Appendix 1: Materials used by Mr. Dudley
(1) U.S. Equity Indices Stabilize
August 1, 2007 – April 25, 2008

(2) Corporate Credit Spreads Decline
January 1, 2007 – April 25, 2008

(3) Global Credit Default Swap Spreads Narrow
March 1, 2007 – April 25, 2008
(4) Implied Volatility Decreases
January 1, 2007 – April 25, 2008

MOVE (LHS)
VIX (RHS)
1-Month Dollar-Yen Vol
1-Month Euro-Dollar Vol (RHS)

Source: Bloomberg

(5) Prices for AAA-Rated Tranches on ABX Indices Rise
January 1, 2007 – April 25, 2008

AAA-Rated Tranches on ABX by Vintage

Source: JP Morgan

(6) Ten and Thirty Year AAA–Rated Municipals* Recover
January 1, 2007 – April 25, 2008

10-Year
30-Year

Source: Bloomberg

*This chart shows the ratio of municipal debt yields to Treasury yields
(7) **Investment Bank Equity Prices Stabilize**

January 1, 2008 – April 25, 2008

Index to 100 on 01/01/08

![Graph showing the stabilization of investment bank equity prices from January 1, 2008, to April 25, 2008.](#)

- Morgan Stanley Equity
- Goldman Sachs Equity
- Lehman Brothers Equity
- Merrill Lynch Equity

Source: Markit and Bloomberg

(8) **Investment Bank CDS Spreads Narrow**

January 1, 2008 – April 25, 2008

![Graph showing the narrowing of investment bank CDS spreads from January 1, 2008, to April 25, 2008.](#)

- Morgan Stanley CDS
- Goldman Sachs CDS
- Lehman Brothers CDS
- Merrill Lynch CDS

Source: Markit and Bloomberg
### (9) Collateral Haircuts Stabilize at Higher Levels

February 1, 2008 – April 9, 2008

| COLLABERAL     | Date  | Overnight |    |    |    |    |    |    | 1-Month |    |    |    |    |    |    | 3-Month |    |    |    |    |    |    |    |    |
|----------------|-------|-----------|----|----|----|----|----|----|---------|----|----|----|----|----|----|---------|----|----|----|----|----|----|----|---------|    |    |    |    |    |    |    |
| Treasury       | 9-Apr | 0.5% 1.5% 0.0% |    |    |    |    |    |    | 0.6% 1.5% 0.0% |    |    |    |    |    |    | 0.7% 2.0% 0.0% |    |    |    |    |    |    |    |    |
|                | 10-Mar| 0.3% 1.5% 0.0% |    |    |    |    |    |    | 0.4% 1.5% 0.0% |    |    |    |    |    |    | 0.4% 1.5% 0.0% |    |    |    |    |    |    |    |    |
|                | 3-Mar | 0.2% 1.5% 0.0% |    |    |    |    |    |    | 0.3% 1.5% 0.0% |    |    |    |    |    |    | 0.4% 1.5% 0.0% |    |    |    |    |    |    |    |    |
|                | 1-Feb | 0.2% 1.5% 0.0% |    |    |    |    |    |    | 0.2% 1.5% 0.0% |    |    |    |    |    |    | 0.3% 1.5% 0.0% |    |    |    |    |    |    |    |    |
| Agency Debt    | 9-Apr | 1.3% 3.5% 0.0% |    |    |    |    |    |    | 2.1% 7.5% 0.0% |    |    |    |    |    |    | 1.6% 5.0% 0.0% |    |    |    |    |    |    |    |    |
|                | 10-Mar| 0.7% 2.0% 0.0% |    |    |    |    |    |    | 1.9% 7.5% 0.0% |    |    |    |    |    |    | 1.7% 5.5% 0.0% |    |    |    |    |    |    |    |    |
|                | 3-Mar | 0.6% 2.0% 0.0% |    |    |    |    |    |    | 1.1% 3.0% 0.0% |    |    |    |    |    |    | 1.4% 4.5% 0.0% |    |    |    |    |    |    |    |    |
|                | 1-Feb | 0.5% 2.0% 0.0% |    |    |    |    |    |    | 1.1% 3.0% 0.0% |    |    |    |    |    |    | 1.2% 4.5% 0.0% |    |    |    |    |    |    |    |    |
| Agency MBS     | 9-Apr | 5% 7% 3% |    |    |    |    |    |    | 6% 8% 3% |    |    |    |    |    |    | 6% 9% 3% |    |    |    |    |    |    |    |    |
|                | 10-Mar| 5% 7% 3% |    |    |    |    |    |    | 5% 8% 3% |    |    |    |    |    |    | 6% 10% 3% |    |    |    |    |    |    |    |    |
|                | 3-Mar | 3% 3% 3% |    |    |    |    |    |    | 3% 3% 3% |    |    |    |    |    |    | 4% 5% 3% |    |    |    |    |    |    |    |    |
|                | 1-Feb | 3% 5% 2% |    |    |    |    |    |    | 3% 6% 3% |    |    |    |    |    |    | 4% 5% 3% |    |    |    |    |    |    |    |    |
| Non-agency MBS | Prime | 18% 28% 15% |    |    |    |    |    |    | 19% 28% 12% |    |    |    |    |    |    | 19% 28% 12% |    |    |    |    |    |    |    |    |
|                | 3-Mar | 16% 18% 15% |    |    |    |    |    |    | 16% 18% 15% |    |    |    |    |    |    | 18% 18% 15% |    |    |    |    |    |    |    |    |
|                | 1-Feb | 13% 20% 5% |    |    |    |    |    |    | 11% 20% 4% |    |    |    |    |    |    | 14% 20% 7% |    |    |    |    |    |    |    |    |
|                | Alt-A | 28% 43% 18% |    |    |    |    |    |    | 28% 43% 18% |    |    |    |    |    |    | 30% 43% 18% |    |    |    |    |    |    |    |    |
|                | 3-Mar | 14% 18% 10% |    |    |    |    |    |    | 16% 20% 10% |    |    |    |    |    |    | 19% 20% 10% |    |    |    |    |    |    |    |    |
|                | 1-Feb | 19% 43% 10% |    |    |    |    |    |    | 16% 43% 10% |    |    |    |    |    |    | 28% 43% 13% |    |    |    |    |    |    |    |    |
| Corporate Debt | High Grade | 17% 25% 10% |    |    |    |    |    |    | 18% 25% 11% |    |    |    |    |    |    | 19% 25% 12% |    |    |    |    |    |    |    |    |
|                | 10-Mar| 12% 25% 5% |    |    |    |    |    |    | 15% 25% 5% |    |    |    |    |    |    | 18% 25% 15% |    |    |    |    |    |    |    |    |
|                | 3-Mar | 11% 25% 3% |    |    |    |    |    |    | 13% 25% 3% |    |    |    |    |    |    | 18% 25% 15% |    |    |    |    |    |    |    |    |
|                | 1-Feb | 10% 25% 3% |    |    |    |    |    |    | 10% 25% 3% |    |    |    |    |    |    | 13% 25% 3% |    |    |    |    |    |    |    |    |
|                | High Yield | 36% 70% 19% |    |    |    |    |    |    | 39% 70% 25% |    |    |    |    |    |    | 39% 70% 25% |    |    |    |    |    |    |    |    |
|                | 10-Mar| 28% 70% 10% |    |    |    |    |    |    | 27% 70% 15% |    |    |    |    |    |    | 36% 70% 25% |    |    |    |    |    |    |    |    |
|                | 3-Mar | 26% 70% 9%  |    |    |    |    |    |    | 27% 70% 10% |    |    |    |    |    |    | 35% 70% 20% |    |    |    |    |    |    |    |    |
|                | 1-Feb | 25% 70% 6%  |    |    |    |    |    |    | 24% 70% 10% |    |    |    |    |    |    | 28% 70% 10% |    |    |    |    |    |    |    |    |

Source: Survey of 14 Hedge Funds and 1 REIT
(10) Bank Term Funding Pressures Revive: One-Month Libor–OIS Spread
August 14, 2007 – April 28, 2008

(11) Three-Month Libor – OIS Spread
August 14, 2007 – April 28, 2008

(12) Range of One-Month LIBOR Rates from 16 Contributing Banks
April 4, 2008 – April 28, 2008
(13) Three-month FX Swap Financing Cost to Three-Month LIBOR
August 1, 2007 – April 28, 2008

Source: JP Morgan

(14) Spread between Jumbo and Conforming Mortgage Rates Remains Wide
January 1, 2007 – April 25, 2008

Source: Bloomberg

(15) TAF Auction Results
December 20, 2007 – April 21, 2008

Source: Federal Reserve Board
(16) Federal Reserve Term Securities Lending Facility Results

<table>
<thead>
<tr>
<th>Auction Settlement</th>
<th>Term</th>
<th>Collateral</th>
<th>Amount</th>
<th>Minimum Fee Rate</th>
<th>Stop-out Rate</th>
<th>Propositions</th>
<th>Bid/Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/28/2008</td>
<td>28 Days</td>
<td>Schedule 2</td>
<td>$75 b</td>
<td>0.25%</td>
<td>0.33%</td>
<td>$86.1 b</td>
<td>1.15</td>
</tr>
<tr>
<td>4/4/2008</td>
<td>28 Days</td>
<td>Schedule 1</td>
<td>$25 b</td>
<td>0.10%</td>
<td>0.16%</td>
<td>$46.9 b</td>
<td>1.88</td>
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<td>4/11/2008</td>
<td>28 Days</td>
<td>Schedule 2</td>
<td>$50 b</td>
<td>0.25%</td>
<td>0.25%</td>
<td>$40.0 b</td>
<td>0.68</td>
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<td>4/18/2008</td>
<td>28 Days</td>
<td>Schedule 1</td>
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<td>0.10%</td>
<td>0.10%</td>
<td>$35.1 b</td>
<td>1.40</td>
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<tr>
<td>4/25/2008</td>
<td>28 Days</td>
<td>Schedule 2</td>
<td>$75 b</td>
<td>0.25%</td>
<td>0.25%</td>
<td>$59.5 b</td>
<td>0.79</td>
</tr>
</tbody>
</table>

Source: Federal Reserve Board

(17) GC Treasury Repo Market Improves as a Result of TSLF Auctions
February 1, 2008 – April 25, 2008

![Graph showing Overnight GC Treasury Repo Rate and Target Fed Funds Rate over time]

Source: Federal Reserve Bank of New York

(18) One-Month Libor -OIS Spread Declines After Fed Actions
August 1, 2007 – April 28, 2008

![Graph showing BPS changes over time with key events marked]

Source: Bloomberg

(19) Fed Funds Futures Curve Shifts Upward

Source: Bloomberg

(20) Eurodollar Futures Curve: A Bigger Upward Shift

Source: Bloomberg
(21) Distribution of Expected Policy Target Among Primary Dealers Prior to April 29-30 FOMC Meeting

Source: Dealer Policy Survey

(22) Distribution of Expected Policy Target Among Primary Dealers Prior to March 18 FOMC Meeting

Source: Dealer Policy Survey

(23) Probabilities for Policy Rate Outcomes for April FOMC Meeting
March 1, 2008 – April 25, 2008

Source: Federal Reserve Bank of Cleveland
(24) Recent Commodity Price Pressures Concentrated in Energy
January 1, 2007 – April 25, 2008

(25) TIPS Implied Average Rate of Inflation: 5-10 Year Horizon
August 1, 2007 – April 25, 2008
(26) Volatility in the Fed Funds Market
January 1, 2008 – April 25, 2008

Source: Federal Reserve Bank of New York

(27) Primary Credit Facility and Primary Dealer Credit Facility Borrowing
January 1, 2008 – April 25, 2008

Source: Federal Reserve Bank of New York
APPENDIX: Reference Exhibits

(28) Treasury Yield Curve Shifts Upward

Source: Bloomberg

(29) Dollar Remains Weak
January 1, 2006 – April 25, 2008

Source: Bloomberg and Federal Reserve Board

(30) Dollar Tracks Interest Rate Differentials
January 1, 2007 – April 25, 2008

Source: Bloomberg

* Based on December 2008 calendar spread.
Appendix 2: Materials used by Mr. Madigan
Material for Briefing on
FOMC Participants’ Economic Projections

Brian Madigan
April 29, 2008
### Table 1: Economic Projections of Federal Reserve Governors and Reserve Bank Presidents

<table>
<thead>
<tr>
<th>Central Tendencies</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real GDP Growth</td>
<td>0.3 to 1.2</td>
<td>2.0 to 2.8</td>
<td>2.6 to 3.1</td>
</tr>
<tr>
<td>January projections</td>
<td>1.3 to 2.0</td>
<td>2.1 to 2.7</td>
<td>2.5 to 3.0</td>
</tr>
<tr>
<td>Unemployment Rate</td>
<td>5.5 to 5.7</td>
<td>5.2 to 5.7</td>
<td>4.9 to 5.5</td>
</tr>
<tr>
<td>January projections</td>
<td>5.2 to 5.3</td>
<td>5.0 to 5.3</td>
<td>4.9 to 5.1</td>
</tr>
<tr>
<td>PCE Inflation</td>
<td>3.1 to 3.4</td>
<td>1.9 to 2.3</td>
<td>1.8 to 2.0</td>
</tr>
<tr>
<td>January projections</td>
<td>2.1 to 2.4</td>
<td>1.7 to 2.0</td>
<td>1.7 to 2.0</td>
</tr>
<tr>
<td>Core PCE Inflation</td>
<td>2.1 to 2.4</td>
<td>1.9 to 2.1</td>
<td>1.7 to 1.9</td>
</tr>
<tr>
<td>January projections</td>
<td>2.0 to 2.2</td>
<td>1.7 to 2.0</td>
<td>1.7 to 1.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ranges</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real GDP Growth</td>
<td>0.0 to 1.5</td>
<td>1.8 to 3.0</td>
<td>2.0 to 3.4</td>
</tr>
<tr>
<td>January projections</td>
<td>1.0 to 2.2</td>
<td>1.8 to 3.2</td>
<td>2.2 to 3.2</td>
</tr>
<tr>
<td>Unemployment Rate</td>
<td>5.3 to 6.0</td>
<td>5.1 to 6.3</td>
<td>4.7 to 5.9</td>
</tr>
<tr>
<td>January projections</td>
<td>5.0 to 5.5</td>
<td>4.9 to 5.7</td>
<td>4.7 to 5.4</td>
</tr>
<tr>
<td>PCE Inflation</td>
<td>2.8 to 3.8</td>
<td>1.7 to 3.0</td>
<td>1.5 to 2.0</td>
</tr>
<tr>
<td>January projections</td>
<td>2.0 to 2.8</td>
<td>1.7 to 2.3</td>
<td>1.5 to 2.0</td>
</tr>
<tr>
<td>Core PCE Inflation</td>
<td>1.9 to 2.5</td>
<td>1.7 to 2.2</td>
<td>1.3 to 2.0</td>
</tr>
<tr>
<td>January projections</td>
<td>1.9 to 2.3</td>
<td>1.7 to 2.2</td>
<td>1.4 to 2.0</td>
</tr>
</tbody>
</table>

1. Projections of real GDP growth, PCE inflation and core PCE inflation are fourth-quarter-to-fourth-quarter growth rates, i.e. percentage changes from the fourth quarter of the prior year to the fourth quarter of the indicated year. PCE inflation and core PCE inflation are the percentage rates of change in the price index for personal consumption expenditures and the price index for personal consumption expenditures excluding food and energy, respectively. Each participant's projections are based on his or her assessment of appropriate monetary policy. The range for each variable in a given year includes all participants' projections, from lowest to highest, for that variable in the given year; the central tendencies exclude the three highest and three lowest projections for each variable in each year.
Exhibit 2
Uncertainty and Risks in Economic Projections

Degree of Uncertainty about Growth Outlook

- Number of Participants
- Lower Historically Normal Higher
- January April

Risk Weighting around Growth Outlook

- Number of Participants
- Weighted to Downside Broadly Balanced Weighted to Upside
- January April

Degree of Uncertainty about Outlook for Total Inflation

- Number of Participants
- Lower Historically Normal Higher
- January April

Risk Weighting around Outlook for Total Inflation

- Number of Participants
- Weighted to Downside Broadly Balanced Weighted to Upside
- January April
Appendix 3: Materials used by Mr. English
Material for the
FOMC Briefing on Monetary Policy Alternatives

William B. English
April 29-30, 2008
### Table 1: Alternative Language for the April 2008 FOMC Announcement

<table>
<thead>
<tr>
<th>March FOMC</th>
<th>Alternative A</th>
<th>Alternative B</th>
<th>Alternative C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Policy Decision</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. The Federal Open Market Committee decided today to lower its target for the federal funds rate 75 basis points to 2-1/4 percent.</td>
<td>The Federal Open Market Committee decided today to lower its target for the federal funds rate <strong>50</strong> basis points to <strong>1-3/4</strong> percent.</td>
<td>The Federal Open Market Committee decided today to lower its target for the federal funds rate <strong>25</strong> basis points to <strong>2</strong> percent.</td>
<td>The Federal Open Market Committee decided today to <strong>keep</strong> its target for the federal funds rate at <strong>2-1/4</strong> percent.</td>
</tr>
<tr>
<td>2. Recent information indicates that the outlook for economic activity has weakened further. Growth in consumer spending has slowed and labor markets have softened. Financial markets remain under considerable stress, and the tightening of credit conditions and the deepening of the housing contraction are likely to weigh on economic growth over the next few quarters.</td>
<td>Recent information indicates that economic activity <strong>remains weak</strong>. Household and business spending <strong>has been subdued</strong> and labor markets have softened <strong>further</strong>. Financial markets remain under considerable stress, and <strong>tight</strong> credit conditions and the deepening housing contraction are likely to weigh on economic growth over the next few quarters.</td>
<td>Recent information indicates that economic activity <strong>remains weak</strong>. Household and business spending <strong>has been subdued</strong> and labor markets have softened <strong>further</strong>. Financial markets remain under considerable stress, and <strong>tight</strong> credit conditions and the deepening housing contraction are likely to weigh on economic growth over the next few quarters.</td>
<td></td>
</tr>
<tr>
<td><strong>Rationale</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Inflation has been elevated, and some indicators of inflation expectations have risen. The Committee expects inflation to moderate in coming quarters, reflecting a projected leveling-out of energy and other commodity prices and an easing of pressures on resource utilization. Still, uncertainty about the inflation outlook has increased. It will be necessary to continue to monitor inflation developments carefully.</td>
<td>Inflation has been elevated, and some indicators of inflation expectations have risen <strong>in recent months</strong>. The Committee expects inflation to moderate in coming quarters, reflecting a projected leveling-out of energy and other commodity prices and an easing of pressures on resource utilization. Still, uncertainty about the inflation outlook <strong>remains high</strong>. It will be necessary to continue to monitor inflation developments carefully.</td>
<td>Although <strong>readings on core inflation have improved somewhat</strong>, energy and other commodity prices have increased, and some indicators of inflation expectations have risen <strong>in recent months</strong>. The Committee expects inflation to moderate in coming quarters, reflecting a projected leveling-out of energy and other commodity prices and an easing of pressures on resource utilization. Still, uncertainty about the inflation outlook <strong>remains high</strong>. It will be necessary to continue to monitor inflation developments carefully.</td>
<td>Inflation has been elevated, and some indicators of inflation expectations have risen <strong>in recent months</strong>. The Committee expects inflation to moderate in coming quarters, <strong>but</strong> uncertainty about the inflation outlook <strong>remains high</strong>. It will be necessary to continue to monitor inflation developments carefully.</td>
</tr>
<tr>
<td><strong>Assessment of Risk</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Today’s policy action, combined with those taken earlier, including measures to foster market liquidity, should help to promote moderate growth over time and to mitigate the risks to economic activity. However, downside risks to growth remain. The Committee will act in a timely manner as needed to promote sustainable economic growth and price stability.</td>
<td><strong>The Committee judged that a further reduction in interest rates was appropriate to foster</strong> moderate growth over time and to mitigate the risks to economic activity. The Committee will act in a timely manner as needed to promote sustainable economic growth and price stability.</td>
<td><strong>The substantial easing of monetary policy to date, combined with ongoing measures to foster market liquidity</strong>, should help to promote moderate growth over time and to mitigate risks to economic activity. The Committee <strong>will continue to monitor economic and financial developments and will</strong> act as needed to promote sustainable economic growth and price stability.</td>
<td>Although downside risks to growth remain, the <strong>substantial easing of monetary policy to date, combined with ongoing measures to foster market liquidity</strong>, should help to promote moderate growth over time and to mitigate risks to economic activity. The Committee <strong>will continue to monitor economic and financial developments and will</strong> act as needed to promote sustainable economic growth and price stability.</td>
</tr>
</tbody>
</table>
Appendix 4: Materials used by Mr. Stockton
### Gross Domestic Product

(percent change at an annual rate)

<table>
<thead>
<tr>
<th></th>
<th>2007-Q4</th>
<th>2008-Q1</th>
<th>2008-Q1</th>
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<td></td>
<td>Final</td>
<td>Greenbook</td>
<td>Advance</td>
</tr>
<tr>
<td>Real GDP</td>
<td>0.6</td>
<td>0.4</td>
<td>0.6</td>
</tr>
<tr>
<td>Final Sales</td>
<td>2.4</td>
<td>-0.3</td>
<td>-0.2</td>
</tr>
<tr>
<td>Personal Consumption</td>
<td>2.3</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Durables</td>
<td>2.0</td>
<td>-7.0</td>
<td>-6.1</td>
</tr>
<tr>
<td>Nondurables</td>
<td>1.2</td>
<td>-0.9</td>
<td>-1.3</td>
</tr>
<tr>
<td>Services</td>
<td>2.8</td>
<td>3.6</td>
<td>3.4</td>
</tr>
<tr>
<td>Business Fixed Investment</td>
<td>6.0</td>
<td>-1.1</td>
<td>-2.5</td>
</tr>
<tr>
<td>Nonresidential Structures</td>
<td>12.4</td>
<td>-2.8</td>
<td>-6.2</td>
</tr>
<tr>
<td>Equipment and Software</td>
<td>3.1</td>
<td>-0.2</td>
<td>-0.7</td>
</tr>
<tr>
<td>Residential Investment</td>
<td>-25.2</td>
<td>-30.9</td>
<td>-26.7</td>
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<td>Government</td>
<td>2.0</td>
<td>0.7</td>
<td>2.0</td>
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<td>Federal</td>
<td>0.5</td>
<td>1.9</td>
<td>4.6</td>
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<tr>
<td>State and Local</td>
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<td>0.1</td>
<td>0.5</td>
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<td>Exports</td>
<td>6.5</td>
<td>6.2</td>
<td>5.5</td>
</tr>
<tr>
<td>Imports</td>
<td>-1.4</td>
<td>2.4</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Level in chained 2000 dollars:

- Change in nonfarm business inventories: -21.7, -2.4, 2.7
- Change in farm inventories: 2.2, 0.8, -0.7
- Net Exports: -503.2, -492.4, -495.9

Price Indexes:

- Total PCE Chain Price Index: 3.9, 3.5, 3.5
- Core PCE Chain Price Index: 2.5, 2.1, 2.2
Appendix 5: Materials used by Messrs. Madigan, Meyer, Clouse, Hilton, and Dudley
Implications of Interest on Reserves for Monetary Policy Implementation

Presentation by Federal Reserve Staff

at

Joint Meeting of Board of Governors and Federal Open Market Committee

April 30, 2008
New powers effective October 2011

- Board may authorize Reserve Banks to pay interest on balances maintained by depository institutions at a rate or rates not to exceed the general level of short-term interest rates
- Board may set required reserve ratios on transaction deposits in a range of 0 to 14 percent (currently 8 to 14 percent)
  - Permits effective elimination of reserve requirements
Remaining statutory constraints

- Reserve requirements can be applied only to transaction deposits, nonpersonal time deposits, and eurodollar liabilities
  - Only depository institutions subject to reserves
  - Reserve requirements were designed to facilitate control of M1

- Prohibition against payment of interest on demand deposits by depository institutions

- Statutory constraints on open market purchases

- Statutory requirements for cost recovery on priced services

- Absence of interest payments to Treasury and foreign central banks on their Fed accounts
Process to date

- Chairman asked staff to begin background work
- System workgroup undertook a preliminary study of a range of options for implementing monetary policy
- System workgroup initiated work on implications for priced services and accounting
- Board hosted a workshop on monetary policy implementation attended by five foreign central banks
- Today’s joint Board-FOMC meeting
Outline of briefing

♦ Overview (Madigan)

♦ Current approach to implementing U.S. monetary policy (Meyer)

♦ Discussion of five options (Clouse and Hilton)

♦ Concluding comments (Dudley)
Following the briefing, we will seek your comments on:

- Criteria for evaluating options
- Options
- Process and Timeline
Implementing U.S. Monetary Policy: Current Framework and Operating Procedures

- **Summarize**
  - banking system’s demand for central bank balances
  - Desk’s management of the supply of balances
  - equilibrium in the federal funds market

- **Focus on policy implementation in normal times**
  - brief discussion of policy implementation since August

- **Conclude with strengths and shortcomings of current approach**
# Demand: Reserve Requirements

## 2008 Reserve Requirement Ratios

<table>
<thead>
<tr>
<th>Type of liability</th>
<th>Requirement (% of liabilities)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net transaction accounts</td>
<td></td>
</tr>
<tr>
<td>$0 to $9.3 million</td>
<td>0 %</td>
</tr>
<tr>
<td>&gt; $9.3 million to $43.9 million</td>
<td>3 %</td>
</tr>
<tr>
<td>&gt; $43.9 million</td>
<td>10 %</td>
</tr>
<tr>
<td>Nonpersonal time deposits</td>
<td>0 %</td>
</tr>
<tr>
<td>Eurocurrency liabilities</td>
<td>0 %</td>
</tr>
</tbody>
</table>

For details on the multitude of complex definitions, rules, carryover provisions, etc., see the 135 page Reserve Maintenance Manual
Demand: Reserve Requirements

- DIs meet reserve requirements by holding
  - currency in vaults and ATMs
  - reserve balances at a Federal Reserve Bank
  - balances at a correspondent bank

- No remuneration, so DIs try to reduce required reserves to the level of vault cash and balances they would hold if there were no requirements
  - sweep programs reduce reservable deposits
  - only 1,500 of 17,000 DIs need to hold reserve balances
  - required reserve balances ≈ 0.1% of total deposits
Demand: Contractual Clearing Balances

- Many DIs want working balances larger than their required reserve balances
  - to clear Fedwire and other payments
  - to provide a cushion against overnight overdrafts

- Thousands of DIs hold contractual clearing balances
  - accrue “earnings credits” at 80% of 3-month T-bill rate
  - credits can be used only to offset fees for priced services
Required Reserve Balances & Contractual Clearing Balances

[Graph showing the comparison of Required Reserve Balances and Contractual Clearing Balances over time, with data points from January 2004 to April 2008.]
Role of Required and Contractual Balances

- Establish a predictable lower bound on period-average demand for balances
  - levels of required & contractual balances are set before each reserve maintenance period
- Averaging provision, carry-over, & clearing band make demand for balances interest-elastic
  - until final day of maintenance period
Demand: Excess Reserves

♦ Large DIs seek to hold zero excess reserves on avg.
  ■ but level varies widely from day to day, reflecting volume of Fedwire payments

♦ Small DIs hold $1.5 billion of ex. res. on avg.
  ■ may need a cushion against overdrafts but not use priced services, so contractual clearing balance unappealing

♦ Total balances (required + clearing + excess) vary between $10 and $25 billion per day in normal times; wider variation since August
Depository Institutions’ Total Balances at Federal Reserve Banks

(daily, January 2007 to March 2008)
Daylight Credit Reduces Demand for Balances

- Fedwire processes > 0.5 million interbank payments (with a value of $\approx 2.5$ trillion) per day
- Rather than holding large non-interest-bearing balances at the Fed, DIs make heavy use of daylight credit to clear interbank payments.
  - sum of end-of-minute overdrafts averages $\approx 60$ billion per day
- Proposed revision to PSR Policy may further reduce demand for balances
  - Fed now charges 36 basis points/yr for daylight credit
  - proposal would make collateralized daylight credit free
Supply of Balances

Desk’s tries to keep $S = D$ to keep $ffr = target$
- Desk seeks to offset changes in autonomous factors and discount window credit that affect supply of balances
- also seeks to accommodate changes in demand

Outright purchases/sales, plus 14- & 28-day repo, supply a base of balances $< \text{projected demand}$

Temporary open market operations add (or drain) balances almost every day

Desk trades with 20 primary dealers
- interbank markets distribute balances
Supply: Autonomous Factors and D.W. Credit

- Unanticipated changes in autonomous factors can make supply of balances differ from projected level
  - currency in circulation
  - float
  - Treasury balance (Treasury deposits at FRBs)
  - foreign repo pool

- Unexpected changes in PDCF credit also can make supply of balances differ from projection
  - Changes in TAF credit are known in advance, and offset
Supply: Temporary Open Market Operations

- Desk executes repo almost every day
  - Size typically from $2 billion to $20 billion
  - Maturities from 1 to 7 days, depending on persistence of projected need
  - Daily o.m.o. are in addition to 14-day & 28-day repo

- Replacing maturing repo with larger repo adds to supply of balances

- Replacing maturing repo with smaller repo (or none) reduces supply of balances
  - Reverse repo to drain balances are rare
How well does our current approach work?

- In normal times, current approach usually keeps effective funds rate close to target
- But current approach allows larger deviations during periods of stress in interbank markets
Effective FFR minus Target:
Normal Times vs. Market Turmoil

(daily, January 2007 to March 2008)
Equilibrium in the Federal Funds Market (1)

- DIs’ demand for balances varies from day to day, reflecting reserve requirements, clearing balance commitments, and volume of payments
- In morning, fed funds usually trade at or near target rate because DIs expect Desk to supply enough balances to make \( \text{ffr} \approx \text{target} \)
  - a firm or soft rate signals excess demand or supply
- Desk conducts open market operation to make day’s projected supply = forecast of quantity demanded
Equilibrium in the Federal Funds Market (2)

- As day progresses, autonomous factors and demand are realized; banks make and settle payments and trade fed funds; and actual ffr is determined

- Desk cannot adjust S of balances late in day, so if realized S ≠ actual D, ffr will deviate from target
  - because balances are not remunerated, an excess supply can push ffr down to zero in the afternoon
  - reluctance to borrow means an excess demand can cause ffr to rise above primary credit rate in the afternoon
  - a small volume of trades at very low or very high rates can make effective (daily average) ffr deviate from target
Burdens Imposed by Current Approach

- Reserve requirements, deposit reports, zero interest on balances impose unnecessary burdens on society
  - Reserves tax from zero interest on required reserve balances $\approx 380$ million in 2006, $340$ million in 2007

- Sweep programs and other methods DIs use to minimize reserves tax waste real resources

- High costs to collect/process deposit data and to monitor/ensure compliance with complex rules for required reserves and contractual clearing balances
Strengths & Shortcomings of U.S. Approach

- Usually keeps funds rate close to target in normal times but allows occasional large deviations
- Allows larger and more frequent deviations from target during periods of market stress
  - Large deviations reflect: projection errors; reluctance to borrow; no remuneration of balances; inability to adjust supply of balances late in day
- Even sophisticated market participants find current approach hard to understand, somewhat opaque
- Reserve requirements & zero interest on balances impose burdens, but are not needed to hit ffr target
Core Structural Elements

♦ Balance Targets: Mandatory, Voluntary, or None
♦ Bands Around Target Balances
♦ Maintenance Period: Single or Multiple Day
♦ Funds Rate Corridor
  ■ Upper Bound: Standing Lending Facility
  ■ Lower Bound: Interest on Excess Reserves (or Redeposit Facility)
Possible Limitations: Stigma and the Standing Lending Facility

- Standing lending facility should, in theory, place a cap on the federal funds rate.
- But stigma may impair the effectiveness of the cap.
- Potentially undermines effectiveness of systems that rely heavily on standing lending facility.
  - Disadvantages institutions that are the least inclined to borrow.

<table>
<thead>
<tr>
<th>Institution Name</th>
<th>Number of Trades</th>
<th>Average Trade Size ($ Millions)</th>
<th>Average Spread over Primary Credit Rate (Basis Points)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citibank</td>
<td>108</td>
<td>340</td>
<td>18</td>
</tr>
<tr>
<td>Bank of America</td>
<td>102</td>
<td>338</td>
<td>35</td>
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<tr>
<td>JP Morgan Chase</td>
<td>185</td>
<td>345</td>
<td>44</td>
</tr>
<tr>
<td>Wachovia</td>
<td>7</td>
<td>239</td>
<td>100</td>
</tr>
<tr>
<td>State Street</td>
<td>4</td>
<td>312</td>
<td>31</td>
</tr>
<tr>
<td>Bank of New York</td>
<td>43</td>
<td>381</td>
<td>23</td>
</tr>
<tr>
<td>Wells Fargo</td>
<td>32</td>
<td>199</td>
<td>73</td>
</tr>
</tbody>
</table>
Multiple- and Single-Day Systems

♦ Multiple Day Systems
  ■ Options 1 and 2
  ■ Intraperiod arbitrage to stabilize the funds rate

♦ Single-Day Systems
  ■ Options 3-5
  ■ Standing facilities and rates of remuneration to stabilize the funds rate.
Option 1: Remunerate Required and Excess Reserve Balances

Key Structural Features
- Standing lending facility sets upper bound on funds rate
- Interest on excess reserves sets lower bound on funds rate
- Mandatory requirements and two-week maintenance period

How it Should Work
- Downward sloping demand curve on last day of maintenance period
- Demand curve on earlier days in the period relatively flat at the target rate over a wide range.
  - Banks can substitute balances across days of the maintenance period
- Desk adjusts supply of balances each day to address daily demands and maintenance-period average needs.
Option 2: Voluntary Balance Targets

Key Structural Features
- Voluntary Balance Target
- Multiple-day Period (between FOMC meetings)
- Relatively narrow target band
- Funds Rate Corridor

How it Should Work
- Basic mechanics similar to option 1
- Longer maintenance period should allow more scope for substitution of balances across days of the period
- Might require less fine-tuning of daily balances but…
- Key question is the magnitude of voluntary requirements
  - Low level could limit scope for substitution and arbitrage
Option 3: Simple Corridor

Key Structural Features
- No target balance
- Narrow symmetric funds rate corridor

How It Should Work
- Downward sloping demand for reserves within the corridor
- Demand for reserves stems from precautionary motive to avoid overnight overdrafts
- Staff would estimate daily demand at the target rate
- Desk would supply daily balances to meet estimated demand at target rate
- Demand curve could be rather steep
- Funds rate could be volatile within the corridor
Option 4: Floor with High Balances

Key Structural Features

- No target balance
- Asymmetric funds rate corridor
  - Remuneration rate set just below target funds rate
- High balances to keep funds rate near the floor of the corridor

How it Should Work

- Desk provides an ample supply of balances each day ($50 billion)
- Funds rate should trade near the lower bound of the corridor
- Fluctuations in reserve factors should have little impact on funds rate
- Could reduce daylight overdrafts
- Potential for strategic behavior?
  - Minimal costs in holding large reserve position
Option 5: Voluntary Daily Target with Target Band

Key Structural Elements

- Voluntary Daily Balance Target
- Relatively wide target band
- Upper bound on full remuneration of balances
- Penalty for shortfalls
- Wide funds rate corridor

How it Should Work

- Demand curve relatively flat within the target band
  - But downward sloping near the boundaries of the target band.
- Desk supplies balances each day close to the midpoint of the target band.
- Key Questions:
  - How large would aggregate level of targets be?
  - How wide to set target band?
General Issues

♦ Competitive issues
  ■ Restrictions on payment of interest on demand deposits

♦ Appropriate setting of remuneration rate
  ■ Somewhat below target rate to reflect risk premium

♦ Governance: FOMC and Board Roles
  ■ FOMC target rate and Board-determined remuneration rate

♦ Transition
  ■ Moving from current system to new system could be complicated
Assessment of Different Options: Objectives

- Reduce burdens and deadweight losses
- Enhance monetary policy implementation
- Promote efficient and resilient money markets and government securities markets
- Promote an efficient and resilient payments system
Option 1: Remunerate Required and Excess Reserve Balances

♦ Advantages:
  ■ Easy to implement given where we are now
  ■ Tested basic framework that would represent an improvement over the status quo

♦ Disadvantages:
  ■ Retains current administrative burdens
  ■ Limited flexibility in reserve averaging parameters

♦ Open Issues
  ■ Uncertain by how much required reserve balances would rise
Option 2: Voluntary Balance Targets

♦ Advantages:
  - Significant reduction in administrative burdens
  - Also a tested basic framework
  - Offers more flexibility in reserve targets

♦ Disadvantages:
  - Retains some administrative burden, for both DIs and FRS

♦ Open issues:
  - Identifying a system of voluntary targets that yields sufficient balances and is administratively workable
Option 3: Simple Corridor

**Advantages:**
- Eliminates administrative burdens of reserve requirements/targets and reserve maintenance periods
- Should keep funds rate within a narrow corridor

**Disadvantages:**
- Funds rate would be more volatile within the corridor
- Heavy use of standing facilities under a narrow corridor increases role of Fed as market intermediary

**Open issues:**
- Would our lending facility be sufficiently effective in limiting rates on the upside?
- May need a better ability to make late-day reserve adjustments
Option 4: Floor with High Balances

♦ Advantages:
  - Eliminates administrative burdens of reserve requirements/targets and maintenance periods
  - Sharply reduces account management burden on DIs
  - Substantial balance sheet/reserve movements may have little impact on rates (although a possible double-edged sword)

♦ Disadvantages:
  - A radical change from the current framework, with limited experience of other central banks upon which to base informed judgments

♦ Open issues:
  - Implications for reserve demand and the functioning of the interbank market, under both normal circumstances and periods of stress
Option 5: Voluntary Daily Target with Clearing Band

♦ Advantages:
  - Significant reduction in administrative burdens
  - Reserve smoothing parameters (voluntary target levels and bands) may be very flexible

♦ Disadvantages:
  - Retains some administrative burden, for both DIs and FRS
  - Limited experience with some features of this framework

♦ Open issues:
  - Identifying a system of voluntary targets that yields sufficient balances and is administratively workable
Overall Assessment Against Objectives

1. Reduce burdens and deadweight losses
   - All options eliminate the reserve tax, either by remunerating required reserves or eliminating requirements
   - But some options have fewer administrative burdens than others

2. Enhance monetary policy implementation
   - All options set a floor for the fed funds rate, and most introduce additional features to help control rate volatility
   - But some options may have more flexible parameters that could be adjusted during periods of stress
Overall Assessment Against Objectives

3. Promote efficient and resilient money markets and government securities markets
   - Most options would still rely on active short-term markets for the distribution of liquidity
   - But there are possible differences in the Fed’s role as market intermediary, and in the impact on the interbank market

4. Promote an efficient and resilient payments system
   - All options are consistent with proposed PSR policy changes
   - But some could yield a higher level of reserves than others as an alternative to daylight credit
Interest on Reserves in a Broader Context

- Consider as part of process of improving overall monetary policy framework
- Current system works well during normal times
- Less robust during times of stress
Weaknesses of Current Monetary Policy Framework

- Volatility of the federal funds rate
- PCF rate not a binding ceiling
- Potential loss of control of federal funds rate after large reserve adds
- Limited ability to constrain upward pressure in term funding rates
Federal Funds Rate Volatility (I)

Daily Average less Target Federal Funds Rate: March 2007 to Present

![Graph showing Federal Funds Rate Volatility from March 2007 to Present]
Federal Funds Rate Volatility (II)

Daily Fed Funds Rates and Ranges: March 2008 to Present

- PCF spread to target rate lowered to 25bp;
- PDCF introduced

### Effective Rate

- April 30–30, 2008

### Fed Funds Target Rate

- April 30–30, 2008

### Primary Credit Rate

- April 30–30, 2008
Implications for Interest on Reserves

- Consider in tandem with changes to overall framework
- Be willing to make significant adjustments to facilitate monetary policy implementation and market robustness
- Options 1 and 2 eliminate reserve tax distortions and Option 2 eliminates most of regulatory burden
- Option 2 has several advantages:
  - Less regulatory burden, voluntary
  - Averaging dampens shocks
  - Considerable experience with this type of framework—similarities with the contractual clearing program
  - Bank of England has been using it successfully
Implications for Interest on Reserves

♦ But other proposals go further in altering fundamental framework

♦ Option 5 is potentially more robust than Option 3 or Option 4:
  ■ Flexible in that number of parameters that can be adjusted—width of corridor and size of voluntary reserve band
  ■ As a result, it could be adjusted readily in response to experience and/or changes in market conditions
  ■ But less empirical evidence available as no other central bank has adopted such a model
Recommendation – Interest on Reserves

- Reserve maintenance periods have advantages and disadvantages
- Smoothing reduces volatility, but shocks get dispersed through the reserve maintenance period
- Single day systems, reserve shocks do not persist
- Recommendation: Develop best proposal within each broad class
- Focus on Options 2 and 5
Next Steps

♦ Identify workable systems of voluntary targets for reserves, needed for either option 2 or 5
  ■ Set clear objectives for aggregate size and distribution across DIs
  ■ Determine how such a system would be applied to a heterogeneous banking system

♦ Critically assess relative merits of maintenance periods vs. daily clearing bands as a source of reserve management flexibility
  ■ and optimum sizes of maintenance period and clearing band width

♦ Define the optimal width of a rate corridor under both options
  ■ understand implications for rate dynamics and the functioning of the interbank market under normal conditions and during times of stress

♦ Assess compatibility of either option with possible changes in counterparties and collateral for central bank credit operations
## Possible Timeline (I)

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apr-08</td>
<td>Board announces System studying approaches to policy implementation and will consult with public</td>
</tr>
<tr>
<td>May-08</td>
<td>Publish white paper on possible approach(es) for three months of public comment</td>
</tr>
<tr>
<td>Apr-08 to Nov-08</td>
<td>Intensive study of two options (options 2 and 5) – public comment consultation with System groups and public</td>
</tr>
<tr>
<td>Oct-08</td>
<td>FRBNY conference on monetary policy implementation</td>
</tr>
<tr>
<td>Dec-08</td>
<td>Staff proposes specific approach to Board and FOMC</td>
</tr>
</tbody>
</table>
### Possible Timeline (II)

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan-09</td>
<td>Board and FOMC discussion; preliminary decision on approach</td>
</tr>
<tr>
<td>Jan-09 to Jul-09</td>
<td>Staff develops detailed proposal—further consultation with System groups and public</td>
</tr>
<tr>
<td>Aug-09</td>
<td>Board publishes final proposal in Federal Register for public comment</td>
</tr>
<tr>
<td>Oct-09</td>
<td>Board publishes rules</td>
</tr>
<tr>
<td>Oct-09 to Oct-11</td>
<td>Prepare for implementation</td>
</tr>
<tr>
<td>Oct-11</td>
<td>Implement</td>
</tr>
</tbody>
</table>
We seek your guidance on several key issues

- Criteria for the evaluation of policy options
  - In particular, the weight to place on reduction in burden and distortions associated with reserve requirements
- Specific options that should be studied further
- Process and timeline going forward
- Interaction with other aspects of policy implementation