The implications of international capital mobility on U.S. monetary policy during the 1990 recession.

Ndeme S. Ngoh
CLARK ATLANTA UNIVERSITY

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Name of Student: NDEME SAMUEL NGOH

Title of Thesis: THE IMPLICATIONS OF INTERNATIONAL CAPITAL MOBILITY ON U.S. MONETARY POLICY DURING THE 1990 RECESSION.

We, the undersigned members of the Committee advising this thesis/dissertation, have ascertained that in every respect it acceptably fulfills the final requirement for the degree of M.A. in ECONOMICS.

Major Advisor: Charles Curtis
Department: Economics
Date: 7/26/95

As Chair of the Department of ECONOMICS, I have verified that this manuscript meets the School’s Department’s standards of form and content governing theses or dissertations for the degree sought.

Chair: 7/26/95

As Dean of the School of ARTS & SCIENCES, I have verified that this manuscript meets the School’s regulations governing the content and form of theses or dissertations.

Dean: 7/28/95

As Dean of Graduate Studies, I have verified that this manuscript meets the University’s regulations governing the content and form of theses or dissertations.

Dean of Graduate Studies: 7/28/95
ABSTRACT

ECONOMICS

NDEME, SAMUEL NGOH.        BS. SUFFOLK UNIVERSITY, 1987
                        MA. CLARK ATLANTA UNIVERSITY, 1995

THE IMPLICATIONS OF INTERNATIONAL CAPITAL MOBILITY ON U.S. MONETARY POLICY DURING THE 1990 RECESSION.

Advisor: Dr. Charlie Carter


This study examines the impact of international capital mobility on the effectiveness of U.S. monetary policy. While its primary purpose is to examine the effects of capital movements in the 1990-1992 recessionary period, the general framework and estimation covers the period from the mid 1970's when international capital movements into the U.S. started increasing significantly.

This study argues that when there was little capital movements into the U.S., (closed economy), monetary policy was very effective. In fact, the Fed projections were essentially met. But when international capital mobility increased due to a highly integrated world economy (globalization), a combination of factors began to influence the effectiveness of monetary policy, constraining its pursuance of domestic objectives.

The 1990 recession was an example where the dividing line between domestic macro management and international monetary economics has become more blurred. Where capital mobility affects the workings of the Fed's actions.

The analysis presented here identifies that even where policy actions are capable of altering the level of economic activity domestically, the ability to do so may be severely constraining and as such takes a longer time in an interdependent world.
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Department:  **ECONOMICS**

School:  **ARTS AND SCIENCES**

Clark Atlanta University

Office Telephone:  **880 6288**

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THE IMPLICATIONS OF INTERNATIONAL CAPITAL MOBILITY ON U.S. MONETARY POLICY DURING THE 1990 RECESSION

A THESIS

SUBMITTED TO THE FACULTY OF CLARK ATLANTA UNIVERSITY
IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR
A MASTER OF ARTS

BY

NDEME SAMUEL NGOH

DEPARTMENT OF ECONOMICS
ATLANTA, GEORGIA

JULY, 1995
ACKNOWLEDGEMENTS

No thesis can be written without imposing on friends or lecturers for comments, criticism and ideas. Throughout the course of writing this thesis, I benefitted from comments and ideas from Dr. Charlie Carter. His encouragement and assistance received in this project extending over some years is sincerely appreciated. There seemed to be no limit to his generosity in sharing with me his deep knowledge of economics.

I also want to thank Dr. Mesfin Bezuneh and Gwen, the Department Secretary, for their assistance in various ways.
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<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>GNP</td>
<td>Gross National Product</td>
</tr>
<tr>
<td>C</td>
<td>Consumer expenditure</td>
</tr>
<tr>
<td>I</td>
<td>Investment</td>
</tr>
<tr>
<td>G</td>
<td>Government purchases of goods and services</td>
</tr>
<tr>
<td>S</td>
<td>Total savings</td>
</tr>
<tr>
<td>T</td>
<td>Taxes</td>
</tr>
<tr>
<td>X</td>
<td>Exports</td>
</tr>
<tr>
<td>M</td>
<td>Imports</td>
</tr>
<tr>
<td>(X - M)</td>
<td>Net exports</td>
</tr>
<tr>
<td>Y</td>
<td>Income or output</td>
</tr>
<tr>
<td>IR</td>
<td>International reserves</td>
</tr>
<tr>
<td>BP</td>
<td>Balance of payment</td>
</tr>
<tr>
<td>K(r)</td>
<td>Capital flows</td>
</tr>
<tr>
<td>Rₜ</td>
<td>Transfer payments</td>
</tr>
<tr>
<td>Ms</td>
<td>Money supply</td>
</tr>
<tr>
<td>Ms/P</td>
<td>Real money supply</td>
</tr>
<tr>
<td>L</td>
<td>Speculative demand for money (liquidity, preference)</td>
</tr>
<tr>
<td>k</td>
<td>Transactions demand for money</td>
</tr>
<tr>
<td>P</td>
<td>(Domestic) Price</td>
</tr>
<tr>
<td>P'</td>
<td>Foreign Price</td>
</tr>
<tr>
<td>e</td>
<td>Exchange rate</td>
</tr>
<tr>
<td>r</td>
<td>Interest rate</td>
</tr>
<tr>
<td>rᵈ</td>
<td>Domestic interest rate</td>
</tr>
<tr>
<td>rᶠ</td>
<td>Foreign interest rate</td>
</tr>
<tr>
<td>d</td>
<td>Interest rate differential</td>
</tr>
<tr>
<td>E</td>
<td>Elasticity</td>
</tr>
<tr>
<td>$</td>
<td>(U.S.) dollar</td>
</tr>
<tr>
<td>£</td>
<td>(British) pound</td>
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CHAPTER 1

INTRODUCTION

Recent world economic events suggest a need to reassess previously held ideas about the insulation of the United States economy from external events or disturbances. Important structural changes in the economy resulting from institutional, regulatory and technical developments, may have altered the nature and effectiveness of the channels through which monetary policy affects the level of economic activity. It has become increasingly convincing that movements of financial capital across national boundaries severely hamper the Federal Reserve’s use of monetary instruments to achieve domestic policy objectives.

The underlying theory, upon which this policy is based, assumes that international capital movement is sensitive to interest rate differentials. It also assumes that capital movements can adversely affect the effectiveness of the Federal Reserve’s, (now henceforth called the Fed) policy objectives of achieving full employment, price stability, economic growth, in a recessionary period, and balance of payments and exchange rate stability.

When the U.S. operated as a closed economy some 30 - 40 years ago, it was free from these external disturbances. Monetary policy operated free from exogenous
influences. It is now widely recognized that the U. S. has become more integrated into the world economy. The integration of world economies opened the boundaries of closed economies. Dornbusch (89) observed that increased financial integration in the 1980s increased the international spillover of domestic policy. Macroeconomic policies for open economies especially the more industrialized nations, differ in fundamental ways from policies of closed economies.\textsuperscript{1} The openness of these economies imposes constraints on the effectiveness and conduct of their macroeconomic policies. In the monetary aspects, the Fed's expansionary and contractionary policies work differently when implemented in an open economy than when same policies are pursued in a closed economy.

When the U.S. existed as a closed economy after World War II, it was free from external disturbances, especially those affecting the working of monetary policy. There were no global financial markets and/or a global economy to influence the U.S. financial markets and its economy. Much so that, whenever the Fed was faced with implementing any of its policy options, it was free from foreign constraints and the desired goals were usually realized. The effects of any change in a monetary policy instrument was more certain then than today. Targets were often achieved with little or no deviations - of under and overshooting. The U.S. was controlling the world economy because it was the only major country whose industrial facilities had not been destroyed by conflicts. It became the political and economic leader and the U.S. dollar as a result, became the

\textsuperscript{1} By a closed economy, we mean an economy without economic relations with the rest of the world. Specifically, there is no trade in goods which might affect output and prices and there are no international financial flows which might affect interest rates and the money stock.
international reserve currency. The U.S. experienced a balance-of-trade surplus with other nations and it served as the world banker. The U.S. became the sole supplier of financial capital as well as equipment capital during the reconstruction period. Until the mid 1960’s, the U.S. was able to finance foreign investments with its trade surplus.²

As Western Europe and Japan recovered after reconstruction, they began to build their economies and to export abroad. As the U.S. and other nations moved closer to open economies or to a globalized economy, the macroeconomic conditions in each country especially the U.S. changed. Exporting abroad, Western Europe and Japan competed with the U.S. in the world (capital) markets. (Edelman 43). Consequently, the U.S. foreign investments grew larger than it’s trade surplus, which was being eaten away by these new entrants in the global market. The new entrants became very competitive and soon experienced trade surpluses and eventually foreign investments and financial capital started to move to the U.S. -- A change in direction.

The volume of international capital since then has increased significantly and especially from 1983 to 1989 when the U.S. interest rates had risen above foreign interest rates. Figure I shows, foreign capital into the U.S. shifted to net outflow of $3.9 billion in 1992 from a net inflow of $11.5 billion in 1991 and from a peak of $68 billion in 1989. Table I shows the flow of financial assets between U.S. and the rest of the world and how U.S. financial assets abroad have declined while foreign assets into the U.S. have increased up until 1990 because of high domestic interest rates which attracted foreign capital and where they began to fall and fell tremendously in 1991 because of low

² Edelman, Joan S.
FIGURE 1
FOREIGN CAPITAL FLOWS TO THE UNITED STATES. (Net, 1979 - 92)
(BILLIONS OF U.S. DOLLARS)

Source: U.S. Dept. of Commerce, Bureau of Economic Analysis.
Table 1.

U.S. INTERNATIONAL TRANSACTIONS FROM 1975 - 1991: III

(Net changes in year to year flows).  In Millions of Dollars.

<table>
<thead>
<tr>
<th>Year or Quarters</th>
<th>U.S. Assets Abroad, net (Increase/Capital outflow)</th>
<th>Foreign Assets in the U.S. net (Increase/Capital inflow)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975</td>
<td>-39,703</td>
<td>15,670</td>
</tr>
<tr>
<td>1976</td>
<td>-51,269</td>
<td>36,518</td>
</tr>
<tr>
<td>1977</td>
<td>-34,785</td>
<td>51,319</td>
</tr>
<tr>
<td>1978</td>
<td>-61,130</td>
<td>64,036</td>
</tr>
<tr>
<td>1979</td>
<td>-64,331</td>
<td>38,752</td>
</tr>
<tr>
<td>1980</td>
<td>-86,052</td>
<td>54,922</td>
</tr>
<tr>
<td>1981</td>
<td>-110,601</td>
<td>80,876</td>
</tr>
<tr>
<td>1982</td>
<td>-118,045</td>
<td>87,866</td>
</tr>
<tr>
<td>1983</td>
<td>-49,490</td>
<td>81,722</td>
</tr>
<tr>
<td>1984</td>
<td>-20,447</td>
<td>87,319</td>
</tr>
<tr>
<td>1985</td>
<td>-32,436</td>
<td>127,106</td>
</tr>
<tr>
<td>1986</td>
<td>-95,982</td>
<td>213,386</td>
</tr>
<tr>
<td>1987</td>
<td>-75,987</td>
<td>211,490</td>
</tr>
<tr>
<td>1988</td>
<td>-82,110</td>
<td>219,299</td>
</tr>
<tr>
<td>1989</td>
<td>-127,061</td>
<td>214,652</td>
</tr>
<tr>
<td>1990: I</td>
<td>37,147</td>
<td>-33,082</td>
</tr>
<tr>
<td>II</td>
<td>-33,462</td>
<td>31,257</td>
</tr>
<tr>
<td>III</td>
<td>-26,689</td>
<td>49,096</td>
</tr>
<tr>
<td>IV</td>
<td>-34,703</td>
<td>39,033</td>
</tr>
<tr>
<td>1991: I</td>
<td>-923</td>
<td>729</td>
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<tr>
<td>II</td>
<td>-14,982</td>
<td>3,503</td>
</tr>
<tr>
<td>III</td>
<td>-11,971</td>
<td>22,816</td>
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- Survey of Current Business. (Various Issues)
domestic interest rates. (See Figure 1).

These movements in foreign capital into and out of the U.S., may be attributed to the liberalization of international capital markets, the U.S. financial deregulation of 1980 and the general financial innovations.\(^3\) For example, as of year end 1980, private foreign investors held $19 billion in U.S. Government securities. By year end 1988, private foreign holdings had risen to $121 billion. Foreign holdings of corporate bonds rose from $22 billion in 1980 to $180 billion in 1988.\(^4\) The decline in foreign assets into the U.S. from 1990 to 1992 might be a result of many factors, one of which might have been the expansionary monetary policy of the Fed during the 1990 recession.

The contractionary monetary policy of the Reagan Administration, based on strict adherence to monetary targets, in order to fight inflation and coupled by the enormous U.S. trade and budget deficits (twin deficits) drove U.S. interest rates at home to unprecedented high levels. These high domestic interest rates bought huge foreign capital into the U.S. which could have resulted in an oversupply of capital, as evidenced in Figure I. And with the downturn of the economy and the beginning of the 1990 recession, the Fed undertook an expansionary monetary policy which drove the domestic interest rates to a new low, and this of course as economic theory notes, leads to an outflow of needed financial capital from the U.S. The systematic increase and decrease of international capital in and out of the U.S. due to changes in the desired holdings of

\(^3\)For a broad general survey of these issues, see Akhtar (1983)

\(^4\)See Friedman (1986a) for a discussion of how foreign investors' portfolio preferences differ from those of U.S. investors.
financial assets by domestic and foreign investors has shown an impediment in the workings of the U.S. monetary policy.

The U.S. economy which was experiencing slow growth in the 1st and 2nd quarter of 1990, fell into a recession in the second half of 1990. This recession is different because it still lingered on in the last half 1992, despite the repeated expansionary actions of the Fed to pull the economy out of the recession and moving again.

When this 1990 recession began, the Bush Administration and private analysts believed that the recession would be short-lived like previous other recessions except the last recession of 1981 - 1982. They believed that this 1990 recession would not be severe and not last as long as the average of post war recessions which last for 11 months. (See Table 2)

In his 1991 Economic Report, President Bush maintained that the present recession would be mild and short-lived, and there would be a recovery underway. Economic Report, (1991). He cited four old economic reasons for recovery:

1. Low interest rates - that the Fed would lower interest rates considerably.
2. Inventories were under control - Fewer inventories and therefore the production of new goods and equipment would pick up because of less inventory in store and a high demand.
3. Rising exports to service growing markets abroad.
4. And the successful end of the Gulf War, will restore consumer confidence.

All these arguments were supposed to restore consumer confidence, but on the contrary, consumer confidence fell and even though the first three arguments happened,
Table 2. CYCLICAL COMPARISONS OF PAST RECESSIONS

<table>
<thead>
<tr>
<th>Recession</th>
<th>Duration¹</th>
<th>Unemployment Rate</th>
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<tr>
<td></td>
<td>Months</td>
<td>Percent</td>
</tr>
<tr>
<td>1948 - 49</td>
<td>11</td>
<td>7.9</td>
</tr>
<tr>
<td>1953 - 54</td>
<td>10</td>
<td>6.1</td>
</tr>
<tr>
<td>1957 - 58</td>
<td>8</td>
<td>7.5</td>
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<tr>
<td>1960 - 61</td>
<td>10</td>
<td>7.1</td>
</tr>
<tr>
<td>1969 - 70</td>
<td>11</td>
<td>6.1</td>
</tr>
<tr>
<td>1973 - 75</td>
<td>16</td>
<td>9.0</td>
</tr>
<tr>
<td>1980</td>
<td>6</td>
<td>7.8</td>
</tr>
<tr>
<td>1981 - 82</td>
<td>16</td>
<td>10.8</td>
</tr>
<tr>
<td>Recession Average*</td>
<td>11</td>
<td>7.8</td>
</tr>
<tr>
<td>1990 - 91</td>
<td>(q)</td>
<td>7.7³</td>
</tr>
</tbody>
</table>

1. Duration based on National Bureau of Economic Research dating of business cycle peaks and troughs.

2. The trough of the recession has not yet been determined, although a majority of the Blue Chip forecasters surveyed in January 1992 placed it in the second quarter of 1991.

3. The values of the recession that began in May, 1991 may differ depending on the course of the economy and data revisions.


* Because of the differences in the events causing recessions, the state of the economy when these events occur, and the responses of businesses to the down turn in activity, the range of cyclical experiences is quite broad.
the recession still continued. Rather than continuing a modest rebound, the economy just flattened out.

Declining nominal interest rates should have boosted interest-sensitive spending. The 3 month treasury bill rate, by 1991 was at 5.38% and by September 1992, was at its lowest level in 29 years at 2.89%. By December, 1991, the discount rate was at 5.45% (See Table 3) Mortgage rates at December 1991 were at 8.5%, the lowest it has been since from 1975. (Figure 2) The low mortgage rates should spur housing starts and sales and also allow household refinancing.

Despite all these very low interest and mortgage rates, collective actions taken by the Fed to increase liquidity and spur growth, the economy continued to show signs of weakness with no major recovery. GNP had continued to fall even while these rates dropped. GNP grew only .2% in 1991 following a .1% decline in 1990 and there were signs to show that the GNP growth in 1992 might be lower than the 1991 growth (see Figure 3).

Unemployment was at its highest level since the 1981 - 82 recession, now at almost 7.8%. Up from 6.7% in 1991. Table #4 shows how the unemployment rate fell to its lowest level in a decade and a half but rose during the 1990 recession to its present level. Real wages have fallen, and so too has personal savings declined from about 9% in 1975 to less than 4% in 1991. The manufacturing sector, considered one of the economy's few bright spot is hurting like the retail, banking and defense industries. The real estate is in the midst of a crisis because construction of new homes has fallen. The federal deficit has reached a high of about more than $4 1/2 trillion and the trade deficit
At the end of 1991, mortgage rates were at their lowest level in nearly a decade and a half and were much lower than their peak in 1981.

Source: Federal Home Loan Mortgage Corporation.
FIGURE 3


Percent per Annum

Source: Dept. of Commerce & Economic Report of the President, Feb. 1992
Table 3.

DOMESTIC INTEREST RATES 1975 - 1991
(Percent Per Annum)

<table>
<thead>
<tr>
<th>YEAR</th>
<th>U.S. TREASURY SECURITY BILLS 3 - MONTHS</th>
<th>DISCOUNT RATE: FEDERAL RESERVE BANK OF NEW YORK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975</td>
<td>5.838</td>
<td>6.25</td>
</tr>
<tr>
<td>1976</td>
<td>4.989</td>
<td>5.50</td>
</tr>
<tr>
<td>1977</td>
<td>5.265</td>
<td>5.46</td>
</tr>
<tr>
<td>1978</td>
<td>7.221</td>
<td>7.46</td>
</tr>
<tr>
<td>1979</td>
<td>10.041</td>
<td>10.28</td>
</tr>
<tr>
<td>1980</td>
<td>11.506</td>
<td>11.77</td>
</tr>
<tr>
<td>1981</td>
<td>14.029</td>
<td>13.42</td>
</tr>
<tr>
<td>1982</td>
<td>10.686</td>
<td>11.02</td>
</tr>
<tr>
<td>1983</td>
<td>8.63</td>
<td>8.50</td>
</tr>
<tr>
<td>1984</td>
<td>9.58</td>
<td>8.80</td>
</tr>
<tr>
<td>1985</td>
<td>7.48</td>
<td>7.69</td>
</tr>
<tr>
<td>1986</td>
<td>5.98</td>
<td>6.33</td>
</tr>
<tr>
<td>1987</td>
<td>5.82</td>
<td>5.66</td>
</tr>
<tr>
<td>1988</td>
<td>6.69</td>
<td>6.20</td>
</tr>
<tr>
<td>1989</td>
<td>8.12</td>
<td>6.93</td>
</tr>
<tr>
<td>1990</td>
<td>7.51</td>
<td>6.98</td>
</tr>
<tr>
<td>1991</td>
<td>5.42</td>
<td>5.45</td>
</tr>
<tr>
<td>1992</td>
<td>3.43</td>
<td>3.25</td>
</tr>
</tbody>
</table>

Sources: Department of Treasury. Board of Governors. Federal Reserve Bank. Various Issues
has continued to grow in size. Consumer confidence is low because of the fear of the unknown economic future, frequent bankruptcies, bank failures, the savings and loan crisis, and the continuous massive business layoffs as a result of company's structural adjustment policies.

The American public does not know where the economy is heading to and they continue to wonder why this recession is dragging this long with no signs of recovery. And despite the very low, low domestic interest rates, the economy has not picked up and it continues to be sluggish. With all these at the back of people's minds, there is a lack of confidence in the Fed and Fed actions. Is it that the Fed policy actions are no longer effective as they used to be or are there some factors that make the Fed policy actions to be less effective and possibly taking longer for us to see signs of growth as the impact lag⁴ is lengthened?

Lawrence Chimerine, Chairman of Chase Econometrics explains, in "Economic Policy, old tools won't work", "The ability of policy changes to improve the economy is much smaller than ever." Chimerine cited the growing internationalization of the U.S. economy, flexible exchange rates and the resulting mushrooming of international capital have made traditional economic policies act in unexpected ways.⁶

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⁵ Sometimes referred to as the out lag. This measures the time between the change in the policy instrument and when the major impact on economic activity is achieved.

⁶ See Levinson Marc (87).
Table 4.

U.S. UNEMPLOYMENT RATE 1975 - 1992

<table>
<thead>
<tr>
<th>Year</th>
<th>All Workers(^1) (Percent)</th>
<th>Civilian Workers(^2) (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975</td>
<td>8.3</td>
<td>8.5</td>
</tr>
<tr>
<td>1976</td>
<td>7.6</td>
<td>7.7</td>
</tr>
<tr>
<td>1977</td>
<td>6.9</td>
<td>7.1</td>
</tr>
<tr>
<td>1978</td>
<td>6.0</td>
<td>6.1</td>
</tr>
<tr>
<td>1979</td>
<td>5.8</td>
<td>5.8</td>
</tr>
<tr>
<td>1980</td>
<td>7.0</td>
<td>7.1</td>
</tr>
<tr>
<td>1981</td>
<td>7.5</td>
<td>7.6</td>
</tr>
<tr>
<td>1982</td>
<td>9.5</td>
<td>9.7</td>
</tr>
<tr>
<td>1983</td>
<td>9.5</td>
<td>9.6</td>
</tr>
<tr>
<td>1984</td>
<td>7.4</td>
<td>7.5</td>
</tr>
<tr>
<td>1985</td>
<td>7.1</td>
<td>7.2</td>
</tr>
<tr>
<td>1986</td>
<td>6.9</td>
<td>7.0</td>
</tr>
<tr>
<td>1987</td>
<td>6.1</td>
<td>6.2</td>
</tr>
<tr>
<td>1988</td>
<td>5.4</td>
<td>5.5</td>
</tr>
<tr>
<td>1989</td>
<td>5.2</td>
<td>5.3</td>
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<tr>
<td>1990</td>
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<td>5.5</td>
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<tr>
<td>1991</td>
<td>6.6</td>
<td>6.7</td>
</tr>
<tr>
<td>1992</td>
<td>7.3</td>
<td>7.4</td>
</tr>
</tbody>
</table>

\(^1\) Unemployment as percent of labor force including resident Armed Forces.

\(^2\) Unemployment as percent of civilian labor force.

Is monetary policy stock? Monetary policy actions are failing to perform as expected, the impact lag is taking longer than normal and showing deviations from expected.

"Policy actions by the Fed have failed to juice the lackluster economy". Levinson. Levinson explained how to shape the course of the economy. He went on to say that, "In 1986, things were different. Heavy growth in money supply, repeated cuts in the Fed discount rate all failed to juice the lackluster economy. The old linkages between the government’s actions and the economy’s response have changed in ways economists do not fully understand. As a result, the government’s economic tools have been partially blunted."

Has international connections made it increasingly difficult to aim economic weapons at domestic targets?

The former Fed Chairman, Paul Volcker testified before the Senate in 1983: "In practice, achieving the appropriate balance is difficult, and a full measure of success cannot be achieved by the tools..........This year 1982 amply demonstrated some of the problems facing monetary policy during a period of economic and financial turbulence, and the need for judgement and a degree of flexibility in pursuing the objectives we set for ourselves.... In setting out our monetary and credit objectives for 1982, the federal reserve has no choice but to take into account the fact the "normal" past relationships between money and economy did not hold in 1982 and maybe in the process of continuing to change. Volcker (1983)

Has the globalization of financial markets and the flows of international capital
diminished and or impaired the Fed's ability to implement a change in its monetary policy?

But no matter how public opinion is swayed of the Fed's performance in the past 1981-82 recession and this 1990 recession, they remain head of the monetary institution and control monetary policy the nation's strength. It faces real problems: how to reconcile the past workings with the present, national domestic independence with a growing liberalized global interdependent world.
Problem Statement

This thesis focuses on whether the closer integration (globalization) of U.S. domestic and foreign financial markets and specifically, international capital mobility has impaired or affected not only the ways in which monetary policy influences the economy but also the strength of its overall influence.

Many financial observers have become increasingly convinced that rapid movements across national boundaries, which are mainly of stock-shift changes in desired asset holdings, severely limit the freedom of the Fed to use the instruments at their command to actually achieve policy objectives.

As we explained earlier, macroeconomic policies for open economies differ from policies of a closed economy. As Table I shows, closer integration of national economies, increased the amount of international capital from Western Europe and Japan into the U.S. Globalization made total demand for dollar-denominated money market instruments more interest rate elastic. The domestic demand for foreign assets became more elastic as they were readily available to U.S. investors and hence provided closer substitutes for domestic assets and money than were available in a closed economy. The foreign demand for U.S. assets also become more elastic because U.S. assets appear more often in foreign portfolios, something that rarely existed sometime ago. Specifically in the U.S., the supply of these assets have become more elastic since the issuers of short-term assets have greater options.

The free movements of assets especially with flexible exchange rates have made
funds and assets available where they are needed. And by increasing the participation of investors in the U.S. financial markets, and moving from fixed exchange rate to the flexible rates, globalization may have made the U.S. money market more sensitive to developments in foreign money and credit markets.

These large increases in foreign participation in U.S. financial markets may complicate monetary policy making. "Merely changing the composition of assets holdings away from one group of investors toward another, changes the market average portfolio behavior when the two groups of investors, domestic and foreign, exhibit different assets preferences." Friedman (1986a). Higher U.S. short-term interest rates make dollar assets more attractive relative to assets dominated in other currencies and lower U.S. domestic short-term interest rates make foreign assets more attractive relative to assets dominated in dollars.

A contractionary monetary policy by the Fed, designed to fight off inflationary pressure, results in an increase in domestic interest rates that inevitably causes an increased inflow of capital as shown in Figure I. This increase in domestic interest rates may inhibit investments, and yet investments may in fact rise if a number of other variables shift sufficiently especially foreign capital into the U.S. to offset the effect of a rise in interest rates. The higher domestic interest rates above foreign rates attract foreign financial capital into the U.S. for domestic investors who need capital, thereby increasing the domestic money supply and increasing inflationary pressure, the Fed is trying to stop.

Table 3 shows the short-term interest rate and how low the interest rates have
fallen and continues to fall. From 1980, as domestic interest rates rose, foreign capital into the U.S. also rose, showing that higher domestic interest rates bring huge foreign capital and low rates causes the reverse situation.

An expansionary policy, designed to stop a recession to increase economic growth and cause full employment may not be observed. We speculate that aggregate demand for money during an expansionary period may have become increasingly less responsive to fluctuations in domestic interest rates. Decreases in the domestic interest rates below the foreign interest rates are likely to cause the already accumulated international reserves in the U.S. in the 1980's and some domestic capital to move out of U.S. in search of higher yields in investments. International reserves or foreign capital and domestic capital, necessary for investments is taken away from the domestic economy and thereby inhibiting growth and any significant economic recovery.

In Table 3, we saw that as domestic interest rates fall, the amount of foreign capital inflow into the U.S. decreased and, the amount of capital outflow, (foreign and domestic capital) increases. The expansionary Fed policy is otherwise slowed due to the ineffectiveness of the policy instruments, and the recognition lag of such policies might have lengthened. Policies designed to put more money into the economy ends up loosing much of it to other foreign economies.

With other factors taken together, one begins to wonder if global monetary interdependence from these open economies are not increasingly interfering with national economic management and if these interdependence, through capital mobility does not undermine national monetary tools.
When as in the 1980's we saw an increase in foreign capital into the U.S., so to did we notice an increase in GNP, real wages, business cycle, and a low unemployment and a rise in economic activity. In the 1990 recession, we saw a continuous decline of the domestic interest rate, running quite below the foreign interest rate and causing a subsequent decline in the GNP now at a low of about 1.5%. As indicated in the introduction, real wages have fallen, the business cycle is at a low level, unemployment is high, up to about 7.5% All these happen even when the Fed continues to pump money into the economy. Is there a leakage somewhere in the economy or does this international capital affect U.S. economic activity? This is what we are trying to find out.
Hypothesis

The hypothesis of this study proposes that increased international capital mobility alters and to some extent negate the nature and extent of monetary policy's influence on economic activity. The ways in which monetary policy is transmitted into the economy have changed substantially within the last 20-25 years because of massive movements in financial capital into and out of the U.S.

Objective

The fundamental objective of this study is to evaluate and measure the effects of international capital mobility on the effective by which the Federal Reserve is able to conduct of U.S. monetary policy.

In keeping with this objective, the thesis will:

1. Identify the factors (variables) that cause capital mobility and the relationship between this factors.

2. Qualitatively verify the influences of the selected factors.

3. Explain how the effects of changes in the money supply causes and affects international capital and how this capital movements adversely affects and complicates the conduct of monetary policies.

4. Provide recommendations or information that might enable the Fed to develop (new) strategies as it operates in a globalized market place and possibly to develop a world monetary policy.
Organization Of The Study

This study begins with a general introduction of the problem (Chapter 1). This is followed by a Review of the Relevant Literature related to international capital mobility and their (adverse) effect on macroeconomic activity and specifically on the conduct and implementation of monetary policy (Chapter 2). Chapter 3 outlines a theoretical framework that relates domestic macroeconomic variables to the foreign sector. The effects of exogenous disturbances on the expansionary monetary policy in the presence of capital mobility and investment decisions is also analyzed.

The empirical analysis and estimated regression results is reserved to Chapter 4.

The conclusion, along with suggestions will be presented in Chapter 5, which is the final chapter.
CHAPTER 2

REVIEW OF RELEVANT LITERATURE

For years, numerous attempts have been made to show how the openness of an economy imposes constraints on the effective conduct of macroeconomic policies. There has been a number of studies on international capital mobility and interest rates, and international capital mobility on domestic economy. Therefore, only those studies considered directly relevant to the issue addressed in the study will be reviewed here.

Under different approaches and varying degrees of successes and accepting the hypothesis these studies have found a number of positive information on the adverse effects of international capital on the conduct of domestic monetary policy.

In one of the many research works done by the Federal Reserve Bank of New York, FRBNY, Radecki and Reinhart (1988), explains that since 1970, financial markets around the world have been moving toward fuller integration, and this trend could have significant implications for each country’s financial markets and the workings of its domestic monetary policy. The FRBNY paper, by increasing the participation of foreign investors suggests that in the U.S., the globalization of financial markets could at times diminish the compatibility of the Federal Reserve’s goals for inflation, employment and external balance. The closer integration of domestic and foreign financial markets could conceivably impair the Federal Reserve’s ability to implement a change in the monetary policy.

The paper focuses on globalization and monetary policy where it seeks to determine whether globalization has loosened the linkages between the instruments of
monetary policy - discount rate and open market operations - and short-term interest rates.

In addressing these issues, Radecki and Reinhart constructed and estimated a single-equation econometric model that fits within a general framework for credit markets with cross country linkages. It relates the spread between the overnight federal funds rate and the three-month treasury bill rate to domestic and foreign economic factors. It explains that the demand for a particular U.S. Financial asset depends on: (a) its own rate of return relative to those of all other domestic assets; (b) the return on dollars on foreign assets, equal to their own rates of return, plus the expected change in the exchange rate; (c) the level of financial wealth and the flow of savings, both here and abroad; and (d) other relevant macroeconomic variables that affect perceptions of risks and the future value of various assets. These relevant variables include foreign sector indicators such as the volatility of the exchange rate and the current account position.

Radecki and Reinhart's model explains the movements in the spread between the overnight federal funds rate and the three month U.S. Treasury bill rate. The spread is most obviously and directly affected by changes in the instruments of monetary policy. The overnight federal funds rate is expected to rise relative to the three-month Treasury bill rate as the supply of bank reserves are tightened; the funds rate is expected to fall relative to the bill rate when reserve supply is easing. Thus, on average, the spread widens as reserve supply tightens, and narrows (and may even turn negative) when supply eases. Many other factors influence the spread between these two interest rates - borrowed reserves, the U.S. Bond rate, movements in foreign interest rates, exchange
rates, the amount of currency risks incurred by investing in foreign assets and the closer integration of U.S. financial markets to those abroad.

Radecki and Reinhart's study provides some empirical evidence indicating that an increased impact of foreign developments on the U.S., money markets may have loosened the linkage between changes in the supply of bank reserves and U.S. money market rates, and perhaps to some extent complicated the use of monetary policy to influence these rates. According to their results, foreign economic factors have been making a greater contribution to the determination of the U.S. short-term rates in recent years. While the impact of a given reserve change has possibly become larger; (it should be noted that this research was tended to concentrate mostly on testing the expectations theory of the yield curve and theories of international interest rate parity). In the face of international financial integration, the predictability of the response of the domestic short-term interest rates have declined.

2. Frenkel asserts in his paper, "Monetary Policy: Domestic Targets and International Constraints", that the openness of the economy imposes constraints on the effectiveness and proper conduct of macroeconomic policies and it also provides policymakers with information which may be usefully exploited in the design of policy. (Frenkel 1982)

Frenkel (1982) discusses in the first section that the open economy is linked to the rest of the world through three key linkages; through international trade in goods and services: through international mobility of capital; and through international exchanges
of national movies. International trade links prices in different national economics. While the evidence on purchasing power parities reveals that this link is not rigid; it is evident that a country cannot choose its long-run trend in the inflation rate independent of the long-run courses of monetary policy and the exchange rate. This relation, Frenkel says, imposes a severe constraint on monitory policy.

International mobility of capital links interest rates on financial assets. In addition, by permitting countries to finance current account in balances, it provides for a channel through which macroeconomic disturbances are transmitted internationally. The internal mobility of capital limits the power of monetary policy. The paper goes on to explain that under a fixed exchange rate regime, a monetary expansion in excess of money demand is likely to have only a limited success in sustaining the change in the nominal money stock. He notes that any temporary reduction in the domestic rate of interest will induce a capital outflow and a loss of foreign exchange reserves, and any attempts to sterilize the monetary consequences of the loss of international reserves is unlikely to be viable in the long run. Under a flexible exchange regime, the monetary authority regains control over the nominal stock, but the international mobility of capital still imposes a severe limitation on the ability of monetary policy to significantly affect the evolution of output and employment. Frenkel explains that a monetary expansion is likely to induce a rapid change in the exchange rate which leads to prompt adjustments of prices and wages.

In his paper, Frenkel explains that the international exchange of national monies and the requirement of monetary equilibrium also imposes a severe limitation on the
effectiveness of monetary policy. Under a fixed exchange rate regime, the authorities lose control over the nominal money stock, and under a flexible rate regime, the requirement of monetary equilibrium ensures that in the long run, changes in the nominal money stock lead to proportionate change in all nominal prices and wages. Because of the rapid change in exchange rate, the constraint on monetary policy that is implied by the homogeneity postulate is likely to be manifested much more promptly in an open economy with flexible exchange rates than in a closed economy.

Frenkel's paper addresses an additional consideration constraining the conduct of monetary policy. This follows from the dynamic linkage between current exchange rates. His dynamic linkage implies that the effect of monetary policy on the exchange rate, and thereby on other economic variables, depends on its effect on expectations concerning future policies.

In summary, Frenkel notes the openness of the economy imposes constraints on monetary policy. These constrains are reflected in either a reduced ability to influence the instruments of monetary policy (like the nominal money supply under fixed exchange rates), or in a reduced ability to influence the targets of monetary policy (like the level of real output), or in an increased prudence in the use of monetary policy because of the potentially undesirable effects on expectations.

The constraints on the conduct of monetary policy depends on the exchange rate regime. Therefore, the question of the country's choice of the optimal set of constraints on monetary policy can be answered in terms of the analysis of the choice of the optimal exchange rate regime. Such analysis reveals that the optimal exchange rate regime
depends on the nature and the origin of shocks that affect the economy. Generally, the higher is the variance of real shocks which affects the supply of goods, the larger becomes the desirability of increased fixity of exchange rates. The rationale for the implication is that the balance of payments serves as a shock absorber which mitigates the effect of real shocks on consumption. The importance of this factor diminishes the larger is the degree of international capital mobility. On the other hand, the desirability of exchange rate flexibility increases the larger are the variances of shocks to excess supply of money, to foreign prices and to deviations from purchasing power parity.

In another study, Porter (1972) examines the effects of monetary policy in Germany on capital flows during the period 1963-70. While his study deals with contractionary monetary policy, its findings are similar to an expansionary monetary policy.

Porter reports tests of the use of changes in reserve requirements (increases) to neutralize the monetary effects of capital inflows. (German interest rates were kept well above Euro-dollar levels, with the result that there were substantial inflows of capital. The Bundesbank tried to neutralize the accompanying rise in bank reserves, largely by means of periodic increases in reserve requirements.

An important finding of the study was that changes in the average reserve requirements - the major control in German monetary policy - are substantially and rapidly offset in their effect on bank liquidity by capital inflows. The paper suggests that the monetary policy options available to a country such as Germany, which allows free
movements of financial capital across its borders, are somewhat limited under fixed exchange rates.

In the study of framework, Porter explains that in an economy such as Germany's which has a high degree of international capital mobility, the demand for money may be satisfied through either domestic or foreign sources. Restrictive monetary policies - such as independently high interest rates, increases in required reserve ratios, and special reserve requirements on the growth of foreign liabilities - may bring about a little reduction in the domestic money supply but may rather cause domestic money demand to be satisfied indirectly through foreign sources. This may occur in one of two ways: (1) German banks may borrow abroad, or (2) if the banks are effectively controlled, corporations and individuals may borrow directly from foreign banks and corporations and then place the funds in German banks. The changes in required reserves of German banks have frequently been intended to neutralize the bank liquidity resulting from the accumulation of foreign currency holdings. While bank reserves can be reduced on any given day by an amount specified by the central bank, such a reduction need not have a sustained effect on bank liquidity. The important factor is whether the foreign lending absorbs any demand for loans that is frustrated by the credit restrictions associated with the increase in required reserves and to what extent neutralization policies are offset.

An econometric approach taken in the paper, used ordinary least squares estimate of capital flows equations, with changes in covered differential and reserve requirements as independent variables. (The approach was subject to simultaneous equation bias,
because German interest rates and forward exchange premium might be affected by capital flows).

Porter refers to the portfolio approach to capital flows and argues that the potential participants in the German capital markets will allocate their stock of wealth, at time t, between German and foreign securities according to the expected net yields and variances in the markets. Accordingly, for a given stock of wealth, changes in expected yield will cause capital flows into or out of Germany. On this assumption, a change in the covered yield differential between Germany and the Euro-dollar market may cause a change in expected yields, and this in turn will cause a once-for-all capital flow in the result that, by the end of the period, portfolios will contain German and foreign securities in the required proportions and there will be no further flows resulting from the yield differentials.

This same approach argues that if demand functions are homogeneous of degree one with respect to wealth, then changes in the stock of wealth, with yields in Germany and other countries being unchanged will be allocated between German and foreign securities in the proportions previously maintained. In this instance, capital flows will result from the divergent levels of interest rates into the two markets. The approach taken in this study is to omit the wealth variable from the equation and to use the changes in covered interest rate differentials and not the levels of the differentials - as independent variables.

The monetary instrument $\Delta R R^*$, the exogenous component of the total change in the required reserve played a key role in the regression. Required reserves may vary
because of changes either in the required reserved ratio or in the stock of liabilities against which reserves must be held; i.e.:

\[
\Delta R R_t = R R_t - R R_{t-1} = r_t L_t - r_t L_{t-1}
\]

\[
= (r_t - r_{t+1}) L_t + r_{t+1} (L_t - L_{t+1})
\]

\[
= \Delta R R_t^* + r_{t+1} (L_t - L_{t+1})
\]

Where \( r_t \) is the average required ratio of reserves to total liabilities (L) and where \( L_t \) is the average liabilities outstanding in month \( t \). The main component of change in required reserves may be regarded as instrument is \( \Delta RR_t^* = (r_t - r_{t+1}) L_t \) since it accounts for the changes in required reserves caused by changes in the reserve ratio.

The main finding of Porter's study was that the impact on base money of changes in average reserve requirements tends to be offset by capital flows amounting to about 80% of the changes in required reserves. The study indicates that corporations turn rapidly to foreign sources if they anticipate that loans will be refused; the subsequent capital inflow is unrecorded and appears as an unclassifiable item in the balance of payment (i.e.; errors and omissions). Despite this finding regarding the offset to acts of monetary restrictions, this study suggests that monetary policy has some impact, since some people and institutions continue to borrow at the penal domestic rates. However, it is clear that large entrepreneurial borrowers have little difficulty in avoiding domestic credit restrictions and this it is to be expected that monetary stringency will have quite uneven impact.

There was evidence of considerable sensitivity of recorded short-term capital flows to changes in interest rate differentials.
In general, the attempts to neutralize capital flows resulting from pursuit of independent monetary policies are found to be substantially offset by the capital flows, with the result that a relatively small degree of monetary independence is obtained at the expense of a large amount of fluctuation in the foreign reserves position. Consequently, the attempts to achieve internal balance appears to have aggravated the external imbalance situation.

Frenkel and Mussa (1981) wrote a paper with a central theme that international linkages between national economies influences, in fundamentally important ways, the effectiveness and proper conduct of national macroeconomic policies. Specifically, their purpose was to summarize the implications for the conduct of macroeconomic policies in open economies of both the traditional approach to open economy macroeconomics (as developed largely by James Meade, Robert Mundell, and J. Marcus Flaming).

Their discussion is organized around three key linkages between national economies: through commodity trade, through capital mobility, and through exchange of national monies. These linkages have important implications concerning the effects of macroeconomic policies in open economies that differ from the effects of such policies in closed economies.

I shall discuss or review the monetary policy in an open economy as the fiscal policy is beyond the control and outside my review.

In the Commodity Market linkages, they explain that international trade links the prices of goods produced and consumed in different national economies. This linkage
has at least three implications for the conduct of macroeconomic policy in open economies. First, they say that according to the principle of purchasing power parity, the price level in one country (in terms of domestic money) should equal the price level in a foreign country (in terms of foreign money) multiplied by the exchange rate between domestic money and foreign money. The key implication of the purchasing power parity is that a country cannot choose its long-run inflation rate independently of its long-run monetary policy and the long-run behavior of its exchange rate. A country, particularly a small country, that fixes the exchange rate between its domestic money and the money of some foreign country will experience a domestic inflation rate and a domestic rate of monetary expansion that are strongly influenced by the monetary policy of that foreign country.

Secondly, the world monetary system and the conduct of national monetary policies must allow for changes in equilibrium relationship between national price levels induced by changes in relative prices of internationally traded goods and of nontradable goods.

Thirdly, macroeconomic policy can do little to offset changes in equilibrium levels of real income resulting from changes in relative prices of internationally traded goods.

For Capital Market linkages, they stated that international capital mobility links interest rates on financial assets denominated in different national monies through the interest parity relationship. This relationship requires that interest differentials between securities denominated in different currencies equal the forward discount or premium. International capital mobility also allows countries to finance imbalances in their current
accounts. The linkage of interest rates through interest parity and the transmission of macroeconomic disturbances through international capital flows have significant implications for the conduct of macroeconomic policy in open economies.

Frenkel and Mussa stated that international capital mobility imposes a severe constraint on the use of monetary policy for domestic stabilization purposes. Under a fixed exchange rate, an increase in domestic credit component of the money supply in a small open economy may temporarily reduce interest rates on domestic securities, but will induce a capital outflow and a corresponding loss of foreign exchange reserve that will rapidly reduce the money supply back to its previous equilibrium level. They suggest that monetary expansion by a large country, which affects conditions in the world financial markets, can be somewhat more effective in influencing domestic prices, output, and employment. However, even a large country will suffer a loss of foreign exchange reserves that is inversely related to its size in the world economy. Sterilization policies of a central bank may temporarily insulate the domestic money supply from changes in foreign exchange reserves; but in the long run, sterilization cannot sustain a money supply that differs from the equilibrium level of money demand. It is said that, under a flexible exchange rate, a government regains long-run control over the nominal money supply. However, international capital mobility still limits the effectiveness of monetary policy. Any increase in aggregate demand induced by lower domestic interest rates is partially dissipated in increased expenditures on imported goods, financed by international capital flows; and exchange responses to perceived changes in monetary policy are likely to lead to rapid adjustments of domestic prices and wage rate, thereby
limiting the effect of monetary policy on output and employment.

In the monetary linkage, Frenkel and Mussa explain that any change in the supply of money or any exogenous disturbance to money demand must lead to changes in the equilibrium values of one or more of the variables that influence money demand. It also implies that any disturbance or policy action that does not directly affect the demand or supply of money must, in equilibrium, lead to offsetting changes in the variables that influence money demand that are consistent with a constant level of that demand.

They explain that the use of monetary policy for domestic stabilization purposes is constrained by the equilibrium level of the demand for money which is largely beyond the control of the monetary authority. An expansion for the domestic credit component of the money supply may temporarily raise prices (especially of nontraded goods), raise output (especially in industries with sticky wages and prices), and reduce interest rates (especially for domestic securities sheltered from world financial markets). In the longer run, however, the direct effect of monetary expansion on desired spending and on desired portfolio reallocations, and the indirect effects of changes in prices and interest rates will induce deficits in the current and capital accounts of the balance of payments.

They go further to explain that the requirements of monetary equilibrium also constrain economic policy under a flexible exchange rate. A flexible exchange rate is not an additional policy tool that can be manipulated by the government, but rather an endogenous variable that is determined by market forces which are influenced by the actual and expected conduct of fiscal and, especially, monetary policy. In particular, from the homogeneity postulate, it follows that, other things constant, in the long run,
changes in the nominal money supply will lead to proportionate changes in all nominal prices, including the price of foreign exchange.

Other important implications of this approach follow from the essential dynamic linkage between current exchange rate and expectations of future exchange rates implied by international mobility of financial assets denominated in different national monies. First, since future government policies will influence future exchange rates, it follows that expectations concerning future policies should influence current exchange rates. Hence, the effect of any particular policy action on exchange rates (and through exchange rates on other macroeconomic variables) will depend on its effect on expectations concerning future policy actions. Secondly, the sensitivity of exchange rates to expectations of future policy implies that the traditional approach to macroeconomic policy analysis, which views policy as isolated actions in response to particular circumstances, is inappropriate. Thirdly, since exchange rates respond quickly to new information about events likely to affect foreign exchange markets, exchange rate adjustments are an important channel for rapid transmission of macroeconomic disturbances and of government policies. Forth, if there is a short-run stickiness of prices of domestic goods in terms of national monies, then rapid exchange-rate adjustments will induce changes in the relative prices of different national output. Finally, exchange rates may be useful as an indicator for monetary policy directed at offsetting fluctuations in money demand, especially when rapidly changing inflationary expectations make nominal interest rates as unreliable indicator of fluctuations in money demand.
5. In another article in the Federal Reserve Bank of New York, Quarterly Review, Mosser (1992) writes about the changes in Monetary Policy Effectiveness.

Mosser writes that since the mid-1970's, large institutional, regulatory, and technological changes in financial markets and intermediaries have significantly altered the nature and extent of monetary policy's influence on the real economy. She notes that several recent studies have been reported on this effect.7

The common theme of her study is that the ways in which monetary policy is transmitted to housing, business investment, trade, and perhaps consumption have changed substantially in the last fifteen years.

Mosser's article evaluates changes in the aggregate effectiveness of monetary policy and changes in transmission mechanisms by examining how traditional large-scale macroeconometric models have changed in the last 10-15 years. Because these large-scale models are designed to measure the important structural interrelationships among economic variables and access different sectors of the economy, they give a fairly complete accounting of the complex transmission mechanisms of monetary policy.

Mosser's article explores changes in policy linkages in two ways. First, it reports monetary policy experiments ("black-box" experiments) that use both past and present versions of several large macroeconometric models to measure the response of real GNP, inflation, and financial variables to changes in monetary policy: and secondly, the article looks at changes in model structure overtime.

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7 For a summary of recent studies, see Bennett (1990), Bosworth (1989) and Friedman (1989).
The article is organized as follows: the first section discusses different ways of measuring sensitivity to monetary policy and the strengths and weaknesses of the large-model approach. The second, documents how monetary policy's overall influence on the real economy has changed in the past decade, as measured by current and past dynamic money multipliers for several different models. The next section uses the Data Resource Inc. (DRI) Model to illustrate some examples of structural changes in these large models since the early 1980's. The discussion focuses on what, if any, implications these charges have had for this model's estimate of the sensitivity of final demand to monetary policy, particularly interest rate sensitivity. Finally, simulation exercises, again using DRI, examine the outcomes of identical policy shocks across different historical versions of the model.

Mosser notes that structural changes generally come from three sources: changes in the estimated sensitivity of final demand to interest rates, either short-term or long-term; changes in the response of final demand to financial wealth and or credit constraints; and changes in estimated coefficients due to changes in the modeling of dynamic relationships.

In conclusion, she suggested that contrary to these studies, the bulk of the evidence presented suggests that the real economy is at least as sensitive to monetary policy today as it was 10 - 15 years ago. In fact, some exercises show that policy has substantially larger effects on output currently. The lags in policy effects, however, are probably longer.

Equation specifications from one model (DRI) confirm that innovations in
financial regulations and institutions have changed both the transmission mechanisms by which policy affects final demand and the size of policy effects. Finally, the article shows that more detailed estimates of the economy's sensitivity to monetary policy depends crucially on how the policy change is measured: through reserves shocks or through interest rate shocks.

6. Mundell's article details that the world is still a closed economy, but its regions and countries are becoming increasingly open. the trend, which has been manifested in both freer movements of goods and increased mobility of capital, has been stimulated by the dismantling of trade and exchange controls in Europe, the gradual erosion of the real burden of tariff protection, and the stability, unparalleled since 1914, of the exchange rates. The international economic climate has changed in the direction of financial integration and this has important implications for economic policy.

Mundell's (1963) paper, concerns the theoretical and practical implications of the increased mobility of capital. In order for Mundell to present his conclusions in the simplest possible way, and bring the implications for policy into sharpest relief, he assumes the extreme degree of mobility that prevails when a country cannot maintain an interest rate different from the general level prevailing abroad.

In his methods of analysis, he assumes perfect capital mobility to mean perfect substitutes. Since different currencies are involved this implies that existing change rates are expected to persist indefinitely and that spot and forward rates are identical. He assumes unemployed resources, constant return to scale, and fixed money wage rates;
this means that the supply of domestic output is elastic and its price level constant. Savings and taxes rise with income, the balance of trade depends only on income and the exchange rate, investment depends on the rate of interest and amongst other assumptions, monetary policy takes the form of open market purchases of securities.

In policies under flexible exchange rates, Mundell considers the effect of an open market purchase of domestic securities that increase in bank reserves, a multiple expansion of money and credit, and down ward pressure on the rate of interest. But the rate is prevented from falling by an outflow of capital, which causes a deficit in the balance of payments, and a depreciation of the exchange rate. The exchange rate depreciation (normally) improves the balance of trade and stimulates, by the multiplier process, income and employment. A new equilibrium is established when income has risen to induce the domestic community to hold the increased stock of money created by the banking system. Since interest rates are unaltered this means that income must rise in proportion to the increase in the money supply, the factor of proportionality being the given ratio of income and money (income velocity). Monetary policy therefore has a strong effect on the level of income and employment, not because it alters the rate of interest, but because it induces a capital outflow, depreciates the exchange rate, and causes an export surplus.

In policies under fixed exchange rates, a capital outflow worsens the balance of payments. To prevent the exchange rate from falling the central bank intervenes, selling foreign exchange and buying domestic money. This shows that monetary policy under fixed exchange rates has no sustainable effect on the level of income. The increase in the
money supply arising from open market purchases is returned to the central bank through its stabilization operations. What the central bank has done is to purchase securities for money, and then buy money with foreign exchange, the monetary effects of the combined operations cancelling. The central bank has simply traded domestic assets for foreign assets.

In concluding, Mundell demonstrates that monetary policy has no impact on employment under fixed exchange rate and monetary policy has a strong effect on employment.

A further implication of the analysis is that monetary policy under fixed exchange rates becomes a device for altering the levels of reserves, leaving unaffected the level of output and employment.
CHAPTER 3
THEORETICAL FRAMEWORK

We specify the relationship between the domestic and foreign sectors of an open economy. This relationship is illustrated by looking at

(1) the foreign sector or the Balance of Payments, (BP),
(2) the real sector of the domestic economy, the Product Market (IS curve) and
(3) the financial sector of the domestic economy, the money market (LM curve)

We shall analyze the interaction of the three sectors, and start with a situation where all three sectors are in equilibrium. And lastly, we look at a situation where there is a disequilibrium in one of the sectors, (LM curve) and examine the implications of such movements in the Fed expansionary policy and the economy.

Balance Of Payment

The Balance of Payment, BP, is divided into two major accounts - the current and the capital accounts. The current account measures net receipts from the export of currently produced goods and services, less payments for imports of currently produced foreign goods and services including payments for debts and services to foreigners. A surplus in the current account occurs when exports exceeds imports and payments to foreigners.

The capital account relates to the net sale of assets abroad. If sale of assets exceeds purchases, a surplus occurs in the capital account.

The Balance of Payment includes both the current account as well as the capital
account. Since the current account and the capital account are impacted by different variables, they must be analyzed separately.

The export function in the current account is implicitly specified as follows:

\[ X = X(p,e) \quad (X_p) < 0 ; (X_e) < 0 \quad \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots 1 \]

where \( X \) is exports, \( p \) is price, \( e \) is the exchange rate.

In equation (1), exports is hypothesized as dependent on foreign incomes and relative prices, \( p \), of domestic goods compared to foreign goods and the exchange rate, \( e \).

From equation (1), exports depend on price. An increase in domestic prices relative to foreign prices makes domestic goods more expensive relative to foreign goods. This will reduce aggregate demand for domestic goods. On the demand side, assuming a sufficiently large price elasticity - the responsiveness of quantity to a change in price - there is a shift towards foreign goods - imports, and a decrease in domestic goods by domestic residents. A tendency for foreign output to rise.

On the supply side, the increase in prices of domestic goods - exports, makes domestic goods expensive for foreign demand because of the dollar price of exports and rate conversion. This will result in a decreased demand and decreased exports. With higher domestic prices and with a reduction in the demand for domestic goods coupled with a reduction in exports, we would expect domestic output to fall and a leftward shift in the IS curve. This reduction in exports due to a change in price is given by a \( \frac{dx}{dp} < 0 \).

A rise in domestic prices decreases exports because an increase in domestic price level will raise the price of domestic goods that compete with foreign goods. This rise
in the price of domestic goods is due to the appreciation of the exchange rate, \( e \), which increases the value of domestic currency relative to foreign currency. But whether the money value of exports rise or fall, depends on whether the decrease in real exports outweigh the increase in price, that is, on the elasticity of foreign demand for exports.

With the dollar value of exports, given as \( X = p \cdot x (p, e) \), we can differentiate \( X \) with respect to \( p \) and obtain,

\[
dx/dp = x + P \frac{dx}{dp} = x \left(1 + \frac{p}{x} \frac{dx}{dp}\right)
\]

1a

\( p/x \) \( dx/dp \) is the price elasticity of demand for exports.

\( Ex = (dx/x) / (dp/p) \) which is negative since a price increase reduces sales volume of exports, along a negatively sloped demand curve. Thus, \( dx/dp \) can be written as

\[
 dx/dp = X (1 + Ex),
\]

where \( Ex \), is the price elasticity of demand for exports.

If the demand for exports has an elasticity greater than unity \( dx/dp \) will be negative and a price increase will reduce the money value of exports. In this case, where \( Ex < -1 \), a price increase reduces \( X \) and increases \( M \).

From equation (1) exports also depend on \( e \), the exchange rate. An up-valuation of the dollar, will reduce real exports, \( dx/de < 0 \), and increase real imports, \( dm/de > 0 \). The real export drop due to more units of foreign currency for a unit of domestic currency, will reduce \( X \) at a given domestic price level.

Demand in the foreign exchange market is generated by domestic exports, \( P \cdot X (p,e) \). The greater the demand for dollars and the lower the total value of exports, due to a change in domestic rices, the lower the demand for dollars. So, an increase in \( e \), increases the dollar price of exports, \( p^f/e \), and expenditure on domestic goods (exports)
by foreigners will decrease.

In all, an increase in either the domestic price or the exchange rate will raise the foreign price of domestic goods and reduce exports. Thus, $dx/dp$ and $dx/de$ are both negative.

The import, $M$, function is implicitly specified as,

$$M = m(y, p, e) \quad dm/dy > 0, \quad dm/dp > 0, \quad dm/de > 0 \quad \ldots \quad 2$$

Where, $p$ and $e$, are as defined in equation 1. $Y$ is the level of domestic income. Equation (2) outlines the relationship between imports and the domestic income, domestic prices and the exchange rate.

A rise in domestic income, $y$, due to a change in Ms, that reduces interest rates, will stimulate investments and raise incomes and spending, and a portion of this increased spending on imports. Thus, when the income of a nation grows rapidly relative to foreign incomes, the nation's imports tend to rise relative to exports. Here, we have a positive relationship between income and imports. $dm/dy > 0$.

An increase in the domestic price level will raise the price of domestic goods that compete with foreign goods and as explained in equation 1, would raise import because of substitution effect. Here $dm/dy > 0$.

The dollar price of imports would be, $p^f/e \cdot m(y, p, e). \quad \ldots \quad 2a$

$p^f/e$ is the foreign price divided by the exchange rate multiplied by (the quantity of) imports. If the elasticity of domestic demand for imports, $Em$, is greater than unity, where $Em < -1$, $dm/dp$ will be positive and a price increase, raises imports.

An appreciation of the exchange rate, $e$, an increase in the value of domestic
currency relative to foreign currency. An increase in e, depreciates the domestic currency, dollar, and makes foreign goods become less expensive relative to domestic goods. So an increase in e reduces the dollar price of imports and increases real imports. Whether m rises or falls with an e increase depends on the domestic price elasticity of demand for imports in a way exactly analogous to a change in p on x, discussed earlier.

Thus, an increase in p and e that increases imports, results in a loss of reserves in the BP.

International capital flows result from the international purchase and sale of assets and this is defined as,

\[ K = k(r) ; \quad k' < 0 \] .......................... 3

Where K is capital outflows in the capital account of the BP and k is a function on interest rate. There exists a negative relationship between k and r. Where r falls due to increase in Ms, k rises and when r rises due to a contractionary policy, k, decreases.

When Ms increases, this reduces interest rate, r, holding foreign rates constant. Domestic interest rates, \( r^d \), are now below the foreign rates, \( r^f \), \( r^d < r^f \), there is a differential which becomes an incentive for the (domestic) investors who are faced with a low domestic return on their assets. Since the demand equation for assets denominated in different currencies are based on a maximization solution, the investors try to make use of this differential and look abroad for higher yields commensurate with risk. Operating in an open economy, the investors take into account of both exchange rate and price uncertainties.
After a careful evaluation and determination of the best optimal portfolio, with risk diversification and risk premium in mind, and expecting a greater rate of return in foreign assets, they substitute domestic money and assets for foreign assets. Substitutability means that if the interest rate on a given asset falls, the desired holdings of that asset falls while the holdings of other assets rises.

The investor can earn $1 + r_e$ abroad by investing $1.00$ for that period. The domestic investor would have to convert U.S. dollars into foreign money, say the British pound, £. $1.00$ would equal $1 / e_e$, where $e$ is the spot exchange rate. Finding a profitable market abroad, the domestic investor can invest large domestic money abroad, and can earn, $(1 + r_e) / e$. This is the quantity of pounds resulting from $1.00$ invested abroad. With large amounts of domestic dollars invested abroad in foreign assets, the domestic investor can earn $n \{1 + r_e / e\}$. As a result, large sums of domestic reserves would be shifted from domestic banks to foreign banks and this outflow of capital reduces the domestic money supply. This, at a given foreign interest rate levels, the net outflow of capital, $k$, will be a decreasing function of the domestic interest rate.

Equilibrium in the BP occurs when the current account, (net exports) equals the capital account, $K$, so that the official settlement is zero. Equations 1, 2, and 3 gives us this equilibrium BP.

$$BP = X(p, e) - M(y, p, e) - K(r) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots
Equation (4) shows the various combination or levels of y and r that produce equilibrium in the BP. Income y, is assumed to influence the current account through the impact on imports by dm/dy.

Interest rates, r, is assumed to influence the capital account, particularly capital outflows, k, through the impact on capital flows by dk/dr. If r rises, liquid short-term financial capital from abroad will flow into the domestic economy. If r declines, liquid short-term financial capital from the domestic economy will go abroad in order to earn the higher interest rate and most of the foreign short-term capital will stay in foreign markets rather than be sent to the domestic economy. So when k < 0, the domestic economy has a balance of payment deficit.

**The Product Market**

The income expenditure model requires that income equal expenditure. (Y = E).

Income is defined as savings and taxes plus imports,

\[ Y = S(y, r) + T(y) + M(y, p, e) \]

\[ ds/dy > 0, \quad ds/dr > 0 \]  \hspace{1cm} 5

where S is domestic savings, T is taxes, M is imports.

\[ S = s(y, r) \]  \hspace{1cm} 5a

Domestic savings is a function of disposable income and interest rate. Savings increases with the level of disposable income because the greater our disposable income, the more we would like to save for the future and the more they are likely to spend on imports. We have ds/dy > 0. Interest rate is the payment one receives as a lender (to the financial institution or as a saver) in order to compensate them for giving up their
purchasing power. When \( r \) rises, savings increases and when \( r \) decreases, the amount of savings reduce. There is a positive relationship between \( s \) and \( y \), with \( ds/dy > 0 \).

\[
T(y) \quad \text{...........................................} \quad 5b
\]

Taxes, \( T \), is a function of income \( y \). As incomes rise from a variety of reasons, so too does the amount of taxes collected rise. There is a positive relationship between \( t \) and \( y \) with \( dt/dy > 0 \).

\[
M(y, p, e) \quad \text{...........................................} \quad 5c
\]

Imports, \( M \), as explained in equation (2) depends on domestic income, prices and exchange rate, with \( dm/dy \), \( dm/dp \) and \( dm/de > 0 \).

The equation (5) illustrates that the higher the domestic income or a rise in income, the greater the savings, the greater the taxes collected and the greater the level of imports.

The expenditure side of the National income is expressed as,

\[
I(r) + G + X(p,e) \quad \text{...........................................} \quad 6
\]

Where \( I \) is investment expenditure

\begin{align*}
G \text{ is Government purchases of goods and services} \\
X \text{ is Exports}
\end{align*}

\[
I(r) \quad \text{...........................................} \quad 6a
\]

Investment spending is assumed to be determined by the (domestic) interest rate. A decrease in \( r \) increases investment spending which income. A rise in \( r \) reduces \( i \) because the rate of borrowing investment funds are higher. A higher rate of payments on borrowed funds reduces the amount or level of profitability.

There is an inverse relationship between \( i \) and \( r \) with \( di/dr < 0 \).
Government spending is fixed exogenously by the policy makers.

Exports as defined earlier in equation (1) depends on price and exchange rate, with $dx/dp$ and $dx/de < 0$.

In equilibrium income will equal expenditure in the National Income identity which is expressed from equations (5) and (6) as,

$$S(y, r) + T(y) + M(y, p, e) = I(r) + G + X(p, e) \quad \text{7}$$

Equation 7 shows the level of y and r that will determine product market equilibrium for a given e and p. Here, we have an equation with two endogenous variables, y and r with two exogenous variables, p and e.

When the Ms is increased, r decreases. This will raise investment spending as more potential projects become profitable. But the increase in Ms, causes p to rise and this change in the domestic price level will change the price of domestic goods relative to foreign goods. As domestic prices rise (holding domestic r constant) I, G, T and S do not change; but because foreign goods (imports) are now cheaper relative to domestic goods, exports decrease, and imports rise and this would cause the IS curve to shift to the left as we shall explain later.

Two equilibrium conditions have been developed so far. The foreign and the product market. To get a more complete determination of the forces at work in an open economy, we bring in the money market.
The Money Market

The money market, like all other markets, has both a demand and a supply side. We will first look at the demand side.

Since people can place their liquid assets into either money or bonds, we might expect that an increase in the interest rate, or the return on bonds, would encourage them to put more of their assets into bonds and less into money. Conversely, a decrease in \( r \) should induce them to shift some assets out of bonds and into money.

This inclination to hold more or less money depending on the interest rate on bonds, we will call the speculative demand for money

\[
L = l(r) \tag{8a}
\]

where \( l \) stands for liquidity preference (the relationship between \( r \) and the demand for money). The speculative demand for money does up as interest rates do down. It has an inverse relationship with \( r \), with \( dl/dr < 0 \).

Another reason people hold money is to bridge the time gap between their receipt of income and payments they make on transactions. As incomes rise, both income and the amount of money spent or expenditure stream grows, and these balances hold to smooth out cash flows must also grow. The holding of money for (daily) transactionary reasons is called the transaction demand for money and it depends on the level of income, \( y \).

\[
K = k(y), \quad k' > 0 \tag{8b}
\]

Both components of the demand for money are stated as the demand for real money balances \( M/P = m \). Thus, the demand for money function can be written from
equations 8a and 8b as,
\[ \frac{M}{p} = m(r, y) = 1(r) + k(y) \] ................................. 9

With \( \frac{dm}{dr} < 0 \) and \( \frac{dm}{dy} > 0 \).

The supply of money, \( M_s \), in this model is assumed to be exogenously fixed by policy makers. Equating the money demand function to the exogenously fixed supply, gives us the equilibrium condition in the money market. equation 9 repeated as the LM curve.

\[ \frac{M}{P} = m(r, y) = 1(r) + k(y) \] ................................. 10

In equation (10), the LM curve, we have two variables \( r \) and \( y \) that will keep the money market in equilibrium with a given level of money supply, \( m \), and a price level, \( p \). The LM curve is drawn for a specific money supply. If \( M_s \) increases, \( M_d \) will have to increase to restore equilibrium. This requires a lower \( r \), so the LM will shift to the right. Similarly a decrease in \( M_s \) will increase \( r \) and the LM will shift to the left.

We now have three markets. The foreign market - give the equilibrium pairs of \( r \) and \( y \) in the Balance of Payment, the IS curve - give the pairs of \( r \) and \( y \) that maintains equilibrium in the product market, and LM curve - gives the pairs of \( r \) and \( y \) that maintains equilibrium in the money market.

Equilibrium in an open economy requires \( r \), \( y \) satisfies all three markets simultaneously. This can only occur when the IS curve, the LM curve and the BP curve all intersect at a common level of interest rate and income. This point is \( E_o \) in Figure 4 where the interest rate and income pair is at \( r_o \) and \( Y_o \). At this points \( r_o \), \( Y_o \) and \( E_o \), there is no reason for either \( r \) or \( y \) to change. Until some exogenous factor change, like
an increase in Ms, e, p and G equilibrium will be consistent with all goods produced
being sold, money demand equal money supplied and a current account surplus equal a
capital account deficit that yields no change in the balance of payment account. These
three markets can be described as follows:

\[
\begin{align*}
BP &= X(p, e) - M(y, p, e) - K(r) \\
IS &= S(y, r) + T(y) + M(y, p, e) = I(r) + G + X(p, e) \\
Md &= Ms = m(r, y) = I(r) + k(y)
\end{align*}
\]

FIGURE 4

SIMULTANEOUS EQUILIBRIUM IN THE IS, LM, BP CURVES
From the three equations, we have two endogenous variables (r and y) and four exogenous variables (p, e, Ms and G,) that satisfy equilibrium conditions in all three markets.

The implicit solution to the structural model is therefore:

\[ r = f_1(p, e, Ms, G) \]

and

\[ y = f_2(p, e, Ms, G) \]

Generally, any change in any of the variables will move any of the curves giving a seemingly indetermined condition in the economy as we have in Figure 5.

**FIGURE 5**

**BP DEFICIT (DISEQUILIBRIUM)**
An analysis of the effect of changes in Ms, is graphically depicted in Figure 5.

A monetary disturbance, increase in Ms has caused a disequilibrium in all the markets with no equilibrium r and y to satisfy the three market equations. We have here a situation where an increase in Ms has shifted the LM curve, explained in equation (10), along the given IS curve, changing the initial r but maintaining the same level of y. With different equilibrium points - A, B and C. Thus, the dMs shifts the LM curve down by an amount, $r_o - r_1$ and as a result, the BP curve is shifted leftwards by an amount $r_o - r_2$ all at the initial $Y_o$ level.

The change in Ms increase has resulted in a new interest rate, $r^d = r_1$, with $Y_o$. It is this movement of the LM and r that has caused other variables p, e, G etc. to move and be displaced and render complications in the economy by,

First, a major adverse reassessment by domestic and foreign investors of the consequences of the likely course of the money supply;
Secondly, an improvement in investment opportunities in foreign markets, that is, a relative rise in the real rate of return on foreign assets leading to capital outflows;
Third, a rise in domestic inflation or prices to well above current prices which affects exports and imports;
Fourth, a rise and maybe continuous rise in interest rates, since they contributed to the shift of capital out of the domestic economy.

Any of these factors could easily discourage foreign investments in domestic assets except the fourth. We need an r that will therefore satisfy $Y_o$ in Figure 5, that will
maintain equilibrium conditions in all three markets.

As a consequence, the stimulating effects of a money expansion, instead of being strengthened by a BP surplus, will be weakened by a BP deficit.

This is explained in the channel map which describes the two main channels through which changes in money supply affects economic activity and the balance of payment as explained in the model. That is the influence of monetary policy - increase in Ms - on economic variables and the effect of these variables on the BP.

In this channel map, it can be seen that Ms, the ultimate source of change affects BP (dBp) indirectly through changes in the exogenous variables. Changes in monetary policy affects this variables, p, e, Ms and G, and real economy directly through changes in r and y. While r affects BP indirectly through k(r) as dBp/dk(r) . dk(r)/dr, y has a direct effect on BP as dBp/dy.

Interest rates, r can affect capital outflows, k(r) directly by dk(r)/d(r), because changes in r affects the sale and purchase of assets which leads to k(r) and causes a change in BP.
where \( U \) is a disturbance term.

In the first equation (11), we measure changes in the price level, \( p \), exchange rates, \( e \), money supply, \( Ms \) and government purchases, \( G \), on domestic interest rates, \( r \).

In the second equation (12), we measure changes in the same set of exogenous variables (\( p, e, Ms \) and \( G \)) on \( y \).

The expected effects of changes in the exogenous variables, \( p, e, Ms, \) and \( G \) on \( y, r, k(r) \) and \( BP \) are described in Table 5.

**Table 5**

DETERMINANTS OF CAPITAL OUTFLOW

<table>
<thead>
<tr>
<th>EXOGENOUS VARIABLES</th>
<th>EFFECTS ON</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( y )</td>
</tr>
<tr>
<td>Increase in ( P )</td>
<td>Falls</td>
</tr>
<tr>
<td>Decrease in ( P )</td>
<td>Rises</td>
</tr>
<tr>
<td>Increase in ( e )</td>
<td>Rises</td>
</tr>
<tr>
<td>Decrease in ( e )</td>
<td>Falls</td>
</tr>
<tr>
<td>Increase in ( Ms )</td>
<td>Rises</td>
</tr>
<tr>
<td>Decrease in ( Ms )</td>
<td>Falls</td>
</tr>
<tr>
<td>Increase in ( G )</td>
<td>Rises</td>
</tr>
<tr>
<td>Decrease in ( G )</td>
<td>Falls</td>
</tr>
</tbody>
</table>

The effects of changes in \( p, e, g, \) and \( Ms \) on \( r, y \) and \( y \) are shown below.

<table>
<thead>
<tr>
<th>ENDOGENOUS VARIABLES</th>
<th>EXOGENOUS VARIABLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>( r )</td>
<td>( p )</td>
</tr>
<tr>
<td>( y )</td>
<td>+</td>
</tr>
</tbody>
</table>
CHAPTER 4

ESTIMATION AND INTERPRETATION OF RESULTS

This chapter evaluates the importance of several variables hypothesized as important factors in a monetary expansion and which can adversely affect or complicate the Fed policy.

Our empirical analysis is based on a general open economy macroeconomic framework. The theoretical discussion was centered around the internal and external economic conditions and capital flows. Our estimated equation developed from each of three sectors (BP, IS, LM) include two policy channel variables of interest rate and income.

Based upon an open economy model, we proposed a functional relationship in a simultaneous linear form as expressed earlier.

\[ r = a + a_2P + a_3e + a_4Ms + a_5G + Ur \]  \hspace{1cm} 11
\[ y = b + b_2P + b_3e + b_4Ms + b_5G + Uy \]  \hspace{1cm} 12

In what follows, we estimate effects on changes in interest rate stemming from changes in the price level, exchange rate, money supply and Government purchases. These estimates allow us to determine the effect of these exogenous variables on interest rates and later on the effectiveness at which monetary policy achieves its desired objectives.

On the second estimate, the same exogenous variables are used to examine time series movement in national income on real GDP. This allows us to quantify the influence of these exogenous factors on income and how they might offset economic
activity and adversely affect the effectiveness of Fed policy.

To estimate the model, quarterly data on all variables were collected for the period 1970 to 1993 IV. Data sources were from various issues and a description follows:

**Interest Rates** (r)
The U.S. 3-month Treasury bill rate are quarterly averages of monthly data reported by the Board of Governors of the Federal Reserve Bulletin. (Board of Governors of the FRS)

**Money Supply** (Ms)
The money supply reflects assets which are very liquid and are readily available for spending. M-1, composing of currency, demand deposits and traveler’s checks. Averages of daily figures, in billions of dollars, reported in the Federal Reserve Bulletin. (Board of Governors of the FRS)

**Prices** (p)
The implicit price deflator for gross domestic product. This are quarterly data, seasonally adjusted and published in the Bureau of Economic Analysis and Economic Report of the President, (various issues).

**National Income** (y)
This are quarterly data, of current dollars, annual rate in billions of dollars and published in the Bureau of Economic Analysis and the Economic Report of the President.

**Foreign Exchange Rate** (e)
Rates are the U.K. pound and values are expressed in U.S. dollars per pound. Reported in the Federal Reserve Bulletin and the Economic Report of the President.

**Government Expenditures**, (G)
Figures include federal, state and local expenditures and are in billions of dollars. Quarterly data at seasonally adjusted annual rates. Published in the Federal Reserve Bulletin and the Economic Report of the President.
Table 6 shows the regression coefficients of the equations for \( r \) and \( y \). The dependent variable in each equation is listed on top and the independent variables are listed on the left. The coefficients of each independent variable is listed alongside the variable. Under each coefficient is listed its \( t \)-statistic.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Interest Rate ( (R) )</th>
<th>Income ( (Y) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( G )</td>
<td>-.006963 (-1.010)</td>
<td>3.407772 (11.442)</td>
</tr>
<tr>
<td>( e )</td>
<td>-.002330 (-1.412)</td>
<td>-.125892 (-1.766)</td>
</tr>
<tr>
<td>( M_s )</td>
<td>-.018502 (-4.149)</td>
<td>.969533 (5.033)</td>
</tr>
<tr>
<td>( P )</td>
<td>.131465 (2.246)</td>
<td>6.148462 (2.432)</td>
</tr>
</tbody>
</table>

\( R^2 \) \( .61437 \) \( .99431 \)

\( F \) \( 35.45 \) \( 3890.82 \)

\( T \)-statistics are in parentheses
Interest Rate Effects

The coefficients of this estimate are presented in Table 6. The estimated equation does not appear to be quite reliable in terms of this statistical criteria. R-square which expresses the degree to which the dependent variable and the independent variable vary together, indicates that about 61 percent of the variation in interest rate is linearly related with variations in the price level, exchange rate, money supply and Government purchases.

To test the significance of correlation coefficient, with a 0.05 level of significance and degrees of freedom (D.F) equal to 4 and 89, the hypothesis of no correlation is rejected. Therefore, there is a significant linear correlation between interest rate and price level, exchange rate, money supply and Government purchases. Apparently, these variables, (p, e, Ms and G) respond slowly to changes in interest rates.

The coefficients are not significantly consistent with economic theory with the exception of money supply variable would result in less than one percent change in interest rate.

The goodness of fit is low and reflects the weak and slow responsiveness of the exogenous variables to the dependent variable. All else equal, this suggests that the exogenous variables collectively through interest rates would not have any significant adverse effect on Fed policy.

Income

The coefficients of this estimate are presented in Table 6. The estimated equation appears to be reliable in terms of both the statistical criteria and theoretical explanation.
All the signs are as predicted.

The estimates are consistent with previous results reported in this and other literature. R - square indicates that about 99 percent of the variation in income is linearly related with variations in the price level, exchange rate, money supply and Government purchases.

The coefficients are statistically significant and consistent with economic theory that (charges in) income can affect price levels by dp/dy, exchange rate by de/dy, money supply by dMs/dy and Government expenditure by dG/dy. Also, the hypothesis of no correlation is rejected indicating that there is a statistically significant linear correlation between income and price level, exchange rate, money supply and Government purchases. From the results, it can be seen that the price level responds positively to changes in income as a one percent change in income would result in more than six percent change in the price level. All else equal, the estimate suggests that income through the exogenous variables is very significant in explaining the complications that can be derived from them and how these variables can adversely affect the Fed policy.
CHAPTER 5
CONCLUSION

Our estimates from the first equation (11) do not support the hypothesis that interest rates do cause capital outflow and \( r \) does not have any significant effects on economic activity and hence, capital outflow, resulting from changes in interest rates, do not alter or to some extent, negate the nature and extent of monetary policy’s influence on economic activity.

But the second estimates on equation (12) strongly support the hypothesis that capital outflow does have an effect on economic activity and hence capital outflow resulting from increases in income does alter and possibly negate the nature and extent of monetary policy’s influence on economic activity.

There are however, some curious facts about capital mobility influence resulting from changes in interest rates and income on economic activity (recession). Some economists have argued that the effectiveness of monetary policy is more effective in stopping inflation than getting us out of a recession. They reason that the high domestic interest rates and curtailed availability of credit that follows a tight monetary policy restricts spending, while the low interest rates and credit availability of an expansionary monetary policy will not necessarily induce people to borrow and spend but only to reduce savings and to purchase higher yielding assets.

As the saying goes, you can lead a horse to water, but you can’t make him drink. So to can be increases in the money supply in a recessionary period. Increases in money supply would not just get us of a recession or slow down but might cause complications
in economic activity by the loss of reserves.

It is also emphasized that the response of a monetary expansion on the economy depends crucially on the state or level of the economy. At very low levels of economic activity and when economic activity is way below full employment, or when savers and investors are concerned about the economy, growth, and inflation expectations, following expected increase in money supply, the expected effects of such expansionary policy can be minimized. This is because of the slow adjustments to economic recovery and the prolonged time lag it takes for the impact lag to be effective.

When the rate of GNP is low, as one would expect in a recessionary period, the total flow of income into the economy and investment spending would be low, and given the sensitivity of capital mobility to interest rates, when money supply is increased, capital which is necessary for economic expansion is lost through the direct link between money, interest rates and capital outflow and as a result, prolongs the economic recovery or makes it look so.

As we earlier discussed, monetary expansion is able to shift the aggregate demand (IS) curve to the right. The question is how far and how long does it take? With increased capital mobility in the 1990s, the increased money supply leads to capital outflow which offsets the money stock increase. The reason is that as capital leaves the domestic economy through imports etc, many things are happening simultaneously that affects the increased money supply so that the money supply increases its effectiveness on the economy at a decreasing rate (because it is offset by capital outflow). At this effective rate, it takes longer for the money increases to be fully utilized and for an
economic expansion to be realized. Thus, the short-term effectiveness of monetary expansion is lengthened.

So, while the Fed is capable of influencing output and economic recovery in the short-run through directly influencing interest rates and income, the increase in money supply may spur investment and growth but yet investment may in fact fall and the rate of economic recovery may decrease if other variables of $p, e, M_s$ and $G$ shift sufficiently to offset the effect of a decrease in interest rate and capital outflows. Controlling capital outflows is not very effective, particularly in the modern setting of highly integrated financial markets and when multinational corporations have money balances in several countries. The capabilities of the Fed in the 1950s and 60s may prove incapable in the 1990s in the face of globalization and capital mobility.


Markowitz, Harry M., Portfolio Selection: Efficient Diversification of Investments (John Wiley & sons. 1959)


