

**THE PAYMENTS RISK COMMITTEE**

**INTRADAY LIQUIDITY MANAGEMENT IN THE EVOLVING  
PAYMENT SYSTEM:**

**A Study of the Impact of the Euro, CLS Bank, and CHIPS Finality**

**Report by the Intraday Liquidity Management Task Force**

**New York**

**April 2000**

The present publication is also available on the Payments Risk Committee website (<http://www.ny.frb.org/prc/>).

## **FOREWORD**

The following document is the result of a study of potential implications for US dollar intraday liquidity risks arising from planned changes to payment systems in the US and globally. It is not meant to be a definitive roadmap to improved liquidity risk management, but is intended to stimulate dialogue on the issue, and to suggest some possible best practices. Naturally, each financial institution's response to the changes will be governed by its own unique set of circumstances.

Because of the broad nature of the topic of intraday liquidity, the Payments Risk Committee decided to limit the scope of its investigation to three topics.

- The implementation of EMU and the supporting euro payment systems created a new paradigm for intraday liquidity management. The project attempted to review the effects of the payment systems changes arising from EMU and to catalog lessons learned and best practices required for managing liquidity in an environment with multiple payment systems.
- It is likely that the implementation of CLS in 2001 will significantly change the intraday funding approach for those currencies that CLS settles. The study attempted to evaluate possible impacts on USD intraday liquidity and treasury management practices, and to evaluate new methods of intraday funding that might mitigate liquidity risks.
- The change to the CHIPS settlement process that will occur in 2001 will alter the timing of and approach to intraday liquidity for the CHIPS participant banks. The study attempted to examine the potential impacts on Fedwire overdraft usage and timing arising from the changed CHIPS settlement model.

We hope that you find the following document both interesting and useful.

Donald R. Monks  
Chairman  
The Payments Risk Committee

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## **1. PREFACE**

The Federal Reserve Bank of New York established the Payments Risk Committee in 1993 as a means of inviting the input of commercial bankers in formulating recommendations for improving the quality of risk management in payment and securities settlement systems. Senior executives with broad payments systems experience from banks active in the payments business were invited to participate in the Committee. In addition to its primary role of formulating risk reduction recommendations, the Committee's objectives are to promote better understanding of payments risk issues among market participants; enhance knowledge of the workings of particular payments systems in the U.S. and internationally and to circulate research on payment systems to participants and the public; promote better communication between private sector institutions and the Federal Reserve Bank and, where appropriate, other bank supervisors within the U.S. and internationally; and provide a forum for discussion of technical issues in payments systems.

The Committee is sponsored by the Federal Reserve Bank of New York and is composed of representatives of Bank of America N.A., The Bank of New York, Bank One N.A., Chase Manhattan Bank, Citibank N.A., Deutsche Bank AG, Morgan Guaranty Trust Company of New York, and State Street Bank and Trust Company. There is also participation by the Federal Reserve Bank of New York and the staff of the Board of Governors of the Federal Reserve System. The Committee is supported by a Working Group of mid-level executives, which conducts research regarding topics designated by the Committee and drafts reports and studies for Committee approval.

### **1.1 The Working Group and Intraday Liquidity Study Task Force**

In December of 1998, the Committee requested that the Working Group undertake a study of the impact that planned changes to payment and settlement systems were likely to have on U.S. dollar intraday liquidity. The Working Group was asked to concentrate its study on changes arising from the adoption of the euro, the implementation of CLS Bank, and the planned changes to the CHIPS system.

Due to the broad range of topics and their scope, the Working Group assembled a Task Force to examine the issues and draft a report. The Working Group recognized the need to involve additional experts, and individuals representing banks, broker-dealers, and the New York Clearing House were recruited from outside of the Committee member banks. A full list of the members of the Task Force follows this preface.

## **1.2 Acknowledgements**

Valuable guidance and support was provided by the members of the Payments Risk Committee and the Working Group, along with support from the staff of the Payments Studies Function of the Federal Reserve Bank of New York. Additionally, the survey of CLS liquidity requirements and review of the relevant sections of the report by CLS Services Ltd staff is gratefully acknowledged. Finally, the provision of data and review by The Clearing House Interbank Payments Company L.L.C. was essential to the work of the Task Force and the assistance was much appreciated.

The conclusions, recommendations, and best practices set forth in this Report do not necessarily represent policies of the institutions represented nor the policies or views of the Federal Reserve System. While each topic chapter can be read with specific regard to that topic alone, references are made throughout the report to areas where cross-over, transition and inter-relationship effects of the various payments systems are important factors in the management of U.S. dollar liquidity.

## MEMBERS OF THE TASK FORCE

Chairman	Mr. Clay Simpson, Bank of America
Co-Chairman	Mr. Carl Rosenberger, Bank of New York
Team Leader (Euro Settlement Systems)	Mr. Richard Heckinger, State Street
Team Leader (CLS Bank)	Mr. Martin Leboutiz, Chase Manhattan
Team Leader (CHIPS Finality)	Mr. Russell Fitzgibbons, Deutsche Bank
Bank of America	Ms. Margaret Kain Mr. Clay Simpson Ms. Virginia Sisson
Bank of New York	Mr. Carl Rosenberger Mr. Phillip Scott
Bank One	Mr. Garrett Glass
Barclays PLC	Mr. Richard Pattinson
Chase Manhattan	Mr. Chris Carlin Ms. Donika Caushaj Mr. Roy DeCicco Mr. David Dutton Ms. Arlene Gariboldi Mr. Martin Leboutiz Mr. Jaime Paterson
Citibank	Mr. David Budinger Mr. Sy Rosen Mr. Tim Waggett
Deutsche Bank	Mr. Russell Fitzgibbons Mr. Gregory Murray Mr. Jerry Olivo
Goldman, Sachs	Mr. Paul Burd Mr. Carmine Del Pezzo
Merrill Lynch	Mr. G.M. Stetter
Morgan Guaranty	Mr. Adam Gilbert Mr. Andrew Powell
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Ms. Mari Baca (Secretary)  
Mr. Spence Hilton  
Mr. Larry Radecki



## **2. EXECUTIVE SUMMARY**

Several structural and operational changes are being planned for 2001 in U.S. dollar payment systems to reduce settlement risk. In particular, the implementation of intraday finality of payments through the Clearing House Interbank Payments System (CHIPS) and the creation of CLS Bank (CLS) for the settlement of foreign exchange transactions are expected to have a significant impact on the U.S. payments environment. This report examines the implications of these changes on U.S. dollar intraday liquidity management.

The Task Force conducted studies on three major topics, namely, euro payment systems, CLS Bank, and CHIPS finality. The creation of the euro in January 1999 and its attendant payments systems effects provides useful background for the assessment of the proposed changes in the U.S.

The Task Force found that the proposed payments system changes will require adjustments to treasury management practices concerning intraday liquidity management. The CLS and CHIPS requirements include periodic funding with specific deadlines, longer operating hours with shorter settlement cycles, and a need for recycling funds between systems and counterparties. Bank treasury managers on the Task Force plan to use liquidity transfers via swaps and other cross currency treasury techniques as a part of "normal" payments processing after CLS Bank is implemented.

The U.S. dollar liquidity demands of CLS are quite small in relation to the pool of liquidity available in the U.S. market; U.S. dollar liquidity is also considered adequate within CHIPS. However, the distribution of intraday borrowing capacity is skewed towards the major U.S. money center banks. CLS explicitly links all of the CLS-eligible currencies, and institutions will need to arrange for committed funding in non-domestic currencies to meet contingency requirements. Since the U.S. dollar accounts for a leg for over 80% of FX transactions, it will have an important role in the intraday treasury funding used to manage overall CLS currency positions.

These changes will create a need for better measurement of payments flows, use of queuing techniques to regulate payment flows, better communications, and a generally higher awareness by treasury managers of developments in the payments processing functions. Payment operations will assume some of the characteristics of continuous industrial processes where real-time measurement is required to assess the buildup of imbalances within systems, identify gridlocks within and between systems, and establish more elaborate contingency plans. The interconnections between systems will also require new control processes in order to cope with unexpected volume and systems changes.

A summary of the conclusions of each report follows:

## **2.1 Euro Settlement Systems**

The implementation of the euro as the single currency for the European Economic and Monetary Union (EMU) has radically altered the euro zone payments landscape. Payment systems (EBA Euro1 system, national real time gross settlement (RTGS) systems, TARGET, *et al*) have been created and modified to support the euro. This study identifies and analyzes current models in place for managing euro intraday liquidity, with particular emphasis on the possible effects of euro intraday liquidity management on U.S. dollar intraday liquidity.

An examination of the euro operating environment and market experiences to date indicates there has been little systemic impact thus far on U.S. dollar liquidity. Lessons learned from the experience of implementing new Euro payment systems include the need to reduce the number and use of euro correspondent accounts; develop systematic monitoring capabilities regarding the status of payments, balances, and collateral across the euro markets; develop an event matrix for contingencies that include rehearsed responses by operations and treasury staff; develop dynamic queue management systems and procedures; and the need for proactive treasury management in conjunction with euro payments processing. Recommendations aimed at identifying and eliminating cross-currency liquidity impacts are made to help institutions effectively manage changes to liquidity positions in and across various currencies and payments systems.

Liquidity linkages between the U.S. dollar and euro payment systems are expected to grow in the future as euro capital markets further develop and the financial activities of international corporations, financial institutions, and governments become increasingly reliant upon the use of both currencies. Enhancements such as liquidity bridges between the French payment systems, and similarly, between the German payments systems are planned. Furthermore, EBA has announced plans to develop a pan-European low-value payment system. Linkages between securities settlements operators, consolidation within the securities and banking industries, and longer trading hours with shorter settlement cycles are likely to put additional pressure on the management of intraday euro liquidity.

## **2.2 CLS Bank**

CLS Bank will have a significant impact on liquidity management. Today's practice of making gross payments throughout the day to settle FX transactions will be replaced under the CLS environment by timed net payments. Additionally, large banks will be required to develop comprehensive liquidity management strategies, as they will assume multiple roles: settlement member, timed payment provider to other settlement members, liquidity provider to CLS, and provider of CLS correspondent services to third parties.

The U.S. dollar payment environment is generally favorable for CLS settlement members. CLS pay-ins will take place during Fedwire's extended hour operating period,

during which time there is very little funds activity. Based on the survey data produced for this paper, the Task Force estimates that the maximum aggregate CLS U.S. dollar pay-in requirement will only require 4% of the available liquidity. CLS shareholders are actively developing liquidity management techniques to manage down CLS pay-in requirements. These tools, which are described in this paper, can potentially reduce the pay-in amount significantly.

While the overall supply of intraday U.S. dollar liquidity does not pose any problems, other U.S. dollar liquidity management concerns remain: the distribution of liquidity, the recycling of available liquidity, and the need for robust contingency plans in the event of abnormal settlements.

Some foreign bank shareholders of CLS have limited or no availability of intraday credit from the Federal Reserve. These participants will need to make arrangements with other banks to provide the needed liquidity for their CLS pay-ins. U.S. banks will have similar limitations in non-U.S. CLS currencies. Arrangements providing access to U.S. dollar liquidity in return for access to non-U.S. dollar liquidity may be established.

Broker dealers do not have direct access to U.S. dollar liquidity. Those that choose to become settlement members will need to make arrangements with their U.S. dollar nostro banks to make their CLS pay-ins. However, broker dealers may not want to use their existing intraday lines to make their CLS pay-ins, since this will limit their access to credit at the start of the active payment day at 8:30 a.m. It may be useful to extend the current tri-party repo market to accommodate these needs.

The need to recycle liquidity from settlement members in a U.S. dollar long position in CLS to banks in a U.S. dollar short position may also arise. There are divergent views, however, on whether the need to recycle CLS liquidity will give rise to an intraday market for the U.S. dollar. Since the amount of liquidity that could be recycled in advance of the start of the active payment day is less than 4% of the total liquidity available to the market, there may not be a clear impetus for such a market to develop.

CLS settlement members should have comprehensive plans to accommodate abnormal settlement scenarios, and these plans should be agreed with their timed payment providers and third party customers. As mentioned earlier, CLS explicitly links all of the CLS currencies. Failures of non-U.S. dollar payment systems, individual bank problems in making non-U.S. dollar payments, and CLS operating problems can have a knock-on effect on U.S. dollar liquidity. This paper contains best practice recommendations that banks and payment system operators can implement to minimize the size and duration of these problems.

### **2.3 CHIPS Finality**

The Task Force examined the impact of the new CHIPS finality process on systemic risk and liquidity requirements for the current and new CHIPS finality

processes. The Task Force's conclusion is that CHIPS finality is a fundamental improvement in the U.S. payment system and will benefit U.S. dollar liquidity management. The distributed method of managing payment messages within bilateral credit limits will be replaced by a centralized queue management process. Participants will have an incentive under the new process to enter all payment messages early in the day; this will result in rapid recycling of funds and fewer liquidity risks at the end of the day. Moreover, failure to fund by a participant will have far less serious consequences than it does under the present arrangement. If a participant does not pay its final pre-funded balance requirement, the only result will be that a comparatively few payment messages that had been delivered to CHIPS will not be sent to nor received by counterparties, and the sending participants will be free to reroute unreleased payment messages through a correspondent or Fedwire. There will be no risk of a catastrophic settlement failure or unwind. The timing of the implementation in January 2001, well before the implementation date for CLS, will permit the new CHIPS finality process to be operational to help mitigate the impact of CLS.

CLS is expected to process a significant share of CHIPS activity (up to 30%) and will ramp up its activity over a two-year period. This may result in potential imbalances and volatility in the CHIPS end-of-day funding requirements as large participants and their offshore branches implement the system. The Task Force did not find it feasible in the time available and with the current databases to model these effects on CHIPS. Each CHIPS member, however, should perform internal analysis to support treasury, operations, and systems planning for the CHIPS changes and the impact of the CLS implementation.

New treasury functions for managing bankwide positions in CLS, CHIPS, and Fedwire (and other major payment systems) are expected to develop in major banks. Treasury professionals are planning to support the new environment with new techniques for swapping positions between banks to adjust CLS, CHIPS and Fedwire imbalances during the day.

Non-U.S. bank participants without significant daylight or overnight borrowing capacity at the Federal Reserve may require new funding arrangements to support CHIPS finality operations. Current CHIPS settlement relationships will be discontinued under CHIPS finality, but are expected to be replaced by nostro agency funding service agreements.

CHIPS finality will reduce administrative expenses associated with the maintenance of bilateral credit limits and the queue management process during the CHIPS processing day. Some current CHIPS participants, however, may find the costs of new funding facilities combined with the systems and operating costs of supporting the changeover to CHIPS finality unattractive in view of the substantially reduced CHIPS volume. The trend towards outsourcing of both U.S. payment and foreign exchange operations is expected to accelerate after the implementation of CHIPS finality and CLS.

## **2.4 Best Practices**

Each of the three project teams developed recommendations for best practices for intraday liquidity management with respect to current and proposed payment system changes. The team participants included specialists in treasury management, payment systems, operations, credit and customer services in institutions with diverse organizations and service strategies. It was agreed that each institution must develop unique treasury management practices, but the following recommendations are suggested as a starting point.

### **Best Practices for Liquidity Management**

#### **1. Euro Settlement Systems**

- Rationalize correspondent accounts.
- Develop systematic monitoring capabilities.
- Develop an event matrix for contingencies.
- Install dynamic queue management.
- Use proactive treasury management.

#### **2. CLS Bank**

- Manage third party currency positions against internal limits.
- Use common nostro accounts for CLS and non-CLS transactions.
- Control daylight overdrafts on Fedwire by tracking and charging for usage.
- Establish committed liquidity facilities to support CLS contingencies.
- Evaluate establishing a liquidity account at CLS Bank to recycle funds.
- Evaluate liquidity swaps to balance CLS and payment systems liquidity.

#### **3. CHIPS Finality**

- Each institution should model the impact of CLS on CHIPS end-of-day settlement.
- Establish committed liquidity facilities to support settlement process.
- Inform CHIPS of plans for shifting activity to CLS Bank.
- Evaluate the use of a “liquidity bridge” between CHIPS and Fedwire to manage imbalances between CLS Bank and CHIPS.
- Establish a Global Money Desk function for managing positions in CHIPS, CLS Bank, and Euro settlement systems.

### 3. EURO SETTLEMENT SYSTEMS

#### 3.1 Introduction

The implementation of the euro as the single currency for the European Economic and Monetary Union (EMU) has radically altered the euro zone payments landscape. Payment systems (EBA Euro1 system, national real time gross settlement (RTGS) systems, TARGET, *et al*) have been created and modified to support the euro; the use of these systems has created a new paradigm for bank intraday liquidity management. This study identifies and analyzes current models in place for managing euro intraday liquidity, with particular emphasis on the possible impacts of euro intraday liquidity management on U.S. dollar intraday liquidity.<sup>1</sup>

An examination of the euro operating environment and market experiences to date is first presented. These discussions highlight the characteristics of the current euro zone financial markets that may ultimately have an impact on U.S. markets. Lessons learned from those experiences and resulting best practices will then be identified. Liquidity linkages between the U.S. dollar and euro payment systems are expected to continue growing in the future as euro capital markets further develop and the financial activities of international corporations, financial institutions and governments become increasingly reliant upon the use of both currencies. Specific events and linkages are examined within the “Future Implications” section of this study for the likelihood that such cross-currency impacts materialize. Finally, recommendations aimed at identifying and eliminating cross-currency liquidity impacts are presented.

#### 3.2 Environment

Trends to date among financial institutions operating in the euro zone point toward little systemic impact on U.S. dollar liquidity. However, it is worthwhile to understand events leading up to the existing state of affairs in the euro zone. When combined with upcoming market changes, such as the continued growth of euro capital markets, these trends are likely to create an environment that may give rise to intraday liquidity management challenges for institutions operating in both the euro and U.S. dollar financial markets.

##### 3.2.1 Euro Zone Payment System Developments

Following publication of the Lamfalussy Report<sup>2</sup> in the early 1990s, the euro zone national central banks (NCB) began the process of introducing RTGS systems to reduce systemic risk within their payment system infrastructures. In Stage 3 of EMU, a new pan-European system, TARGET, was introduced to link these national RTGS systems.<sup>3</sup>

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<sup>1</sup> Recognizing that the euro payments systems are relatively new, that they include varying local standards of operation, are in aggregate of similar scale to the U.S. financial markets, and involve the interdependencies of global markets in general, the Task Force decided it would be beneficial to examine the relevance and potential future impacts of euro intraday liquidity management on U.S. dollar intraday liquidity management.

<sup>2</sup> Specifically, "Report of the Committee on Interbank Netting Schemes of the Central Banks of the Group of Ten countries", November 1990, BIS, reformatted and repaginated March 1999 for BIS website publication.

<sup>3</sup> High value netting systems, including the EBA, have continued to operate but with modification to accommodate the euro.

Consequently, market practitioners now have no less than 20 euro payment systems over which to make euro payments.

Statistics show definite patterns of usage of these payments systems both in terms of the volume (number) of transactions and the associated value of the transactions.<sup>4</sup> Given the skewed distribution of volume and value of payments, and based on anecdotal feedback on the location and nature of intraday liquidity problems, the Task Force decided to focus its analysis on the following euro payments systems: TARGET, Euro1 (EBA), EAF (Germany), PNS (France) and SEPI (Spain). National RTGS systems have also been analyzed, as they carry significant volumes and values of euro payments that may affect euro intraday liquidity, and possibly U.S. dollar liquidity.<sup>5</sup>

### ***3.2.2 Complexities of Liquidity Management***

With the introduction of the euro, the historical one-to-one relationship of a currency being linked to a specific payment system vanished overnight. Instead, market participants were faced with a choice of 20 euro payment systems and accompanying concerns over appropriate routing and accounting conventions. In response to these concerns, sponsoring organizations and industry working groups addressed the directives, rules, procedures and policies regarding the use of each system. For example, the Heathrow Group<sup>6</sup> members agreed on basic principles on the routing of payments.<sup>7</sup> Among other actions, the group developed a common contact list of payment and treasury managers, identified provider practices such as early-in-the-day payments when practical and, following the euro's start-up, standard interbank compensation practices between banks to cover costs arising from inaccurate or untimely payments.<sup>8</sup>

It is clear that the need for attention to euro intraday liquidity management was also well recognized early by regulators. For example, in July 1998, the European Central Bank (ECB), the operator of TARGET, issued its descriptive paper on TARGET and made the following statement regarding the need for flexible liquidity management:

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<sup>4</sup> The distribution of payments activity and value by payments systems types (i.e., RTGS and various netting systems) is shown in the charts in Appendix A to this Report. Concentration of use of the national RTGS is shown in the charts in Appendices B and C, with the top five national RTGS carrying about 91% of average daily volume (number of transactions) and 88% of average daily value of all 15 national RTGS.

<sup>5</sup> It is primarily the systems that carry the high volumes and values that are considered likely to contribute to problems of in management of intraday liquidity. However, any system or user of a system remains a possible source of payments problems.

<sup>6</sup> The Heathrow Group was formed in 1998 as an industry group to discuss matters of common interest regarding euro payments. It is now aligned with the European Banking Federation (EBF).

<sup>7</sup> Their recommendations are attached as Appendix D to this Report.

<sup>8</sup> These guidelines are contained in Appendix E.

## **FLEXIBLE LIQUIDITY MANAGEMENT**

Connecting to different payment infrastructures will necessitate the management of multiple liquidity positions in the euro. It is important to note that there are at present no well-established intraday liquidity bridges between different euro payment systems. On an intraday basis, only the funds received within each system can be used to make outgoing payments via the same system.

In order to reduce risk, large-value net settlement systems have to respect binding intraday limits on participants' positions, which cannot normally be increased during the day. Once these limits have been reached, payments are blocked. Liquidity is effectively trapped in the net settlement system until the point at the end of the day when the balances of such netting systems are settled by means of a payment through TARGET or the domestic RTGS environment.

In TARGET liquidity will in principle be available to participants at all times. TARGET will run smoothly and will provide a fluid payment system. National central banks will grant free intraday credit to TARGET participants up to an amount participants will be able to determine themselves by providing adequate collateral. Participants will not be restricted by any net debit or credit caps. Each participant will be able to make a payment as and when it so chooses.

*From "TARGET", page 8, European Central Bank, July 1998...*

Notably, the ECB referred to the need for *intraday liquidity management*. Similarly, the risk of unbalanced payments flows resulting from multiple euro payments systems was recognized by the Bank of England, which stated:

***Intraday euro liquidity management.*** There is a risk that the wide range of alternative payment arrangements available after the introduction of the euro may undermine the natural balance between inflows within any one system which underpins most national payment systems at present. In RTGS systems, such a development could put pressure on the external collateral available to support individual banks' net debit positions, while in netting systems this pressure will fall on the net credit and net debit caps placed on each bank to control intraday risks. If left unchecked, these imbalances could grow quickly, potentially creating gridlock across the system as a whole.

*From Bank of England, "Practical Issues Arising from the Introduction of the Euro," Issue No. 10, December 1998, page 66*

Although alerted to the coming complexity of euro payments systems in the run-up to the introduction of the euro, many payment system operators and payment providers underestimated these challenges. The common attitude was that the euro



would be "just another currency." However, the complexity proved to be not in introducing a new currency, but rather in dealing with the disparate payments systems and working towards integrating the operations and management information into a unified and real-time intraday liquidity management process.

### ***3.2.3 Consolidation of Payment Providers***

With less than one full year of operations, a trend toward concentration of activity in several of the payments systems is observed. There are both fewer institutions providing payments services and concomitantly, the providers are using only several of the existing payments systems. This trend is a function of the consolidation of institutions as well as the restructuring of business lines by existing providers. Moreover, the trend appears to be accelerating, owing to the opportunities for acquisitions and mergers and institutional responses to cross-border opportunities. Trends related to the consolidation of euro zone financial institutions and the rededication of resources to core competencies have been observed in the marketplace and referenced by at least one other study.<sup>9</sup> Accelerated rationalizing of payment processing banks is expected after the millennium changeover.

### ***3.2.4 Market Linkages***

While the U.S. dollar and euro capital markets and payment systems are not linked by means of specific systems or mechanisms, either public or private sector, there is growth in use of either market as a close substitute for the other. Trading liquidity in foreign exchange, money market and equities instruments are such that market operators can quickly and efficiently trade from one market to another. Consequently, almost any systemic or isolated factor that might affect one market can be translated to the other, including problems with intraday liquidity. The shift of activity from one market to the other, while it might be diffused among many operators, can have significant impact on "normal" activity in the other currency.

## **3.3 Experience to Date**

Experiences with euro payment systems since January 1999 point to intraday events that have led to euro zone liquidity fragmentation. These experiences have not to date yielded material impacts on U.S. dollar liquidity. Nevertheless, they do directly contribute to an environment that, given the increasing linkages between the euro and U.S. financial markets, fosters such possibilities. An understanding of these experiences is therefore essential if future U.S. dollar liquidity pitfalls are to be avoided.

Causes of liquidity fragmentation can be classified into the following categories: operational, technical, policy, and bank procedure. It should be noted that the first three classifications refer to the operations of the payments systems, while the last classification refers to the actual use of the systems by participating banks.

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<sup>9</sup> Possible Effects of EMU on the EU Banking Systems in the Medium to Long Term, European Central Bank, February 1999

### ***3.3.1 Operational***

Users and operators of the euro payments systems have noted that many euro intraday liquidity management issues have been functions of the following factors:

- *Inexperience with the new systems.* New, modified, and enhanced systems came into existence with the implementation of the euro. It appears that many early payments problems arose as a result of the lack of familiarity with the features, formats, and timing of use of the various payment systems.
- *Continued use of "correspondent" accounts outside of payments systems.* Many European banks in particular continued to credit correspondent accounts in lieu of actual payments through one (or more) of the payments system(s). While the "payment" might be considered final in such cases, the immediate liquidity (and indeed, the liability and risk) aspects may be contrary to the expectations of the receiving bank, so that netting and collateralization effects will be at variance from those anticipated by the receipt of a "real" payment by the receiving bank.
- *Operational log jams.* Payments are not being channeled evenly through payments systems both in terms of timing and volume of usage. There is some benefit gained from effectively monitoring a few payment systems. Nonetheless, operational delays may still arise and affect payments in other systems.
- *Systemic Liquidity Limitations.* Because payments and receipts are not spread evenly throughout the processing day or across payment systems, it has been necessary for banks to conduct liquidity swaps. These arrangements involve banks paying and simultaneously receiving funds from other banks across different systems in order to reduce debit or credit positions within netting systems. Swap transactions are necessitated by the combination of systemic liquidity limitations imposed as a risk control measure by the EBA netting system and the use of other payment alternatives by a number of banks. While such transactions might get around liquidity caps to effect payments, there is the danger that they might exacerbate operational gridlocks by introducing additional volumes into the payments systems. In addition, these payments create counterparty risks and affect credit lines.

### ***3.3.2 Technical***

Given the decentralized nature of TARGET, a technical failure in one RTGS system can very quickly affect the entire TARGET system by causing liquidity deficiencies in other RTGS systems. Specific effects will depend upon the size of the 'stricken' RTGS system and the time of day when the outage occurs.

Various TARGET extensions were required during the first week of January when several RTGS systems became stricken on the same day. A key lesson learned from this experience was the importance of timely information being made available to market participants in the event a 'stricken' RTGS system causes a market-wide impact.

### ***3.3.3 Policy***

A primary objective of TARGET is to promote the efficiency, safety, and reliability of intra-EU cross-border payments by interlinking the national RTGS systems. TARGET was also developed as a mechanism for distributing monetary policy,

specifically to control the supply of euros and to ensure the immediate collateralization for any euro "created" by means of a payment overdraft. The ECB's supervision of TARGET activities tends to focus on the acceptable forms of collateral (not something that changes minute-to-minute) and the size and changes in size of available liquidity and system capacity, rather than optimizing day-to-day liquidity flows.

### 3.4 Bank Practices

The practices of individual banks are also considered a source of many of the euro intraday liquidity problems that have been experienced to date. Euro payments systems may be sound and operating properly, but bank practices can create or worsen intraday liquidity problems. Of course, the combination of both bank and system problems is possible, and such a combination of factors was probably at play during the first weeks of euro payments.

Industry and user groups have stated that if banks "stick to the rules of the road" there should be very few payments problems such as gridlocks, unwanted end-of-day positions, and need for liquidity swaps. Even so, several specific bank practices have been identified as real or potential sources of euro intraday liquidity problems.

- *Systems Preparedness.* Many banks failed to interpret the S.W.I.F.T. data fields related to the identification of the receiving bank. In addition, banks were not prepared to resolve problems arising from their inattention to the additional data required in payments messages. Many banks also hard-coded their choice of local payment system and/or bank, thereby limiting their flexibility to change standing instructions in the event of system outages or congestion.
- *Continued Use of Correspondent Accounts.* As a result of the significant number of correspondent accounts being maintained, banks may find it difficult to track where expected payments are received. Correspondent accounts, once required to initiate foreign currency payments (say a French franc payment for a German bank), became an available alternative destination to which others could send payments under the euro environment. For those who viewed the euro as "just another currency," the solution was to create accounts in each country. These banks overlooked the fact that other institutions would look to make payments at any of the available accounts throughout the euro zone. As a result, a bank might receive its expected funds in any number of locations.

This problem was particularly severe during the first few weeks of euro processing. A number of sending banks made "on us" or "book" transfers to complete payments rather than sending funds through the euro payment systems. While those conditions should be viewed as a particularly severe one-time event, the potential for continuing problems exists if banks continue to maintain correspondent accounts throughout the euro zone.

- *Intraday Liquidity Monitoring Capabilities.* It appears that a number of banks do not have the proper resources to monitor their aggregate and component payment system liquidity positions. Component pieces include payment system balances, balances

held at correspondent banks, and collateral used or available for intraday borrowing at each euro zone NCB. Banks that are unable to appropriately evaluate their liquidity positions cannot recognize nor respond to liquidity gridlock situations. Other banks have not revamped their systems and internal communications procedures to reflect the new need to track positions across multiple payment systems and NCB accounts.

There is a strong need for comprehensive and timely management of real time payments information. Each bank needs to have a real time, dynamic and unified view of its intraday liquidity position so it may develop intraday payments strategies for such things as pre-notification, timing of payments versus expected receipts, and to use the most appropriate outlet for work-arounds to fix problems as they arise. Larger institutions are generally expected to have the "better" systems, but this is not found to be universally true. Indeed, some relatively large banks believed that payments would carry on with euro in a "business as usual" fashion, and that the euro payments operations would not require significant changes in procedures and management information systems.

- *Forecasting Capabilities.* This issue is an extension of the monitoring process. While banks were familiar with projecting aggregate end-of-day positions, many experienced difficulties forecasting positions within individual payment systems or correspondent accounts on an intraday basis. Detailed information required to project end-of-day positions at each payment system or correspondent account is not available to all euro zone banks due to MIS or procedural limitations.
- *Liquidity Control Procedures.* Once liquidity fragmentation either had occurred, or was expected to occur, it was not always clear that banks knew how to address the situation. Within some institutions it appeared that treasury and payments operations personnel did not know how to identify an event, how to address it, or even determine who should address it. Typical euro zone situations included:
  - Exhaustion of collateralized intraday facilities
  - Reaching EBA debit/credit caps
  - Extending combined potential end-of-day shortfalls beyond collateralized position at central banks
  - Liquidity impacts of individual long and short client accounts on the bank's overall position.
- *Dynamic Queue Management.* Banks that cannot influence the flow of payments from their systems run the risk of creating gridlock situations for themselves and others. There were situations earlier in the year where banks had funds pending to another bank in the EBA system but could not complete the payment due to their debit cap restrictions. These banks had no apparent facility to hold up the payments in the EBA or redirect the payments to another system. If the bank were to complete the payments, they would have to manually recall the payment instructions from the systems, repair the messages and manually redirect the payment to another system. Such intensive efforts limit flexibility and disable a bank's most natural liquidity control mechanism.

### **3.5 Future Implications**

While euro liquidity positions have not yet had systemic impacts on U.S. dollar positions a number of situations can be described, or are already known, where such impacts might arise. Potential implications of known upcoming events are described below:

#### ***3.5.1 Payment Systems***

Since the introduction of the euro, various markets have announced developments, some of which seek to address specific local liquidity management issues. For example, in March, the French market introduced a liquidity bridge to allow participants to recycle liquidity between the PNS and TBF payment systems. The German authorities have announced plans to integrate ELS and EAF to improve settlement and enhance liquidity management capabilities. Finally, the EBA has announced plans to develop a pan-European low-value payment system.

Events such as these that seek to enhance liquidity will strengthen acceptance of the euro as a reserve currency. That acceptance may, in turn, increase the likelihood of cross-currency funding initiatives by market participants.

#### ***3.5.2 Foreign Exchange and Swap Markets***

Liquid foreign exchange and currency swap markets serve a variety of beneficial financial functions. It is this fluidity of cross-currency financial flows, however, that also creates the opportunity for liquidity issues to spread from one financial market to another. For example, euro liquidity shortages arising from payments gridlocks or other operational failures could easily impact U.S. dollar payments markets if one or several major players choose to fund short euro positions with long U.S. dollar positions.

#### ***3.5.3 Securities Settlement***

Consolidation is also taking place in the securities processing realm. This is expected to lead to larger value payments, requiring strict deadlines, to be channeled through the systems. While some of the value might be offset by cross-border links and dual listing with securities netting arrangements, the centralization of such processes is likely to further concentrate the activity. In addition, shorter settlement cycles and extended hours of market operations have been proposed, thereby potentially placing additional pressure on payments systems. Funding shortages in one currency might well be overcome by utilizing excess available funds in another currency. It is also possible that cross border securities settlement linkages will, over time, evolve to connect U.S. and European securities markets. That development could perpetuate the need for more cross-currency funding arrangements.

#### ***3.5.4 Evolving euro zone capital markets***

As euro zone capital and derivatives markets expand, a financial institution's ability to monitor and control liquidity flows in these markets will become paramount. Inadequate risk management tools will subject these institutions to volatile earnings and

liquidity swings. Greater volatility across the euro zone, in turn, may spread to the U.S. dollar market through cross-funding activities. Additionally, institutions that fail to monitor, forecast, and control liquidity positions in a systemic fashion could find payment flows gridlocked. An inability to execute euro zone payments could have a domino effect into the U.S. payment systems that would, in turn, prevent counterparties from delivering U.S. dollar payments to that institution. These events would also erode that institution's ability to make further U.S. dollar payments.

### **3.6 Best Practices**

In anticipation of the euro, a number of benchmark practices were introduced by financial institutions into their liquidity management process. The banks that are perceived to have fared the best at the start of euro processing incorporated at least some of the following best practices into their activities.

- *Rationalize correspondent accounts.* Fewer euro zone correspondent accounts reduce the incidence of misdirected funds. Banks that maintain wide correspondent networks for such reasons as business reciprocity are likely to find that the cost of liquidity fragmentation exceeds the profitability of the reciprocal business relationships.
- *Develop systematic monitoring capabilities.* Cross-system position monitoring processes provide critical information to the treasury department including opening balances, payments and receipts processed, and payments and receipts pending. These capabilities should allow for real-time understanding of current positions and collateral usage and provide adequate warning of gridlock situations that are developing or might possibly develop.
- *Develop an event matrix for contingencies.* The event matrix identifies the array of anticipated events, corresponding action steps, and responsibility for actions. Most (re)actions to gridlock situations can be addressed in dual fashion, first by a bank's payments operations unit and then by its treasury group. Staff training is required to understand the need for such information and ensure proper actions are implemented once a given situation has been identified.
- *Dynamic queue management.* Processes that consider current and projected liquidity positions of individual payment systems can eliminate or reduce the impact of individual bank gridlock situations and the potential for systemic spillover effects. Since payment operations units oversee the flow of payments into the payment systems, they are the natural first lines of defense to address gridlock situations. Payment routing criteria should include current and projected liquidity considerations. Operations should also maintain the ability to redirect payments across systems on an intraday basis as a means of reducing liquidity fragmentation and resulting payments gridlock.

- *Proactive treasury management.* When it is not possible to solve gridlock situations through alternate routing techniques, treasury functions can intervene in the process. Offsetting long and short positions across payment systems can be neutralized through the execution of payment system swaps with other payment system participants. Temporary shortages of cash can be offset by interbank loans where willing counterparties are available.

### **3.7 Recommendations**

Although there has been no systemic negative impact on U.S. dollar liquidity as a result of euro liquidity issues, initiatives and developments noted throughout this report could lead to events that cause critical euro liquidity issues, and, in turn, affect U.S. dollar liquidity. Recommendations directed at payment operators, regulators, and individual bank participants are discussed below.

#### ***3.7.1 Recommendations for Financial Institutions***

Many of the experiences and practices of financial institutions that emerged with the introduction of the euro may be applied to future financial market situations. Although future events cannot be fully anticipated, it is possible to create a mechanism by which events may be identified and addressed as they emerge. The Task Force recommends that the concepts described below be embedded within the liquidity control processes of institutions. These processes should enable them to effectively manage changes to liquidity positions in and across various currencies and payment systems.

- *Identify market changes.* Each institution should have a process, formal or otherwise, for spotting market changes that impact liquidity flows. Examples of upcoming market trends with liquidity implications include the expected mass closing of legacy currency correspondent accounts and the resulting need to change standing settlement instructions. Once identified, such market level trends can be evaluated for impact to the organization.
- *Identify impact on the firm's liquidity.* Impacts on marketplace and individual liquidity positions can next be projected. Environmental changes in the euro or U.S. dollar financial markets must be analyzed for domino effects to the organization in other markets. A complete impact assessment can then be reviewed by the firm.
- *Reconfigure the organization's strategic outlook.* Certain marketplace developments will be of such significance that firms will reassess their set of component businesses. Decisions to exit or enter businesses and redeploy capital may well result. The nature of short and long term liquidity warehousing may also change as a result of these strategic decisions.

For example, the ECB's study of February, 1999, entitled "Possible Effects of EMU on the EU Banking Systems in the Medium to Long Term" suggests that disintermediation of current banking business brought on by the development of euro capital markets will encourage continued industry concentration and retrenchment by euro zone, U.S. and other banks. A prime example of disintermediation is the

securitization of corporate debt previously met through bank lending. One expected response to this trend is the expansion of product offerings over a larger geographic base. This suggests that cross-currency funding arrangements could become more common as bank liquidity in one major currency is used to fund activity denominated in another currency. This in turn could produce knock-on effects across multiple financial markets. The funding outlook of financial institutions will have to be expanded to consider such cross-currency developments.

- *Establish tactical responses.* As strategic responses to changing market conditions are developed, they must manifest themselves in procedural changes to day-to-day liquidity management practices and the systems used to execute those practices. Ultimately all changes to financial flows impact interbank payment systems and member participants. Those systems and participants will have to alter payment operations and treasury funding processes as a result of changing strategic direction.

Concepts emanating from experiences and best practices identified by banks during the euro's rollout will be indispensable at this stage of the process. First among these key concepts is cash concentration. Banks should strive to reduce the number of locations where cash is held in any currency to an absolute minimum, given other practical constraints such as securities settlement requirements and diversification of credit risks.

Coordination among banks is suggested to provide an orderly closure of accounts, with checkpoints in the 18 months or so from mid-2000 until 2002, that include standards of communication among affected parties, notice periods, and closure dates. This will help manage or avoid closure of legacy accounts *en masse* at the end of 2001. Existing industry groups, with sponsorship or participation by central banks and regulators, should immediately pursue these efforts.

Membership in multiple national or cross-border payment systems should also be re-evaluated and, where possible, reduced. Some banks have a number of payment systems from which they may make or receive payments. This results in liquidity fragmentation, as intraday funds are available in one system while payments are required to be disbursed from another.

- *Communicate changes and initiate training.* Once plans and processes are developed they must be adequately distributed across the organization. Formal training, process documentation, and business continuity plans in support of payment processing and cross currency liquidity management platforms are required. Payment operations and treasury staff members must know how to (re)act when situations present themselves. As changes in the marketplace are identified all resulting situations that staff can anticipate should also be identified. Corresponding actions and responsibilities should also be assigned.
- *Institutionalize quality assurance.* Banks should view their intraday liquidity management practices in the larger contexts of best treasury management practices



and industry recommendations for payments processing in general. At the most detailed level, banks should also subject their payments practices to quality standards that relate to both internal and external service level agreements. If no formal service level agreements exist, then banks should define such standards and measure performance against the standards on a regular or, as a best practice, continuous basis. In addition, banks should establish means to identify patterns of problems and determine ways to rectify problems that reoccur.

### ***3.7.2 Recommendations for Payment System Operators, Regulators and Industry Groups***

The recommendations below address infrastructure and process shortcomings in euro payment processing that have contributed to liquidity problems.

- *Maintain and improve market standards.* In the absence of strong regulatory leadership, the EBF - Heathrow Group provided an important private sector initiative by establishing guidelines and principles to assist in providing an orderly payments market for the start of EMU. However, as individual RTGS systems continue with their set of rules or guidelines, it is crucial that the behavior of banks in any one RTGS system is not to the detriment of the wider market. Accordingly, as EMU's transition period moves forward, there is still an important role for the EBF - Heathrow Group and the ECB to play in ensuring broad industry agreement on issues affecting the wider market.
- *Develop reliable payment system communication procedures.* Transparency in the dissemination of information concerning technical problems is essential. Clear and robust communication mechanisms must be established between the central authorities so that any intraday or end-of-day RTGS system outages are speedily disseminated to payment system participants. Such a process will allow these institutions to take appropriate measures and ensure an orderly payments market at all times.
- *System Operator Processing Enhancements.* Some users suggest that the European System of Central Banks (ESCB) could supplement its value added to day-to-day processing routines. Efforts to smooth payment flows through enhanced communication processes regarding RTGS system status would be beneficial. These efforts might include the identification of liquidity gridlocks and suggestions to alleviate the problem. Also, the ESCB, by virtue of its role as RTGS operator, observes bank practices on a daily basis. It is therefore in the unique position to suggest alternative processing mechanisms to individual payment providers that appear to pursue practices detrimental to the euro payments marketplace. Observations might cover topics such as optimizing collateral usage or noting the impact of a particular bank on marketplace liquidity.
- *Establish mandatory and enforceable payment standards.* The regulations, guidelines, policies, and procedures governing euro payments suffer from gaps in coverage, overlaps, lack of consistency in scope and application, and variance with actual practices. This contributes to ambiguity in payment systems rules and best

practices. As a consequence, some key decisions may be left up to the individual banks, which often take actions that are in their best interest and not that of the functioning of the overall payment system. While the efforts of the EBF - Heathrow Group in establishing payments processing standards are laudable, they might not be sufficient in terms of dealing with systemic issues or problems that have a broad public policy aspect.

Additionally, the supervision of banks using euro payments systems currently tends to focus on access and collateral management operations and generally does not cover management of the settlement processes for the euro. It is recommended that the NCBs and the ECB form industry groups to monitor practices regarding euro liquidity beyond the mechanical issues of how the payments systems are operating.

- *Improve the operating efficiency of the primary settlement systems.* Patterns of usage and concentration of activity in particular payments systems must be monitored. System enhancements in turn should be administered through a continuous process to accommodate average and peak capacity requirements. Additionally, intraday liquidity management can be improved by additional data and system functionalities for the reporting of transactions on a real-time basis both by banks and settlement systems. Such information will contribute to dynamic management of the queuing, timing, and release of payments to improve payments efficiencies and to avoid liquidity problems at the client service level.
- *Promote the development of an efficient intra-day and overnight euro-funds market.* A key challenge of managing intra-day liquidity for the euro is matching institutions with long and short positions in the currency. Payment gridlock as a result of banks reaching payment caps often occurred because banks could not obtain euros from banks holding excess euro positions. A more effective way of communicating amongst the banks to facilitate this process should be developed.

### **3.8 Conclusion**

It seems likely that current euro zone banking developments, coupled with upcoming financial market changes, will lead to intraday euro liquidity issues impacting the U.S. dollar payment market. Furthermore, the number of financial institutions, corporations and governments that utilize both currencies will increase as euro capital and money markets continue to develop. As a result, it is imperative that all market participants understand existing intraday liquidity considerations related to the euro zone payments infrastructure and individual payment bank practices.

Lessons learned during the first months of euro processing have highlighted these liquidity considerations. Fortunately, many adverse cross-currency intraday liquidity impacts can be avoided or actively managed. The recommendations of this study are intended to call attention to processes that are likely to help payment market operators and bank participants identify, address, and respond to these situations.

## 4. CLS BANK

### 4.1 Introduction

CLS Bank will have a significant impact on intraday liquidity management.<sup>10</sup> Specifically, the payment requirements for CLS Bank participants will change both the timing and shape of payment flows among the participants. Additionally, the liquidity management needs will be more complex under the CLS Bank environment, and particularly so should any of the participants choose to take on multiple roles *vis a vis* CLS Bank.

The payment requirements under CLS Bank will differ from the current requirements in two key ways. Whereas in the current environment gross payments are made prior to the end of each settlement day, under CLS Bank, payments will be made on a net basis in central bank funds during specified times throughout a business day.<sup>11</sup> The net amount of the funding flows, however, will remain the same.

CLS Bank will also introduce complexities to the liquidity management of its members. The liquidity requirements for CLS Bank participants – whether settlement members, timed payment providers, or liquidity providers – will differ substantially from the needs of financial institutions today.<sup>12</sup> Complexities will increase due to the fact that the major payment banks in each currency may be expected to provide all three services, that is, serve as settlement members, timed payment providers, and liquidity providers. They may also commit themselves as third party service providers. Besides all this, participants must be prepared to manage liquidity in an abnormal settlement environment.

The following report addresses the liquidity management challenges that CLS Bank will introduce in the U.S. dollar market.<sup>13</sup> In the first section, the results of a survey undertaken by CLS Services are examined to compare the estimated U.S. dollar pay-in requirements of the participants during the ramp-up period<sup>14</sup> against the availability of liquidity in the U.S. dollar market. The distribution and recycling of available liquidity are also discussed. In the second section, the potential for the

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<sup>10</sup> See Appendix F for background information on CLS Bank.

<sup>11</sup> The specific timing of the pay-ins will vary significantly by the time zone for the CLS-eligible currencies. Whereas for the Asian currencies the pay-ins will take place near the end of (or after) the current payments day and in the European time zone pay-ins will take place during the morning hours of the normal payments day, pay-ins in the North American time zone will occur before the start of normal payment system hours. See Appendix G for the CLS Bank pay-in period in relation to today's normal payment system hours for the initial wave of CLS currencies.

<sup>12</sup> See Appendix H for a glossary of CLS Bank terms.

<sup>13</sup> CLS Bank explicitly links the CLS-eligible currencies. Therefore, any effective liquidity management strategy for CLS Bank settlement members will address multi-currency liquidity needs. This paper addresses U.S. dollar liquidity management, and therefore, provides an incomplete picture of CLS Bank liquidity issues. Work is underway by other study groups to link the various individual currency efforts. For example, a UK-based group, led by Patrick Perry, Barclays group treasurer, has already held its first meeting.

<sup>14</sup> The CLS “ramp up” period refers to the initial period of CLS Bank operations (approximately 15 months) when a significant number of CLS eligible transactions will be done outside CLS Bank as members transition their transactions and branches into the CLS environment. During the ramp up period, CLS eligible transaction will be split between inside and outside CLS Bank. The ramp-up period will be categorized by sharper, more volatile pay-ins than the post ramp-up period, when the great majority of CLS eligible transactions will be done within CLS Bank.

development of a market for third party services, along with the unique liquidity management needs of third party service providers, is explored. The final section deals with the potential liquidity implications under abnormal settlement situations; these situations may arise out of systems and operations problems experienced by CLS Bank, RTGS systems, or settlement members, and such factors as double settlement days or unexpected holidays.

## **4.2 Timing and Sizing of CLS Liquidity Flows**

In an effort to understand the impact CLS Bank will have on U.S. dollar liquidity, a focused survey was conducted of CLS Bank shareholders with a presence in the United States. The survey participants were asked to provide CLS Services Ltd. with all maturing and current foreign exchange trades with other CLS Bank shareholders, including branches, for the period of July 1 through July 16, 1999.<sup>15</sup> Of the 49 shareholders that were asked to participate in the survey, nineteen provided CLS Services Ltd. with data for one or more of their planned CLS branches.<sup>16</sup>

CLS Services Ltd. reviewed the trade data that it received and matched trades based on amount, currency, trading partner, trade date, and value date. Approximately 50,000 individual trades for CLS eligible currencies among the survey respondents were matched. CLS Services Ltd. used this data to determine the U.S. dollar position for each U.S. dollar settlement member<sup>17</sup> by day. The survey results indicate that in a CLS Bank environment and on a normal basis, these trades would generate between U.S. \$5 billion<sup>18</sup> and \$10 billion in daily pay-in requirements for the survey participants. This pay-in amount represents between 6% and 15% of the gross value of the U.S. dollar trades for the survey period.<sup>19</sup> It is believed that the results of the survey will be indicative of the end state ramp-up period.<sup>20</sup>

### ***4.2.1 Availability of liquidity to meet CLS Bank pay-in requirements***

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<sup>15</sup> The survey period included a “double day” (July 6<sup>th</sup>) and an “end of a quarter” day (July 1<sup>st</sup>).

<sup>16</sup> The survey participants were ABN Amro, Bank of America, Bank of New York, Bank of Tokyo-Mitsubishi, Bank One, Canadian Imperial Bank of Commerce, Chase Manhattan Bank, Citibank, Deutsche Bank, Goldman Sachs, Hong Kong and Shanghai Banking Corporation, Merrill Lynch, Morgan Guaranty Trust Company, Morgan Stanley and Company Inc., Paribas, Royal Bank of Canada, Skandinaviska Enskilda Banken AB, State Street Bank of Boston and UBS AG.

<sup>17</sup> The survey pay-in amounts are based on the U.S. dollar settlement instructions that CLS Bank had on file at the time of the survey. The majority of the survey participants indicated that they would serve as self-clearers for U.S. dollar trades with the exception of the broker dealers who selected a major U.S. bank to settle their position. The CLS Bank settlement instructions may change prior to the ramp-up period.

<sup>18</sup> Dollar amounts are U.S. dollars unless noted otherwise.

<sup>19</sup> In earlier studies that CLS has conducted, the pay-in amount was approximately 5% of the gross value with full shareholder participation. It should be noted that during the ramp-up period, there will be challenges specific to that period that a shareholder will need to address. For example, a CLS Bank shareholder may enter into a trade with a non-enabled branch of another shareholder. In this situation, the trade will have to be settled outside of CLS Bank; this may affect CLS Bank pay-in requirements as well as the gross payment system the trade is settled through.

<sup>20</sup> The impact of third party activity is not included in the survey data.

The CLS Bank pay-in period<sup>21</sup> is scheduled to take place from 1:00 a.m. to 6:00 a.m. Eastern Standard Time.<sup>22</sup> During this period, participants will be responsible to send payments to CLS Bank to cover their net short positions in hourly installments, in accordance with their pay-in schedules.<sup>23</sup>

The results of the CLS survey and the availability of liquidity in the U.S. suggest that there is sufficient liquidity to meet the U.S. dollar CLS Bank pay-in obligations in a normal state through the ramp-up period. Pay-ins to cover net short positions in the U.S. dollar will be made through the Fedwire funds transfer system.<sup>24</sup> Intraday liquidity in Fedwire is provided through the granting of Federal Reserve credit, commonly referred to as “daylight overdrafts” or “daylight credit.”<sup>25</sup> The peak CLS Bank pay-in amount observed from the survey period was less than 4% of the available liquidity in the U.S. The impact on U.S. dollar liquidity when all CLS Bank shareholders and their branches are operational and third parties services are included will need to be addressed at a later date.<sup>26</sup>

Additionally, the timing of CLS Bank pay-ins for the U.S. dollar seems to be generally favorable. The CLS Bank pay-in cycle coincides with Fedwire’s “extended hours” period, which lasts from 12:30 a.m. to 8:30 a.m..<sup>27</sup> During these early morning hours, the number of funds transfers occurring over Fedwire is minimal.<sup>28</sup> This means that a copious supply of intraday liquidity in the form of daylight credit will be available

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<sup>21</sup> Before the start of each settlement day, CLS Bank will calculate the net position for each participant in each eligible currency for the transactions to settle that day. Participants will have net long positions in some currencies, and net short positions in others. Net short positions must be funded over the course of the day by payments made to CLS Bank (referred to as pay-ins). Pay-in schedules issued by CLS Bank will specify the amounts due in each currency and the time by which the pay-ins must be sent.

<sup>22</sup> All subsequent times refer to U.S. Eastern Time, unless noted otherwise.

<sup>23</sup> Pay-ins for Asian currencies will be sent in three installments, and pay-ins for all other currencies, in five. The installments may be front-loaded based on the net pay-in amounts and the short position limits. CLS Bank requires that all pay-in amounts over the short position limit be received by 3:00a.m., which is the CLS Bank target settlement completion time.

<sup>24</sup> The Fedwire funds transfer system is a large-dollar electronic payment system owned and operated by the Federal Reserve System. Depository institutions that maintain a reserve or clearing account with a Federal Reserve Bank may use Fedwire to transfer funds on their own behalf or on behalf of their customers. These transfers originate from the settlement of interbank purchases and sales of fed funds; the purchase, sale, and financing of securities transactions; the disbursement or the repayment of loans; and the settlement of real estate transactions. Fedwire is a real-time gross settlement system, meaning that each transaction is processed individually and is initiated and settled individually. Immediate intraday finality is an important characteristic of the Fedwire service. In 1998, 98.4 million funds transfers with a total value of \$329 trillion were made over Fedwire, an average of \$3.3 million per transaction.

<sup>25</sup> See Appendix I for a description of the Fedwire overdraft process.

<sup>26</sup> The efficiencies from netting a larger number of transactions will likely mean that the increase in efficiencies will not be linear to the increase in volume.

<sup>27</sup> Effective December 8, 1997, Fedwire expanded the hours for its funds transfer service and began operating from 12:30 a.m. – 6:30 p.m. The Board of Governors determined that the expansion of this service could be a useful component of private sector initiatives to reduce settlement risk in the foreign exchange markets and to eliminate an operational barrier to potentially important innovations in privately-operated payment and settlement services.

<sup>28</sup> See Appendix J for the average funds overdrafts of CLS Bank shareholders for the month of July 1999. There will be an additional need for liquidity during the “extended hours” when CHIPS Finality is implemented in January 2001. The amount required is projected to be \$3 billion, equal to the value of the collateral that is in place to support current CHIPS processing. This is not an incremental requirement since this is the same amount of treasury securities currently held by CHIPS participants. The actual amount may be lower than the \$3 billion as some CHIPS participants can do pre-funding.

at a time when financial institutions will be required to make U.S. dollar payments to CLS Bank.

Two other U.S. dollar liquidity management issues relating to CLS Bank pay-ins, however, may be a source of potential concern. The first is the distribution of the available liquidity; the second issue concerns the recycling of liquidity at the start of the main payment day from participants that are long in the U.S. dollar in CLS Bank to participants that are short. Each of these issues is more fully explored below.

#### ***4.2.2 Distribution of liquidity***

The distribution of available liquidity for CLS Bank shareholders may potentially be a source of concern. Different categories of shareholders have different levels of access to Fedwire intraday credit. Broker dealers, for example, currently do not have direct access to central bank liquidity. Additionally, the liquidity facilities provided by the Federal Reserve to foreign CLS shareholders as a group are smaller than those for domestic shareholders.

Broker dealer shareholders of CLS, should they opt to become settlement members, will need to arrange for a commercial bank to serve as their timed payment provider.<sup>29</sup> In turn, these commercial banks will need to have sufficient liquidity to support the CLS Bank pay-in obligations of the broker dealers. This liquidity provision must be accommodated within the intraday limits established for the broker dealer customers, raising the issue of credit risk. Due to a concern that normal intraday activity of broker dealers may be restricted because of these limits, an initiative is currently underway to assess the feasibility of extending the current repo market to secure CLS Bank liquidity facilities for broker dealers.

Unlike broker dealers, foreign shareholders of CLS Bank do have direct access to central bank liquidity. Foreign banks account for 19% of the \$308 billion in intraday liquidity facilities provided by the Federal Reserve to CLS Bank shareholders.<sup>30</sup> Overall this liquidity has proven to be adequate; individually, however, it may not be. Some of these foreign shareholders have very limited (or no) Federal Reserve Bank liquidity facilities. Additionally, some of the foreign shareholders are major FX market participants, and their U.S. dollar liquidity requirements may be as large as the U.S. money center banks and even larger than some of the less active U.S. banks. Therefore, there will likely be a need for foreign banks to arrange for liquidity support from U.S. banks with excess capacity.

Some foreign banks have raised the possibility of using a portion of their assets pledged with the Federal Reserve Discount Window to obtain incremental liquidity directly from the Federal Reserve. There is some precedent for this approach in Y2K facilities extended by the Federal Reserve. Foreign banks have also raised the possibility

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<sup>29</sup> Broker dealer shareholders of CLS Bank include Morgan Stanley Dean Witter, Goldman Sachs, Merrill Lynch and Bear Stearns.

<sup>30</sup> Ten domestic member banks of CLS and 35 foreign member banks with a presence in the U.S. have Fedwire accounts.

of collaborating with central banks to establish a multi-currency collateral pool which could be used to provide the liquidity needed for CLS Bank pay-ins, largely through the use of their home currency collateral. This proposal could be broadly useful to participants in multiple national payment and securities clearing systems, especially in light of the incremental liquidity requirements posed by DvP and the increased use of RTGS systems. Given the complex cross-border issues involved and the lack of harmonization in central bank arrangements for intraday liquidity provision and overnight borrowing, implementation of a cross-currency collateral pool may require an extended timeframe for implementation. Additionally, there may be an opportunity for U.S. bank settlement members with excess U.S. dollar liquidity to commit a portion of this excess in return for non-U.S. dollar liquidity commitment. While foreign banks only account for 19% of Federal Reserve Bank intraday facilities, most U.S. banks are in a similar (or more adverse) situation for non-U.S. dollar currencies.

#### ***4.2.3 Recycling of available liquidity***

In today's environment, the U.S. dollar leg of FX transactions is largely cleared through CHIPS. CHIPS is currently an end-of-day net settlement system<sup>31</sup>, so the liquidity to settle these transactions is needed only at the close of the CHIPS day, presently at 5:00 p.m. In the CLS Bank environment, this liquidity will be needed before the "normal" payment day begins. As a result, liquidity that was previously available to support payment activity throughout the normal payment day will reside with CLS Bank settlement members with long U.S. dollar positions at 6:00 a.m., the end of the scheduled CLS Bank day. There appears to be sufficient gross liquidity among the U.S. dollar participants to enable the market as a whole to process its payments. The issue that must be addressed is how the available liquidity will be recycled among the participants. Mechanisms are needed in order to recycle liquidity from U.S. dollar long settlement members to other payment system participants.

A number of techniques are being evaluated to address CLS liquidity issues, in particular mechanisms to recycle liquidity. Industry practitioners representing each of the CLS currencies are working towards developing "industry practice solutions;" these will probably incorporate aspects of the elements discussed below. Each of these approaches involves cross-currency liquidity management versus pure U.S. dollar liquidity management.

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<sup>31</sup> CHIPS will change to a system that provides intraday finality in January 2001.

<b>Mechanism</b>	<b>Requirement for CLS</b>	<b>Benefit</b>	<b>Issues</b>
Common Collateral Pool <sup>32</sup> Held With Central Banks	<p>Excess collateral pledged with one central bank would be used to generate liquidity with another central bank.</p> <p>Cross-currency repos based on central banks accepting each others' government bonds.</p> <p>No CLS Bank development is required, as CLS Bank will not play a role in this arrangement.</p>	Efficient use of collateral without needing to re-pledge it to a central bank where liquidity is required.	Central banks need to work together on the mechanics of this approach. Useful models to review as a basis for developing this mechanism include the Correspondent Central Banking Model implemented by the ECB and the G2000 proposals for Y2K liquidity contingency
Single Leg FX Settlement	<p>Acceptance of FX deals where one leg is a CLS-eligible currency and the other is not.</p> <p>Settlement of single-sided cash flows.</p>	Extension of settlement risk benefits to broader range of FX business.	
Money Market: Loans, Deposits	<p>Integration of MM deals into pay-in schedule and pay-out process.</p> <p>Settlement of single sided cash flows with need for an enhanced risk management model.</p>	<p>Direct funding of CLS obligations.</p> <p>Removal of intra-day liquidity gap between FX and MM instruments.</p> <p>Effective netting of MM settlement, resulting in reduced transaction volume.</p>	<p>Loans and deposits are not securities and are settled over the counter. The question remains whether CLS would know that the appropriate obligation has been set up.</p> <p>Adjustment of legal terms and conditions of loans and deposits are required.</p>

<sup>32</sup> Refer to Appendix K for an example of a cross-currency collateral pool.



<b>Mechanism</b>	<b>Requirement for CLS</b>	<b>Benefit</b>	<b>Issues</b>
Repo/Reverse Repos	Integration of repo transactions into pay-in schedule and pay-out process. Settlement of single sided cash flows within CLS. Linkage to relevant securities settlement systems (i.e., Euroclear and Cedel) to ensure DVP settlement occurs.	Direct funding of CLS obligations (i.e. directly offset pay-in requirements). Removal of intra-day liquidity gap between FX and repos.	Legal issues and incorporation under existing ISMA/PSA agreements which govern repo transactions. Are CLS and repo counterparts the same?
CLS Liquidity Account	New liquidity account structure. Book-entry settlement of loans and swaps transacted between participants across liquidity account. Market pricing of intra-day swaps (intra-day yield curve). CLS member facility to execute intra-day swaps within own trading and risk management systems.	Allows cash to be re-circulated within CLS without needing funds to be remitted to domestic RTGS. Utilizes CLS account to store liquidity generated in RTGS systems and lend within CLS Bank.	Will CLS release sufficient long funds on a timely basis to make this facility useful in practice to cover funding of pay-ins? CLS Bank simulations are required.
Intraday Federal Funds Market <sup>33</sup>	This effort is outside the scope of CLS.	Institutions without sufficient liquidity would have another source of funds for a limited intraday period.	Counterparty risk is possible, constraining the development due to limited intraday overdraft and dealing limits.

<sup>33</sup> See Appendix L for a description of the Federal Funds Market.

<b>Mechanism</b>	<b>Requirement for CLS</b>	<b>Benefit</b>	<b>Issues</b>
U.S. Dollar/FX Liquidity Swaps <sup>34</sup>	CLS or another agreed agent would provide an automated facility to effect matched inside/outside liquidity swaps for all CLS settlement members. Settlement members would provide standing instructions to the agent, including credit availability and potential swap counterparties. Based on available information, the agent will perform all processing, including submitting timed payment instructions to CLS and settlement member correspondents. CLS modeling is required to determine the optimization rules used in setting up swap counterparties and amounts.	Inside/outside liquidity swaps would adjust the timing of payments to more naturally coincide with external payment flows. Inside/outside liquidity swaps could potentially alleviate the peaks associated with the first two CLS pay-ins.	The results of the CLS modeling will determine if the inside/outside swap algorithm can significantly reduce pay-in peaks through the use of a modest level of swap lines.
CHIPS/Fed Funds Swaps	This effort is outside the scope of CLS.	Liquidity imbalances between CHIPS and Fedwire are resolved.	CHIPS and Fedwire will need to develop a mechanism to provide for this functionality
Common Collateral Pool Held With CLS Bank	CLS Bank would hold collateral and onward pledge to relevant central banks to generate required intra-day liquidity.	Reduces impact of intra-day funding gaps. Allows efficient funding mechanism to be used to meet pay-in obligation.	CLS Bank has already investigated this as part of the liquidity provision evaluation and concluded that it is not a practical approach.

The Task Force believes that the options of a cross-currency collateral pool and the direct settlement of money market transactions and repos within CLS Bank would significantly enhance the liquidity management capability of CLS Bank participants. These options, however, do not represent near-term solutions. It is recognized that the willingness of central banks to support a common collateral pool on an ongoing basis and the time frame for its implementation are highly uncertain. Additionally, the time frame for implementing direct settlement of money market transactions is also unknown. Repos

<sup>34</sup> Refer to Appendix M for a discussion of swap tools for liquidity management at CLS Bank.

would require co-operation between CLS Bank and the major securities depositories such as Euroclear and Cedel, which could be a slow process.

#### **4.2.4 Best Practices**

- As an interim measure, the use of the CLS liquidity account may be of benefit because it allows effective and rapid re-circulation of liquidity within CLS. Several assumptions, however, need to be validated by CLS Bank prior to commencing its use. These include whether such a facility may be implemented and operated cost-effectively; whether sufficient liquidity can be released from settlement accounts into liquidity accounts to assist with the management of pay-in schedules; and whether the impact of receiving excess liquidity within CLS Bank will not adversely impact the overall efficiency of the national payment systems.
- Inside/outside liquidity swaps would be an effective tool to manage liquidity imbalances if the results of the CLS modeling are positive. An external cross-currency working group, under the direction of the CLS Cross-Currency Liquidity Group, has been formed to explore this recommendation in greater detail.

### **4.3 Payment System Issues**

Once operational, CLS Bank is expected to have a significant impact on the CHIPS finality settlement system. The CHIPS study group attempted to estimate these potential effects. For a discussion of their work, please refer to the section on the CHIPS finality settlement system.

### **4.4 CLS Third Party Services**

The development of a market for third party services is expected to introduce distinctive liquidity demands that the service providers will need to manage. Third party services in the context of CLS are defined by a number of attributes; the essential one is that the third party will have no direct relationship with, and will in fact be unknown to, CLS Bank. Transactions may be submitted for processing to CLS Bank by either a settlement or user member that has agreed to provide services to the third party client.

Although both CLS Bank settlement and user members may provide CLS clearing services, only settlement members will be responsible for settlement of all positions generated by CLS Bank clearing.<sup>35</sup> The net settlement positions in CLS Bank of settlement members could therefore arise from their own trades, those of their own third party service customers, those of their user member customers for settlement services, as well as their user member customers' third party services positions. This will have significant implications for intraday liquidity management.

The size of the potential market for third party services is difficult to predict precisely. Transactions of current CLS shareholders represent a large percentage of the settlement value at risk in the FX market.<sup>36</sup> Of the total global FX market exceeding \$3

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<sup>35</sup> In theory, third parties could also provide third party services.

<sup>36</sup> CLS Services, with KPMG as data custodian, performed an analysis of SWIFT MT 300 confirmation and FXNET data for the month of July 1997. It included data for major branches of 59 G-20/G-40 banks. The

trillion per day, it is estimated that only \$810 billion will be settled under the current CLS framework of 63 shareholders and seven eligible currencies.<sup>37</sup>

In the absence of third party services, a large portion of the remaining market transaction volume may continue to be processed in traditional settlement channels. However, the Task Force anticipates the development of a robust U.S. dollar market for third party services to capture some of this volume. CLS shareholders will have a number of incentives to offer third party services, including the opportunity to offset anticipated revenue losses in their traditional clearing products, to maintain volume levels in their payment services, and to maintain or expand key relationships centered on clearing products. An informal sampling of Sibos '99 attendees indicated that a dozen banks intended to offer third party services. Subscribers to third party services will be able to realize the risk reduction benefits of CLS without the related costs and responsibilities of ownership in CLS Bank. Regulatory enthusiasm for mitigating settlement risk beyond the primary interbank market may provide additional impetus.

The Task Force believes that a limited number of institutions will possess the requisite financial strength, access to liquidity, and technology platform needed to offer third party services. Although many banks are skilled at managing the current intraday liquidity needs for their own institutions and their customers, the clearing and settlement responsibilities of third party service providers will introduce further complexities to the liquidity management needs in what is expected to be an already complex multi-currency environment under CLS. Additionally, the investment required for developing the infrastructure and technology to offer third party services will be substantial.

Third party service providers must understand how their product offerings will affect their management of liquidity on an intraday basis. Among the issues to be aware of include how these offerings will impact their overall demand for liquidity, how they meet their timed funding requirements for CLS Bank pay-in schedules, and their usage of daylight credit. The Task Force believes that the intraday liquidity management of the U.S. dollar in particular will be affected by the offering of third party services. For example, the U.S. dollar was an offset in more than 80% of the CLS Bank eligible deals examined by CLS Services in its survey. Additionally, the United States is home to a number of major global payments providers participating in CLS Bank, many of whom can be reasonably expected to offer third party services.<sup>38</sup>

Liquidity management demands in turn must be accounted for in decisions relating to counterparty and third party credit risks, establishment of position limits, pay-out policy, and decisions on technology infrastructure design. For example, third party service providers must decide how CLS Bank positions for third parties should be

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study and related BIS data derived a 30% transaction market share for CLS owners; approximately 110,000 CLS eligible deal "sides" settled in an estimated total daily market of 430,000 CLS eligible deal "sides."

<sup>37</sup> The seven currencies include the Canadian dollar, euro, pound sterling, Swiss franc, and the United States dollar, all five of which will go live on CLS Bank on day one; the other two currencies, the Japanese yen, and Australian dollar, will become CLS-eligible shortly thereafter. These seven currencies are the first wave of currencies that CLS Bank will operate with.

<sup>38</sup> Global payment providers include both U.S. domestic banks and non-U.S. headquartered banks.

managed, whether separately or as part of the service provider's aggregate position. Cutoff times for transaction submission and cancellation, perhaps earlier than that permitted by the CLS Bank itself, will also need to be negotiated.

The expected concentration of a large volume of third party services to be offered by a few settlement members may in turn lead to a concentration of liquidity pressures among a relatively small number of market players. Nonetheless, the aggregation of a number of customer positions may result in smaller net pay-ins to CLS Bank, as one customer's long position in a currency offsets the short position of another customer. This netting effect, combined with maximum short position limits for each customer and selectivity in providing service only to credit-worthy institutions, will serve to mitigate the incremental liquidity risk associated with third party services.

#### ***4.4.1 Best Practices***

- Manage third party CLS positions separately from bank positions to better control usage of short position limits at CLS Bank and facilitate forecasting of third party services cash requirements.
- Use common nostro accounts for both CLS Bank and non-CLS Bank transactions to minimize cash control problems with the required tight funding time frames.<sup>39</sup>
- Establish a cutoff time for submission of third party service transactions (4:00 p.m.), prior to value date and opening of same day window, in order to enhance cash forecasting and control; relieve use of the CLS same day trading window for settlement members "trading down."
- Establish short position limits for each third party service customer, for each currency, and for overall third party customer short positions so that settlement member's total limits can be controlled and allocated according to bank-wide policies.
- Track the running forecast for third party service positions for each value date and actively manage the short position limits and bank-wide short position limits to acceptable levels by using FX transactions/swaps.<sup>40</sup>
- Time pay-outs to third party service customers after CLS Bank settlement to facilitate liquidity management. Place hold on third party services pay-outs via Fedwire until covering funds are received unless paid against approved third party services daylight limits.
- Develop procedures, processes, and systems to track the amount and duration of Fedwire daylight overdrafts. A control mechanism will support pricing or other incentive mechanisms to rationalize the use of third party limits, reduce the occurrence of pay-ins that are not properly pre-funded, and manage settlement members' use of Fedwire debit cap.
- Request pre-advice of large transactions potentially resulting in daylight overdrafts on Fedwire.

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<sup>39</sup> However, there may also be legal and operational benefits associated with segmentation of CLS and non-CLS accounts.

<sup>40</sup> Some banks believe that FX transactions/swaps are relatively inefficient since banks may only be short in a single currency.

## **4.5 Abnormal Settlement / Contingency**

The implementation of CLS Bank will effectively link the performance of settlement members with that of nostro agents, central bank RTGS systems, and CLS Bank. It is through these linkages that events such as operational or systems disruptions experienced by any of the parties, double processing days, and unscheduled holidays in one or more of the eligible currencies, may give rise to abnormal settlements and liquidity disruptions in the local markets.

### ***4.5.1 Systems and Operations Problems***

Contingency plans for systems or operational problems should be established to ensure that the impact of disruptions on CLS shareholders, RTGS systems, and non-CLS Bank related activities are minimized. Minimum contingency requirements should be established in the Service Level Agreements, particularly where an institution's performance is dependent on that of a service provider.

The time sensitivity of recovery from either a CLS Bank or an RTGS System failure will be heightened by the time zone differences between the various RTGS systems. The U.S. RTGS system has the advantage of being the last to close, at least 11 hours after the funding completion, and has more time to recover from system failures within the day.

### ***4.5.2 CLS Bank Systems and Operations Problems***

The extent to which a systems or operational failure at CLS Bank will affect the settlement of trades will vary depending on the timing and severity of the problem. In a CLS Bank computer simulation of settlements of trades between 50 major banks in six currencies, 98% of transactions by volume were settled in the first 30 minutes and 99% within the first two hours.<sup>41</sup> The simulations reflected a slightly lower rate of settlements when taking transaction value into consideration: over 80% percent of the transactions by value settled within the first thirty minutes and 90% within the first two hours.

Unrecoverable system failures within this two-hour period will have an impact on the recycling of liquidity into the local markets.<sup>42</sup> For example, a recent CLS Bank survey indicates that up to \$10 billion in liquidity will be at risk of not being recycled into the U.S. market should CLS Bank fail to recover from system or operational problems. Because the survey results are based on the activities of 19 participants, a more comprehensive study including the CLS Bank eligible activity of all CLS shareholders and their third party customers is required in order to fully assess the impact on U.S. dollar liquidity.

### ***Best Practices***

- The CLS Bank systems should have back-up or redundancy capabilities that will enable system recovery within 30 minutes from system point of failure.<sup>43</sup>

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<sup>41</sup> The six currencies are the Canadian dollar, euro, pound sterling, Swiss franc, United States dollar, and Japanese yen.

<sup>42</sup> Refer to Appendix G for settlement completion times.

<sup>43</sup> See Appendix N for CLS contingency procedures.

- There should be contingency hardware, which will allow processing from a remote site should the primary site become inoperable.
- Establish contingency plans for resuming operation in a manual mode from point of failure.
- Crisis risk management procedures should include a process whereby all RTGS systems are made aware of CLS Bank or RTGS systems/operations problems.
- CLS Bank should establish minimum standards for disaster recovery for its shareholders.
- Service Level Agreements should be established between CLS Bank and the Central Bank RTGS systems. These agreements should clearly identify disaster recovery procedures including:
  - The various levels of system failure and contingencies for processing transactions across the CLS Bank account.
  - Deadlines for system recovery from the point of failure.
  - Processing extensions and deadlines.

#### ***4.5.3 RTGS Systems and Operations Problems***

The CLS settlement process is directly linked to the processing of transactions across the CLS Bank accounts maintained at the central banks. Systems and operations failures at any of the RTGS systems will limit the ability of participants to meet their pay-in schedules, resulting in funding failures. Although CLS Bank will be able to continue to settle transactions until the short position limits of the affected currency have been reached, settlements will not occur for the remaining trades until system recovery or alternative funding methods have been arranged.

The failure to settle trades will have a direct impact on the recycling of liquidity in and across the other RTGS systems. This in turn will cause short term liquidity distortions and may disrupt non-CLS Bank related transactions. Further analysis utilizing data provided by all shareholders needs to be performed in order to fully assess the impact of a RTGS system failure on CLS Bank and the “knock on” effect across the remaining CLS currencies.

#### ***Best Practices***

- Systems back-up or redundancy capabilities should be consistent across RTGS systems.
- There should be contingency hardware, which will allow processing from a remote site should the primary site become inoperable.
- Contingency plans should identify alternative means of providing funding to the CLS Bank accounts to prevent downstream failure across the other CLS-eligible currencies.
- Minimum deadlines for system recovery from point of failure should be defined.
- Capabilities for extending processing deadlines should be described.

#### ***4.5.4 Settlement Member Systems or Operational Problems***

Systems or operating problems experienced by a settlement member in any market may impact settlement and/or liquidity in all other markets. The currency

location, in particular the local time zone and respective central bank operating hours, as well as the pay-in schedule of the settlement member experiencing the problems are critical factors which will determine the time available to address the problems.

A settlement member experiencing systems or operating problems will unlikely be able to fulfill some of its obligations to CLS Bank. These include issuing payment instructions to the central bank or to correspondents to meet its pay-in requirements, confirming receipt of funding from user members or third parties, and distributing currencies due to user members and third parties upon request. Implications of systems and operating problems on intraday liquidity management vary by time of day. Specifically, the timing of the difficulty will affect the member's ability to meet at least its first two pay-in requirements, the ability to pay in prior to the close of central banks in other time zones, and the ability to receive and distribute currency associated with user member and third party settlements.<sup>44</sup> All this will have potentially significant effects on CLS Bank and local market settlements.

Of course, if multiple settlement members are affected by a local market infrastructure disaster or other force majeure event, the difficulties would be compounded. CLS Bank is considering the implications of facilitating swaps between currency longs and shorts in the affected market(s) in the event that multiple settlement members experience problems. Another issue of concern would be the case where a settlement member or a user member directly submitting trades is unable to submit trades by the deadline for matching at CLS Bank. Unmatched trades would not be eligible for settlement through CLS Bank, thus requiring gross settlement. Gross settlement is less efficient and results in greater risk

#### ***Best Practices***

- All settlement members should have back-up or redundancy capabilities, which support recovery of payment/operating capabilities within 30 minutes of a problem occurring.
- Alternative back-up links with the capacity to instruct a relatively small number of high value payments through the local central bank or nostros should be in place. In the U.S. market, it would be practical to expect that a FedLine terminal or even phone instructions could be used to initiate the limited number of U.S. dollar payments required.
- Settlement members should require similar contingency capabilities of their user members and third parties.
- Receipt of currency due would typically continue to be credited to the settlement member's central bank or nostro accounts despite the settlement member's problem. User members and third parties could continue to pay in any currency due the settlement member and the settlement member could likely distribute currency due such participants via the back-up facilities previously discussed.

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<sup>44</sup> In recognition of the limited hours of overlap in the operations of RTGS systems, the CLS Bank pay-in schedule algorithm is designed to facilitate multilateral currency settlement as long as the first two scheduled payments are submitted. In addition, currency short position limits (and aggregate short position limits) will support complete settlement beyond the first two payments and some level of settlement if the first two payments cannot be made. Local currency liquidity providers will be used to cover any liquidity shortfalls up to the short position limits.



- Settlement members should require similar rapid recovery capabilities from their central banks and nostros.
- Given the limited number of pay-ins required, it is practical to expect that effective alternative payment methods should be made readily available for the currencies participating in CLS Bank.

#### ***4.5.5 Liquidity Issues***

Liquidity availability in the proper currency and at the time required is necessary for the efficient settlement of FX obligations in CLS Bank. There may, however, be times when settlement members do not have sufficient liquidity at the central bank or in nostro accounts to comply with their pay-in schedule, either at the required times or any time thereafter. When all alternatives have been exhausted, and a settlement member or several settlement members are still unable to meet their pay-in obligations, settlements that cannot be cleared will be removed from net settlement and will revert to gross settlement. This will require CLS Bank to recalculate the net positions of all impacted participants with potentially disruptive results.

#### ***Best Practices***

- Settlement members should negotiate primary and secondary liquidity facilities with nostro banks to facilitate the pay-in obligations in the timeframes required.

#### ***4.5.6 Double Settlement Days***

The importance of systems reliability and contingency backup, as well as access to timely and sufficient liquidity, is further heightened on days following U.S. holidays not common to the rest of the world. During such days, deal settlements can double, possibly straining capacity and access to liquidity in the CLS settlement timeframe. This phenomenon is well recognized in the current CHIPS environment. However, it is anticipated that the multilateral net settlement process in CLS Bank, with a limited number of scheduled pay in transactions, will significantly reduce the capacity strains currently experienced in the settlement of the U.S. dollar side of FX deals. Results of the CLS survey of 19 shareholders illustrate the benefits of multilateral net settlement. The total pay-in obligations for July 6 (the first U.S. business day following the July 4 holiday) under the CLS Bank multilateral netting environment was \$8 billion, not substantially different from other days in the study. The total pay-in obligations under gross settlement, on the other hand, would have been \$105 billion, approximately twice the size of obligations for other days in the modeled period.

#### ***Best Practices***

- Anticipate possible need for additional liquidity on double settlement days. Forecast scheduled settlements for that day and plan for liquidity needs.
- Apply liquidity management techniques previously discussed.

#### ***4.5.7 Unscheduled Holidays***

The implications of unscheduled holidays on settlement efficiency and the associated liquidity impacts are more difficult to assess. The date of the unscheduled

holiday, affected currency, timeliness of notification, and aggregate pay-in obligations for that currency are all significant variables. The current market practice, when time permits, is to cancel and rebook the trades subject to the unscheduled holiday. In normal conditions the unscheduled holidays are announced in advance. However, it is difficult to assess the impact of unscheduled holidays affected in markets experiencing some sort of crisis.

CLS Bank has been asked to model a representative combination of variables using the data gathered for July 1999. The model should provide an indication of the magnitude of possible settlement disruptions and the downstream impact on liquidity in other markets.

#### ***Best Practices***

- Minimize, to the extent practical, pay-in and pay-out positions in markets where unscheduled holidays may occur. This may be addressed via swaps or other strategies previously identified.
- Look to CLS Bank to coordinate “involuntary liquidity providers” balancing currencies payments due but not paid to institutions in the holiday market, with currency receipts due but not received from institutions in the holiday market.
- Arrange swaps with remaining positions in currencies expected to be paid to or received from institutions unexpectedly absent from the process.
- When time permits, trades subject to unscheduled holidays should be rejected by CLS Bank and resubmitted by the shareholders with an amended value date.

#### **4.6 Conclusion**

CLS Bank will have a significant impact on liquidity management. Today’s practice of making gross payments throughout the day to settle FX transactions will be replaced under the CLS environment by timed net payments. Additionally, large banks will be required to develop comprehensive liquidity management strategies, as they will assume multiple roles: settlement member, timed payment provider to other settlement members, liquidity provider to CLS, and provider of CLS correspondent services to third parties.

The U.S. dollar payment environment is generally favorable for CLS settlement members. CLS pay-ins will take place during Fedwire’s extended hour operating period, during which time there is very little funds activity. Based on the survey data produced for this paper, the Task Force estimates that the maximum aggregate CLS U.S. dollar pay-in requirement will only require 4% of the available liquidity. CLS shareholders are actively developing liquidity management techniques to manage down CLS pay-in requirements. These tools, which are described in this paper, can potentially reduce the pay-in amount significantly.

While the overall supply of intraday U.S. dollar liquidity does not pose any problems, other U.S. dollar liquidity management concerns remain: the distribution of liquidity, the recycling of available liquidity, and the need for robust contingency plans in the event of abnormal settlements.

Some foreign bank shareholders of CLS have limited, or no, availability of intraday credit from the Federal Reserve. These participants will need to make arrangements with other banks to provide the needed liquidity for their CLS pay-ins. U.S. banks will have similar limitations in non-U.S. CLS currencies. Arrangements providing access to U.S. dollar liquidity in return for access to non-U.S. dollar liquidity may be established.

Broker dealers do not have direct access to U.S. dollar liquidity. Those that choose to become settlement members will need to make arrangements with their U.S. dollar nostro banks to make their CLS pay-ins. However, broker dealers may not want to use their existing intraday lines to make their CLS pay-ins, since this will limit their access to credit at the start of the active payment day at 8:30a.m. It may be useful to extend the current tri-party repo market to accommodate these needs.

The need to recycle liquidity from settlement members in a U.S. dollar long position in CLS to banks in a U.S. dollar short position may also arise. There are divergent views, however, on whether the need to recycle CLS liquidity will give rise to an intraday market for the U.S. dollar. Since the amount of liquidity that could be recycled in advance of the start of the active payment day is less than 4% of the total liquidity available to the market, there may not be a clear impetus for such a market to develop.

CLS settlement members should have comprehensive plans to accommodate abnormal settlement scenarios, and these plans should be agreed with their timed Payment providers and third party customers. As mentioned earlier, CLS explicitly links all of the CLS-eligible currencies. Failures of non-U.S. dollar payment systems, individual bank problems in making non-U.S. dollar payments, and CLS operating problems can have a knock-on effect on U.S. dollar liquidity. This paper contains best practice recommendations that banks and payment system operators can implement to minimize the size and duration of these problems.

## **4.7 Summary of Best Practice Recommendations**

### ***4.7.1 Liquidity and Treasury Management Best Practices***

1. Establish a CLS liquidity account to allow for effective and rapid re-circulation of liquidity within CLS. The following assumptions need to be validated by CLS Bank prior to commencing:
  - Such a facility can be implemented and operated cost-effectively;
  - Sufficient liquidity can be released from settlement accounts into liquidity accounts to assist with the management of pay-in schedules.
  - The impact of receiving excess liquidity within CLS Bank will not adversely impact the overall efficiency of the national payment systems.
2. Inside/outside liquidity swaps would be an effective tool to manage liquidity imbalances. An external cross-currency working group, under the direction of the CLS Cross-Currency Liquidity Group, has been formed to explore this recommendation in greater detail.

### ***4.7.2 CLS Third Party Services Best Practices***

1. Manage third party CLS positions separately from bank positions to better control usage of short position limits at CLS Bank and facilitate forecasting of third party services cash requirements.
2. Use common nostro accounts for both CLS Bank and non-CLS Bank transactions to minimize cash control problems with the required tight funding time-frames.<sup>45</sup>
3. Establish a cutoff time for submission of third party service transactions (6:00 p.m.), prior to value date and opening of same-day window, in order to enhance cash forecasting and control; relieve use of the CLS same day trading window for settlement members “trading down.”
4. Establish short position limits for each third party service customer, for each currency and for overall third party customer short positions, so that settlement member’s total limits can be controlled and allocated according to bank-wide policies.
5. Track the running forecast for third party service positions for each value date and actively manage the short position limits and bank-wide short position limits to acceptable levels by using FX transactions/swaps.<sup>46</sup>
6. Time pay-outs to third party service customers after CLS Bank settlement to facilitate liquidity management. Place hold on third party services pay-outs via Fedwire until covering funds are received unless paid against approved third party services daylight limits.
7. Develop procedures, processes, and systems to track the amount and duration of Fedwire daylight overdrafts. A control mechanism will support pricing or other incentive mechanisms to rationalize the use of third party limits, reduce the occurrence of pay-ins that are not properly pre-funded, and manage settlement members’ use of Fedwire debit cap.
8. Request pre-advice of large transactions potentially resulting in daylight overdrafts on Fedwire.

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<sup>45</sup> However, there may also be legal and operational benefits associated with segmentation of CLS and non-CLS accounts.

<sup>46</sup> Some banks believe that FX transactions/swaps are relatively inefficient since banks may only be “short” in a single currency.

#### ***4.7.3 CLS Bank Systems/Operations Problems Best Practices***

1. The CLS Bank systems should have back-up or redundancy capabilities that will enable system recovery within 30 minutes from system point of failure.<sup>47</sup>
2. There should be contingency hardware, which will allow processing from a remote site should the primary site become inoperable.
3. Establish contingency plans for resuming operation in a manual mode from point of failure.
4. Crisis risk management procedures should include a process whereby all RTGS systems are made aware of CLS Bank or RTGS systems/operations problems.
5. CLS Bank should establish minimum standards for disaster recovery for its shareholders.
6. Service Level Agreements should be established between CLS Bank and the central bank RTGS systems. These agreements should clearly identify disaster recovery procedures including:
  - The various levels of system failure and contingencies for processing transactions across the CLS Bank account.
  - Deadlines for system recovery from the point of failure.
  - Processing extensions and deadlines.

#### ***4.7.4 RTGS Systems/Operations Problems Best Practices***

1. Systems back-up or redundancy capabilities should be consistent across RTGS systems.
2. There should be contingency hardware, which will allow processing from a remote site should the primary site become inoperable.
3. Contingency plans should identify alternative means of providing funding to the CLS Bank accounts to prevent downstream failure across the other CLS eligible currencies.
4. Minimum deadlines for system recovery from point of failure should be defined.
5. Capabilities for extending processing deadlines should be described.

#### ***4.7.5 Settlement Member Contingencies Best Practices***

1. All settlement members should have back-up or redundancy capabilities, which support recovery of payment/operating capabilities within X hours of a problem occurring.
2. Alternative back-up links with the capacity to instruct a relatively small number of high value payments through the local central bank or nostros should be in place. In the U.S. market, it would be practical to expect that a FedLine terminal or even phone instructions could be used to initiate the limited number of U.S. dollar payments required.
3. Settlement members should require similar contingency capabilities of their user members and third parties.
4. Receipt of currency due would typically continue to be credited to the settlement member's central bank or nostro accounts despite the settlement member's problem. User members and third parties could continue to pay in any currency due the

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<sup>47</sup> See Appendix N for CLS contingency procedures.

settlement member, and the settlement member could likely distribute currency due such participants via the back-up facilities previously discussed.

5. Settlement members should require similar rapid recovery capabilities from their central banks and nostros.
6. Given the limited number of pay-ins required, it is practical to expect that effective alternative payment methods should be made readily available for the currencies participating in CLS Bank.

#### ***4.7.6 Abnormal Settlement Liquidity Issues Best Practice***

1. Settlement members should negotiate primary and secondary liquidity facilities with nostro banks to facilitate the pay-in obligations in the timeframes required.

#### ***4.7.7 Double Settlement Days Best Practices***

1. Anticipate possible need for additional liquidity on double settlement days. Forecast scheduled settlements for that day and plan for liquidity needs.
2. Apply liquidity management techniques previously discussed.

#### ***4.7.8 Unscheduled Holidays Best Practices***

1. Minimize, to the extent practical, pay-in/pay-out positions in markets where unscheduled holidays may occur. This may be addressed via swaps or other strategies previously identified.
2. Look to CLS Bank to coordinate “involuntary liquidity providers” balancing currencies payments due but not paid to institutions in the holiday market, with currency receipts due but not received from institutions in the holiday market.
3. Arrange swaps with remaining positions in currencies expected to be paid to or received from institutions unexpectedly absent from the process.
4. When time permits, trades subject to unscheduled holidays should be rejected by CLS Bank and resubmitted by the shareholders with an amended value date.

#### ***4.7.9 Outstanding Issues to be addressed***

This section contains a list of issues that remain.

1. Creation of an alternative platform to borrow against U.S. Treasury Securities in conjunction with one of the major Custody/Clearing banks is currently in the definition stage.
2. Establish a cross-currency collateral pool with Central Bank would be an efficient mechanism for generating liquidity in required currencies through collateral maintained with a specific central bank.
3. Direct settlement of money market transactions and repos within CLS Bank would help remove the intra-day funding gap by offsetting obligations directly within CLS Bank.

## 5. CHIPS FINALITY

### 5.1 Introduction

On July 29, 1999, following a one-year review by Federal Reserve staff, the Board of Governors raised no objections to the proposal to transform the Clearing House Interbank Payment System (CHIPS) from an end-of day multilateral net payment system to one that will provide intraday finality. This proposal, to be implemented in January 2001, will achieve a number of important risk-reducing objectives, key among which is the elimination of any possibility of settlement failure on CHIPS. This section of the report addresses the effect the new processing system will have on participant banks and other payment systems. Following a background of the current CHIPS processing system, a brief overview of the new CHIPS system is given. Issues surrounding CHIPS finality, specifically, benefits of the new system and the effect of a participant's failure to provide required funding under CHIPS finality, are also provided. The effect of CLS Bank on CHIPS finality is then examined. This is followed by a discussion of treasury implications. Finally, best practices recommendations are proposed.

### 5.2 Background

Today, CHIPS is the largest private net settlement payment system in the world, processing among 77 participants approximately 225,000 payment messages worth an average of \$1.2 trillion daily.<sup>48</sup> On peak days, this can exceed 400,000 payments worth \$2 trillion. Given these volumes, systemic risk from a settlement failure has been an ongoing concern for both the participants and their central bank regulators. In response to this concern, the Clearing House<sup>49</sup> has made several major changes over the last 20 years to protect the system and its participants from settlement risk. For example, in 1981, CHIPS moved from next-day to same-day settlement. In 1984, CHIPS added rules on bilateral limits, and two years later imposed net sender debit caps, thereby limiting the risk that a single participant could present to the system. In 1990, settlement finality was guaranteed, even in the event of an insolvency of the system's largest debtor, through the imposition of a loss-sharing formula, and collateral requirements. In short, CHIPS was Lamfalussy compliant before the standard had even been published.<sup>50</sup> Most recently, in 1997, CHIPS improved settlement finality to "Lamfalussy Plus One" through debit cap reductions and collateral increases, so that the system could withstand the simultaneous failure of the two members with the largest debit positions.

Despite these improvements to the processing system, several key concerns remained. Firstly, although the CHIPS rules are clear that release of a payment message finally and irrevocably obligates the sending participant to pay the amount of the payment message to the receiving participant, this obligation is finally discharged only

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<sup>48</sup> A list of member banks and yearly volume statistics can be found in Appendices O and P.

<sup>49</sup> In March 1998, The New York Clearing House Association L.L.C. transferred ownership and operational responsibility for CHIPS to a new affiliate, The Clearing House Interbank Payments Company L.L.C. ("CHIPCo"). References in this paper to the "Clearing House" shall mean CHIPCo or its predecessor, the New York Clearing House, as appropriate.

<sup>50</sup> "Report of the Committee on Interbank Netting Schemes of the Central Banks of the Group of Ten countries," November 1990, BIS; reformatted and repaginated March 1999 for BIS website publication.

upon the completion of settlement at the end of the day, raising the possibility, however remote, that a debtor participant might not have sufficient funding available to pay its obligation at the end of the day.<sup>51</sup> Secondly, despite the existence of a loss-sharing agreement and collateral, the possibility of an unwind exists. The CHIPS loss-sharing formula would not withstand an economic or natural disaster that leads to the complete financial collapse of a major nation. Finally, even in a controllable event where CHIPS can settle after the failure of one or more participants, under the current rules it is the surviving participants that will share in the loss created by the insolvency. Naturally, the participants want to eliminate this exposure.

Aware of these remaining concerns, the Clearing House sought to implement further changes to the processing system in order to reduce systemic risk, without any adverse effect on efficiency or cost. Specifically, the Clearing House wanted to eliminate any possibility of a settlement failure on CHIPS, make CHIPS payment messages final at the time they are released to the receiving participants, avoid significant increases in collateral or liquidity costs, avoid the inefficiency associated with multiple intraday Fedwire-based settlements to support the finality of CHIPS settlements, and retain the economic and operational efficiencies of CHIPS and attract additional interbank commercial payment traffic.

### **5.3 CHIPS Finality Settlement: An Overview**

In line with these objectives, two essential changes are being proposed to the current CHIPS system. Firstly, CHIPS will replace the current Treasury securities collateral with a prefunded balance maintained in a “prefunded balance account” on the books of the Federal Reserve Bank of New York. Secondly, CHIPS will use a new computer program, the “balanced release algorithm,” to control the release of the payments to and from member banks and receiving participants.

The Revised Rules have not yet received Clearing House or Federal Reserve approval but are expected to incorporate the following:

#### ***5.3.1 Start of Day***

- Each participant is required to deposit its initial prefunded balance requirement to the prefunded balance account at FRBNY. The required amount may be deposited as soon as CHIPS opens at 12:30 a.m. and should be deposited no later than 9:00 a.m. (7:00 a.m. on a day after a U.S.-bank holiday). It is expected that most participants will pay their prefunded balance requirements by making Fedwire payments from their own reserve or clearing accounts, or, if they do not have their own reserve or clearing accounts at a Federal Reserve Bank, through a correspondent that does have a Federal Reserve account.
- The amount of the initial prefunded balance requirement will be established by the Clearing House using a formula designed to ensure optimal system performance. The

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<sup>51</sup> There has never been a settlement failure on CHIPS, although there have been a number of occasions of the risk of possible disruptions in U.S.-dollar settlements, such as the failure of Bankhaus Herstatt in 1974. More recent examples include the failures of Drexel, BCCI, and Barings.



amount will be recalculated weekly using the latest transaction history of each participant. Participants will not be permitted to make any additional deposits to or withdrawals from the prefunded balance account between the time that they have paid their initial prefunded balance requirement and the end of the final clearing.

### ***5.3.2 Intraday Operations***

- The initial prefunded balance becomes a participant's opening balance on CHIPS. The available balance in each participant's account will vary throughout the day based upon the release and receipt of payment messages from other participants. As payment messages are netted, set off, and released by CHIPS, CHIPS will post the appropriate debits and credits to the available balances of the sending and receiving participants. However, in no case will a participant's available balance be permitted to fall below zero or to rise to more than two times the initial prefunded balance (the "maximum available balance"). This latter limitation prevents a participant that might be having system problems releasing payment messages from building an excessive balance and absorbing excessive system liquidity.
- Payment messages will ordinarily be released in batches, although individual releases may also occur. Batches may be between two participants, or may involve several participants. The balanced release algorithm will ensure that these debits and credits do not cause the available balance of any participant to drop below zero or rise above the maximum available balance. The multilateral nature of the balanced release algorithm will give far more flexibility than the current bilateral net credit limits, which today require that payments from Bank A to Bank B be directly offset by reciprocal payment messages from B to A. Under the new system, offsetting payment messages may be received from any CHIPS participant.
- The netting and the posting of the debits and credits to the available balance constitute final settlement of all payment messages in each batch. It therefore satisfies, finally and irrevocably, the obligation of each paying participant to pay the amount of the payment message to the receiving participant. CHIPS payment messages will no longer be subject to final settlement at the end of the day. They will be finally settled upon receipt.
- For a payment message released individually, the amount of the payment message will simply be debited to the sending participant's available balance and credited to the receiving participant's available balance. Given the limitations on available balances built into the balanced release algorithm, payment messages released individually are likely to be smaller than those released in batches.

Figure 1

**CHIPS Operational Timeline (1Q2001) – EST**

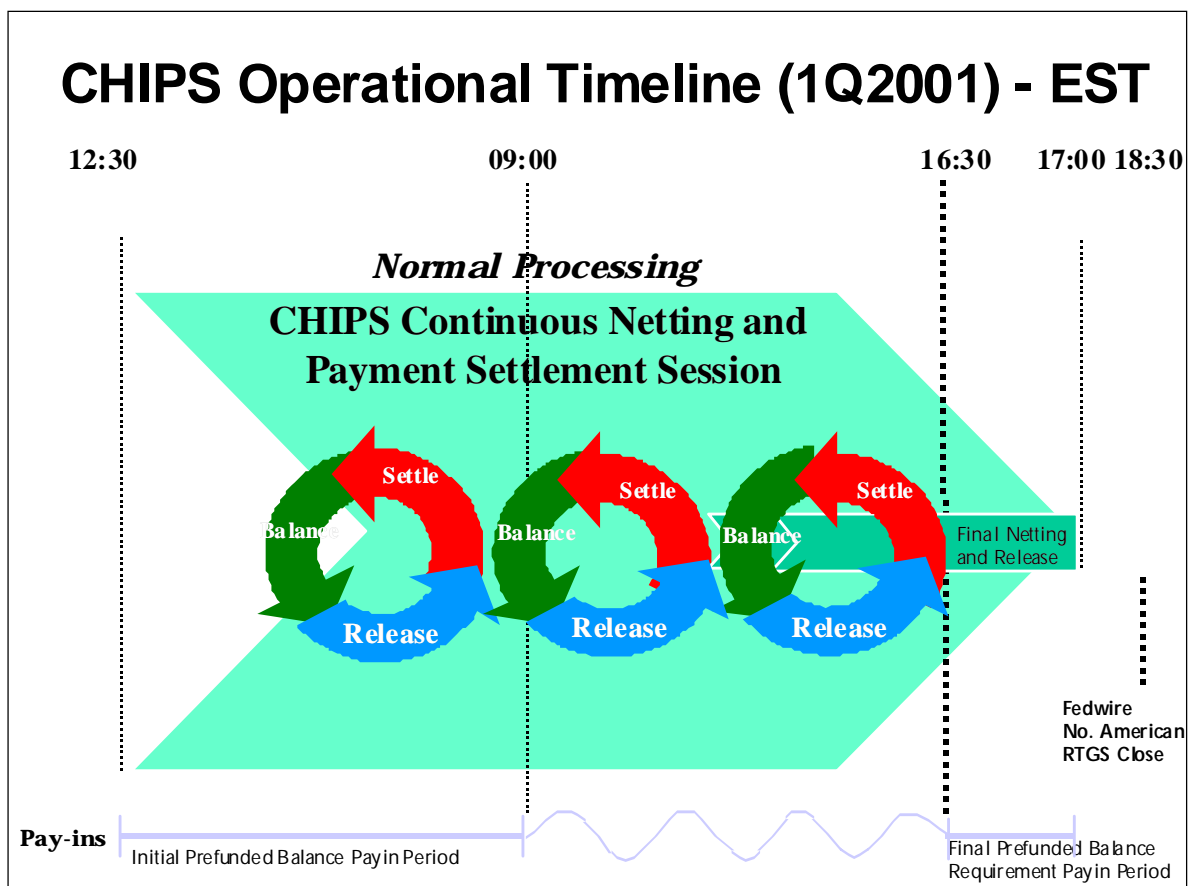


Figure 1 above is a timeline for the CHIPS finality process. Key times are at the top of the chart, and a description of processes and pay-ins are at the bottom. The process starts with the payment of the initial prefunded balance requirement after 12:30 a.m.; this is approximately equal to current collateral requirements totaling \$3 billion for the all participants. These balances are used to release payments with finality continuously until 5:00 p.m. Then, a final balance is required to permit the netting and release of all remaining payments. If a participant does not pay its final prefunded balance requirement, CHIPS will release as many of the remaining payment messages as possible with the balances on hand. Payment messages that remain unreleased following this phase will expire, and CHIPS will notify each participant of its unreleased payment messages so that the participants can make the payments by alternate routes.

### *5.3.3 End of Processing Day*

CHIPS will close at 5:00 p.m. for the input of new payment messages. Procedures proposed for use at the end of day will differ markedly from those in use today. Specifically:

- Immediately after the system closes, CHIPS will run what is called “initial closing netting and release.” CHIPS will remove the maximum available balance limitation and run the balanced release algorithm one more time. (The minimum available balance limitation of zero will remain in place.) This should cause the release of additional items; extensive modeling suggests that following this phase, 99.6% of all current CHIPS payment messages, comprising 97.5% of current total value, will have been released. The remaining unreleased messages will be about 2.5% of total value settled, equal to approximately \$30 billion.
- Following the initial closing netting and release stage, CHIPS will calculate a net balance for each participant without actually netting, setting off, or releasing any of the payment messages remaining. This net will be combined with the participant’s existing remaining available balance to calculate each participant’s “final prefunded balance requirement.” (This number will be zero for those participants where the sum of the net balance and the available balance is zero or positive.) Each participant will then be notified of its final prefunded balance requirement.
- Each participant will then have 30 minutes, until 5:30 p.m., to send a Fedwire payment order in the amount of its final prefunded balance requirement to the prefunded balance account. (Naturally, a participant need not fund this amount itself. It may arrange liquidity with a funding participant, and the funding participant would send the payment on its behalf.) Once all Fedwire payments are received, CHIPS will be fully funded and all pending payment messages will be released. Finally, CHIPS will send to each participant that has an available balance greater than zero a Fedwire payment order in the amount of its final available balance. This would complete the processing day.
- Modeling reveals that approximately \$30 billion in gross payments will not be settled during the day and will be carried over into the final prefunded balance requirement. However, this modeling only examined current CHIPS activity, and the Task Force expects the volume and dollar dynamics to change under the new system. CHIPS will settle 97.5% of the amount of the current CHIPS system; however, it is known that not all payments today intended for CHIPS actually are paid over CHIPS.
- On an average day today between 4:30 p.m. and 6:30 p.m., CHIPS participants have to re-route to Fedwire about \$80 - 90 billion of payments that they cannot process due to the CHIPS’ bilateral limits and sender net debit caps. Because these transactions are never released to CHIPS, they do not appear in any of the modeling done by the Clearing House.
- Under CHIPS finality, there are no bilateral credit limits, and participants will input all payment messages to the system as soon as they wish to pay them. Due to the way that the balanced release algorithm works, the more payment messages are entered to the system, the more efficient the netting scheme, and the more payment messages

that the Clearing House expects to be settled. It is anticipated that adding an additional \$80-90 billion in “new” payment messages to CHIPS will actually have a positive effect in terms of system turnover and netting efficiency.

## **5.4 BENEFITS OF CHIPS FINALITY**

As a result of the proposed changes, the Task Force anticipates major benefits for the member banks, their customers, and Federal Reserve operations. These benefits fall into four categories.

### ***5.4.1 Systemic Risk***

The new system will virtually eliminate any payment system risk associated with payment messages that are released through CHIPS. Every payment message will be final when released by CHIPS to the receiving participant. The amount of the payment message can therefore be made immediately available to the beneficiary with no risk of loss due to a sender’s insolvency. Moreover, under CHIPS finality, the consequences for others of a participant’s failure to pay its final prefunded balance requirement at the end of the day will be far less serious than a failure today to pay the end-of-day-settlement obligation. The failure to meet the final prefunded balance requirement will result in relatively few payment messages that had been delivered to CHIPS being cancelled by the system and not sent onward by the receiving participants. The sending participant will still be free to re-route these payments via either a correspondent or Fedwire, and the risk of an unwind or catastrophic settlement failure will not exist.

### ***5.4.2 Liquidity***

The new CHIPS processing system will contribute to improved use of liquidity. CHIPS participants today, constrained by debit caps and bilateral limits, must arrange their payments to maximize the liquidity permitted by these limits. Most participants choose to send their small-value payments early and hold large transactions for later in the day. One effect of this is that payment messages that remain unexecuted in the outgoing queue to CHIPS are usually the largest payments. Since the balanced release algorithm works best with a mix of large and small payments, under the new CHIPS processing system there will be no benefit to participants in withholding larger payments until late in the day. The clearing of both large and small payment messages throughout the day also means that participants will face fewer liquidity risks should there be some kind of end-of-day problem.

### ***5.4.3 Credit and Operational Effects***

The credit and operational burdens for CHIPS participants under the new processing system will be eased. Firstly, participants will no longer have to establish, maintain, and revise bilateral limits vis à vis each other; nor will they need to deal with any intraday requests for line modifications to accommodate exceptionally large payment messages stuck in the payment release queue. Secondly, because under the new system a single daily Fed funds transfer will replace the current government securities collateral, participants will no longer need to monitor the maturities of collateral nor substitute for maturing collateral. Additionally, participants will maintain a balance in the prefunded

balance account rather than unproductive overnight deposits of U.S. Treasury securities, a financial benefit to most institutions. Participants will in most instances also be responsible for paying their own final prefunded balance requirements and therefore will no longer need to designate settling participants to settle their end-of-day position. Finally, settling participants will no longer have to make daily credit decisions, often for very large dollars, over whether or not to settle the CHIPS positions of smaller participants for whom they have designated settling participants.

#### ***5.4.4 Reduction of Federal Reserve Settlement Risk***

As already discussed, caps and bilateral limits today prevent a significant amount of payment messages from settling over CHIPS. The new system will permit CHIPS to process more payment messages and reduce the necessity to re-route payments over Fedwire after CHIPS has closed.

### **5.5 CHIPS Finality and Participant Abnormal Conditions**

Neither the CHIPS nor participant systems contingency plans are expected to change with the implementation of the new settlement process. However, under the new processing environment, participants will face new liquidity requirements and must be prepared to react in circumstances when these requirements are not met. The following section covers the effect on CHIPS participants of a failure to provide required funding.

#### ***5.5.1 Failure to Fund the Initial Prefunded Balance***

The initial funding period lasts from 12:30 a.m. until 9:00 a.m. CHIPS will not provide notifications to participants informing them of the participants that have not paid the required amount; therefore each participant is responsible for actively monitoring transaction flows. Because payment messages may not be sent by or to an unfunded participant, its failure to fund may be detected by observing the lack of activity to or from that participant. Unless each participant is vigilant, however, unreleased payment messages may build.

#### ***5.5.2 Intraday Operations***

If a problem surfaces at a participant during the payment day, the Clearing House staff has the authority to suspend the participant immediately, suspend the participant after the close of business, or monitor the participant for a period.

#### ***5.5.3 End-of-Day Processing***

Under CHIPS finality, payment messages are final when released. "Unwinding" payment messages and loss-sharing will not occur. By the very nature of CHIPS finality, each payment message is final when released. Therefore, if a participant should be suspended, all payment messages released up to the point of suspension are final.

In the event that one or more participants do not send in final prefund balance requirements within the allotted 30 minutes, CHIPS will consider the prefunded balance account only "partially funded." In this case, the balance release algorithm will be run one final time, and CHIPS will release all payment messages that can be netted and

released with the balances at hand. Any payment messages still unreleased after this process will expire, and CHIPS will notify the sending participants so that they can send the unreleased payments another way (e.g., by Fedwire or another network), reject the payment orders that they received from their customers, or reenter the item for release on the following day.

To simulate the failure of one or a few participants to pay their final prefunded balance requirements, the Clearing House took five days of actual CHIPS payment messages and analyzed this data through the balance release algorithm in the same way the new system will work. In addition, end-of-day processing was conducted assuming that the two participants with the largest final prefunded balance requirements did not pay these amounts to the prefunded balance account. The results were as follows:<sup>52</sup>

Date	Number of Payments Not Released by All Banks After Partial Funding of the Final Netting and Release Phase	Payments Not Released by Nonfunding Banks after Partial Funding of the Final Netting and Release Phase	Dollars Not Released by All Banks After Partial Funding of the Final Netting and Release Phase (in billions)	Dollars Not Released by Nonfunding Banks After Partial Funding of the Final Netting and Release Phase (in billions)
Sept. 10, 1998	22	17 (77%)	\$3.2	\$2.0 (63%)
Sept. 11, 1998	13	10 (77%)	2.6	2.1 (81%)
Sept. 14, 1998	34	24 (71%)	6.0	2.4 (40%)
Sept. 15, 1998	41	19 (46%)	6.2	2.8 (45%)
Sept. 16, 1998	33	12 (39%)	7.2	1.9 (26%)

This survey took the payment messages in the same order as they were delivered on the dates surveyed, with large payment messages generally concentrated at the end of the day. If large payment messages were more evenly distributed throughout the day, as is most likely to be the case when the new method goes into effect, the results are expected to be substantially better.

The survey also demonstrates that small participants will not have a disproportionate number of unreleased payment messages. Of the 143 payment messages that were not released during the five days of the simulations, only twelve (eight per cent) were delivered by smaller participants (i.e., those that presently have debit caps of less than \$400 million). No small participant had more than two unreleased payment messages on any given day, and for all five days only one small participant had to make gross payments in excess of the debit cap it has under the present system.

<sup>52</sup> This simulation and its interpretation is part of the "Proposal for CHIPS Finality" submitted by The Clearing House Interbank Payments Company L.L.C. to the Board of Governors of the Federal Reserve System and the Federal Reserve Bank of New York, April 13, 1999.

In sum, in the event of a participant's failure to pay its final prefunded balance requirement, the effect is likely to fall predominantly on the participant that did not fund, few small participants will be significantly affected, and it is unlikely that participants will have to reroute payments with a gross value in excess of their present debit caps (which is a market-driven measure of their liquidity). These effects are in contrast to what would occur today if a participant were not to pay its net debit balance. Each of the remaining participants would have to take a piece of the failed participant's net debit balance (the remaining participant's additional settlement obligation, or ASO). If a remaining participant defaulted on its ASO, its collateral would be sold to its settling participant to meet its obligation. If more than two major participants failed to settle, the loss-sharing arrangement might not apportion all of the failed participants' settlement obligations among the remaining participants and there could be a settlement failure and all of the day's payment messages might have to be unwound.

In short, the simulations demonstrate that CHIPS should be able to withstand the effect of a failure to pay a final prefunded balance requirement and that the effect of a failure to fund is likely to be absorbed more easily than a settlement failure and an unwind under the present arrangement.

## **5.6 Effect of CLS on CHIPS Finality**

The Task Force, with the assistance of the Clearing House, attempted to identify the liquidity impact of CLS<sup>53</sup> on CHIPS. Clearing House staff identified payment messages from a sample CHIPS day that were most likely to migrate to CLS ("qualified transactions"), based on the counterparties and the content of the message (an FX trade in a qualified currency). The Task Force tested these results on a message by message basis with internal bank data and concluded that there were inaccuracies in the transactions selected.<sup>54</sup> Even after adjustments were made to the extraction software, a number of CLS qualified transactions could not be identified accurately.

The Task Force believes that the only conclusive way to identify the CLS qualified transactions would be to have each CLS member identify on a transaction level each payment that would be excluded from CHIPS and effected over CLS during a survey period.<sup>55</sup> This, however, is outside the scope and timeframe of this project.

Despite the limitations of these exercises, the following observations can be made. Firstly, the transactions that will be removed from CHIPS will be fairly balanced, i.e., payments sent and received through CLS will be fairly equal in count and amount

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<sup>53</sup> See the section on CLS of this report for a description of CLS and its functions.

<sup>54</sup> Task Force members found it fairly easy to identify the impact of the migration of their institution's activity to CLS because of the use of the CHIPS common foreign exchange universal identification number. It was not, however, as easy to determine customer activity that would be impacted, for two reasons. Firstly, the credit controls on CHIPS restrain payment flow both in count and amount from its participants. Secondly, there is no definitive method to determine if a payment will migrate to CLS from CHIPS.

<sup>55</sup> Refer to Appendix R for a sample methodology to identify CLS transactions.

after the CLS ramp-up period. This observation supported the best estimate of the Task Force that the long term effect on CHIPS liquidity will not be substantial. It was agreed, however, that the CLS ramp-up period during its first two operating years will create volatile liquidity requirements for end-of-day settlements for both CLS member banks and their counterparties. Nevertheless, there are several steps that should be taken to minimize disruption during the ramp-up period. Banks should keep CHIPS and other affected payment systems informed of their plans to move volume to the CLS Bank; this will allow the systems to anticipate volume shifts and model what the effects might be. Additionally, if possible, banks should coordinate volume shifts so that such shifts are balanced; this will minimize liquidity demands at both the CLS Bank and the affected payment systems.

Secondly, using the currently available data, modeling indicates that CHIPS finality helps to mitigate the effect of CLS on CHIPS liquidity requirements during the ramp-up period and produces better results than with the current CHIPS settlement process. The results consistently demonstrated that CHIPS finality is far more liquidity-efficient than the current CHIPS procedure.

## **5.7 Treasury Implications**

### ***5.7.1 Money Desk Operations***

The money desks at the major U.S. clearing banks assume responsibility for managing Fedwire and CHIPS positions, including end-of-day settlement. The current CHIPS settlement operates relatively smoothly and efficiently. Over \$1.2 trillion in daily CHIPS activity results in an average of \$7.7 billion of settlements to and from the settling participants. Since a small number of settling participants settle on behalf of other participants, the “net down” effect simplifies the settlement process.

The new CHIPS finality process will require substantial change for the money desk function. Prefunding in an amount approximately equal to current CHIPS collateral will be required to be on deposit; this may result in the early use of Fed daylight overdrafts. Banks without Fed debit caps must borrow from other institutions (a nostro funding agent). Additionally, CHIPS payment messages will be entered into the system as received during the day with releases and settlement subject to the new CHIPS balanced release algorithm. Based on test results, a payment message may take a minimum average release of two seconds to a maximum release of over four hours with an average of four minutes. Participants will need to more closely monitor payment messages to allow for possible delays.

### ***5.7.2 Nostro Funding Services***

It is anticipated that foreign CHIPS participants will seek nostro funding assistance from U.S. participants (most likely a former CHIPS settling participant) to ensure the processing of the final prefunded balance requirement. While this process may appear to be similar to the current end-of-day settlement routine, there are significant differences that will arise under CHIPS settlement finality.



Firstly, the risk control structure will change under the new CHIPS system. In the current CHIPS environment, risk controls constrain the maximum net debit amount to any one participant based upon market determined bilateral limits. Therefore, settling participants that settle for nonsettling participants currently establish approved credit facilities equal to the CHIPS net debit cap to cover this potential settlement exposure for those participants, knowing that the end-of-day requirement must be within this limit. Under CHIPS finality, no limits on the amount of the final prefunded balance requirement for any one participant will be systemically imposed.<sup>56</sup>

Secondly, the amount of payments that settling participants make on behalf of nonsettling participants are expected to change under the new CHIPS system. Under CHIPS finality, the end-of-day funds flows will no longer be netted for participants they are funding; a separate payment must be made for each participant. This may result in a greater amount paid on behalf of participants and a greater use of daylight overdraft on Fedwire if nostro funding services are provided by the current settling participants to the nonsettling participants they settle for. A best practice for any participant considering offering to process the final prefunded balance requirement for any other participant would be to reach a clear understanding over the roles and responsibilities among the all parties involved. Particular emphasis should be paid on time frames and credit amounts. This is all the more important given the extension of the CHIPS operating day to 5:00 p.m. and the concomitant tightening of the time frames for funds movements.

Finally, in today's CHIPS environment, the decision of whether and how to process a residual payment not processed through CHIPS because of net debit cap or bilateral credit limit constraints is made by the sending participant in advance of or following CHIPS settlement. The decision of the CHIPS settling participant is then limited to funding the net debit position of each participant. Under CHIPS finality, a decision not to pay a CHIPS participant's final prefunded balance will result in pending payment messages expiring with the sending participant free to send the payment by another medium. While no recommendation is presented here as to how to allocate responsibilities, it is essential that these issues be resolved by all concerned for any participant considering the provision of final prefunded balance payment services.

The decision by CHIPS to implement a final gross clearing guideline on the overall size of residual payment messages and the amounts allocated to individual participants, coupled with the intention to refine and modify the amount of the initial prefunded balance requirement, may serve as important mitigating controls on the amount of the final prefunded balance requirement. However, it does not obviate the need for achieving clarity as to the roles and responsibilities for any participant that anticipates providing end-of-day funding services.

### ***5.7.3 Liquidity Risk Mitigants***

In order to manage the end-of-day balance requirement under the new CHIPS system, institutions may find it necessary to move funds to and from Fedwire and CHIPS

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<sup>56</sup> Final gross clearing guideline will be established by the Clearing House and each participant's outstanding payment messages at the end of a day will be monitored on an ex-post basis.

on an intraday basis. One technique expected to be used is to remove an unreleased CHIPS payment message and reroute it to Fedwire, potentially reducing the final prefunded balance requirement. The plans for managing CLS Bank short positions include a variety of swap tools for liquidity management.<sup>57</sup>

During the implementation of the euro, a technique called an “inside-outside” FX swap was developed to adjust positions between the various euro systems; legs settled in various systems to adjust cash positions as required in each system. The Task Force believes that the use of such swaps could be a valuable technique in adjusting positions between CLS Bank, CHIPS, and Fedwire. In order to properly coordinate settlement positions between CLS Bank, CHIPS, and Fedwire (as well as other payment systems), the development of a global treasury money desk function should be considered by CLS Bank members and other banks with important offshore operations. The coordinating treasury money desk function must be supported by real-time information for CLS Bank, CHIPS and Fedwire with pro forma position analysis on an ongoing basis beginning at midnight CET and ending with the settlement of Fedwire in the U.S.

Two countries currently operating dual payment settlement processes have implemented procedures for moving funds between the two settlement systems (EAF / ELS in Germany and PNS / TBF in France). An automated process for moving funds between CHIPS and Fedwire is seen by several members of the Task Force as useful in the environment after the implementation of CLS and CHIPS finality. For example, if the end of the settlement process on CLS results in a long dollar position on Fedwire, it may be necessary to transfer these funds to CHIPS to cover an end of day balance requirement. Rather than rerouting CHIPS settlements to Fedwire or entering into swap arrangements with one or more counterparties resulting in additional transaction costs and with counterparty risk, an automated process (called a “bridge”) might be developed to exchange funds on a payment versus payment (PVP) basis between counterparties operating on Fedwire and CHIPS.

## **5.8 Recommendations and Best Practices**

- Each CHIPS participant should establish a working group, including representatives from its treasury, correspondent banking operations, and systems departments, to plan for systems and operational enhancements required to implement the treasury management requirements of CHIPS finality. This group must coordinate closely with treasury planning for the implementation of CLS Bank.
- After CHIPS finality is implemented, participants should increase monitoring of payment flows for each counterparty throughout the extended day. Detecting imbalances early will provide additional time to reroute unreleased payments or anticipate end-of-day funding requirements.

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<sup>57</sup> See Appendix M in section on CLS Bank.

- Internal modeling should be conducted by each CHIPS participant to determine the effect of the CLS implementation on CHIPS operations (including the CLS ramp-up period) in order to help determine maximum CHIPS treasury funding requirements.
- During the ramp-up to mature volume on CLS Bank, banks should keep CHIPS and other affected payment systems informed of their plans to move volume to the CLS Bank.<sup>58</sup> Additionally, banks should, if possible, coordinate volume shifts so that such shifts are balanced.
- Appropriate end-of-day funding facilities on a committed basis must be in place from both private and Federal Reserve sources to cover maximum increases in the CHIPS final prefunded balance requirements based upon the modeling of bankwide flows and in anticipation of unscheduled events.
- There is a need for detailed service agreements between CHIPS participants and nostro funding agents to support the roles and responsibilities for funding CHIPS final prefunded balance requirements.
- “Inside-outside” swaps should be developed as an alternative approach to rerouting payments to correct CHIPS settlement imbalances or to recycle funds from the CLS settlement to CHIPS. Further development of an automated process (“bridge”) to move funds between CHIPS and Fedwire should be considered after experience is gained operating in the CHIPS finality environment.
- CLS treasury management must be closely coordinated with CHIPS and Fedwire money position operations to forecast CHIPS final pre-funded balance requirements. Major banks may establish a global money desk function to manage U.S. dollar positions across all payment systems and CLS.
- New information systems should be developed to monitor and forecast treasury requirements updated on a real-time basis between CLS, CHIPS, and Fedwire.

## 5.9 Conclusion

The Task Force examined the effect of the new CHIPS finality process on systemic risk and liquidity requirements for the current and new CHIPS finality processes. The Task Force’s conclusion is that CHIPS finality is a fundamental improvement in the U.S. payment system and will benefit U.S.-dollar liquidity management. The distributed method of managing payment messages within bilateral credit limits will be replaced by a centralized queue management process. Participants will have an incentive under the new process to enter all payment messages early in the day; this will result in rapid recycling of funds and fewer liquidity risks at the end of the day. Moreover, failure to fund by a participant will have far less serious consequences than it does under the present arrangement. If a participant does not fund its final

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<sup>58</sup> See Appendix R for a sample methodology to identify USD CLS transactions.

prefunded balance requirement, the only result will be that a comparatively few payment messages that had been delivered to CHIPS will not be sent to nor received by counterparties, and the sending members will be free to reroute unsettled payments through a correspondent or Fedwire. There will be no risk of a catastrophic settlement failure or unwind. The timing of the implementation in January 2001, well before the implementation date for CLS, will permit the new CHIPS finality process to be operational to help mitigate the impact of CLS.

CLS is expected to process a significant share of CHIPS activity (up to 30%) and will ramp up its activity over a two-year period. This may result in potential imbalances and volatility in the CHIPS end-of-day funding requirements as large participants and their offshore branches implement the system. The Task Force did not find it feasible in the time available and with the current databases to model these effects on CHIPS. Each CHIPS participant, however, should perform internal analysis to support treasury, operations, and systems planning for the CHIPS changes and the effect of the CLS implementation.

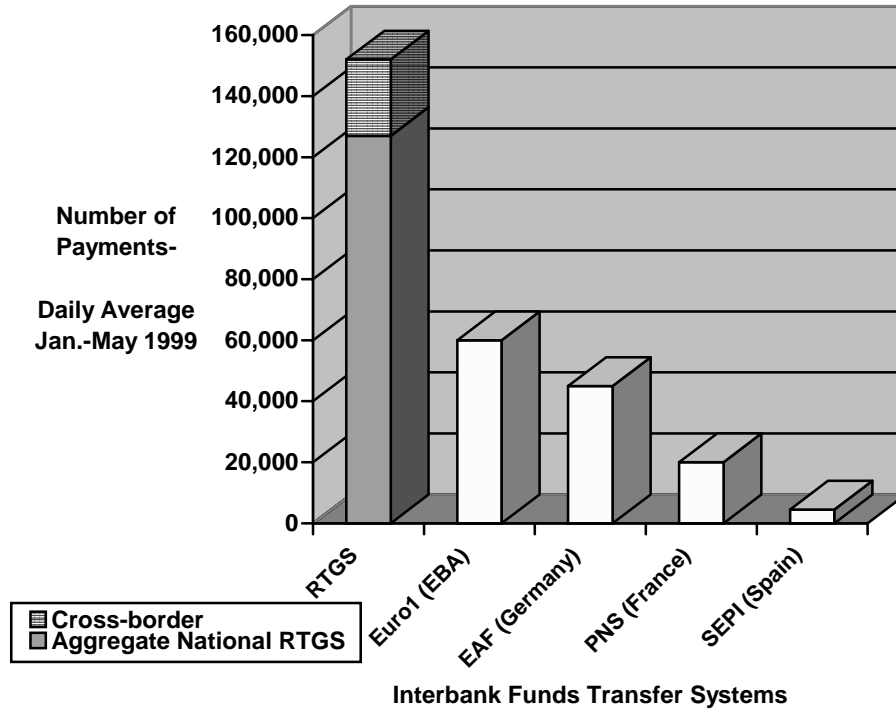
New treasury functions for managing bankwide positions in CLS, CHIPS, and Fedwire (and other major payment systems) are expected to develop in major banks. Treasury professionals are planning to support the new environment with new techniques for swapping positions between banks to adjust CLS, CHIPS and Fedwire imbalances during the day.

Non-U.S. bank participants without significant daylight or overnight borrowing capacity at the Federal Reserve may require new funding arrangements to support CHIPS finality operations. Current CHIPS settlement relationships will be discontinued under the proposed CHIPS rules, but are expected to be replaced by nostro agency funding service agreements.

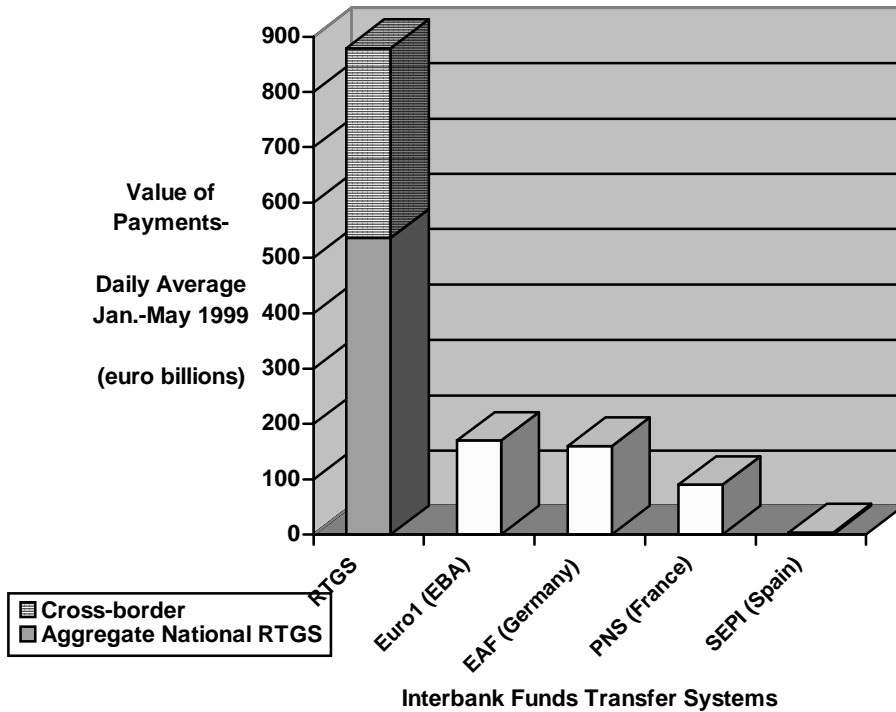
CHIPS finality will reduce administrative expenses associated with the maintenance of bilateral credit limits and the queue management process during the CHIPS processing day. Some current CHIPS participants, however, may find the costs of new funding facilities combined with the systems and operating costs of supporting the changeover to CHIPS finality unattractive in view of the substantially reduced CHIPS volume. The trend to outsourcing of both U.S. payment and foreign exchange operations is expected to accelerate after the implementation of CHIPS finality and CLS.

6. APPENDICES

Appendix A Volume of Payments Instructions



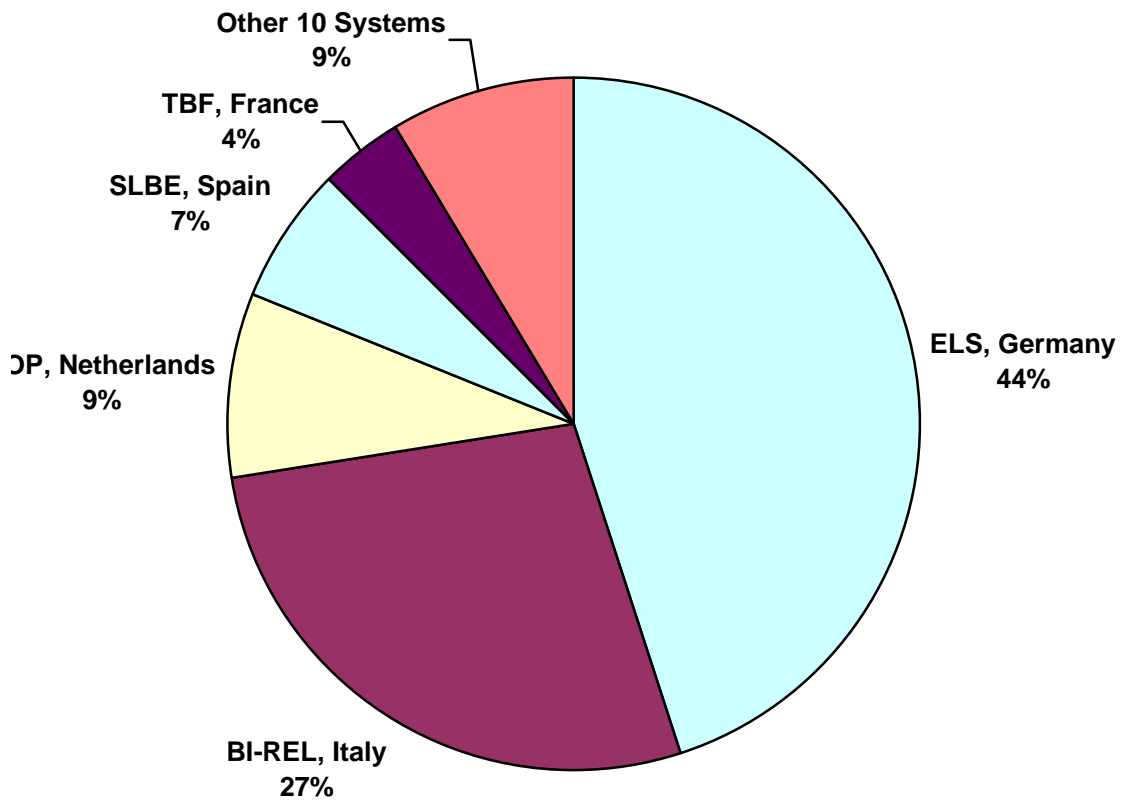
Value of Payments Instructions



Appendix B

## Distribution of National RTGS Payments

Percent of average daily transactions  
January-May 1999

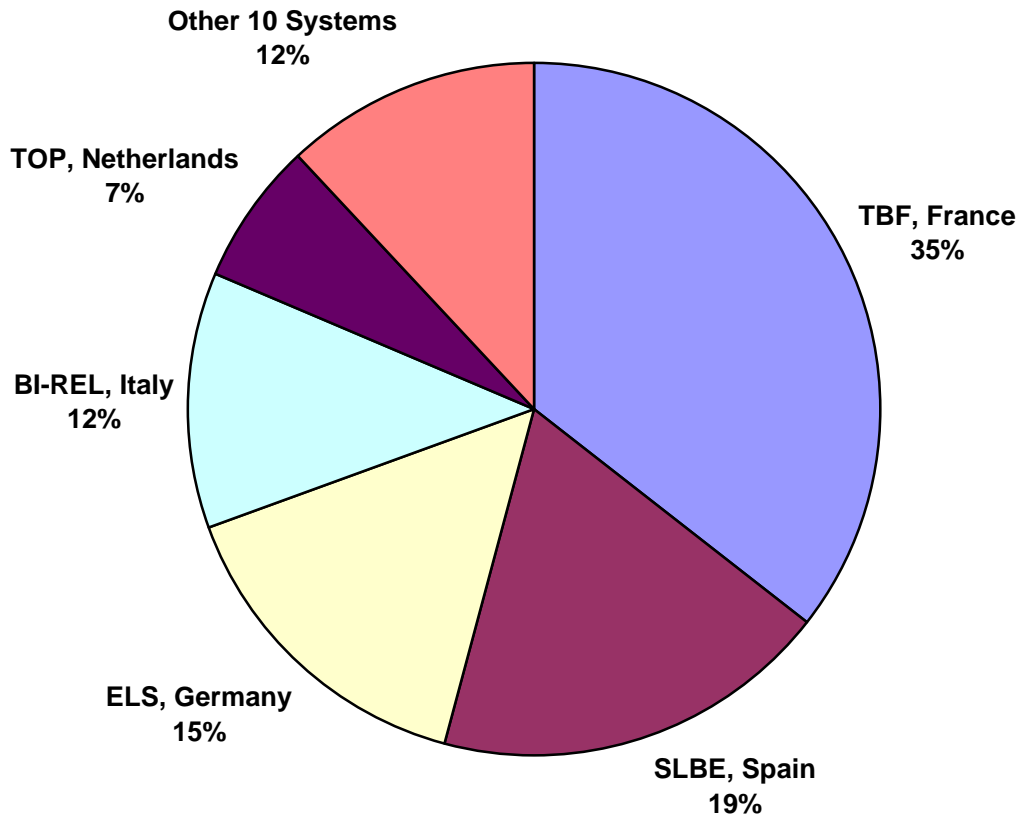


Source: ECB, [www.ecb.int](http://www.ecb.int)

Source: ECB, [www.ecb.int](http://www.ecb.int)

## Distribution of National RTGS Payments

Percent of average daily value  
January-May 1999



Source: ECB, [www.ecb.int](http://www.ecb.int)

## Appendix D

The EBF - Heathrow Group's original proposed conventions for the routing of euro payments were as follows

### **Routing of Euro Payments**

**The conventions under which the market operates at present link the currency of a payment to a particular country. By default, the payment is paid and settled using a payment system in the country concerned. With the introduction of the euro, this linkage between currency and country is removed. A group of 31 major global clearing banks, meeting at Heathrow (the 'Heathrow Group'), has recommended best practice for clearing banks when routing euro payments for same-day value to other clearing banks with access to more than one euro payment system.**

- In accordance with today's best practice, it is the responsibility of the paying clearing bank to pay direct to the branch (or subsidiary) of the clearing bank indicated in the payment message received from its account holder, where the specified branch or subsidiary is directly addressable at a euro payment system.**
- However, if the branch (or subsidiary) of the receiving clearing bank is directly addressable at more than one payment system, it cannot unilaterally dictate through which system the payment is directed.**
- Whilst the choice of payment system cannot be imposed by the receiving clearing bank, this does not rule out national, regional or bilateral agreements which could cause certain payments to be directed through pre-agreed payment channels.**
- Where the receiving and paying clearing banks are directly addressable at any of the euro payment systems, it would be normal practice to use one of these systems.**
- Nothing in the Heathrow Group's recommendations prevents a clearing bank from complying with a specific payment instruction from an account holder.**
- For large payments, it would be normal practice for a paying clearing bank to inform the receiving clearing bank if it intends to use a system other than the system which would normally be used.**
- Settlement instructions for foreign exchange, money market and other financial instruments and other euro payments should not specify a particular payment system to be used, except where pre-agreed contractual arrangements require transactional finality: e.g. RTGS systems.**



## Appendix E

### The Heathrow Group

#### EURO INTERBANK COMPENSATION GUIDELINES

1. These guidelines have been drawn up as a recommended basis for the settlement of claims for compensation arising from payments between banks in euro effected by members of euro payment systems in the European Union.
2. Where a claim for compensation is identified, it is expected that the banks involved will settle the claim on the basis that no bank should be unjustly enriched or injured by the actions of another bank.
3. Compensation under these guidelines is payable only between the banks directly involved with a payment (the remitting bank and the receiving bank). If there is a payment chain, each link of the chain should be considered separately.
4. Payment or attempted payment of compensation under these guidelines does not constitute and should not be construed as an admission of negligence or fault on the part of any of the banks involved, nor should it imply any legal obligation on either party.
5. Compensation under the guidelines is to be paid in euro. Interest claims of less than euro 200 are regarded as *de minimis* and not made.
6. In addition, a fixed flat administration fee of euro 200 is payable or deductible in relation to any single adjustment by/from the bank who originally made the error. Administration fees in respect of multiple payment adjustments to a single entity may be agreed bilaterally.
7. Where the product of amount and period exceeds 100 million (e.g., euro 10 million for 10 days or euro 50 million for 2 days), the precise compensation terms (e.g., compensation rate) are for agreement between the parties. However, it is expected that the bank involved will settle such claims on the basis that no bank should be unduly enriched or injured by the actions of another bank.
8. Once a bank has lodged a claim, such claim should be acknowledged within 2 business days and settled or declined within 10 business days.
9. Banks should ensure that claims are made within 90 days of an error arising and may only claim for a maximum period of 90 days. However, if there is a delay in the settlement of the principle payment, the initiating bank has the right to claim for any period in excess of 90 days.
10. Interest Rate calculation formula (value of funds) to be used:  
Amount of payment in euro X Compensation rate X Actual number of calendar days for which funds held

11. The 'Compensation Rate' to be used for the use of funds claims is the average of each day's EONIA rate less 0.25 percent as published on a daily basis for the days included in the above formula when calculating compensation (however, if the EONIA rate less 0.25 percent is less than the ECB deposit facility rate then the ECB deposit facility rate is to be used). For compensation claims that relate to a request to back value as a result of non-payment then the 'Compensation Rate' to be used will be the average of each day's EONIA rate plus 0.25 percent as published on a daily basis for the days included in the above formula when calculating compensation (however, if the EONIA rate plus 0.25 per cent is more than the ECB marginal lending facility rate then the ECB marginal lending rate is to be used). If a daily overnight rate for one day is not available, the immediately preceding published daily rate is to be used for that particular day.

**Note: A 'Business Day' means a day on which the TARGET interlinking system is operational as defined by the European Central Bank. The start and end dates of the period for which an interest claim is made must be business days.**

## Appendix F

### An Introduction to CLS

#### *What is CLS?*

In 1995 a group of major foreign exchange (FX) trading banks organized an ad hoc committee called the Group of 20 (or G-20) to consider how the private sector might develop a solution to the problem of FX settlement risk.<sup>1</sup> The result of this study was the CLS concept, which stands for *Continuous Linked Settlement*, the process that provides for a simultaneous exchange of the currencies in each FX contract to eliminate settlement risk.

The following year, the Bank for International Settlements (BIS) issued the Allsopp Report. Concerned about the systemic implications of settlement risk, the BIS called for a three-pronged approach in tackling FX settlement risk. Specifically, the report encouraged action by individual banks to control their FX settlement exposures; collective industry action to provide multi-currency services to reduce risk; and action by central banks to support and encourage private sector progress.

In line with its earlier efforts, in July of 1997 the G-20 banks formed a company, CLS Services Ltd. (CLS), to develop and build CLS Bank. The initial shareholders of CLS were the G-20 banks. In April-July 1998, CLS conducted an intensive capital-raising exercise which resulted in a further 24 international banks becoming shareholders. Additional banks have since become shareholders and, at the time of writing, the total number of shareholders is 63 institutions from 14 countries, providing a broad cross-section of ownership, by region and bank size.

CLS operates as a private limited holding company. It is headquartered in London and is in the process of establishing a representative office in Tokyo. Its primary focus is the creation of CLS Bank, which will be formed to provide a new solution to FX settlement risk reduction. CLS Bank will provide payment-versus-payment (PvP) settlement for gross transactions in eligible currencies. CLS Bank, which will be based in New York, will be a special purpose bank supervised by the Federal Reserve. The headquarters of CLS Bank will be in New York.

#### *How will CLS Bank work?*

CLS Bank will work using a system of Continuous Linked Settlement, hence the organization's name. It will facilitate the reduction of the risk associated with FX settlement by virtue of the simultaneous settlement of the currency legs of a transaction across the books of CLS Bank. The principal feature of the service is that both sides of the settlement instruction will be settled, or neither side will be settled.

CLS Bank will maintain a single multi-currency account for each settlement member. It will credit a settlement member's account when it receives a funding pay-in and debit the account when it pays out settlement proceeds.

CLS Bank will have a settlement account with a central bank for each currency in which it settles transactions. Settlement members will pay-in currency to their accounts at CLS Bank through the

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<sup>1</sup> Today, the average value of FX trades settled daily worldwide is U.S. \$3.5 trillion. FX trades are currently settled by paying the two currency legs separately. Because there is often a delay in payment between the two legs, even though a bank makes its payment, it may not receive the payment it was expecting in return. This risk is known as settlement risk.

approved payment systems; CLS Bank will pay-out settlement proceeds through these same payment systems.

Each settlement member will be required to pay in balances at CLS Bank to cover currency short positions within certain limits. Prior to each day's settlement period, which will last for the few hours that the major payment systems in all time zones overlap, CLS Bank will have all the linked currency settlements for the day lined up in a queue.

The settlement process will begin and operate continuously. The settlement process involves the settlement of instructions in the settlement queue in accordance with the service's settlement algorithm and risk tests. CLS Bank will control settlement and pay-outs from Settlement Members' accounts, ensuring that their account balances comply with risk controls at all times. To facilitate settlement, CLS Bank's settlement process will move repeatedly during the settlement cycle between three tasks: taking in funding, settling transactions in the queue, and paying out available funds in accordance with applicable rules and regulations.

CLS Bank will not guarantee that it will settle every settlement instruction submitted. In accordance with its rules, CLS Bank may refuse to settle an instruction submitted for settlement. For example, if a settlement member does not pay in required funding, CLS Bank may refuse to settle further instructions. Any unsettled instructions will be returned to the settlement members who submitted them, and the settlement members will need to make alternative settlement arrangements for those trades.

#### *Currencies included in the CLS Bank system*

CLS Bank will operate with a first wave of seven currencies: the Canadian dollar, euro, pound sterling, Swiss franc and the United States dollar will go live on day one; these will be shortly followed by the Japanese yen and then the Australian dollar.

CLS Bank will include additional currencies in the system as soon as practical. The criteria for inclusion of a currency in the service include a suitable real-time gross settlement ("RTGS") system (or approved payment system) with sufficient overlapping hours, a satisfactory legal environment, and available liquidity in the money market.

#### *Membership of CLS Bank*

There are two classes of membership of CLS Bank: settlement members and user members. Both settlement members and user members may submit their customers' transactions through CLS Bank, and both types of members must be affiliated with a shareholder of CLS Services in the manner prescribed by the CLS Bank Rules.

#### *Settlement Members*

Settlement Members must meet certain additional criteria established by CLS Bank. Each Settlement Member will have a single account with CLS Bank through which it submits instructions on its own behalf as well as on behalf of sponsored user members and third-party customers. CLS Bank will treat the settlement of these instructions as if they were the settlement member's own positions.

#### *User Members*

User members will be able to submit their instructions directly through a network link to CLS Bank. Settlement members will be able to control and approve the instructions that their sponsored user members introduce. Settlement members will set the level of the controls they wish to apply. Third-party customers will not have direct access to CLS Bank. Their instructions

will be submitted by a settlement member or user member.

*Building the CLS Bank System*

In April 1998, CLS appointed IBM to design, implement, test and provide facilities management services for the hardware and software systems of CLS Bank.

CIMAD, a wholly owned IBM subsidiary, based in Belgium, will be responsible for the software development. ATOS, France's second largest IT Services provider, will be sub-contracted to provide assistance with the development of the RTGS interfaces.

SWIFT will provide the network communications services supporting CLS Bank interface. SWIFT plans to provide its existing network application and its new IP network infrastructure to be developed as part of its Next Generation program. The requirements and priorities of CLS will be the first deliverables of the Next Generation program.

Beta testing of the CLS Bank settlement system and communications network began at the beginning of May 1999 with the participation of Barclays, HSBC, JP Morgan and UBS. Beta testing covers three stages: core system functionality, member functionality and CLS systems functionality.

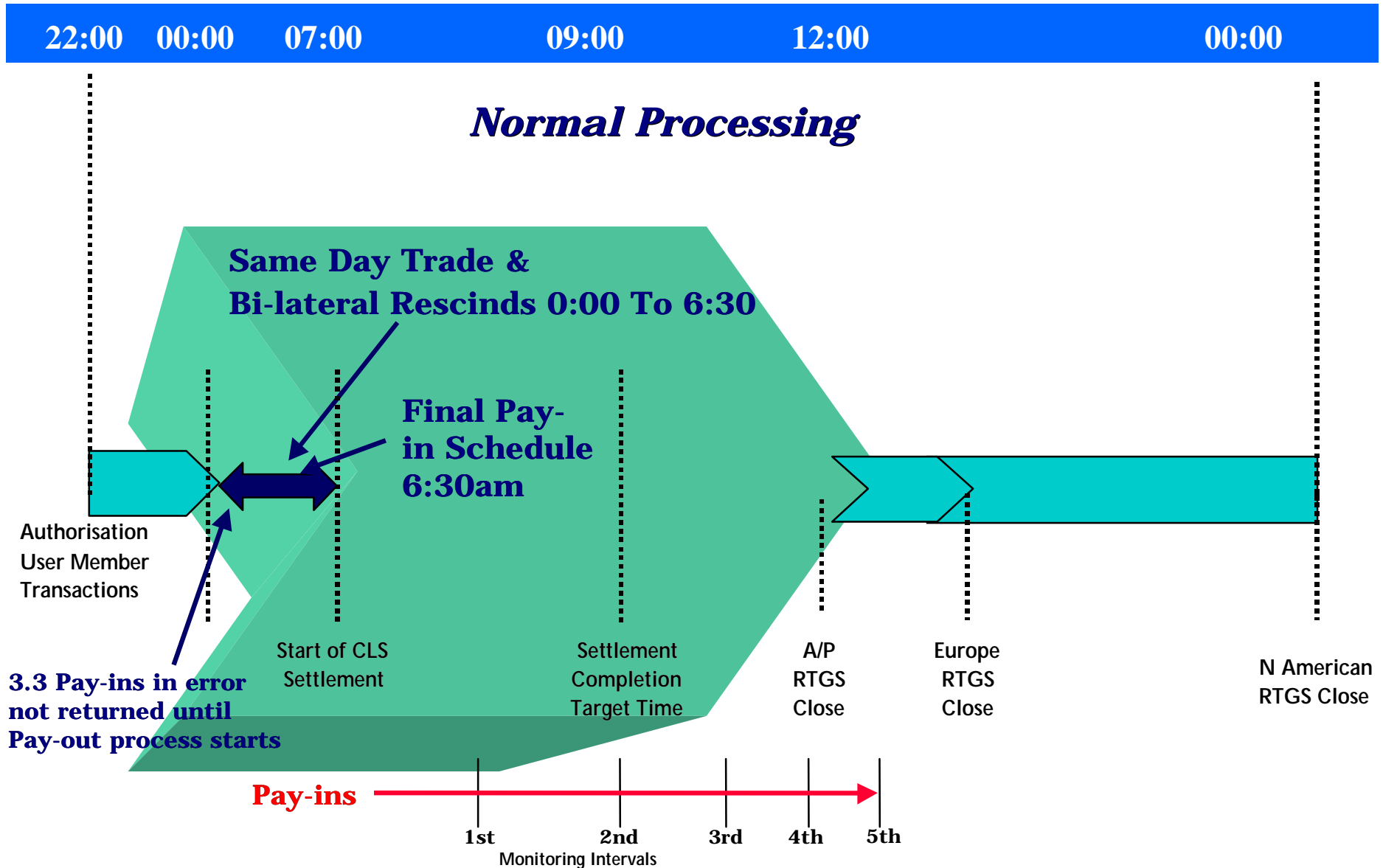
In advance of the go live date, CLS Bank expects to begin intensive, "as live" operational trials of the new system with a group of shareholders. CLS is currently in discussions with shareholders to determine the composition of the trial group.

*Key milestones: from conception to CLS Bank*

July 1997	CLS Services Ltd. founded
April 1998	CLS appoints IBM to develop, implement and operate the software and hardware facilities for CLS Bank and reaches agreement, in principle, with SWIFT for provision of a communications network
April 1998	Capital raising program approved by CLS Services Ltd. Board
July 1998	Capital raising program complete
May 1999	Beta tests of CLS Bank system begin

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# CLSB Operational Timeline - CET



## **Appendix H**

### **Glossary of Terms**

The definitions in this Glossary are those, which applied at the time this version of the Member Handbook, were issued. Changes in CLS Bank International rules or procedures may subsequently alter these definitions. Such alterations will be reflected in later versions of the Handbook.

#### **Accepted**

An input is accepted if it is authenticated and its format is valid.

#### **Account**

An account carried on the books of CLS Bank for a Settlement Member. Each Settlement Member's Account includes that Settlement Member's Currency Balances for each Eligible Currency.

#### **Account Balance**

Account Balance means in respect of a Settlement Member the sum of the Currency Balances included in such Settlement Member's Account, expressed in their Base Currency Equivalents. The Bank will calculate a Settlement Member's Account Balance before the Settlement of any Instruction or any Pay-Out with respect to such Settlement Member.

#### **Account Statement**

A list of all debits and credits posted to an Account including an opening and closing balance.

#### **Aggregate Short Position Limit (ASPL)**

For any Settlement Member, the maximum Adjusted Aggregate Short Position that such Settlement Member is permitted to incur at any time during a Settlement Period, as established and as amended from time to time.

#### **Bank** (*known also as CLS Bank*)

Bank means the CLS Bank International, an Edge corporation and its successors.

#### **Bilateral Rescind Cut off Deadline (per currency)**

The latest time that a transaction can be bilaterally rescinded by Settlement Members for the current settlement day.

#### **Branch**

A branch is a Member's office that has its own SWIFTNet link address. It is the same legal entity as the Member. All Members must have at least one Branch.

#### **Central Bank**

Central Bank means the central monetary authority responsible for an Eligible Currency.

#### **CLS System**

The software and hardware system for providing CLS Bank services, including the core system for processing inputs, settlements, accounts and related application information, the Member API and data communications networks.

#### **CLS Gateway**

The CLS Gateway will be linked to the CLS System through SWIFTNet Interactive via SWIFTNet Link and will be used by Members to receive all information.

#### **Counterparty**

A party to a trade.

#### **Currency Balances**

In respect of a Settlement Member n informational record or bookkeeping entry on the books of the Bank indicating the current amount (positive or negative) of a particular Eligible Currency included in such Settlement Member's Account. A Currency Balance is not a separate account.

#### **Eligible currency**

A currency for which the Bank will offer settlement services.



**End of Business Day**

The time at which Bank closes the last currency.

**Funding Completion Target Time (FCTT)**

Time specified on the Pay-In Schedule by which all Settlement Members should have completed their required Pay-ins.

**Gross Input**

Details of a gross trade provided for matching and settlement in the Bank.

**Haircut**

For any Eligible Currency, the volatility margin parameter specified from time to time with respect to such Eligible Currency.

**Input**

Input is an Instruction submitted to the Bank.

**Instruction**

An Instruction given by a Member through a Submission Office to the Bank instructing the Bank to Settle certain currency payment obligations arising pursuant to a Transaction or any Amend Instruction or any Rescind Instruction.

**Liquidity Provider**

A financial institution that commits to provide the Bank with an amount of specific currency on demand, within an agreed time period.

**Long Position**

Long Position means a Currency Balance if that Currency Balance is greater than zero. The Bank will calculate a Settlement Member's Long Position before the Settlement of any Instruction and any Pay-Out with respect to such Settlement Member.

**Mark to Market**

The value of a position in a currency expressed in the Base Currency as determined by reference to the Bank market exchange rates.

**Matched**

A pair of Instructions matched by the Bank in accordance with the procedures set out in the Member Handbook.

**Member**

A Settlement Member or User Member.

**Minimum Pay-Out Amount**

The Minimum Pay-Out Amount” means the lesser of (i) the projected Long Position in an Eligible Currency expected to be credited to a Settlement Member’s Account in respect of such Eligible Currency on a given Business Day and (ii) the minimum Pay-Out that the Bank will make in such currency specified in the Member Handbook.

**Net Positive Overall Value**

Used in risk evaluation, the sum of a Settlement Member' net cash balances.

**Nostro Agent**

A bank or financial institution which maintains an account for a Settlement Member to facilitate payments by or to such Settlement Member in a particular Eligible Currency.

**Notification**

A system-generated message containing specific information about an event or action in the CLS System or an operational message generated and sent by the Bank.

**Partial Settlement**

Partial Settlement” means settlement processing using an algorithm applied to those Instructions that cannot be settled in their entirety. The Bank will calculate and settle the maximum amount that can be settled at that time, returning the remaining unsettled portion to the Settlement Processing Queue to be retried for settlement later

**Pay-In**

A payment of Eligible Currency made by a Settlement Member to the Bank.

**Pay-In Call**

A call for an additional / revised Pay-In by the Bank to a Settlement Member.

**Pay-In Period**

The period in which Pay-Ins should be made to the Bank (set for each Eligible Currency).

**Pay-In Schedule**

A schedule of Pay-Ins delivered by the Bank to a Settlement Member. Pay-In amounts will be specified for each Eligible Currency in which a Settlement Member has a Short Position.

**Pay-Out**

The payment by the Bank to a Settlement Member. Pay-Outs will be specified for each Eligible Currency in which a Settlement Member has a Long Position.

**Pay-Out Algorithm**

The algorithm specified in the Member Handbook for purposes of calculating Pay-Outs at a particular time during each Settlement Period.

**Payment System Closing Time**

The time at which the RTGS System for an Eligible Currency is expected to cease operations during the Settlement Period.

An Instruction given by a Member to cancel an Instruction previously submitted.

**Reserve Balance**

Used in the Pay-Out calculation; for any Eligible Currency, the value that is held back on a Settlement Member's account while settlement is in progress.

**Risk evaluation**

The process that is applied to determine whether a transaction can be settled. The evaluation is on the Short Position Limit in each currency, the Aggregate Short Position Limit and the Net Positive Overall Value.

**RTGS System**

An approved real-time gross settlement system in which processing and settlement with finality takes place continuously in real time across Central Bank accounts.

**Same Day Trade**

A Settlement Instruction submitted to the Bank after the settlement queue for the current value date has been assembled.

**Settlement**

The settlement of Instructions across the books of the Bank by the simultaneous making of debits and credits to the Accounts of the respective Settlement Members.

**Settlement Algorithm**

Transactions can be settled in one of two ways:

An "all or nothing" settlement where the complete transaction is settled if it passes the risk evaluation.

A Partial Settlement is where the largest possible fraction of a transaction will be settled within the risk evaluation.

**Settlement Completion Target Time (SCTT)**

The target time specified in the Member Handbook as the time when on any Business Day by which all Transactions on the Settlement Queue for that Business Day are to be settled.

**Settlement Period**

The Settlement Period means for any Business Day the period commencing with the establishment of the Settlement Processing Queue and terminating upon the conclusion by the Bank of all efforts to effect further Settlement of Instructions on such Business Day, The period shall generally occur between the hours of 07:00 CET to 12:00 CET on each Business Day

**Settlement Processing Queue**

The list of all Settlement Eligible Instructions submitted to the Bank for Settlement on a particular Business Day. The queue is continually tested in the settlement process and Instructions are removed as they are settled.

**Short Position**

Short Position means for any Currency Balance if that balance is less than zero. The Bank will calculate a Settlement Member's Short Position before the Settlement of any Instruction and any Pay-Out with respect to such Settlement Member.

**Short Position Limit**

For any Eligible Currency and any Settlement Member, the maximum amount by which the Settlement Member is permitted to maintain a negative Currency Balance in respect of such Eligible Currency, as such limit is established and as amended from time to time.

**Sponsor**

In respect of a User Member, a Settlement Member who has agreed to Settle Instructions submitted by such User Member.

**Splitting**

The process for subdivision of a large gross Transactions into smaller component transactions.

**Standard Settlement Instructions**

Standard instructions from each Settlement Member in each Eligible Currency, specifying the bank and account to which Pay-Outs from the Bank should be made via the RTGS System.

**Start of Business Day**

The opening time for the Bank.

**Suspend Instruction**

Any Instruction submitted by a Member for Settlement which is suspended by the Bank.

**S.W.I.F.T FIN**

FIN is a value-added storage and forward messaging service based on an X.25 network and a centralized message center. The service is provided to banks by S.W.I.F.T.

**Third Party**

A Third Party is an institution that has no direct relationship with the Bank and can only submit Instructions or settle trades through a Member of the Bank.

**Trade**

A contract between two parties to buy and sell specific amounts of currency at a rate and on a date agreed between them.

**Transaction**

A single foreign exchange, spot, option or other transaction between two entities.

**Unilateral Rescind Deadline**

A time after which Instructions can only be rescinded by matching Bilateral Rescind Instructions. The Unilateral Rescind Deadline will be the time on a Business Day when the Initial Pay-In Schedules are sent.

**Unmatched**

Input is considered unmatched if it has no matching input when it is received.

**Unsettled Transactions**

Transactions on the settlement queue which are not settled at the moment of inquiry.

**User Member**

A bank or financial institution which submits Instructions to the Bank for settlement on its own behalf or for an external party.

**Validation**

The process of determining whether the details of an input are consistent with requirements for processing of inputs in CLS Bank.

**Value Date**

The settlement date of a transaction.

## **Appendix I**

### **Fedwire Overdraft Process**

Participants that use the Fedwire system may, during the course of the business day, incur daylight overdrafts. A daylight overdraft occurs at any point when the balance in a depository institution's Federal Reserve account becomes negative. Under the Federal Reserve's Payments System Risk Policy, all institutions that maintain a Federal Reserve account are assigned or may establish a net debit cap. Net debit caps represent the maximum dollar amount of uncollateralized daylight overdrafts that an institution may incur in its account during a single day ("single-day cap") or over a two-week period ("two-week average cap").

The size of an institution's net debit cap is determined by that institution's cap category and its reported capital. There are six cap categories, namely, zero, exempt-from-filing, *de minimis*, average, above average, and high; each cap category is associated with cap multiples. All cap categories are granted at the discretion of the Reserve Banks. The categories that allow the highest usage of daylight credit require an institution to perform a self-assessment of its own financial and operational capacity.

An institution's net debit cap is calculated as its cap multiple times its risk-based capital. Depending on its cap category, an institution may have two different cap multiples, one for its single-day cap, and one for its two-week average cap. Additionally, because the dollar amount of a net debit cap is a function of an institution's capital, the cap will vary over time as the institution's capital changes. Limits on an institution's use of daylight credit, then, are sufficiently flexible enough to reflect the overall financial condition of each institution.

Federal Reserve account balances are measured using the Daylight Overdraft Reporting and Pricing System (DORPS). DORPS captures debits and credits resulting from an institution's payment activity on a minute-by-minute basis. Account balances are measured at the end of each minute during the standard Fedwire operating day based on the institution's opening balance and all payment transactions posted to the institution's account up until that time.

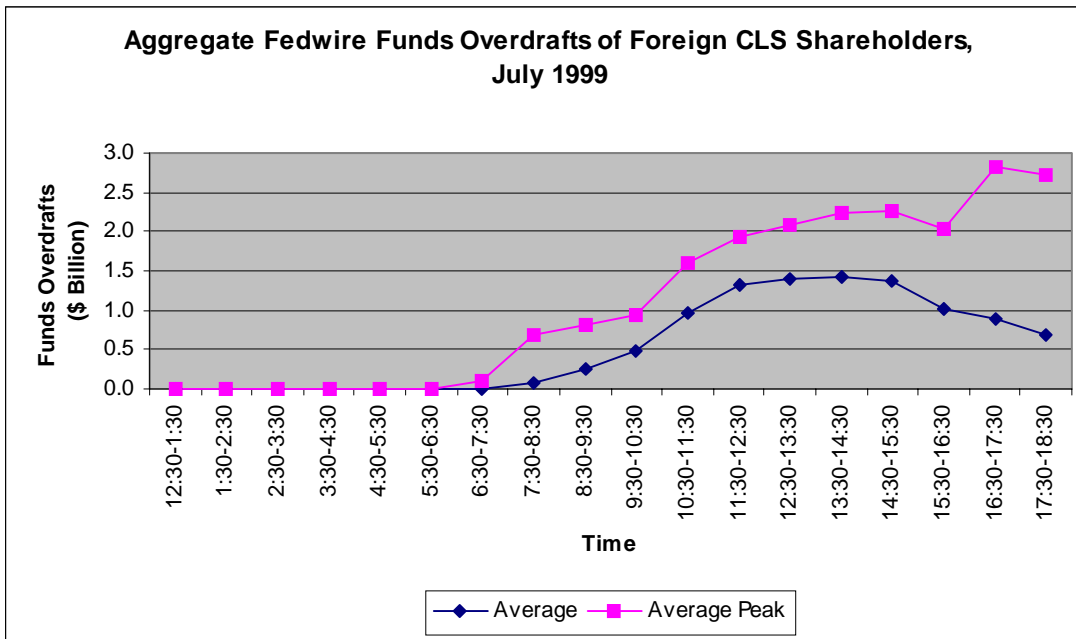
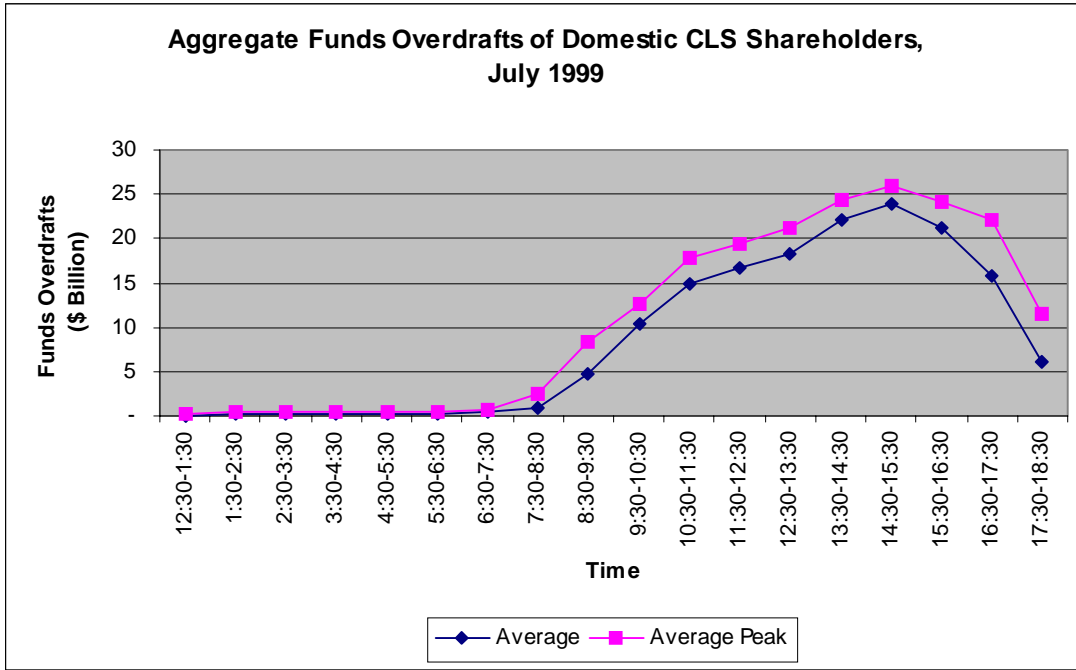
End-of-minute balances are used by Reserve Banks for determining compliance with net debit caps. A cap breach occurs when an institution's account balance for a particular day shows one or more negative end-of-minute account balances in excess of its single-day net debit cap. A cap breach would also occur if an institution's average peak daily overdraft over a reserve maintenance period were greater than its two-week average cap. A daylight overdraft cap violation may initiate a series of actions by the Reserve Bank, depending upon the size and frequency of the overdrafts and on the institution's financial condition.

End-of-minute balances are also used for calculating daylight overdraft fees. Effective April 1994, institutions are assessed fees for daylight overdrafts incurred in their accounts. These fees are intended to provide a financial incentive for institutions to control their use of intraday Federal Reserve credit and to recognize the risks inherent in the provision of intraday credit.

## Appendix J

### Average funds overdrafts of CLS Bank shareholders for the month of July 1999

The Fedwire funds transfer system business day has been broken down into 18 hourly periods. Data for ten domestic CLS Bank shareholders and thirty-five foreign shareholders have been included.



## Appendix K

### Cross-Currency Collateral Pool Example

UBS has CHF 10 billion assets domiciled in Switzerland (SEGA) but requires USD liquidity within Fedwire. The following sequence of transactions would achieve this:

- UBS pledges CHF 10 billion of assets to SNB who grants UBS equivalent liquidity within SIC (minus haircut)
- This SIC liquidity is transferred to the UBS's liquidity sub-account at CLS; that is cleared between UBS and CLS as a normal RTGS payment
- UBS executes a same-day CHF/USD swap with the Federal Reserve (sell CHF/buy USD)
- First leg is settled by:
  - Debiting UBS's liquidity account at CLS and crediting the Federal Reserve's liquidity account at CLS
  - The Federal Reserve crediting UBS within Fedwire in USD by an amount equal to the agreed CHF/USD swap rate
- Second leg is settled by:
  - Crediting UBS's liquidity account and debiting the Federal Reserve's liquidity account at CLS for the CHF transaction
  - UBS paying the Federal Reserve back via the FEDWIRE system.

Such an approach therefore allows CHF liquidity to be transformed into USD on an intra-day basis.

Variants on this model would be:

- CLS executes the swap with the Federal Reserve on a brokerage basis for UBS
- UBS executes the swap with another CLS participant (such as Citibank or Chase) who provides the USD liquidity either within CLS liquidity account or Fedwire.

## **Appendix L**

### **Federal Funds**

Federal funds are deposit balances at Federal Reserve Banks that can be transferred between depository institutions within the same business day. Banks keep deposits at Federal Reserve Banks to meet their reserve requirements and to clear financial transactions. Transactions in the federal fund market enable depository institutions with balances in excess of their reserve requirements to sell reserves to institutions that are either overdrawn on their Fed account or are holding reserve deficiencies with respect to their requirements. Federal funds transactions neither increase nor decrease total bank reserves. Instead, they redistribute bank reserves and enable otherwise idle funds to yield a return.

Participants in the federal funds market include commercial banks, thrift institutions, agencies and branches of foreign banks in the United States, federal agencies, and government securities dealers. Other financial institutions serve as intermediaries in the market by borrowing and lending funds on the same day, channeling funds from those institutions holding excess funds to borrowers. Several broker firms that neither borrow nor lend funds arrange transactions between lenders and borrowers in order to earn commissions.

Federal funds transactions can be initiated by either a funds lender or a funds borrower. An institution seeking to lend federal funds can identify a borrower directly, through an existing banking relationship, or indirectly, through a federal funds broker. The most commonly used method to transfer funds between depository institutions is for the lending institution to authorize its district Federal Reserve Bank to debit its reserve account and to credit the reserve account of the borrowing institution.

The most common type of federal funds transaction is a very short-term loan between two financial institutions; some transactions, however, have longer-term maturities. Most overnight loans are booked without a contract. The borrowing and lending institutions exchange verbal agreement based on various considerations, particularly their experience in doing business together, and limit the size of transactions to established credit lines in order to minimize the lender's exposure to default risk. Such arrangements facilitate speedy processing at the lowest possible transaction cost.

Federal funds transactions are used by depository institutions in several ways. Fed funds sales or purchases may be managed just like other assets or liabilities of a short-term nature on banks' balance sheets. But perhaps most fundamentally, banks use fed funds transactions to make same-day adjustments in their deposit balances at the Fed to ensure that they end each day holding a level of balances that is both positive and consistent with meeting any requirements they may have for holding reserves. For an institution that is active in the clearing and settlement of wholesale financial transactions, either for its own account or on behalf of its depositors, the clearing of such financial payments often creates a direct need to arrange offsetting federal funds transactions to control the impact of net settlements on their Fed balance.

The volume of fed funds transactions arranged each day by the major brokers may range in size anywhere from \$50 billion to \$75 billion. Trading is active throughout the day beginning in the early morning hours, typically around 8:30 a.m., right up to the close of Fedwire which is scheduled for 6:30 p.m. each day.

The interest rate on federal funds, the federal funds rate, is highly sensitive to Federal Reserve open market operations that influence the supply of reserves in the banking system. For example, if the Federal Reserve wishes to decrease the federal funds rate, it may purchase securities in the open market, thereby increasing the availability of bank reserves and putting downward pressure on the federal funds rate. Sales of securities by the Fed in the open market tend to have the opposite effect.

In formulating monetary policy, the Federal Reserve's Open Market Committee (FOMC) sets a target level for the federal funds rate, and directs the trading desk at the Markets Group at the Federal Reserve Bank of New York to use open market operations to keep the funds rate around the target level.

Usually the federal funds rate is higher than the discount rate, the interest rate at which banks borrow from the Federal Reserves. However, the Fed does not allow banks to borrow at the discount window for profit. It monitors discount window and federal funds activity to make sure that banks are not borrowing from the Fed in order to lend at a higher rate in the private money markets.



## Appendix M

### Swap Tools for Liquidity Management at CLS Bank

*Example of a CLS 'inside-outside' FX swap.*

Situation:

Bank A has received the CLS Bank Pay-in Schedule issued at 00.00 CET. It shows that Bank A is due to Pay USD to CLS Bank in the total amount of USD 2,000. The USD must be transferred through Fedwire to Bank A's account at CLS Bank in accordance with the following schedule:

#### USD Short Position Limit USD 600

Funds due by	0800 CET	0900 CET	1000 CET	1100 CET	1200 CET
Total required	700	1,400	1,600	1,800	2,000

In addition, Bank A is scheduled to receive CHF 3,000 from CLS Bank.

Bank A is concerned with the amount of USD that it is required to pay during the earlier hours of Fedwire operations, 0800 CET being 0200 EST. Accessing this amount early on will result in a charge for daylight overdraft on Fedwire.

Bank B has a Pay-in Schedule that requires CHF to be transferred through SIC to Bank B's account at CLS Bank in accordance with the following schedule:

#### CHF Short Position Limit CHF 500

Funds due by	0800 CET	0900 CET	1000 CET	1100 CET	1200 CET
Total required	1,250	2,500	2,666	2,833	3,000

In addition, Bank B is scheduled to receive USD 2,000 from CLS Bank.

Bank B is concerned with the amount of CHF that it is required to pay early in the day through SIC. Incoming funds are expected in the afternoon through SIC. Accessing this amount early on will require repo funding.

Through the use of an electronic broker or other means, Bank A and Bank B are able to enter into a pair of offsetting FX swaps that will alleviate their respective concerns.

The FX deals are:

1. Bank A purchases USD 1,000 and sells CHF 1,500 to Bank B for settlement through CLS Bank for value same day.
2. Bank A purchases CHF 1,500 and sells USD 1,000 to Bank B. In this case the agreement is to settle the trade through CHIPS (USD) and SIC (CHF), also same day.

The spot rate of 1.50 CHF/USD is applied to both deals.

The settlement instructions for deal #1 are submitted to CLS Bank within the 0000 to 0630 window provided for same day trades. The SIC and CHIPS settlements are processed in the normal manner.

Bank A and Bank B will receive updated Pay-in Schedules from CLS Bank, reflecting the new instructions.

#### Bank A USD

##### USD Short Position Limit USD 600

Funds due by	0800 CET	0900 CET	1000 CET	1100 CET	1200 CET
Total required	200	400	600	800	1,000

Receive CHF 1,500

**Bank B CHF****CHF Short Position Limit CHF 500**

Funds due by	0800 CET	0900 CET	1000 CET	1100 CET	1200 CET
Total required	500	1,000	1,166	1,333	1,500

Receive USD 1,000

Thus the earliest pressure on each bank's capacity to obtain liquidity is reduced. By settling the 'outside' swap as described, there is an offsetting effect within these other settlement mechanisms as well, particularly at CHIPS where the net result is reflected prior to Fedwire settlement at the end of the day.

*Example of a CLS 'inter-day' FX swap.*

Situation:

Bank A and Bank B have exactly the same Pay-in obligations as described above. However, they prefer to roll the cash positions forward in CLS Bank instead of moving the positions into the alternative settlement mechanisms on the same day. One result of this is that the settlement risk between A and B is now eliminated. The trades will be as follows:

1. *Bank A purchases USD 1,000 and sells CHF 1,500 to Bank B for settlement through CLS Bank for value same day.*
2. *Bank A purchases CHF 1,500 and sells USD 1,000 to Bank B. In this case the agreement is to settle the trade through CLS Bank, but value tomorrow.*

While the spot rate of 1.50 CHF/USD has again been used, there is a swap differential that should be reflected in the price between the two days, and this will be subject to negotiation between the banks.

The effect on the Pay-in Schedules for both banks on the day in question will be identical to that achieved through the use of the 'inside/outside' trade. Tomorrow's instructions at CLS Bank will include those relating to the forward legs of the 'tomorrow' trade.

## **Appendix N**

### **CLS Contingency**

CLS Services Ltd has ensured that the system architecture is such that there is no single point of failure. In addition, the following arrangements have been put in place:

- Dual Data Centers (Primary / Secondary)
- Business Continuity Office
- Contingency arrangements in place in case of failure of links to RTGS systems

## Appendix O

***CHIPCo Member Banks***  
**There are 77 CHIPCo Member Banks:**

<b>Name</b>	<b>CHIPS Routing #</b>	<b>Name</b>	<b>CHIPS Routing #</b>
ABN AMRO Bank N.V.	958	First National Bank of Boston	793
American Express Bank Ltd.	159	First National Bank of Chicago	979
Arab Bank PLC	572	First Union Bank International	509
Australia & New Zealand Bkg. Group Ltd.	991	First Union National Bank	285
Banca Commerciale Italiana	531	Fleet Bank National Association	032
Banca di Roma	861	The Fuji Bank, Limited	970
Banca Nazionale Del Lavoro	981	Harris Trust and Savings Bank	776
Banco Bilbao Vizcaya, S.A.	184	HSBC Bank USA	108
Banco de la Nacion Argentina	855		
Banco di Napoli	764	The Industrial Bank of Japan, Ltd.	834
Banco di Sicilia	773	International Commercial Bank of China	908
Banco do Brasil S.A.	355	Israel Discount Bank of New York	976
Banco do Estado de Sao Paulo, S.A.	860	KBC Bank N.V.	824
Banco Nacional de Mexico	771	Korea Exchange Bank	877
Bangkok Bank Public Co. Ltd.	869	M & T Bank	555
Bank Hapoalim B.M.	886	The Mitsubishi Trust and Banking Corp.	862
Bank Leumi USA	279	Morgan Guaranty Trust Company	023

Bank of America, N.A.	959	Natexis Banque	992
Bank of China	326	National Australia Bank	772
Bank of Communications	1262	The National Bank of Kuwait SAK	217
Bank of Hawaii	540	The Northern Trust Company	112
The Bank of New York	001	Norwest Bank Minnesota, N.A.	407
Bank of Nova Scotia	253	Paribas	986
Bank of Tokyo-Mitsubishi, Ltd.	963	PNC Bank, National Association*	222
Bankers Trust Company	103	Republic National Bank of N.Y.	482
Banque Nationale de Paris	768	The Sakura Bank, Limited	969
Barclays Bank PLC	257	Sanwa Bank Limited	982
Bayerische Hypo-und Vereinsbank AG	880	Skandinaviska Enskilda Banken	303
Brown Brothers Harriman & Co.	480	Societe Generale	422
The Chase Manhattan Bank	002	Standard Chartered Bank	256
Citibank, N.A.	008	State Bank of India	914
Commerzbank AG	804	State Street Bank and Trust Co.	487
Compagnie Financiere de CIC-UE	865	Sumitomo Bank, Limited	967
Credit Agricole Indosuez	266	The Sumitomo Trust & Banking Co., Ltd.	400
Credit Lyonnais	807	The Tokai Bank, Limited	474
D. G. Bank	845	UBS AG	799
The Dai-Ichi Kangyo Bank, Ltd.	430	Unibank A/S	569
Den Danske Bank	371	UniCredito Italiano SpA	853
Deutsche Bank AG	378	Union Bank of California, N.A.	505
Dresdner Bank AG	830		

**\* Inactive Participant**

**Appendix P**

***CHIPS Yearly Volume Statistics***

<b>Years of Operations</b>	<b>Business Days</b>	<b>Number of Participants</b>	<b>Total Dollars Volume***</b>	<b>Total Transaction Volume</b>
1970*	180	9	\$547,615,444	531,778
1971	250	15	\$1,131,043,459	801,725
1972	250	15	\$4,766,919,981	2,029,312
1973	250	15	\$9,184,508,815	2,710,927
1974	250	56	\$10,704,349,972	3,474,194
1975	250	63	\$10,984,093,108	6,035,347
1976	250	69	\$13,138,412,336	7,123,203
1977	250	77	\$16,190,636,464	8,247,530
1978	250	80	\$20,357,618,638	9,587,874
1979	250	92	\$26,844,745,422	10,939,641
1980	251	100	\$37,121,139,871	13,244,426
1981	250	99	\$40,090,491,736	15,865,423
1982	251	99	\$52,971,279,272	18,642,034
1983	251	117	\$60,307,620,949	20,187,976
1984	250	138	\$69,134,986,179	22,822,230
1985	250	142	\$78,401,027,605	24,850,426
1986	251	140	\$106,583,481,092	28,527,878
1987	252	139	\$139,808,593,176	31,900,251
1988	251	139	\$165,388,378,741	33,962,623
1989	251	140	\$190,212,347,368	36,520,215
1990	251	131	\$222,107,644,171	37,324,466
1991	251	126	\$217,312,321,589	37,564,127
1992	253	122	\$238,255,498,155	39,073,091
1993	252	121	\$265,745,211,884	42,162,247
1994	251	115	\$295,443,759,600	45,598,359
1995	251	111	\$310,021,249,560	51,032,782

1996	252	104	\$331,541,104,158	53,489,396
1997	251	95	\$362,186,525,130	58,971,837
1998	252	85	\$350,372,302,940	59,075,806
1999**	229	77	\$275,319,181,293	52,564,906
<b>TOTAL:</b>	<b>7,431</b>	<b>--</b>	<b>\$3,922,174,088,108</b>	<b>774,862,030</b>

**Highest Payment Volume Day in CHIPS History - November 28, 1997- 457,012**  
**Highest Dollar Volume Day in CHIPS History - \$2,236,688,276,858.64**

**\* First Day On Line was April 6, 1970**

**\*\* Year-To-Date as of November 30, 1999**

**\*\*\* All Dollar Amounts are Expressed in Thousands**

## Appendix Q

### CHIPS Finality Glossary

Bilateral netting and release: a method of releasing and settling payment messages in a batch that consists of one or more payment messages from one participant ("first participant") as a sending participant to another participant as receiving participant ("second participant") and one or more payment messages from the second participant as sending participant to the first participant as receiving participant. The bilateral net balance is the net balance resulting from netting the obligations that each participant has to pay in respect of the payment messages in the batch. Each participant's bilateral net balance is applied to its available balance.

Final prefunding: the procedure in which participants with final prefunded balance requirements transfer these amounts to the prefunded balance account. If every participant with final prefunded balance requirement makes the transfers, it is a full final prefunding. With a full final prefunding, all remaining payment messages are settled and released and CHIPCo transfers from the prefunded balance account to each participant whose final available balance is a positive number an amount equal to its final available balance. If one or more participants with a final prefunded balance requirement does not made the required transfer to the prefunded balance account, the result is a partial final prefunding. In the case of a partial final prefunding, the available balance of each participant that has paid its final prefunded balance requirement will be increased by that amount. The remaining payment messages will then be set off, netted, and released to the extent possible using the available balances in the prefunded balance account, and any payment messages that remain unreleased after this procedure expire, which is effective as the cancellation of those payment messages by the sending participants.

Funding Participant: a participant that makes deposits to the prefunded balance account on its own behalf or on behalf of another participant (nonfunding participant).

Individual release: a method of releasing and settling a payment message in which the payment message is not netted against any other payment messages; the sending participant's available balance is debited in the amount of the payment message and the receiving participant's available balance is credited the same amount.



Initial closing netting and release: the netting, setting off, and release of as many payment messages as possible after the close of CHIPS for the delivery of payment messages using the available balances in the prefunded balance account. Each participant's resulting balance is posted to its available balance to arrive at its final position. If the final position is a negative number, it is the final prefunded balance requirement, which the participant must transfer to the prefunded balance account.

Initial prefunded balance: the amount that a participant transfers to the prefunded balance account. Throughout the day, CHIPS records increases and decreases to the balance resulting from the netting, settlement, and release of payment messages. The result of these adjustments is a participant's intraday available balance. During the day, the minimum available balance is zero and the maximum available balance is twice the participant's initial prefunded balance. At the end of the day, following the final prefunding, a participant's available balance is its final available balance.

Initial prefunded balance requirement: the amount that a participant must send to the prefunded balance account each day before it can send or receive CHIPS payment messages.

Multilateral netting and release: a method of releasing and settling payment messages in a batch that consists of payment messages to or from three or more participants. Multilateral net balances are the result of the netting of the obligations associated with all payment messages in the batch, and each participant's multilateral net balance is applied to its available balance.

Prefunded balance account: a special deposit account at the Federal Reserve Bank of New York ("FRBNY") that holds the prefunded balances used to settle CHIPS payment messages.

## Appendix R

### Sample Methodology to Identify USD CLS Transactions

The methodology provided below is intended to serve as a sample approach for institutions to take in order to determine the impact of CLS on U.S. dollar payment systems. The methodology does not address third party foreign exchange transactions from non-CLS shareholders. Additionally, it will not be completely accurate in instances where foreign exchange transactions are not clearly identified; for those that are, an institution cannot be certain that the transactions involve a CLS-eligible currency.<sup>1</sup>

#### Data Required

1. List of CLS shareholders and their CLS branches.
2. CLS-eligible currency listing.

#### Identification of an institution's own FX activity for CLS shareholders and their CLS branches

An extract of an institution's foreign exchange activity with CLS shareholders and their branches will reflect that institution's reduction in volume as a result of CLS.

If the extract is taken directly from foreign exchange data, it should include the following information for deals where both sides of the trade are CLS-eligible currencies:

- New Trades
- Maturing Trades
- CLS Shareholder
- Trade Date
- Value Date
- Cancellation notice (if future dated)\*
- Amendment notice (if future dated)\*

\*Amendments or cancellations should be matched to the original trade and adjusted or deleted as appropriate.

The next step is to sort the trades by value date. If there is an indication as to how the funds transfer, whether payment or receive, will be made (via CHIPS, Fedwire or book transfer), this information should also be included as it will allow an institution to calculate the impact CLS will have on its CHIPS, Fedwire, and book transfer activity in terms of volumes and dollar value.

Total the payments and receives for USD by type for each value date; then calculate the net for each day. Sum the number of payments and receives by value date and type to determine the volume reduction for foreign exchange activity.

If the extract of FX activity is taken from USD funds transfer data, an institution needs to identify the transactions for the CLS shareholders and their CLS designated branches. For transactions that are "paid through" or "received from" an intermediary bank, an institution also needs to look

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<sup>1</sup> It is believed however, that the initial CLS currencies and shareholders represent 70%-80% of this population's foreign exchange activity.

at the by order party for receives and the account party for payments to identify CLS shareholders. (The intermediary bank does not have to be a CLS shareholder.) Payments and receives should be totaled by type for each value date; the net of the two is an institution's CLS position. Total the number of payments and received by value date and type to determine volume reductions.

#### Identification of Customer Activity

In order to identify the activity it processes for CLS shareholders and their branches, an institution needs to identify which shareholders maintain demand deposit accounts with it. The institution then must extract the transactions for these accounts that are with other CLS shareholders and branches. As stated previously, for transactions that are "paid through" or "received from" an intermediary bank, it also needs to look at the by order party for receives and the account party for payments in order to identify CLS shareholders. (The intermediary bank does not have to be a CLS shareholder.) Payment type should be included as part of the extract process.

In order to isolate foreign exchange transactions, additional criteria is required. The examples that follow reflect reference information that can be found in a foreign exchange transaction. This information can be found in either predetermined or free formatted reference fields.

#### **Examples**

SWIFT common reference used to identify foreign exchange trades

Deal

Spot

Forward

FX Swap

Forex

FX

Foreign Exchange

FEX

ISO currency codes (AUD, CAD, CHF, EUR, GBP, JPY, and USD)

The reference information listed above is only a partial listing and should be expanded based on the activity an institution processes for its customers and how they identify their foreign exchange activity. When in doubt, the extract should include questionable transactions that are to be manually reviewed to determine if they are foreign exchange related. The extract should exclude foreign exchange trades an institution conducts with itself since these have been captured separately.

Once an institution is satisfied that the extract is accurate, it should total the payments and receives by type for each value date and calculate the net of the two by day. Total the number of payments and receives for each value date and type to determine the volumes that will migrate to CLS.

The net of an institution's own and its customer activity by day will determine its CLS liquidity requirements.