments and to Sha Lu at the Federal Reserve Bank of New York and Jhuvesh Sobrun for excellent research assistance.

[2] For details on the methodology and changes over time, see King and Mallo (2010). See King and Rime (2010) and McCauley and Scatigna (2011) for discussions of the drivers of FX trading. See, for example, Baba et al (2008), Melvin and Taylor (2009) and Goldberg et al (2011) for discussions of the FX market and the recent financial crisis.

In this special feature, I seek to take stock of the activity in the FX market at the midpoint between two Triennials and describe how market turnover was affected by the recent financial crisis. By applying a technique known as benchmarking to the different sources on FX activity, I produce a monthly time series that is comparable to the headline numbers from the Triennial going back to 2004.

Taking stock of FX activity during the financial crisis and now

I estimate that in October 2011 daily average turnover was roughly $4.7 trillion based on the latest round of FX committee surveys. Moreover, I find that FX activity may have reached $5 trillion per day prior to that month but is likely to have fallen considerably into early 2012. Furthermore, I show that FX activity continued to grow during the first year of the financial crisis that erupted in mid-2007, reaching a peak of just below $4.5 trillion a day in September 2008. However, in the aftermath of the Lehman Brothers bankruptcy, activity fell substantially, to almost as low as $3 trillion a day in April 2009, and it did not return to its previous peak until the beginning of 2011. Thus, the drop coincided with the precipitous fall worldwide in financial and economic activity in late 2008 and early 2009.

FX activity was just above $3 trillion per day in April 2009 …

… and roughly $4.7 trillion per day in October 2011

The article is organised as follows. In the first part, I discuss the different gauges of FX activity available, highlighting differences in methodology, coverage and scope. I start with surveys of financial institutions before turning to information obtained from trading platforms or settlement systems. In the second part, I review the concept of benchmarking and then apply the methodology to available data on FX activity.

Gauges of foreign exchange activity

In general, there are two types of data sources on FX market activity: surveys of financial institutions, and turnover data obtained from either trading platforms or settlement systems. The different sources cover a variety of FX instruments. These include spot transactions, outright forwards, foreign exchange swaps, currency swaps and currency options (see the box for a description of FX instruments). The surveys tend to cover the full set of instruments and provide detailed breakdowns in terms of, for example, currency pairs, types of counterparties and execution methods. In contrast, trading platforms and settlement systems are tailored to specific instruments and often provide only aggregate turnover, but the information is available at higher frequencies.

Surveys of financial institutions

I focus here on the Triennial Survey published by the BIS and on the more frequent FX committee surveys of the markets in the United Kingdom, North America, Canada, Singapore, Japan and Australia.[3] The surveys measure

The Triennial Survey and FX committee surveys …

[3] In addition, a number of central banks, including the Reserve Bank of New Zealand, the Central Bank of Norway, the South African Reserve Bank and Sveriges Riksbank, publish volume statistics for their respective currencies.

Foreign exchange instruments

FX volume surveys report turnover by instrument. Instrument types include the following:

Spot transactions are single outright transactions that involve the exchange of two currencies at a rate agreed to on the date of the contract for value or delivery within typically two business days.

Outright forwards involve the exchange of two currencies at a rate agreed to on the date of the contract for value or delivery at some time in the future. This category also includes forward foreign exchange agreement (FXA) transactions, non-deliverable forwards (NDFs) and other forward contracts for differences.

Foreign exchange swaps involve the exchange of two currencies on a specific date at a rate agreed to at the time of the conclusion of the contract, and a reverse exchange of the same two currencies on a future date at a rate agreed to at the time of the contract. For measurement purposes, only the long leg of the swap is reported, so that each transaction is recorded only once.

Currency swaps involve the exchange of fixed or floating interest payments in two different currencies over the lifetime of the contract. Equal principal based on the initial spot rate is typically exchanged at the beginning and close of the contract.

Currency or foreign exchange options are contracts that give the right to buy or sell a currency with another currency at a specified exchange rate during or at the end of a specified time period.

activity in terms of the notional or nominal amount of the contracts. Turnover is reported in US dollar equivalents.

… are not directly comparable

The surveys differ in three important aspects: market definition, reporting basis and double-counting adjustments. Only the Triennial attempts to capture the global market in its totality. In contrast, the FX committee surveys confine themselves to a specific geographical location. There are two ways to classify where a given trade took place. The reporting basis is either the location of the sales desk of the trade or the location of the price-setting dealer of the transaction, also referred to as the "trade desk". Double-counting arises because transactions between two reporting entities are recorded by both of them. The FX committee surveys adjust for local, ie within-country, double-counting while the Triennial adjusts for both local and cross-border double-counting. In addition, there are minor differences in the instruments covered and the history available.

Consequently, while similar in nature, the aggregate volume of the FX committee surveys is not directly comparable to that of the Triennial. Table 1 provides an overview of the characteristics of the individual surveys.

The objective of the Triennial is to obtain comprehensive and internationally consistent information on the size and structure of the FX market with a view to increasing market transparency and monitoring activity in the global financial system. The survey was first conducted in April 1989 and has been repeated every three years since.

Triennial FX activity went up 20% in 2007–10

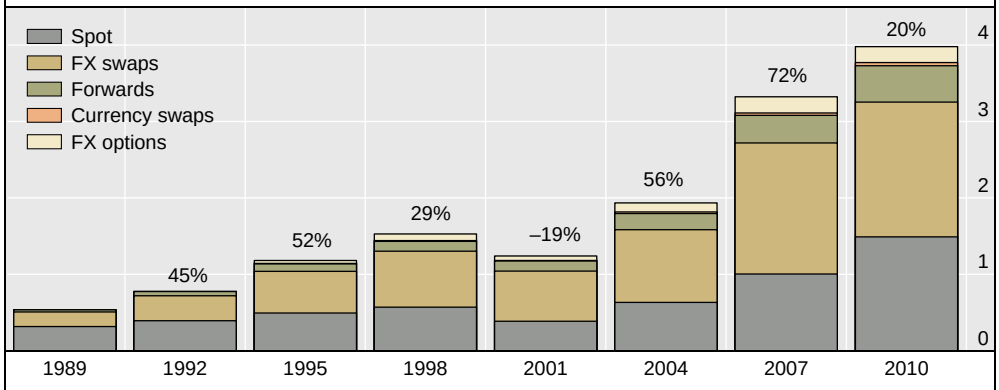
According to the Triennial, FX activity has grown continuously over the last two decades, with the exception of the 2001 survey following the introduction of the euro in 1999 (Graph 1). Reported FX activity increased eightfold from $500 billion in April 1989 to $4.0 trillion in April 2010. FX activity grew 20% between the last two surveys in April 2007 and April 2010.

FX committees in all major markets …

Several central banks in the major FX centres around the world are sponsoring industry groups, called FX committees, which provide a forum for

Foreign exchange and derivatives market turnover

In trillions of US dollar equivalents



[1] Percentages denote growth since previous survey.

Source: BIS Triennial Surveys, 1989–2010. Graph 1

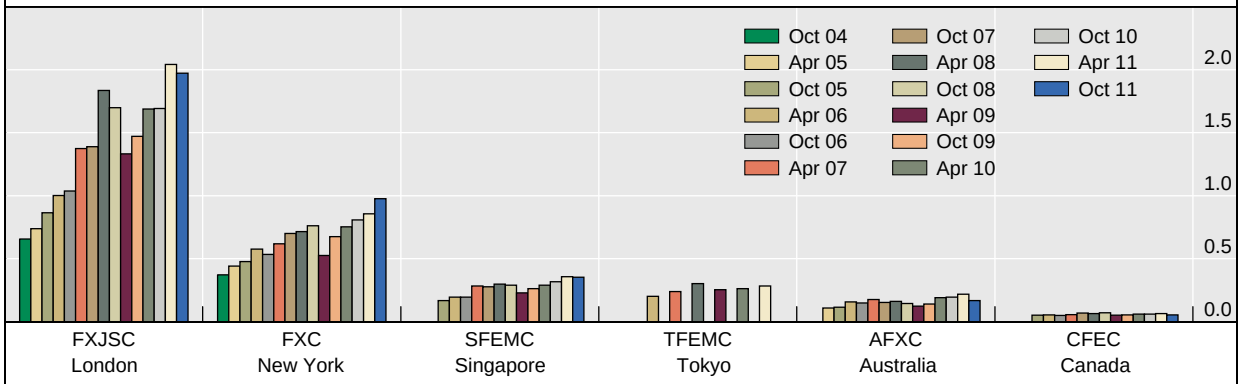
market participants to discuss issues of common interest. For example, the committees serve as vehicles to develop standards and best practices related to FX trading and operations. The current slate of committees includes: the Foreign Exchange Joint Standing Committee (FXJSC) in London, the Foreign Exchange Committee (FXC) in New York, the Singapore Foreign Exchange Market Committee (SFEMC), the Tokyo Foreign Exchange Market Committee (TFEMC), the Australian Foreign Exchange Committee (AFXC) and the Canadian Foreign Exchange Committee (CFEC).[4]

… conduct semiannual surveys …

In order to provide more frequent information on the size and structure of FX activity, the committees conduct semiannual volume surveys of their respective markets.[5] The surveys are carried out in April and October and

FX committee survey volumes

In trillions of US dollar equivalents



Source: FX committee surveys. Graph 2

[4] The FXC covers transactions that are priced or facilitated by traders in the United States, Canada and Mexico. The group of reporting dealers includes three Canadian banks. Eight Canadian banks participate in the CFEC survey. In addition, the ECB sponsors the Foreign Exchange Contact Group (FECG), and in Hong Kong SAR the Treasury Market Association (TMA) also covers foreign exchange-related issues. At present, the committees in Frankfurt and Hong Kong do not publish FX volume data.

[5] In the case of the TFEMC, the survey is conducted annually during the month of April.

Comparison of FX trading activity surveys

	BIS	FX committee surveys					
		London	New York	Singapore	Tokyo	Australia	Canada
Frequency	Triennial	Semiannual	Semiannual	Semiannual	Annual	Semiannual	Semiannual
Survey start	Apr 1989	Oct 2004	Oct 2004	Oct 2005	Apr 2006	Apr 2005	Oct 2005
Double-counting corrections	Local and cross-border	Local	Local	Local	Local	Local	Local
Instruments	All instruments	All instruments	No currency swaps	All instruments	No currency swaps	All instruments	All instruments
Reporting basis	Sales desk	Trade desk	Trade desk	Trade desk	Trade/Sales desk	Sales desk	Trade desk
Market	World	UK	N America	Singapore	Japan	Australia	Canada

London = Foreign Exchange Joint Standing Committee; New York = Foreign Exchange Committee; Singapore = Singapore Foreign Exchange Market Committee; Tokyo = Tokyo Foreign Exchange Market Committee (TFEMC); Australia = Australian Foreign Exchange Committee; Canada = Canadian Foreign Exchange Committee; All = spot FX, outright forwards, FX swaps, currency swaps and FX options. In 2010, the TFEMC changed the reporting basis from a trade desk basis to a sales desk basis.

Sources: 2010 Triennial Central Bank Survey; FX committee surveys. Table 1

hence coincide with the Triennial every three years. The results of the surveys are released in a coordinated fashion roughly three months after the survey month. The latest set of results covering October 2011 was released on 6 February 2012. Graph 2 shows the level of activity across the different markets and time.

… showing, for 2007–10, growth in line with the Triennial

The FX committee surveys – like the Triennial – show that most trading takes place in London and New York. In particular, the turnover in the United Kingdom dwarfs that of any other market centre. At slightly over $2 trillion per day in April 2011, its reported volume was larger than the other surveyed markets put together. According to FX committee surveys, trading activity grew some 18%, on a weighted average basis, between April 2007 and April 2010 – broadly in line with the growth suggested by the Triennial.

Data from trading platforms and settlement systems

Higher-frequency data available from …

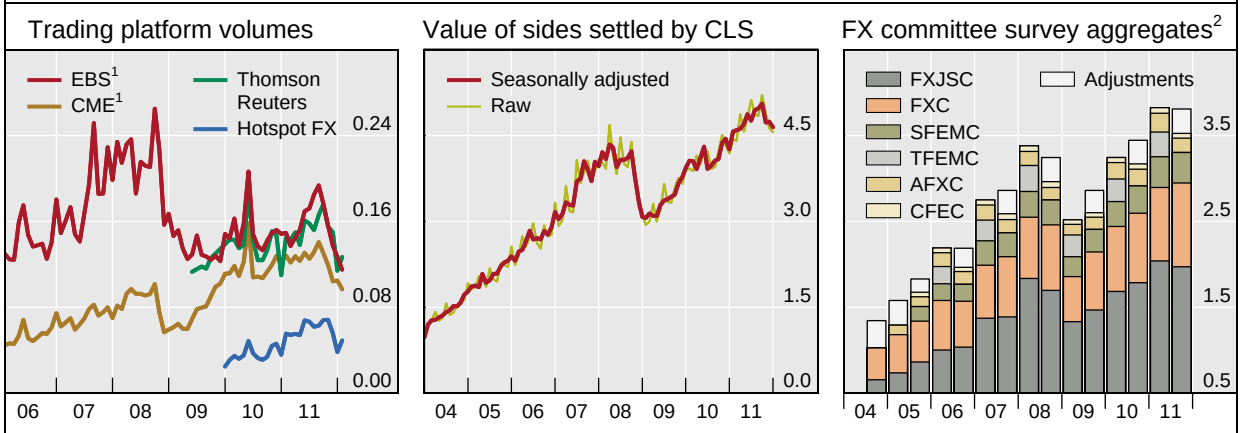
FX activity information gleaned from trading platforms and settlement systems is a by-product of their respective business operations. As with the surveys, activity is reported in US dollar equivalents. A potential issue in using this type of data to assess FX activity is that it can be hard to distinguish overall market trends from market share trends for the specific platform or system. Moreover, as the data are of higher frequency, seasonal patterns and/or calendar effects are likely to be more pronounced.

… trading platforms …

FX instruments are traded in a multitude of ways, ranging from voice brokers to electronic platforms (King and Rime (2010), King et al (2011)). Increasingly, the electronic platforms are making data on turnover readily available, yielding another source on FX activity. Here, I use as illustrative examples the inter-dealer broking systems offered by EBS and Thomson Reuters, the multi-bank trading system Hotspot FX and the Chicago Mercantile Exchange (CME), which offers trading and clearing for FX futures and FX

Daily average turnover

In trillions of US dollar equivalents



[1] Seasonally adjusted. [2] Semiannual data refer to April and October observations.

Sources: CLS Group; CME; EBS; FX committee surveys; Hotspot FX; Thomson Reuters; BIS calculations due to adjustments. Graph 3

options (Graph 3, left-hand panel). Daily average activity reported by EBS, Thomson Reuters and the CME for the last couple of years has been in the range of $100–200 billion a day, whereas activity on Hotspot FX has been around $50 billion a day. While the platforms cover different FX instruments and by themselves only represent a small share of the market, together they can give an indication of wider market trends. For example, EBS and the CME both experienced a steep drop in activity after the Lehman bankruptcy in September 2008. Moreover, all platforms saw a significant spike in May 2010 and experienced a considerable drop in activity in late 2011 and into 2012.

… and CLS Bank

As with trading, FX instruments can be settled in different ways.[6] CLS Bank International (CLS) is the principal settlement institution for FX transactions. CLS was founded in response to concerns raised by the G10 central banks about settlement risk in FX transactions (BIS (1996)). CLS eliminates settlement risk by ensuring that settlement of both legs of a FX transaction occurs simultaneously – a process known as payment versus payment (PVP) (Galati (2002)). CLS began operating in September 2002. Settlements have grown sharply since its start, reflecting a combination of market growth and increasing market share.[7]

CLS settlements dropped 30% after Lehman

Settlement activity is measured in terms of the value (and number) of "sides". A side reflects a payment from one party to another. For example, a spot transaction gives rise to two sides being settled, whereas an FX swap gives rise to four sides in its lifespan – two at its inception and two at maturity. CLS settlements have more than doubled over the past six years. In early 2005, CLS settled sides worth around $2 trillion on average per day, whereas settlements averaged more than $4.5 trillion a day in 2011 (Graph 3, centre

[6] Settlement methods include traditional correspondent banking, bilateral netting and settlement systems.

[7] According to a 2008 Committee on Payment and Settlement Systems study, CLS settled 55% of FX obligations of surveyed institutions (BIS (2008)).

panel). From April 2007 to April 2010, settlements via CLS rose 27%, somewhat higher than the growth implied by the Triennial.[8] After the Lehman bankruptcy in September 2008, the value of settlements dropped by almost 30% by the end of the year, before slowly rebounding to pre-Lehman levels by April 2010.[9]

Benchmarking FX activity

Creating a measure comparable to that of the Triennial ...

As documented above, the FX committee surveys, the trading platform data and CLS settlements paint a broadly similar picture of rapid growth in FX market activity from the mid-2000s up to September 2008. This expansion of activity was followed by a precipitous fall in the wake of the Lehman bankruptcy well into the first half of 2009. Since then, most sources suggest that FX market activity has recovered and has exceeded the peak reached during the financial crisis. The question is how these trends can be translated into a measure of global activity comparable to that of the Triennial Survey.

... by using benchmarking ...

The concept of benchmarking helps here. It deals with the problem of combining a time series of higher-frequency with a series of less frequent data for a certain variable into a consistent time series (Bloem et al (2001)). The lower-frequency series provides the most reliable information on the overall level and longer-term movements of the variable. However, the higher-frequency or indicator series provides the only information available on the short-term movement of the variable.

... to match the movement of high-frequency data

A number of different benchmarking techniques are available.[10] Here, I rely on the proportional Denton technique. This technique is based on the principle of movement preservation. It seeks to match the growth in the indicator series as closely as possible by minimising the sum of squared deviations, while ensuring that the resulting series matches the reliable series (Bloem et al (2001)). In mathematical terms, the technique can be written as:

$$\min_{\{X_t\}_{t=1}^{T}} \sum_{t=2}^{T} \left[\frac{X_t}{X_{t-1}} - \frac{I_t}{I_{t-1}}\right]^2 \quad \text{s.t.} \quad X_s = A_s \text{ for } s \in \Omega \subset \{1,\ldots T\} \tag{1}$$

[8] During the financial crisis, the value of daily settlements peaked on 19 March 2008, when CLS settled sides worth $10.3 trillion (CLS (2008a)). In contrast, the number of sides settled peaked on 17 September 2008, when over 1.5 million sides (worth $8.6 trillion) were processed for the first time (CLS (2008b)). The record in terms of the number of sides settled has been broken a couple times since then, and is currently above 1.9 million sides (CLS (2011)).

[9] A greater focus on settlement risk during the financial crisis resulted in more trades being settled on CLS and in more participants in the FX market seeking to join CLS (Melvin and Taylor (2009)). Moreover, while settlements are related to trading activity, they represent an imperfect measure. For example, a decrease in settlement activity can reflect either a decrease in trading, or a decrease in FX swaps relative to spot and forward transactions. Moreover, settlements within say a month include sides that were the result of trading in prior months.

[10] Different benchmarking techniques are used, for instance, by statistical agencies around the world to produce quarterly national accounts.

where $\{X_t\}_{t=1}^{T}$ is the benchmarked series, ie the outcome of the procedure, $\{I_t\}_{t=1}^{T}$ is the related high-frequency (or indicator) series, $\{A_s\}_{s\in\Omega}$ is the low-frequency series, and Ω is the set of dates on which the low-frequency series is observed (see Appendix for details on how to solve this problem).

From triennial to semiannual ...

To arrive at a higher-frequency series for global FX market activity, I apply a three-step approach. First, I construct an aggregate volume series for the FX committee surveys. I do this by simply adding up the individually reported volumes while adjusting for the fact that the surveys began at different points in time and that the survey for Japan is conducted only annually (Graph 3, right-hand panel).[11] Second, I use this aggregate volume series for the FX committee surveys to convert the Triennial Survey numbers to a semiannual frequency (Graph 4, left-hand panel). Finally, I use seasonally adjusted daily average settlement values from CLS to convert the constructed semiannual series to a monthly frequency (Graph 4, right-hand panel).[12]

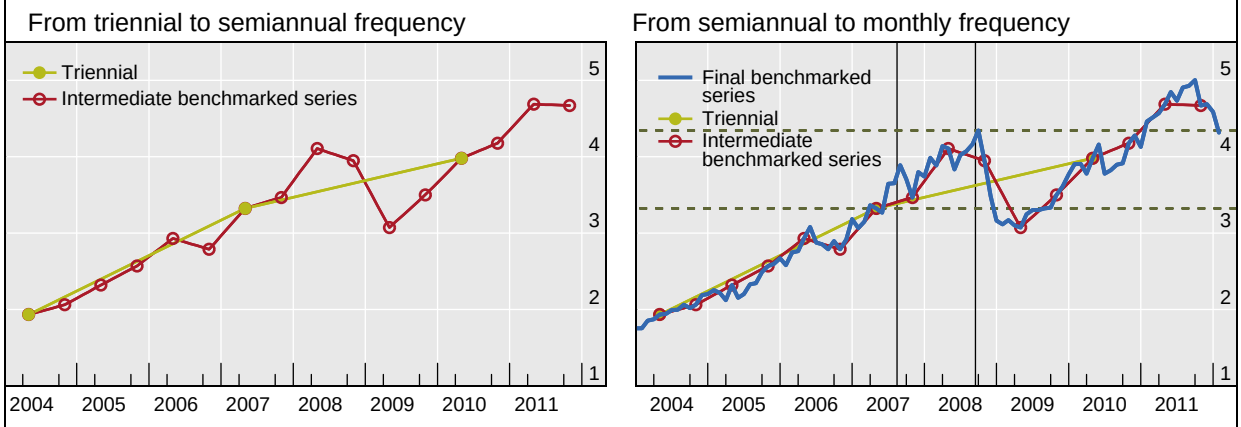
... and from semiannual to monthly time series

The analysis suggests that global FX activity grew close to linearly between the Triennials in 2004 and 2007. The only exception was an apparent lull in activity in the second half of 2006. In other words, the trend implied by simple interpolation provides a reasonable description of the development of FX activity over this three-year period.

The picture is quite different for the subsequent three-year period covering the recent financial crisis. During this period, global FX activity deviated considerably from the trend implied by the Triennial. The analysis suggests that global trading activity continued to grow both in the run-up to the onset of the

Benchmarked average daily FX trading activity

In trillions of US dollar equivalents



The vertical lines refer to 9 August 2007 and 15 September 2008. The horizontal lines indicate the 2007 Triennial Survey level and the peak reached during the financial crisis.

Source: BIS calculations. Graph 4

[11] The aggregate FX volume was adjusted up prior to the start of the AFXC, SFEMC, CFEMC and TFEMC surveys by assuming that their size relative to the FXJSC and FXC surveys was the same as reported in the initial surveys. Moreover, simple interpolation was used to fill in October values for the TFEMC survey with the exception of October 2011, where the growth rate of the other markets was applied to the TFEMC turnover.

[12] It is in principle possible to use multiple indicator series, but due to the shorter samples I did not use the additional data from the trading platforms.

crisis in August 2007 and during the first year of the crisis. FX activity reached $4 trillion per day perhaps as early as late 2007 and peaked during the tumultuous period around the Lehman bankruptcy in September 2008, at almost $4.5 trillion. Moreover, the start of the turmoil appears to have induced greater month-to-month volatility in activity. Subsequently, daily average activity fell by more than 30% – to just above $3 trillion in April 2009. That is, FX activity fell below the level of the 2007 Triennial.

Nonetheless, by mid-2009, global FX activity had started to pick up again and it rose to $4.0 trillion a day in April 2010, as reported by the last Triennial. Yet FX activity did not surpass the peak level experienced during the financial crisis until the turn of the year 2010–11. As such, the analysis paints a more nuanced picture than the Triennial, which shows FX trading activity being up 20% over the course of the financial crisis. The latest FX committee survey-based reading in October 2011 suggests a level of activity of about $4.7 trillion a day. In addition, our measure shows that FX activity may have reached $5 trillion per day in September 2011, before dropping off considerably by the end of the year and into January 2012.

Activity might have reached $5 trillion in September 2011 before dropping off considerably into 2012

Conclusion

The FX market is one of the most important financial markets in the world. It facilitates trade, investments and risk-sharing across borders. While good and timely data are available on prices of FX instruments, the same is not true for trading activity. The authoritative source on turnover (the Triennial) scores high on quality but gets lower marks for timeliness. In this article, I show how it is possible to leverage alternative sources on FX activity to obtain a timelier grasp of turnover developments. I produce a time series that, despite some caveats, is comparable to the headline number from the Triennial. The results show that FX activity continued to grow during the first year of the financial crisis but experienced a sharp drop after the Lehman bankruptcy, from which it recovered only slowly. Moreover, I find that trading activity was about $4.7 trillion per day in October 2011.

References

Baba, N, F Packer and T Nagano (2008): "The spillover of money market turbulence to FX swap and cross-currency swap markets", *BIS Quarterly Review*, March.

Bank for International Settlements (1996): "Settlement risk in foreign exchange transactions", *CPSS Publications*, no 17, May.

——— (2008): "Progress in reducing foreign exchange settlement risk", *CPSS Publications*, no 83, May.

——— (2010): *Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity in April 2010 – Preliminary global results*, September, www.bis.org/publ/rpfx10.htm.

Bloem, A, R Dippelsman and N Maehle (2001): *Quarterly National Accounts Manual – concepts, data sources, and compilation*, International Monetary Fund, www.imf.org/external/pubs/ft/qna/2000/textbook.

CLS (2008a): "CLS Bank settles new record value", press release, 19 March, www.cls-group.com/Media/Pages/NewsArticle.aspx?id=16.

——— (2008b): "CLS Bank settles new record volume", press release, 17 September, www.cls-group.com/Media/Pages/NewsArticle.aspx?id=36.

——— (2011): "CLS sets new record for daily settlement volume", press release, 23 September, www.cls-group.com/Media/Pages/NewsArticle.aspx?id=85.

Galati, G (2002): "Settlement risk in foreign exchange markets and CLS Bank", *BIS Quarterly Review*, December.

Goldberg, L, C Kennedy and J Miu (2011): "Central bank dollar swap lines and overseas dollar funding costs", *Federal Reserve Bank of New York Economic Policy Review*, May.

King, M and C Mallo (2010): "A user's guide to the Triennial Central Bank Survey of foreign exchange market activity", *BIS Quarterly Review*, December.

King, M, C Osler and D Rime (2011): "Foreign exchange market structure, players and evolution", *Norges Bank Working Paper*, no 10.

King, M and D Rime (2010): "The $4 trillion question: what explains FX growth since the 2007 survey?", *BIS Quarterly Review*, December.

McCauley, R and M Scatigna (2011): "Foreign exchange trading in emerging currencies: more financial, more offshore", *BIS Quarterly Review*, March.

Melvin, M and M Taylor (2009): "The crisis in the foreign exchange market", *Journal of International Money and Finance*, no 28, pp 1317–30.

Appendix

Following Bloem et al (2001), the first-order conditions for the proportional Denton technique can be found with the help of the following Lagrange function:

$$L_{\mathrm{Pr}op}(X_1,\ldots X_T;\boldsymbol{\theta}) = \sum_{t=2}^{T}[\frac{X_t}{X_{t-1}} - \frac{I_t}{I_{t-1}}]^2 + 2\sum_{s\in\Omega}\theta_s(X_s - A_s) \tag{2}$$

The first-order conditions, with respect to X_t, and benchmark restrictions constitute a system of linear equations that are straightforward to solve. For example, if T = 5 and $\Omega = \{1,5\}$, then the system is:

$$\begin{bmatrix} I_1^{-2} & -(I_1I_2)^{-1} & 0 & 0 & 0 & 1 & 0 \\ -(I_1I_2)^{-1} & 2I_2^{-2} & -(I_2I_3)^{-1} & 0 & 0 & 0 & 0 \\ 0 & -(I_2I_3)^{-1} & 2I_3^{-2} & -(I_3I_4)^{-1} & 0 & 0 & 0 \\ 0 & 0 & -(I_3I_4)^{-1} & 2I_4^{-2} & -(I_4I_5)^{-1} & 0 & 0 \\ 0 & 0 & 0 & -(I_4I_5)^{-1} & I_5^{-2} & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ X_3 \\ X_4 \\ X_5 \\ \theta_1 \\ \theta_5 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ A_1 \\ A_5 \end{bmatrix} \tag{3}$$

In matrix notation, we have:

$$\underset{T+S\times T+S}{\mathbf{O}} \cdot \underset{T+S\times 1}{\mathbf{X}} = \underset{T+S\times 1}{\mathbf{A}} \Rightarrow \underset{T+S\times 1}{\mathbf{X}} = \underset{T+S\times T+S}{\mathbf{O}^{-1}} \cdot \underset{T+S\times 1}{\mathbf{A}} \tag{4}$$

where the matrices are defined as suggested in the simple example.