THE CASE FOR EUROPEAN

MONETARY UNION

Thesis Approved:

Gerald M Lage
Thesis Adviser

Frank J. Temple

Don Holbert

Michael J Applegate

Rufus Waters by GMF

Norman N Durham
Dean of the Graduate College

PREFACE

This study is concerned with the introduction of a single currency for the member states of the European Communities and to discuss the potential costs and benefits resulting from such a monetary union. The primary objective is to assess the costs of introducing a monetary union in Europe through ex ante harmonization of member states monetary policies. A simple monetary model of exchange rate determination is used in the research. The purchasing power parity doctrine which is a part of the model is tested by spectral analysis.

The author wishes to express his appreciation to his major adviser, Dr. Gerald M. Lage, for his guidance and assistance throughout this study. I also must acknowledge my great debt to Dr. Alan R. Waters, for instilling in me an interest in international finance and for his assistance throughout this thesis. Appreciation is also expressed to the other committee members, Dr. Frank G. Steindl, Dr. Michael J. Applegate, and Dr. Donald Holbert, for their invaluable assistance and constructive criticisms in the preparation of the final manuscript. I also wish to express my gratitude to Dr. Homa Motamen for suggesting the topic of this research.

The moral support provided by my family, particularly Massoumeh Diba and Mehdi Metghalchi, is much appreciated, as is the technical advice given by Kamvar Farahbod. In addition, appreciation is extended to Mrs. Sandra Ireland for the excellence of the final copy and her valuable suggestions concerning form.

This dissertation is dedicated to my mother, Khorshid, and to the memory of my father.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

PURPOSES OF ANALYSIS

Introduction

The attempt in the last few decades to unify Europe through Economic and Monetary Union (EMU) has stimulated this study. The desire for some sort of European union in not new; it was recognized after World War I (WWI), and reached a climax in September, 1929, when French Foreign Minister Briand proposed in the Assembly of the League of Nations at Geneva "some king of confederal bond" (une sort de lien confederal) between people of Europe (Vaughan, 1979, Chapters 1-4).

However, it is after World War II (WWII) that a host of schemes were put forward for the purpose of the European integration. The creation of the Organization of European Economic Cooperation in 1949, the European Payments Union in 1950, the European Coal and Steel Community in 1951, the Common Market in 1957, the Common Agricultural Policy in the early 1960s, the proposal for Economic and Monetary Union in 1970, and finally the European Monetary System in 1979 were all attempts to move towards economic and monetary union, which would ultimately lead to political union. The member countries have explicitly vowed to transform themselves into a political entity. The approach, therefore, is to bring integration via an indirect strategy concentrating on economic and monetary union, compatible with the neofunctionalist theory of integration (see Chapter II). Monetary union is thus seen as

a symbol or rallying-point around which economic and political union can be constructed. Therefore, the drive toward monetary integration will appear again and again in the future despite its lack of progress during the 1970s. Moreover, its introduction will be facilitated once the economic environment becomes more favorable.

Methodology

To investigate the economic consequences of monetary union, economists developed the theory of optimum currency areas during the 1960s. They asked the question, "What are the economic conditions for a group of countries among which it may be optimal to have fixed exchange rates and let a new common currency, or the existing national currencies as a group, float with the rest of the world?" Our approach to monetary union, however, is different from the optimum currency areas question. We believe that the attitudes of European countries are not determined by short-term tactical considerations, but rather a long-run objective toward political and economic union. Assuming that an economic union has to be formed, we will ask what would be the potential costs and benefits of using a "monetarists" strategy to help development toward full economic union. The "monetarists" strategy emphasizes a quick introduction of fixed exchange rates, harmonization and then unification in the monetary field which would oblige member states to harmonize their economic policies. The "economists" strategy, in contrast, insists on economic coordination and harmonization first, to be followed by exchange rate rigidity and monetary union.

Nature of the Present Study

The main benefit from monetary integration is that, since it

increases the degree of economic integration, it thereby improves the allocation of economic resources as markets were enlarged. (The terms "monetary integration" and "monetary union" are used interchangeably. However, one should keep in mind that monetary union is the final stage of the process of monetary integration.) Moreover, economic and monetary union increases the degree of political union which would promote a state of friendship and cooperation and more significantly give Europe super-power status.

The main case against monetary integration is as follows: If a country wants to maintain both internal and external balance it needs two instruments of policy. The loss of the exchange rate instrument would force a country to use internal policies in order to correct an external disequilibrium. (This possible consequence of monetary union can be seen in Corden, 1972; Aliber, 1972; Fleming, 1971; Magnifico, 1971; Johnson, 1971, and Salin, 1974.) The critics argue that monetary integration will not work because the departure from internal balance will result in large-scale unemployment in some countries which would not be acceptable to them.

The purpose of this research is to show that the above objection to monetary integration is weak. We believe that large-scale unemployment will not result as a consequence of the loss of exchange-rate instrument for the nations of the European Economic Community (EEC). (The official name was change to European Community (EC) to reflect the broader aspirations of the member nations.) Large-scale unemployment would not result because exchange rates are mainly a monetary phenomena and could not have a lasting effect on a real variable (unemployment). Indeed, if exchange rate changes could not have an effect on employment other than in the short run, and knowing that the frequent use of

use of exchange rate depreciation makes the short run always shorter, then the cost of the loss of the exchange rate instrument is relatively much less than its critics suggest. In view of sizable benefits resulting from monetary union and its relatively negligible cost, one should make a strong case for European Monetary Integration.

We will use a simple monetary model of exchange rate determination. The model is condensed to one reduced-form equation that expresses a functional relationship between the exchange rate and its ultimate determinants. Estimates of the reduced-form equation for various EC countries permit us to determine whether exchange rates are a monetary phenomenon or not.

Plan of Study

Chapter II reviews the historical attempts toward economic and monetary union since WWII. In Chapter III, the writer examines in some detail the potential benefits and costs of monetary union. Chapter IV describes the methodology and statistical techniques to be employed. In particular, the researcher outlines the recent development of the monetary approach to the balance of payments and its implication for monetary union. Chapter V provides the empirical findings of the reduced form equation between EC countries. Chapter VI discusses the existing strategy toward monetary union, namely, the coordination of members' economic policies through the European Monetary System. Chapter VII summarizes the research and outlines the major conclusions.

CHAPTER II

BACKGROUND

The Postwar decades have seen a series of attempts to unify Europe. On June 5, 1947, in his famous address at Harvard University, George Marshall, the U.S. Secretary of State, proposed a substantial American aid to European countries (Teitgen, 1975). Marshall called for a European recovery program, in which all European nations would participate in a spirit of cooperation, to prepare their economic restoration. With a view to responding to this offer, 16 European governments (Austria, Belgium, Denmark, France, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Sweden, Switzerland, Turkey, and the United Kingdom [note that the Soviet bloc refused to come in]) opened the conference of European Economic Cooperation on July 12, 1947, in Paris. Subsequently, a second conference of the 16 nations on March 15, 1948, resulted in the creation of the Organization for European Economic Cooperation (OEEC). The ultimate purpose of this agreement was a large free trade area.

The organization effected progress. In 1949, Eurpoean production figures, excepting Greece and Germany, had reached 1938 levels. In July of that year the members agreed on the first major reduction of import controls, removing 50 percent of all such restrictions from private trade among themselves. The expectation that the level of reduction would rise to 60 percent during the next 12 months was in some instances exceeded. A protectionist trend of more than 20 years'

duration, going back to the Great Depression, had finally been reversed (Schmitt, 1969). The importance of the Marshall Plan and the OEEC, through which a large part of the aid funds was channeled, cannot be overemphasized in a study of European integration.

By 1949 it was apparent that further expansion of European trade was being hampered by bilateral trading, and that an expansion of trade would require a wider multilateral basis; it was in search of this that further efforts were directed. The result of these efforts was the European Payments Union (EPU) which was formally signed on September 19, 1950. Although EPU was to serve as a system of regional multilateral clearing, its wider aim was to pursue the long-run goal of European economic integration (Scammell, 1961).

However, the problem with EPU was that is was restricted to Europe. Creditor countries had an incentive to discriminate in favor of purchases inside the EPU while encouraging exports to non-EPU countries in order to avoid granting automatic credits. Another move toward unification was the creation of the Council of Europe on May 5, 1949. This Council was to comprise a consultative assembly in Strasbourg, whose members were appointed by the parliament or government of each country, and a ministerial committee in Brussels composed of the foreign ministers of the member states. The Council would harmonize views and form recommendations on all but defense matters, but it would be without any legislative power and without any executive responsibility. This Assembly did, however, serve as the great forum in which the future shape of a united Europe was debated.

The European Options

By late 1950, as a result of these attempts to unify Europe, there

were significant differences over goals. Essentially, the controversy was between rebuilding and transcending the nation state. Cutting across controversies over goals were differences over strategies which separated the economic from the political determinists. The result, as suggested by Figure 1, was four rather distinct approaches to postwar problems.

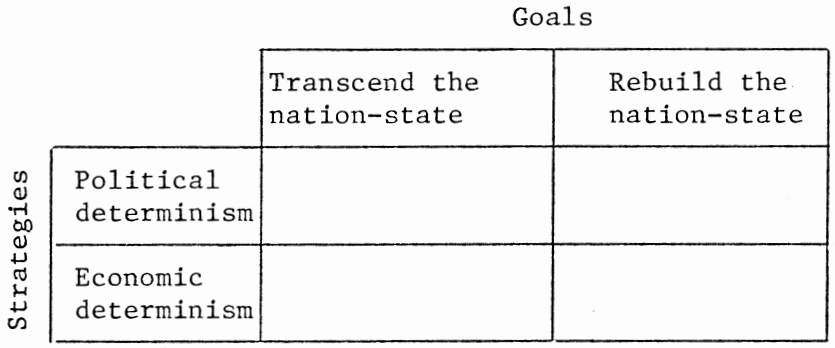

Figure 1. The European Approaches

According to Lindberg and Scheingold (1970) the rebuilders were preoccupied, first and foremost, with the massive destruction of WWII, and they felt that the most effective way to reconstruct would be through the nation-state. To the transcenders, re-establishment of the old order would be little more than the prelude to a new round of destruction; the simple lesson of the 20th century seemed to be that the nation-state was no longer visable--economically, militarily, or politically.

The controversy over strategy was the conflict between economic determinism and political determinism. In the heart of economic determinism lies the functionalist approach: In order to control

international conflict and promote welfare at a world scale, the functionalists proposed the creation of various international agencies for cooperative solutions to social and economic problems (Haas, 1964, Chapter 1).

The functional appraoch is, in general, compatible with the continued existence of nation-state, since it calls for no more than cooperative solutions to common problems, making this approach very appealing to those who wished to rebuild the nation-state and saw the primary obstacles as economic. According to Lindberg and Scheingold (1970), there was, in addition, a second brand of functionalism which they referred to as neofunctionalism. According to them, neofunctionalism differs from traditional functionalism in that it established some prerequisites to effective problem solving which involve a partial, but direct, threat to the autonomy of the nation-state. Specially, it is argued that one must begin with a real delegation of decision-making authority to a supranational agency.

Neofunctionalists believed in their approach to a logic of integration. Very briefly, the neofunctionalist reasoning is: Since economic problems are interconnected, any solution of a problem by supranational agency, once started, would lead to another one, so that the process has a cumulative character, thus leading gradually to deprevation of autonomy for nation-state; thus, this approach attracted those who wished to transcend the nation-state and, on the other, those who were inclined to think of economic problems as determinant.

The political determinists were inclined to believe that cooperation on noncontroversial problems could lead no further than to peaceful resolution of noncontroversial issues. However, within this general strategy, there were divisions between the transcenders and the

rebuilders. For example, the transcenders represented by the European Union of Federalists advocated a program of achieving the political federation of Europe through continuous contact and liaison with ministers and parliaments (Haas, 1968). They argued that the OEEC or the Council of Europe should be vested with certain strong central powers at the outset through which they could allocate economic goods among their members. For them, some kind of U.S. of Europe was the most desirable goal.

The rebuilders, on the other hand, did not sympathize with the idea of transfer of authority from nation-state to some "high authority" on a European level. However, they advocated political cooperation between governments to solve any controversial issues. Thus Figure 2 shows the European options after filling the four cells of the matrix of Figure 1.

		Goals: Transcend the nation-state	Goals: Rebuild the nation-state
Strategies	Political determinism	Federalists (U.S. of Europe)	Nationalists (Confederation)
	Economic determinism	Neo-functionalist (economic integration)	Functionalist (free trade)

Figure 2. The European Options

However, as Lindberg and Scheingold (1970) have pointed out, the orderly positioning within the four cells is clearly an exercise of

hindsight. Yet it seems incontestable that these are in general the positions that emerged between the end of the war and 1950.

In view of the above classification, we can then say that the creation of the Organization of European Economic Cooperation was an economic approach, and the creation of the Council of Europe was a political approach, to European unification.

The Schuman Plan

In May, 1950, Robert Schuman, the French Foreign Minister, in a famous declaration made in the name of his government, proposed that France and Germany subject their entire coal and steel production to a single, supranational authority (Teitgen, 1975). Membership was to remain open to all other European countries which might wish to participate and would be willing to meet the terms of the agreement. The Schuman Plan prepared by Jean Monnet was a radical step in that it was the first proposition in which governments would surrender important powers to a new supranational body (Bromberger, 1969). Quickly the plan was approved by Germany, Italy, and the Benelax countries. Britian, however, refused to accept Schuman's supranational principle, which would have removed control of key industries from the sphere of national jurisdiction. According to Schmitt (1962) although it was a Labor government which assumed responsibility for this refusal, it reflected an attitude shared by Britons of all political hues.

The British refusal, according to Teitgen (1975), was a momentous time for a choice fraught with consequences: Should the very principle of integration be sacrificed to ensure British participation? With the approval of the government, Schuman let it be known that there could be no question of this. The dies were cast; "L'Europe des six" was coming to birth.

On April 18, 1951, the final draft of the European Coal and Steel Community (ECSC) was signed by the six foreign ministers and on August 10 of the following year, the treaty took effect. It is not the purpose of this study to go into the details of the articles of the treaty; Article 9 is reproduced below only in order to emphasize the surpa-national character of ECSC.

> ARTICLE 9: The High Authority shall be composed of nine members designated for six years and chosen for their general competence. A member shall be eligible for reappointment. The number of members of the High Authority may be reduced by unanimous decision of the council. Only nationals of member states may be members of the High Authority. The High Authority shall not include more than two members of the same nationality. The members of the High Authority shall exercise their functions in complete independence in the general interest of the Community. In the fulfillment of their duries, they shall neither solicit nor accept instructions from any government or from any organization. They will abstain from all conduct incompatible with the supranational character of their functions. Each member state undertakes to respect this supranational character and not to seek to influence the members of the High Authority in the execution of their duties. The members of High Authority shall not exercise any business or professional activities, paid or unpaid, nor acquire or hold, directly or indirectly, any interest in any business related to coal and steel during their term of office or for a period of three years thereafter (Weil, 1965, p. 15).

The treaty also provided for a Council of Ministers, consisting of ministers from six member states of the Community whose function, according to treaty, was to assist the High Authority in carrying out its task.

As a result of establishment of the common market for coal and steel, the volume of trade in ECSC products rose by 93 percent between 1952 and 1955, while the increase in trade in all other sectors liberal-ized under the OEEC Code, but not under the common market, amounted to only 59 percent in the same period (ECSC, 1956). By 1956 the community felt that it could claim that it had fulfilled one of the major

objectives which has been assigned to it and could be served as a model for future attempts at supranational integration in the economic world, thereby opening the way politically for the negotiations which resulted in the following year in the signature of the Treaties of Rome and the establishment of the General Common Market and Euratom.

The Common Market

On March 24, 1957, representatives of France, Belgium, the Netherlands, Luxembourg, Italy, and the Federal Republic of Germany signed the Treaty of Rome, and on January 1, 1958, the EEC came into being. The Rome Treaty, however, was a consequence of the limitation of the ECSC which was a one-dimensional approach to economic integration. A wider scope than ECSC was needed. The Treaty of Rome, which established a general Common Market, was thus a logical consequence of the success of ECSC.

Objectives of the Treaty

Article 2 sets the aim of establishing a Common Market and progressively approximating the economic policies of Member States, to promote throughout the community a harmonious development of economic activities.

> Article 3 aims at (a) elimination, as between Member States, of customs duties and of quantitative restrictions in regard to the importation and exportation of goods, as well as of all other measures with equivalent effect. (b) Establishment of a common customs tariff and a common commercial policy toward third countries. (c) Abolition of the obstacles to the free movement of persons, services, and capital. (d) Inauguration of a common Agricultural Policy (Weil, 1965, p. 13).

Being interested specifically in European monetary integration, this study will not go into the details of the articles but will quote those which are related to monetary integration.

Article 103 is on economic policy and states that economic trends are a matter of common interest and therefore member states should consult with each other and with the Commission on measures to be taken in response to current circumstances.

> Article 104: Each member state shall pursue the economic policy necessary to ensure the equilibrium of its overall balance of payments and to maintain confidence in its currency while ensuring a high level of employment on the stability of the level of prices.
>
> Article 105: In order to facilitate the attainment of the objectives stated in Article 104, member states shall coordinate economic policies. They shall for this purpose institute a collaboration between the competent services of their administrative departments and between their central banks. The Commission shall submit to the Council recommendations for the bringing into effect of such collaboration. In order to promote the coordination of the policies of member states in monetary matters to full extent necessary for the functioning of the Common Market a Monetary Committee with consultative status shall thereby be established with the following tasks:
>
> - to keep under review the monetary and financial situation of Member States and of the Community and also the general payments system of Member States and to report regularly thereon to the Council and to the Commission; and
>
> - to formulate opinions, at the request of the council or to the Commission or on its own initiative, for submission to the said institutions.
>
> The Member States and Commission shall each appoint two members of the Monetary Committee (Weil, 1965, p. 42).

Article 107 states that the exchange rate should be treated as a matter of common concern. Article 108 envisages the possibility of mutual aid in case of serious difficulties in the balance of payments. As regard capital movement, Article 67 states that to the extent

necessary for proper functioning of the Common Market, capital movement restrictions should progressively be abolished.

Finally, Article 130 envisages the establishment of the European Investment Bank which would facilitate the financing of the following projects: aid in the development of the less developed regions, the conversion and modernization of enterprises in cases where the necessary funds cannot be supplied by a particular member nation, and projects of common interest to several members, such as large highways, tunnels, and bridges.

Having quoted the most relevant articles concerning economic and monetary integration, we will briefly describe the institutional setting of EEC.

Similarly to ECSC, the EEC consists of a European Commission whose members act independently of individual Nation-States (duties and responsibilities of the Commission are set in Article 155 of the Treaty). There is also the Council of Ministers whose task would be consultation among the member government and the coordination of their policies (duties and responsibilities of the Council of Ministers are set in Article 145 of the Treaty). Again we see two kinds of institutions, one independent from individual Nation-State, the other responsible to individual Nation-State; one based on functionalist approach and the other on federalist approach. There would also be a Court of Justice with powers to cover all Common Market matters. The last institution is the European Parliament, which would be linked with the parliaments of member states and would review and measure community policies year by year. (For more detail of institutional setting, see De la Mahotiere, 1970.)

Common Agricultural Policy

The major goal of abolishing all tariffs and other trade restrictions among themselves, which was programmed in detail in the Rome Treaty, was successfully completed by July, 1968, sooner than was originally planned. The Treaty also established principles and guidelines for a Common Agricultural Policy (CAP). (These principles and guidelines can be found in Articles 38 to 48.) The CAP was designed to protect farmers within each member country by imposing some kind of import restrictions on many farm products. To assure satisfactory stable farm income, a system of "target" prices and "intervention" prices was introduced. The target prices of wholesale trade are set from year to year and actual market prices tend to move somewhere between the two levels which have a spread from 5 to 10 percent from target price. Thus, these small variations around the target prices determine the intervention prices, the minimum price at which commodities are bought wholesale to maintain the price floor, and maximum price at which commodities are sold wholesale from official stocks to maintain the ceiling price. If we subtract the cost of shipping the product from the port of entry to the main consuming area, we obtain the "threshold" price. The difference between the c.i.f. (cost, insurance, freight) import price and the threshold price is imposed on the former as an import levy, and to the extent that the prices at which import shipments are offered vary at the community frontier, the levy also varies. In this manner, the variable import levy has replaced the usual system of customs duties and quotas for target-price farm commodities (Feld, 1979; Kreinin, 1975).

However, as a result of political power of the farmers, agricultural lobbies were very strong in all European parliaments and it became clear that when the Commission had a decision to make on a single common price for any product, it would be forced to establish a price very near the highest existing price for that product, rather than take the average of all prices. So high prices were to be the order of the day; this was to lead to gross over-production, all of which had to be paid for out of a European Agricultural Guidance and Guarantee Fund (EAGGF), and, to iron out the difference between the high Common Market price and the low world price, export subsidies or negative levies would have to be very high--another heavy burden for the EAGGF and another cause of bitter dissention when it became clear that the surplus-producing countries, mainly France, were easily getting the best of the deal, since the EAGGF was paying out to them far more than they put in.[1]

The maintenance of high agricultural support prices is not the only cost which the members of the EEC must bear in support of the farmers; fluctuations among the member countries currencies are also highly costly, and amounted to nearly $2 billion in 1976. As the EEC neared the end of the transition period, December 31, 1969, it was obvious that the whole edifice of the CAP was in danger of collapsing. The devaluation of the franc and revaluation of the D-mark had weakened the carefully erected but unsoundly based common price system. For example, when in August, 1969, France devalued the franc by 11.1 percent with target prices unchanged (expressed in dollars), the new franc parity implied a proportionate rise in the franc prices of agricultural products, thus encouraging French farmers to expand production at the expense of, say, German farmers who were in a less favorable competitive position as a result of French devaluation. Thus,

French devaluation upset the hard-fought compromise target price of soft wheat ($106.25 per metric ton) and the Council of Ministers had to establish a new one: it was that France would increase the franc price of wheat in two stages over a two-year period and, in the interim, was required to levy broader taxes on wheat exported to other members and to subsidize imports from other members. This solution involved not only a departure from common prices but also a temporary nullification of one of the primary purposes of the franc devaluation--to improve the trade balance by increasing exports and reducing imports (Ingram, 1973). If total disintegration of the CAP were to be avoided, very serious thought indeed would have to be given to the monetary relationships between the EEC countries.

The Treaty of Rome was nowhere more discreet than in its references to harmonization of monetary and fiscal policies and did little more, in fact, than provide for the establishment of a Monetary Committee. Thus, it was felt in the early stages of the European Economic Community, that there was a need for more monetary cooperation to redress the imbalance which was found in the Treaty of Rome. Thus, on June 19, 1963, the Commission submitted to the Council the recommendation on collaboration in monetary and financial matters in the Common Market accounced in the Action Program, which proposed first the establishment of a special committee of governors of national banks of the six member states--which would eventually lead to an organization similar to the Federal Reserve System in the United States; second, the institution of an agreed on and defined consultation procedure at the level of finance ministers or of governors of the national banks to discuss all matters of major financial concern or interest, such as variations in bank rate, decisions relating to

minimum liquidity ratios, etc.; and third, the formulation of a common community attitude in major international financial institutions and discussions (i.e., IMF) (Weil, 1965).

The Commission's Action Program, rather modest, did not receive a warm welcome by the various EEC governments. Also, in 1963 the Community faced its first monetary crisis which marked the end of an uninterrupted honeymoon period of almost five years. France and Italy were faced with strong inflationary pressures which resulted in a balance of payment crisis in the latter country in 1964. This led to an inflow of funds to Federal Republic because of expectations of the revaluation of the Deutsche-mark; and according to Tsoukalis (1977) the crisis of 1963-64 created a more favorable climate for the adoption of the Commission's proposals of June, 1963. Thus, in May, 1964, the Council of Ministers set up the Committee of Governors of Central Banks and a budgetary policy committee consisting of senior officials from national ministries of finance, as well as representatives of the Commission. In addition, there was agreement not only on parity change consultation but also on broader prior consultations on all international monetary problems. However, during 1963-68 there was no significant progress in the monetary field which, according to Bloomfield (1973) seemed to reflect the continuing payments surpluses and mounting reserves of individual member countries.

Although there was little progress in monetary field during these years, the Commission had stressed the need for a fuller coordination of monetary and financial policy as stated in the General Report.

> One result of growing interpenetration of the economies of the member countries in the European Communities has been the increasingly marked interdependence of national monetary and financial trends. Experience in recent years shows that integration has progressed to such a point that the achievement of the economic objectives of each of the

> Member States is now to a great extent dependent on the economic trends in the partner countries. The consequence of this process of integration is that there is a need for fuller coordination of monetary and financial policies (EEC Commission, 1968, p. 124).

Also, monetary coordination was on the European Parliament's agenda, which concluded, at its session of November 28 to December 2, 1966, the adoption of a resolution of the community's future activities in the field of monetary policy and the creation of a European monetary union (Bulletin of the European Communities, January 1967). The fortunate situation of general balance of payments surplus among the member states did not last very long. In 1968-69 there was a monetary crisis involving mainly France and Germany. In the wake of the French political crisis of May, 1968, a sharp loss of confidence caused a substantial flight of capital from France which brought about the introduction of exchange controls in France and led to a speculative crisis associated with expectations of a devaluation of the French franc.

The pressures on the French franc were compounded in the fall of 1968 by rumors of a possible revaluation of the German mark. Because of this speculative atmosphere, the principal European foreign exchange markets were closed while an emergency meeting of the Group of Ten was held in Bonn in November of the same year. During this meeting, the French joined the U.S. and British representatives in exerting pressure on the Germans to obtain a revaluation of the deutchemark. Given the importance of exports for the German postwar economic performance and also given the political strength of the export sector, the Germans defied the pressure exercised upon them by the Big Three in favor of a revaluation of the deutschmark. The French likewise ruled out a devaluation of the French franc and opted in favor of a more restrictive monetary and fiscal policy and even more severe exchange restrictions.

So the anticipated revaluation of the German mark and devaluation of the French franc did not materialize.

When the foreign exchange markets reopened, there was a short calm period which did not last long. Speculative pressures against the franc and in favor of the mark were very intense in the beginning of 1969, and they ultimately resulted on August 8 in the franc devaluation by 11.1 percent against the dollar. Also, the Germans decided in September, 1969, to let the mark float for a short period. The mark jumped immediately, and by the end of October a new revaluated parity was established, up by 9.29 percent against the dollar.

The crisis of 1968-69 provided a strong driving force toward increased monetary cooperation in the EEC, and of course it is this 1968 monetary crisis which gave the kick-off to elaborate discussion on definition and implementation of the so-called economic and monetary union (EMU) (Maillet, 1976).

The Barre Plan

It became clear to the members of EC that the events of 1968-69 could not be permitted to recur in the future, for they severely strained trading relationships and defeated the purpose of the Common Agricultural Policy. As one alternative, the EC members opposed the establishment of a more flexible exchange rate system, which was advocated by American economists, and was being considered by IMF as a replacement for the Bretton Woods system. Many European leaders felt that the adoption of a more flexible exchange rate system would ultimately destroy the EC itself. The Commission came up, in February, 1969, with a memorandum on the coordination of economic policies and on monetary coordination within the community--the so-called Barre

Plan (Supplement to Bulletin of the European Communities, March 1969). In terms of concrete proposals, the plan contained four main elements:

1. Member states' commitment not to alter their parity rates without prior common agreement.
2. The elimination of margins of fluctuation between member states' monies and adoption of identical margins in regard to a third country.
3. The establishment of some kind of machinery in the community for mutual assistance, for example, the formation of a system of short-term and medium-term monetary support and assistance.
4. Finally, the plan called for a greater convergence and compatability between national economic objectives. Thus, the system of prior consultation should be extended to all economic policy decisions which could have an influence on other community members' economies.

The second Barre Plan, submitted in December, 1969, envisaged a three-stage process leading to economic and monetary union by 1978; it again advocated that the six member countries should gradually narrow their exchange rate margins, coordinate their economic and monetary policies, harmonize their taxes and establish a machinery for mutual balance of payments assistance.

The desire to move toward an economic and monetary union, and the Barre initiatives, could not prevent the monetary crisis of 1968-69 which ended with a devaluation of the French franc in August, 1969, followed by a revaluation of the D-mark in October of the same year. Both decisions, the French devaluation and the German revaluation, were not preceded by consultations within the community, despite the obligation undertaken by all member countries in May, 1964, and

furthermore, despite the fact that the system of prior consultations had been extended less than a month before the French devaluation.

When the French devalued the franc in August, 1969, France had to pay 11.11 percent levies on agricultural exports to other member states. Another serious situation arose when the mark was allowed to float and jumped immediately by 9 percent against the dollar. Germany was threatened with a flood of agricultural imports and the German government imposed border taxes of 8.5 percent without consulting her partners (De la Mahotiere, 1970).

By December 31, 1969, the transitional period envisaged in the Treaty of Rome was to be terminated. And with the exchange crisis of 1969 and the subsequent flaw in the CAP, the time was appropriate for advances on other fronts to maintain the momentum already achieved and even to avoid retrogression. To many European leaders, the logical course was a drive to full economic and monetary union.

Formal and informal discussion continued throughout the year and culminated in the summit conference of community heads of state at the Hague on December 1-2, 1969. Consensus seemed to be that the members should now declare their determination to proceed to, and undertake, the first steps toward full economic and monetary union. At the end of the conference it was agreed among other things that during 1970 the Council draw up a plan, based on the Barre Plan, to establish by stages an economic and monetary union in the community. On March 6, 1970, the Council turned this task over to a committee, headed by Pierre Werner of Luxembourg. In the interim, community cnetral banks agreed to establish a system of short-term monetary support among member central banks with $2 billion being made available for a period of up to three months to nations experiencing balance-of-payments difficulties.

The Werner Report

The Report of the Werner Group submitted in 1970, laid down a program for the establishment by stages of an Economic and Monetary Union (EMU) by 1980 (Supplement to Bulletin of the European Communities, July and November, 1970). This gradual approach was based on the neofunctionalist theory of integration which characterized the European approach to unification from its beginning (Werner, 1977). The coal and steel market could not subsist by itself and induced the search for an integration of all economic sectors in the Common Market: the common agricultural policy involving a unique market and unique prices brought out the drawbacks of the absence of monetary cooperation in the community.

In order to discern the full political consequences of this approach, the Werner Group first described very precisely and clearly the possible final state of the union. At the final state this union involves either the establishment of a single common European currency, or the irrevocable fixing of parities among participating European currencies. Technically, the choice between the two systems would appear to be unimportant. However, psychological and political considerations would strongly support the adoption of a single currency, thus guaranteeing the irreversibility of the action.

Some other consequences of such union would be:

1. The creation of liquidity in the entire community, and monetary and credit policies would be centralized.
2. There would be a community monetary policy vis-a-vis the rest of the world.
3. Member states would unify their policies on capital markets.

4. The main components of budget policy--especially the volume, and the size of the budget surplus and the method of financing a deficit--would be decided at the community level.
5. Regional and structural policies would no longer be exclusively the domain of member states.
6. Trade unions and employers' organizations would be systematically and continuously consulted at the community level.

As a result of these steps, the completion of economic and monetary union would require the creation or the transformation of a number of community organs, to which certain functions hitherto exercised by national authorities would have to be transferred. The Werner Report said that these transfers of responsibility would represent a process of fundamental political significance, implying the progressive development of political cooperation. Economic and monetary union would thus appear as an unavoidable stimulus to political union in the long run. According to Werner (1977), the Werner Report was representative of two schools of thought on union, the "Monetarist" and the "economist". The distinction between the two approaches to monetary union is the ordering of events in the process of monetary union. The "monetarists" insist on a quick imposition of fixed exchange rates, harmonization and then unification in the monetary field which would oblige member states to harmonize their economic policies. The "economists", in contrast, emphasize economic coordination and harmonization first, to be followed by exchange rate rigidity and monetary union. The main protagonists in this debate were France and Germany. France was eager for a more rigid fixing of exchange rates within the community to preserve the common agricultural policy of which it was the main beneficiary. The Germans, on the other hand, were in favor of

the "economist" approach of the coordination of the economic and growth policies of the individual member states. To reconcile the two schools of thought, the Werner Report stressed the principle of parallelism: simultaneous harmonization of economic policies and monetary policies.

The Werner Report emphasized the lack of progress in the economic and monetary field: that the growing interpenetration of the economies has weakened the independence of the short-term economic policies pursued in the member countries; and this loss of independence at national level has not been offset by the creation of community policy (Supplement to Bulletin of the European Communities, July 1970). The Report went on to point out that unless national economic policies were coordinated and harmonized, differences in policy preferences would lead to balance of payments disequilibria which would jeopardize the survival of the customs union and the functioning of the CAP. Moreover, policy divergencies had contributed to the failure of the community to assert itself adequately in international monetary relations. To overcome the above criticisms, the Werner group proposed the following:

> . . . measures must be adopted under a set of related headings: The establishment of overall economic guidelines, the coordination of short-term economic policies through money and credit arrangements, through the budget and taxation and through incomes policy, the adoption of community policies on structure, the elimination of exchange fluctuations between the community currencies, greater stability in parity relationships, the harmonization of external monetary policy, the integration of capital markets, etc. All this will require in the first place fuller coordination of national policies, then their harmonization through the adoption of agreed directives, and lastly the transfer of responsibilities from the national to the community authorities. As progress is gradually made, Community instruments will have to be created to take over from or underpin the national instruments.
>
> In all the fields, the measures to be taken are interdependent and will strengthen each other; in particular, the development of monetary unification must be closely related to adequate progress in the coordination, and later unification, of the economic policies (Supplement to Bulletin of the European Communities, July, 1970, p. 10).

In describing above the measures to be taken to achieve a European Monetary Union in three stages over ten years, the Werner Group only presented a list of measures to be adopted during the first stage which would last three years. It did not go on to clearly define and detail the second and third stages. As for the first stage, the Werner Group proposed the strengthening of the system of prior consultations which would cover medium-term economic policy, short-term economic policy, budgetary policy, monetary policy, etc.

Although there were some debates within the Werner Group concerning the EC exchange rates system, the majority of experts favored gradually narrowing margins of fluctuation between EEC currencies. Moreover, in order to prepare the final stage, the Werner Group proposed the establishment of a European Fund for Monetary Cooperation as soon as possible, even during the first stage; but it should have to come at the latest during the second stage. The Fund could serve as an organization to coordinate the foreign exchange activities of its members, to extend short-term and medium-term monetary support. The amount and basis of credit to be available through the Fund was not fully determined and could undergo a progressive evolution toward a pooling of reserves at the Community level; ultimately, in the final stage, it would have to be integrated in the "Community system for the central banks."

The final report of the Werner Group was not substantially different from the first report (Supplement to Bulletin of the European Communities, November, 1970). The objective was again a complete economic and monetary union in European Community by 1980. However, the need for institutional reforms was mentioned in the final report. It was envisaged that by the final stage two organs of the Community would be established, namely, the "center of decision for economic

policy" and the "Community system for the central banks." The former would be politically responsible to European Parliament, and would be involved with the formulation of the Community economic policy. The Community system for the central banks was similar to the Federal Reserve System in the United States. The creation of these two organs emphasizes the principle of parallelism or, in other words, the reconciliation of the "monetarist" and "economist" approaches to monetary union: simultaneous progress in the field of coordination of economic policy and of monetary cooperation.

The First Stage

In March, 1971, the Commission came up with a resolution on the implementation of the first stage of monetary and economic union which was adopted by the Council of Ministers. (For a complete survey of the first stage, see Tsoukalis, 1977, pp. 112-150.) For the most part, the Commission's proposals were in line with Werner Group's recommendation, but there was disagreement on institutional aspects and on transfer of powers from member state to the Community level which resulted in the introduction of a precautionary clause that would make the transition from first stage to second more conditional.

Following the acceptance of initial phase of EMU (1971 to 1973 inclusive), the central banks of the Community decided to reduce from June 15, 1971, intracommunity margins of fluctuation from 1.5 to 1.2 percent on either side of parity. (Maximum permissible fluctuation between any two EC currencies would be reduced from 3 to 2.4 percent.) In addition, they established a machinery for medium-term (two to five years) financial assistance among members of up to $2 billion (Bloomfield, 1973).

The progress toward implementation of the first stage of EMU--most importantly, the narrowing of intra-EC margins of fluctuation--was severely damaged by international monetary crisis of Summer, 1971. The first jolt came on May, 1971, when large speculative short-term capital moved out of the United States into the European countries, which in turn resulted, on May 5, in the closing of foreign exchange markets in Germany, Netherlands, Belgium and Switzerland.

The Commission was against any revaluation of European monies vis-a-vis the dollar, and also against any free floating of these monies vis-a-vis the dollar. The Commission proposed that member countries affirm their absolute determination not to modify their parity and take concerted action to curb the inflows of funds through regulation of Eurodollar market. However, it was impossible to agree on a common formula, and on May 10, when the exchange market reopened, the German and the Dutch currencies were floated while capital controls were introduced for other EEC countries. Under these circumstances, central-bank governors suspended their previous decision to narrow the fluctuation margins of their currencies against each other from June 15, 1970. As Tsoukalis (1977) put it:

> The decision of the German government, in defiance of the opinion of its EEC partners and its own central bank, to float the Deutschemark was in marked contrast to the whole strategy on EMU and the decisions taken only two months before. The French decided to adopt an 'empty chair' policy with respect to any discussion related to EMU and the whole project was shelved until December, when the crisis was, at least temporarily, resolved. The floating of the Deutschemark was also strongly resented because of the disruptive effects which it would have, as in 1969, on the functioning of the CAP (p. 114).

The second jolt, more serious than the first, took place in August, 1971, when President Nixon announced that the dollar would no longer be freely convertible into gold. To cope with this new

challenge, consultations between member countries (and with future members) were intense, and the monetary committee offered two solutions to the EEC countries: either a joint float of the member countries vis-a-vis the rest of the world, or a two-tier exchange market separating commercial rates from financial rates (Maillet, 1976).

The six again agreed to disagree on the measures to be taken. The Germans and the Dutch maintained a joint float of their currencies (floating also was adopted by the Italians, English, Swiss, and Japanese). France and Belgium adopted a two-tier exchange market with commercial Belgian franc joining the guilder and Deutschemark in the common float and the introduction by France of a tight exchange control.

Under these circumstances, business confidence disappeared, and international investment quickly evaporated as currencies struggled to find their real international value (Abott, 1979). The desire in Europe for some form of fixed rates was apparent, but there was no agreement as to how this should be achieved.

It was only after the Smithsonian Agreement of December 18, 1971, that a renewed thrust was imparted to the movement toward EMU. The Smithsonian Agreement tried to introduce a minimum order and stability in the foreign exchange markets through a general realignment of currencies. The Deutschemark was revalued by 4.6 percent. The Belgian franc and the Dutch guilder were revalued by 2.8 percent, no change for the French franc and the British pound, while Italian lira was devalued by 1 percent. Among other major currencies, the U.S. dollar was devalued by 7.9 percent, the Japanese yen revalued by 7.7 percent vis-a-vis gold. At the same time, the margins of exchange rate fluctuation were tripled from .75 to 2.25 percent. This meant that the cross rate of any two EEC currencies could move by as much as 9 percent if they

switched positions in relation to the dollar. As Thygesen (1979a) put it:

> Fluctuations of this magnitude were thought to be incompatible with the proper functioning of intra-trade and with the aim not to encourage the use by European firms of the dollar as a unit of account and store of value--the value of the dollar would in fact have become more predictable than other EC currencies. In self-defense a Community exchange rate system--the snake--was set up in March, 1972, by an Agreement among the central banks of the original six EC members and the three applicant countries (p. 315).

In April, 1972, the European snake was formally launched. Its main goal was to reduce the maximum permissible fluctuation between any two participating countries from 9 to 4.5 percent, thereby removing the asymmetry vis-a-vis the dollar. This narrower EEC band within the wider dollar band caused the EEC system of exchange rates to be called "the snake in the tunnel." Denmark, Great Britian, and Ireland, the prospective members of the Common Market, also joined the snake. To maintain the EEC currencies within the narrower band, the central banks agreed to intervene with EEC-currencies whenever a member currency was at its lower or upper limit.

In June, 1972, a confidence crisis hit sterling which resulted in massive outflow of capital from United Kingdom and triggered the British withdrawal from the snake. Ireland and Denmark followed suit thereafter. At the beginning of 1973, there was a new monetary crisis which triggered the Italian withdrawal from the snake and a dollar devaluation of 10 percent.

Because of a lack of agreement among the nine members concerning a common solution, six member countries--Germany, France, Denmark, and the Benelax group--decided to float their currencies in common in March, 1973. (Denmark, Great Britian, and Ireland formally joined the Common Market in January, 1973.) Thus, while exchange rates between the

participating members would be held within narrow limits, no limits would apply between each of them and the dollar. With the "tunnel" abolished, the EC exchange rate agreement became known as the "snake in the lake" (Congress of the United States, Joint Economic Committee, 1979).

To support the joint float (the snake without the tunnel) the proposed European Monetary Cooperation Fund was established in April, 1973. Its functions were limited to facilitating coordination between central bank, multilateralization (the transformation of bilateral credits and debts into credits and debts with the Fund) of the debt settlements, administration of the systems of short-term monetary support and the use of European unit of account as the basis for all accounts between national central banks and the Fund. (Before April, 1973, the mechanism of short-term monetary support was administered by central banks.) The long-term role of the Fund was, however, more ambitious. It would evolve into a European federal reserve system which would be able to pull together member countries' foreign exchange reserves and create its own credit facilities.

The joint float introduced in March, 1973, was viewed in the EC countries as a major step toward EMU; but it generally contained seeds of trouble (Kreinin, 1975). For although the dollar was generally weak, it was weaker against the mark than against other EEC currencies. And there was not, on the Community level, any arrangement to deal with this situation. Given the German aversion to inflation, this could easily result in internal imbalances between members of the floating group, necessitating adjustment in the internal exchange rate or even the abandonment of the joint float. Indeed, the German mark was revalued by 5.5 percent in June and the Dutch guilder was revalued by

5 percent in September. In January, 1974, France, under a strong speculation against the franc, decided to let the franc temporarily float and thus withdrew from the European snake. (France also abolished its two-tier exchange market in March, 1974.)

The first stage of EMU was ended in December, 1973, without achieving substantial progress toward stabilizing EEC exchange rates, and very little progress in the field of monetary cooperation. Indeed, the European Monetary Cooperation Fund, as Tsoukalis (1977, p. 151) put it, ". . . was not much more than a plate on a door in Luxembourg."

In January, 1974, the French franc fell out of the snake, was brought back into it in July, 1975, but again left it for good in March, 1976. During 1975 there were no major steps taken toward EMU. However, suggestions were made to facilitate the achievement of EMU. The Fourcade Plan--submitted in September, 1974, with no success and resubmitted in May, 1975, again with little positive response--proposed a concerted float of all EEC currencies, a joint dollar policy, extension of Community credit facilities, and the use of a new European Unit of Account as a pivot in the Community exchange system.

The Marjolin Report submitted in March, 1975, emphasized the necessity of European Union for EEC members and stressed the measures to be taken on urgent problems, without elaborating a complete plan of EMU. Its diagnosis was striking: "In 1975, the Community was no nearer to EMU than in 1969. In fact, if there had been any movement, it was a backward movement" (Maillet, 1976, p. 78). In the monetary field, the Group proposed: (a) coordination among member countries of their intra- and extra-European monetary policies; (b) creation of an exchange stabilization fund; and (c) introduction of a new unit of account defined in terms of a basket of EEC currencies similar to the method

used in the construction of the Special Drawing Right (SDR) by the IMF. (The Group did not advocate the creation of a new organ, if European Monetary Cooperation Fund could be revised to stabilize exchange rate movements.)

In Section IV the Group proposed the steps that should be taken toward EMU, namely, suggestions on industrial policy, energy policy, policy concerning capital markets, the Community budgetary policy, and more important, the creation of a Community Unemployment Fund.

Another important proposal in 1975 was made by a group of prominent economists--The All Saints' Day Manifesto for European Monetary Union (The Economist, November 1, 1975). Very briefly, the Manifesto proposed the introduction of an attractive European Parallel Currency (EPC) in member countries, which would quickly drive national currencies out of circulation.

Another major proposal was made in July, 1976, by Duisenberg in which he presented certain proposals concerning the coordination of economic policy and the management of exchange rates. (The Duisenberg proposal is discussed in Oort, 1979.) Duisenberg proposed the establishment of a "target zone" for exchange rates among EEC countries (individual floating countries as well as a group of countries such as the snake). The target zone should reflect the country's assessment of future exchange-rate developments as determined by, among other factors, the policies the country intended to follow, and the target zone should be defined in terms of effective exchange rates. According to the proposal, member countries would accept an obligation not to undertake policies designed to push their rate out of the zone; however, once the effective rate was out of the zone, there was no obligation for the member country to adjust its effective rate, but

only enter into consultation with its partners as well as the Commission of the EC. This lack of obligation to maintain effective rates within the target zone is the basic difference from the snake system.

None of the above proposals received a warm welcome by EC governments. There was little disposition on the part of the individual countries to modify national policies, or even at times to forego purely political advantage in the interests of wider Community objectives. Many thought that the disintegration of the snake, the drastic deterioration in terms of trade following the jump in oil prices of 1973-74, and the subsequent stagflation in most EEC countries had dealt a fatal blow to the prospects of achieving EMU.

However, given the basic motivation of member governments to European unification, the subject of European Monetary Union again made headlines in 1977. The revival of interest was fostered by Jenkins (1978), president of EEC Commission, in a speech in Florence, Italy, in October, 1977. He suggested that the European Community could help itself through troubled times by reviving the idea of Economic and Monetary Union. The president of the EEC Commission called for a fresh approach to the problem of EMU. In contrast to the gradual approach advocated by the Werner Plan, he suggested that there should be a great leap toward integration. "We have to look before we leap, and know when we are to land. But leap we eventually must" (Jenkins, 1978, p. 14).

The leap came on December 5, 1978, when it looked as though the European Community was about to split. After nearly 30 hours of debate among the nine heads of government at the Brussels summit, six countries agreed to join the new European Monetary System (EMS). Britian, Italy, and Ireland first stayed on the sidelines, but within

a week Italy and Ireland changed their minds and agreed to join EMS. The French-German initiative (EMS), an ambitious scheme, contains three parts: an exchange rate system, the creation of a European currency (ECU), and the first steps toward a European Monetary Fund. (A more detailed discussion of the EMS will be given in Chapter VI.) Each country's official rate is defined vis-a-vis the ECU, and since the ECU itself is defined as a weighted average of member currencies, it is impossible for any one currency to revalue upward--or downward--in terms of this average without a compensatory depreciation--or appreciation--of all the other participating currencies. Any adjustment of mutually agreed on exchange rates can thus be effected only by mutual consent (Triffin, 1980).

The first adjustments were made in September, 1979, when the German mark was revalued 5 percent against the Danish krone and 2 percent against each of the other six participating currencies, with no change in the bilateral rates between the latter. These adjustments implied an upvaluation of the German mark by 1.01 percent, a devaluation of the Danish krone by 3.8 percent, and a uniform .97 percent devaluation of the other six currencies vis-a-vis the ECU.

Despite the success of the EMS in its early period, the system's more abmitious second stage--in which the use of the ECU as a reserve asset (instead just a unit of account for the purpose of central banks bookkeeping) is recommended--seems more difficult to implement as a result of Mittrand's election in France. The new French president proposes, for example, to reduce imports by reinforcing trade restrictions against Japan. That could ultimately disrupt relations with France's other traditional trading partners and jeopardize its commitment to European Economic and Monetary Union.

Summary

The major goal of abolishing all tariffs and other trade restrictions among member states, which was programmed in detail in the Rome Treaty, was successfully completed by 1968. Also, over the decade of the 1960s, the Common Agricultural Policy emerged as the "force motrice" of the European unification. The monetary crisis of 1968-69 gave the kickoff to discussion on definition and implementation of an Economic and Monetary Union. By 1970 a plan was ready--the Werner Report--which contained three parts: (a) reasons why new efforts are needed; (b) description of the ultimate goal; and (c) implementation of the plan by stages over 10 years, with specific measures to be taken on the first stage.

The Werner strategy was based on fixed exchange rates and the coordination of economic policies. It failed because of the demise of the Bretton Woods system, and because of the changing structures of the international monetary system (with challenges from Japan, OPEC, Korea, etc., to be added to the "dollars baladeurs"). Rising inflation and unemployment, coupled with stagnant economic growth and rising international tension did not push the nine deeper into each others' arms in the hope of forging joint solutions to their many economic difficulties. They chose instead to mark time, to look for national remedies, i.e., using the exchange rate as an instrument for balance of payments adjustment, which might rebound against them.

ENDNOTE

[1]Until 1970, 45 percent of EAGG financing was derived from levies collected on agricultural imports and the remainder from direct budgetary allocations from the member governments. Since that year, the EAGGF has comprised of agricultural import levies, customs duties, sugar levies, and an appropriate part of the Value Added Tax (VAT) collected by member governments. However, until 1978 this last source of revenue has not been forthcoming, and therefore, the share of "own resources" to cover total expenditures was only 66.9 percent, with the remainder to be covered by GNP-based contributions from the member governments.

CHAPTER III

POTENTIAL COSTS AND BENEFITS

Optimum Currency Area

To study the feasibility of the monetary union in Europe, economists developed the theory of optimum currency areas during the 1960s. They attempted to find economic conditions for a group of countries, like the European Community, among which it may be optimal to adopt a common currency.

For Mundell (1961), a currency area should be formed if there is a high degree of labor mobility within that area. McKinnon (1963) considered that a currency area should be formed by highly open economies, i.e., relatively high ratio of tradeable to non-tradeable goods. Kenen (1969) argued that countries with a high degree of product diversification are better candidates for forming a currency area. Ingram (1959; 1973), Scitovsky (1969), Whitman (1967), and Magnifico (1973) have suggested a high degree of financial integration, therefore a high degree of capital mobility among several countries as a criterion for optimum currency area. For Haberler (1970) and Fleming (1971) the similarity of inflation rates is the necessary condition to form a currency area. Tower and Willett (1970) emphasized that high degree of policy cooredination among nations is the relevant criterion for a group of countries to form a currency area. Vaubel (1976) agrued that the need for real exchange-rate variabilities must be regarded as the criterion of whether a given group of countries should adopt a

common currency or not; nations with large real exchange rate changes under flexible exchange rates would better refrain from currency unification. (For surveys of optimum currency areas, see Ishiyama (1975), Salin (1974), and Tower and Willett (1976).)

In all the above analyses attempts have been made to pinpoint economic conditions under which a group of countries may introduce a common currency among themselves such that the costs for individual country is zero (optimal for that country); little attention had been given to potential benefits of a common currency. The approach to European Monetary Union taken in this research is different from that of the optimum currency areas; we do not treat the question of monetary union as an optimality problem, but as a cost-benefit question. Assuming--based on a very long history of European desire to unify Europe--that an economic union has to be formed, we will ask what would be the potential costs and benefits of using a "monetarist" strategy, namely, a quick introduction of monetary union to enhance development toward full economic union. Our objective, therefore, is to enumerate the potential benefits and costs resulting from introducing a monetary union in Europe. The introduction of monetary union is facilitated if its cost, relative to its benefit, is negligible.

Meaning of Monetary Union

Before analyzing costs and benefits of the monetary union, it is appropriate to start with its definition. Monetary union is the final stage of a process of monetary integration. The main characteristics of monetary union would be a total and irrevocable fixity of exchange rate with zero margins of fluctuation, or establishment of a single currency. This is a necessary but not sufficient condition for a

complete union; it should also imply centralized monetary policy, a common external monetary policy, an integrated capital market, and adoption of regional policies on a Community level. However, in the interim period of the process of monetary integration, the various member countries could have their own central banks, and hence determine their own money supply or credit policies. Also in this interim period, the participants could choose a strategy of gradual elimination of margins of fluctuation in the hope of reaching a zero margin in the end-stage of the process of integration.

Benefits of Monetary Integration

Economic Union

The main argument in favor of monetary union is that, since it increases the degree of economic integration, it thereby improves the allocation of economic resources as markets are enlarged. Smith (1937) had long ago stated that the key to increased productivity was specialization, which in turn was limited by the extent of the market, and therefore, an increase in the market size would contribute to the rise in productivity. The market-size hypothesis, which states that with given natural resources and capital a higher level of manufacturing productivity can be attained in a wider market, could not be rejected by findings of an OECD study comparing 44 American and British industries (Paige and Bombach, 1959). Evidence supplied by OECD and some other studies suggest, as Balassa (1961) concluded, that:

> . . . under ceteris paribus assumptions, a wider market will make possible the attainment of higher levels of manufacturing productivity. As for the case of economic integration, this proposition implies that a fusion of national markets would improve the growth prospects of the participating countries (p. 116).

To summarize, the argument goes like this: A large market would make possible economies of scale in mass production and distribution, resulting in increased productivity and lower costs; large-scale producers would have easier access to sources of capital and bigger research and development budgets which would stimulate technical improvement and modernization. One of the main reasons that Europeans viewed a Common Market as an economic necessity was that the scale of technology had begun to outstrip the scale of the European nation-state to an extent that could not be ignored. The predominance of IBM and the weakness of European manufacturers of computers was an example of a need for a wider market. Therefore, monetary union in seen to enhance economic integration which in turn improves allocation of resources and economic efficiency so that individual welfare should increase in member countries. As Boyer de la Giroday (1974) has stated:

> The treaty establishing the European Economic Community derives essentially from the realization that the countries of Western Europe are no longer large enough for the economic welfare of population. The treaty seeks to go beyond the nation-state as the fundamental unit of production and trade (p. 9).

For liberal classical economists economic integration meant that individuals of member countries are free to enter into transactions with whoever offers the most acceptable terms, buyers may buy in the cheapest market, sellers may sell in the dearest market, workers may seek employment where rewards are most attractive, capital may flow to where expected returns are highest, etc. In the context of European union, economic integration is more encompassing than the liberal classical definition. In the discussion of EMU, although there is not a concensus of opinion regarding the meaning of economic integration, most observers, however, agree on the need for centralized decision

making on some economic objectives like full employment, price stability and growth, in addition to elimination of all kinds of trade barriers including exchange rates fluctuations. Since this research emphasizes the monetary arm of EMU, we will not spend more time on its economic arm which is in itself a more comprehensive area of research.

Common Currency

To see the benefits of a common currency among EC countries, the functions of money (medium of exchange, unit of account, store of value) will be discussed both under a flexible exchange rate and a monetary union among member countries.

The usefulness of money as a medium of exchange increases with the size of its transaction domain. Exchange rate flexibility increases transaction costs (i.e., brokers fees) and the time and trouble needed to convert one national money into another (i.e., currency conversion). Hence, on the basis of the usefulness of money as a medium of exchange, Tower and Willet (1976) argue, the world is the optimum currency area.

The most important function of money as a unit of account in international economics is to calculate comparative advantage for more than single transactions at the current instant in time. Advocacy of flexible exchange rates implies abandonment of the use of money as a unit of account for calculating comparative advantage (Kindleberger, 1972). Although the forward market may provide convenience to remove the exchange risk from particular transactions for fixed amounts, it has almost no relevance for removing risk from streams of expenditure and sales. For these, a single money is needed.

The third function of money is as a store of value which makes possible different time profiles in sales and purchases. Advocates of

flexible exchange rates, by assuming a large pool of stabilizing speculation with excellent prevision of the future, solve the problem of providing international money as a store of value. However, as we will discuss later, the empirical evidence on stabilizing speculation is mixed, and most observers agree that flexible rates tend to be unstable in the common sense meaning of moving up and down a lot from day to day, month to month, and year to year. A common currency for several countries would be a better store of value, because such a currency can command a wide selection of commodities that are free from price changes due to exchange rate changes.

In summary, there is nothing that flexible rates can do, regarding functions of money, that a common currency cannot do better.

Economy of Foreign Exchange Reserves

It is very likely that participants in a monetary union as a whole will need less international reserves than the sum of members' reserves (Salant, 1973). This is so because of the expansion of intra-community official borrowing facilities and improved adjustment through the operation of market forces on trade and private capital flows, including accommodating short-term flows. On the same ground, Mundell (1973) and Laffer (1973) point out to the possibility of a reduced need for international reserves in the process of European Monetary Unification. Their argument is based on the idea of spreading economic fluctuation over space and time. Mundell (1973) argues that the gains from a common currency system arise from opportunity it allows a country to redistribute the burden of random fluctuations through time. Laffer (1973) argues that the need for international reserves will decrease because external shocks tend to cancel each other out in accordance with the law of large numbers.

Preservation of Common Agricultural Policy

Many have suggested that a flexible exchange rate regime would have harmful effects on the functioning of the CAP, and since the CAP is seen as a kind of "force motrice" in the process of European integration, therefore they advocate monetary union for the survival of the CAP and the continuing drive toward European integration.

However, not all economists agree on the necessity of fixed rates to preserve CAP, as Johnson (1971b) argues:

> The chief European objection to this system (floating rate system) stems from the common agricultural policy. The argument is that changes in exchange rates among members confer a competitive advantage or impose a competitive disadvantage on one nation's farmers in competition with the farmers of other nations. This argument, however, is fallacious. If inflation is proceeding more rapidly in one member than in another, its farmers are being put at a steadily increasing competitive disadvantage by rising costs in conjunction with fixed product prices (p. 41).

Also, Salin (1974) argues that flexibile rates facilitate the objectives of the CAP. This is because, under flexible rates, price adjustment would be very gradual and insensible. However, the writer believes that the above objections are not sound, since in a monetary union we would expect that the inflation rates of member countries be approximately the same and that there is no room for sizable exchange rates adjustments which Salin (1974) argues are more harmful for the CAP.

Strengthening the International Monetary System

Van Ypersele (1979a) argues that a flexible exchange rate regime upsets international trade and business investment; on the other hand, the political reality of today's world would not permit a world-wide

parity system such as we knew in the days of Bretton Woods. He, therefore, advocates a sort of international monetary reform with two aspects. The first aspect will be to create large stable monetary zones throughout the world, within which more stable exchange rates can be maintained. Basically, three main zones are envisaged: a European zone, a yen zone, and a dollar zone. The second aspect envisages a reduction in exchange rate fluctuations between these three zones.

Countering Inflation

Advocates of monetary union argue that such a union will certainly lead to a common rate of price movement. Some even go further to argue that monetary union could help to break the present chronic inflarionary disorder (Jenkins, 1978).

The argument that monetary union could help to country the chronic inflationary disroder stems from the debate over influation under fixed and flexible rates. There are two main arguments suggesting that flexible rates have an inflationary bias compared with fixed rates (Crockett and Goldstein, 1976). The first major argument is based on the asymetrical or the so-called ratchet effects of changes in exchange rates. This inflationary bias arises because flexible rates imply more frequent exchange rate changes than do fixed rates, and since nominal prices in goods markets are inflexible downward, depreciations lead to domestic price increases in depreciating countries that are greater than the corresponding price declines in revaluing countries. (This argument is attributed to Laffer and Mundell by Wanniski (1974).) Crockett and Goldstein (1976) in a discussion of the empirical evidence on this point, concluded that, all things considered, the empirical evidence for the existence of ratchet effects is not particularly

compelling. Nevertheless, if these ratchets do exist--and the empirical evidence certainly does not preclude this possibility--the net price effect would seem to point to some inflationary bias for flexible exchange rates.

The second argument in which the exchange rate regime may affect inflation is usually referred to as the "discipline argument" and, as Crockett and Goldstein (1976) point out, even ardent supporters of flexible rates such as Sohmen (1963), Haberler (1964), and Yeager (1968) view this as perhaps the potent objection to a system of flexible rates.

The discipline argument is that under fixed exchange rates, the high-inflation country will, ceteris paribus, suffer a deterioration in its balance of payments and a loss of international reserves. And a persistent deficit will ultimately lead the high-inflation country to discipline itself by restraining aggregate demand so as to bring its inflation rate into line with that of its trading partners.

Under flexible rates, the immediate consequence for a high-inflation country would be a depreciation of its currency and a higher level of its nominal price; hence flexible rates will remove the balance of payments constraint in both surplus and deficit countries.

According to Crockett and Goldstein (1976) the validity of the discipline hypothesis rests essentially on two propositions: (a) that a fixed exchange rate regime will reduce the dispersion of inflation rates across countries, and (b) that such dispersion is narrowed more by reducing the inflation rate of high-inflation countries than by increasing the rate of low-inflation countries. After reviewing the empirical evidences on these propositions, Crockett and Goldstein (1976) concluded that empirical evidences do show an increase in the dispersion of inflation rates across countries since generalized

floating, and that the nature of adjustment under Bretton Wood did place a greater adjustment burden (discipline) on deficit that on surplus countries. Major countries that have been led to adopt restrictive domestic policies for balance of payments reasons under Bretton Wood are United Kingdom (1954-55, 1957, 1960-61, 1965-66), Italy (1963-64), Japan (1956-57, 1963-64, 1966-67), and France (1956-57).

Although the empirical evidence on the inflationary bias of flexible exchange rates is not compelling, we believe with Crockett and Goldstein that there does appear to be a case--resting more on a priori plausibility and past experience than on strong empirical evidence--for supposing that flexible exchange rates make it easier for inflationary pressures to arise and to be accommodated than do fixed rates.

Vicious and Virtuous Circles Hypothesis

Advocates of monetary integration are disenchanted with the adjustment process of floating exchange rates in Europe, particularly in United Kingdom and Italy on the one hand, and Germany (and Switzerland) on the other. It is argued, not only that flexible rates do not help the adjustment process in Europe but also they encourage a process of vicious and virtuous circles which exacerbate the discrepancies in inflation rates among European Community member countries and therefore block and set back progress towards European monetary and economic integration. (Discussion of vicious and virtuous circle hypothesis can be found in Lanfalussy (1979), Basevi and De Grauwe (1979), and Bilson (1979).) Briefly, the argument can be stated as follows: In high-inflation countries a decline in the exchange rate results, even before the slightest impact is felt on export volume, in an immediate

rise in the cost of essential imports such as energy and raw materials and thus aggrevates the internal inflation rate. This in turn may result in further depreciation of the exchange rate. These two phenomena follow and reinforce each other, setting in motion a cumulative process leading to a vertiable vicious circle. Conversely, in low-inflation countries an opposite "circle" takes place.

Many economists in Europe reasoning on the vicious circle line therefore advocate a renewed attempt at monetary integration in Europe. On the other hand, the critics argue that, although floating rates have not worked perfectly in Europe, the opposite thesis, namely, that fixed rates did not demonstrate a better environment for appropriate adjustment process.

Exchange Rate Instability and Its Costs

It is argued that exchange rate instability not only encourages the process of economic disintegration but also has detrimental effects on foreign trade and investment in Europe.

The debate over destabilizing speculation is an old one among economists. Nurkse (1944) argued that such an outcome was likely; on the other hand, Friedman (1953) has a theoretical argument that speculation must be stabilizing. With the advent of generalized floating in the 1970s, there is a renewal of interest in the subject in the literature. However, as a result of the controversy over theoretical arguments, the question seems at bottom an empirical one. And as Artus and Young (1979) point out, a good deal of evidence indicates, after six years of flexible rates, that such a system tends to be unstable in the common sense meaning of moving up and down a lot from day to day, month to month, and year to year. Moreover, as

Dornbusch (1976), Kouri (1976), Keran and Zeldes (1980), Bilson (1979) and others argue, the fact that asset markets move faster than goods markets, the immediate response of the exchange rate to a monetary policy change over-shoots the new long-run equilibrium rate.

Moreover, Van Ypersele (1979a) argues that the downward overshooting has led to inflationary pressures via increased import prices and wage indexation in some countries in Europe. These countries are afraid to allow their economy to grow faster, lest this expansion increase pressures on balance of payments, and cause a further currency depreciation. On the other hand, the upward overshooting will necessarily involve deflationary effects through decreased competitivity. Therefore, it is argued that the overshooting element in the vicious circle hypothesis has a deflationary impact on the whole in the EC members.

While most economists today agree that exchange rates are volatile in the common sense of the term, there is a controversy over the impact of such a volatility on the international trade and investment.

On the one side of this controversy are economists like Burtle and Mooney (1978) who, combining information on costs with direct survey of American businessmen, conclude that:

> . . . We come to the tentative conclusion that while the cost of doing business internationally has increased, this increase has not led to any serious cutback in the international operations of U.S. companies (p. 157).

The above tentative conclusion is also supported by econometric studies of Hooper and Kohlhagen (1978) and Carse, Williamson, and Wood (1980).

On the other side, economists like Van Ypersele (1979a) and Heller (1980) argue that exchange rate instability has an adverse impact on foreign trade and investment. It is argued that exchange

rate instability increases uncertainty in international transactions, therefore discouraging both foreign trade and international investment. The additional uncertainty associated with foreign trade could be related to the exchange rate risk and in the case of an importer, also to a price risk. While it may be possible to hedge against exchange risk, forward currency transactions cannot simultaneously protect the importer from both the exchange risk and the price risk (Chacholiades, 1978). Moreover, there are numerous situations where hedging becomes very difficult, if not impossible. Long-term commitments of capital through foreign direct investment would be an example. In this case, a stream of earnings dominated in a foreign currency might be anticipated, and even if hedging were possible, it would be prohibitively expensive. In summary, advocates of monetary integration conclude that exchange rate uncertainty tends to have an adverse impact on foreign trade and investment. It also reinforces protectionist pressures in Europe as is argued by Van Ypersele (1979a).

> . . . One can safely say that exchange rate fluctuations have managed to replace partly the old customs barriers in their negative effects on growth and the developing of a large European market and enterprises with such dimension. The dismantling of customs barriers and the progress towards integration was one of the elements of faster growth in Europe in the 1960s. The instability and uncertainty as to the exchange rate movements between Europe on currencies the last few years was felt to act as a brake on integration and growth (p. 11).

The above tentative conclusion of an adverse impact on trade is also supported by empirical studies. Masera (1976) in an econometric study finds an overall adverse impact of exchange rate movements on the volume of world trade during 1973. Abrams (1980) by using a single-equation econometric model, found that exchange rate uncertainty did have an adverse effect on international trade flows in the 1973-76

period. In a survey of U.K. entrepreneurs, Oppenheimer (1978) points out that U.K. businessmen seem to react more negatively than their U.S. counterparts to exchange rate instability. The Industrial Federations of the EC members, representing various business sectors in individual countries, came out unanimously in favor of a return to fixed parities and argued that only with the achievement of an EMU would fixed exchange rates be guaranteed once and for all (Tsoukalis, 1977).

Despite the absence of a strong evidence, the writer tends to conclud, on a priori basis, that trade has been inhibited by exchange rate fluctuations which also reinforced protectionist pressures in Europe, therefore halting the process of economic integration. Because of these adverse impacts of exchange rate fluctuations on economic integration in Europe, one should not be surprised at what has happened: The creation of European Monetary System in December, 1978.

Political Union

Because of the massive destruction during WWII, the European nations have shown, since 1945, a strong desire to avoid any future hostilities and have thus opted for much greater degree of integration. Therefore, monetary integration should not be interpreted narrowly as a relapse into the doomed world of pre-Smithsonian fixed exchange rates; rather, as Emerson (1979) argues, it should be interpreted as a strategic catalyst in the community's economic and political integration. The community has explicitly vowed to transform itself into a political entity. The strategy, therefore, is to induce member states into political entity. The process of monetary integration would lead in the course of time to a single European currency, a European central bank, and a European monetary policy--that is to some of the crucial

elements of political union. Some economists are very categorical on the above argument and say that "L'Europe se fera par la monnaie ou ne se fera pas."

Costs of Monetary Integration

Large-Scale Unemployment

The main argument against monetary integration in Europe is that some countries, especially those with high inflation rates, will end up with more unemployment than they desire, and therefore it is argued that these countries would resist any attempt toward monetary integration.

The above argument makes use of the Phillips curve concept. Consider two countries, A and B, each characterized by the same Phillips curve $P_{ab}P_{ab}$ (Figure 3). Country A has a preference for point a and B for point b on $P_{ab}P_{ab}$.

Now assume that A and B decide to form a monetary union by fixing their exchange rates. As A has a higher rate of inflation, it will develop a trade deficit with B. Exchange rates being fixed, either A has to deflate, therefore increasing the unemployment from U_a to U_b, or B has to inflate, therefore accepting a higher rate of inflation, or they can compromise and choose a point like C on $P_{ab}P_{ab}$. In that case, A will have more unemployment than it desires and B will have more inflation than it desires; therefore, it is argued because of different preferences among EEC countries, the formation of a monetary union will not be accepted by those countries who judge they are bearing too great a cost.

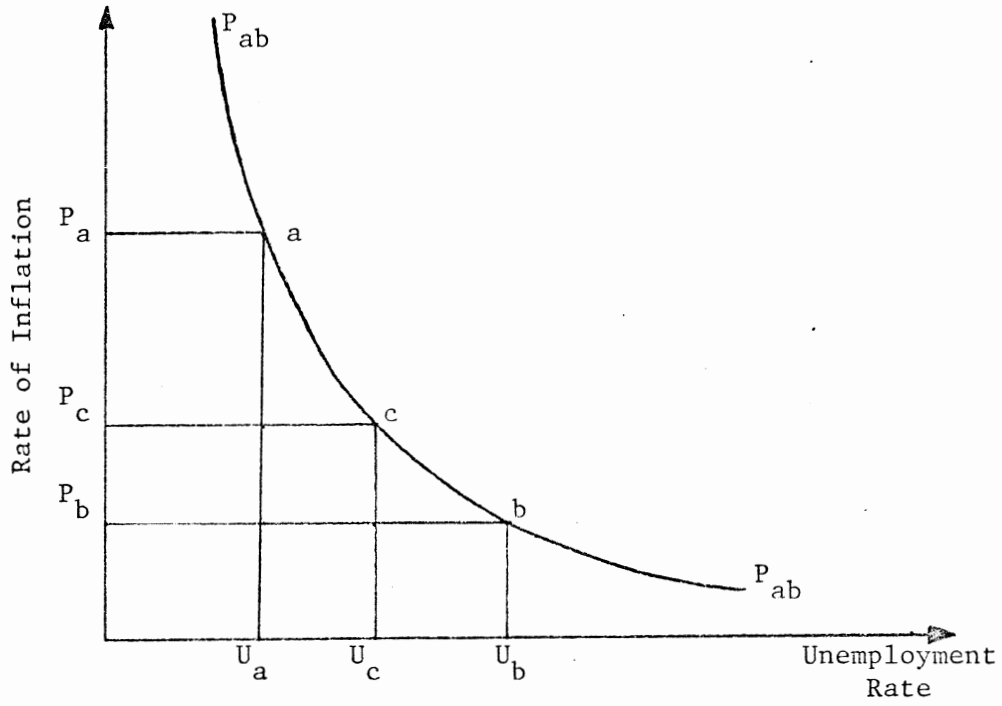

Figure 3. A and B Have the Same Phillips Curve

We can expand this analysis by considering the case where Phillips curves are not the same. In Figure 4, A is characterized by P_aP_a and B by P_bP_b as their respective Phillips curve. Country A prefers point a and B has a preference for point b before the introduction of monetary union.

The inflation rate being higher in B, to maintain the balance of payments equilibrium between themselves, either A has to revalue its money or B has to devalue its. If they form a monetary union by fixing their exchange rate, then the inflation rates must be "harmonized." This, however, does not necessarily mean that they must be equalized. As we will see in the next chapter, exchange rates are determined in the long run by both supply and demand for money.

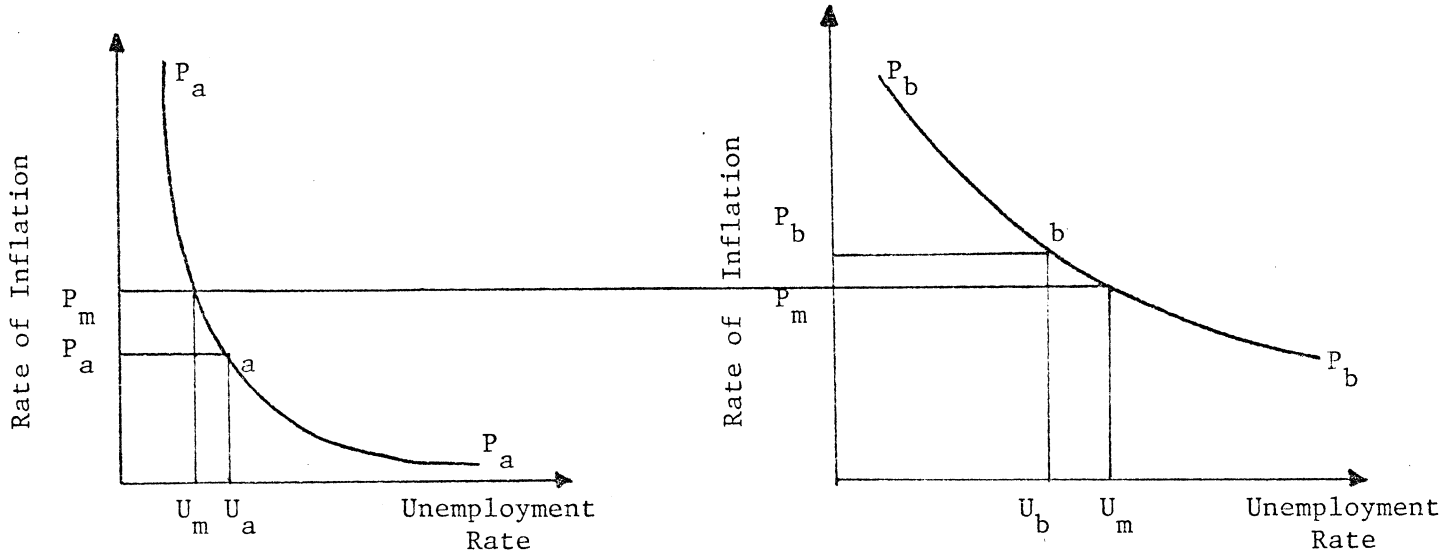

Figure 4. A and B Have Different Phillips Curves

Assume for simplicity that harmonization is achieved by equalizing the inflation rates in both countries; suppose this common rate of inflation is given by P_m. Therefore, when monetary union is formed, both countries find themselves in a less favorable position on their respective Phillips curves and as a result each government perceives a cost associated with participating in a monetary union. For example, the perceived cost for B of joining a monetary union would be the increase of unemployment rate from U_b to U_m. Although there is a benefit of decreasing the inflation rate from P_b to P_m, country B judges the cost of higher unemployment to outweigh the benefit of lower inflation, and if this net perceived cost to B is very large, country B will resist joining the monetary union. The same argument could also be made for country A.

In summary, the critics of monetary union argue that abandoning exchange rate flexibility would force a country to use internal policies in order to correct an external disequilibrium; therefore, the loss of the exchange rate instrument would not be acceptable for some countries which assess such a cost very high.

It is the purpose of this research to show, by using a model of the monetary approach to exchange rate determination, that exchange rates are mainly monetary phenomena and could not have a lasting effect on real variables (unemployment) in ECC countries. If exchange rates are mainly monetary phenomena, then the main objection to monetary union would be weak. Therefore, the governments' perceptions of the cost of joining a monetary union should decrease. Once this favorable economic environment to monetary union is realized, the introduction of such a union will be facilitated. (For a critic of the

monetary union, see Corden (1972), Aliber (1972), Fleming (1971), Magnifico (1971), Johnson (1971) and Salin (1974).)

CHAPTER IV

MONETARY APPROACH TO THE BALANCE OF PAYMENTS

Introduction

The so-called "monetary approach" to the theory of the balance of payments is an alternative to the "elasticity approach", the "absorption approach", and various other Keynesian approaches which may be termed "the foreign-income multipler approach" and "the Meade-Tinbergen-Keynesian economic policy approach". (The meaning of these approaches are summarized by Johnson (1977).) The Monetary Approach, originated by Polak (1957), Polak and Boissoneault (1960), Polak and Argy (1971) at the International Monetary Fund and developed in the 1960s and early 1970s by Mundell (1968) and Johnson (1972) concentrates less on the employment effects of devaluation and more on its monetary nature. According to "monetarists", stabilization policy cannot influence the real long-term equilibrium position; only the price level is influenced, when the exchange rate is fixed.

Some Fundamental Propositions of the Monetary Approach

1. The crucial balance of payments concept is one that shows the effect of a balance of payments deficit or surplus on domestic monetary base. Since only transactions considered below the line are directly related to monetary base, for "monetarists" the crucial balance of payments consideration is the official settlements balance. In this

sense, the balance of payments is an essentially monetary phenomenon. An assumption which, often implicitly, forms the basis of the elasticity approach and the other subsequent approaches is that the monetary consequences of a disequilibrium of the balance of payments are completely neutralized. In the monetary approach, on the other hand, it is precisely a full effect of these monetary consequences on the money supply that is assumed.

2. A second proposition in the monetary approach maintains that balance of payment disequilibrium is the result of the discrepancy in the domestic stock demand for and supply of money. As Kreinin and Officer (1978) explain, a balance-of-payments surplus, according to monetary approach, occurs when the demand for money exceeds the money stock. If the excess demand for money is not satisfied from domestic sources, funds will be attracted from abroad to satisfy it. A deficit reflects excess supply of money as a stock. When the stock of money exceeds the demand for money balances, people try to get rid of the excess supply by increasing purchases of foreign goods and services, by investing abroad, or by transferring short-term funds abroad to acquire foreign assets. In this manner an excess demand for or supply of money may be cleared through the markets for goods, services, or securities.

3. A third proposition maintains that balance-of-payments disequilibria are inherently temporary and self-correcting. Any balance of payments disequilibrium or exchange rate movement reflects a disparity between actual and desired money balances and will automatically correct itself, provided that a stable demand for money exists.

As Kreinin and Officer (1978) point out, the feature responsible for the self-correcting is that the money demand function is considered as a stock demand and not as a flow. A surplus--the result of an excess domestic demand for money--will continue only until the inflow of foreign funds raise the stock of money to the level necessary to satisfy the demand. A deficit will continue only until the outflow of funds reduces the money stock to the level of desired money balances. However, if the monetary authorities pursue a sterilization policy, then continuous deficit or surplus are possible.

4. The monetary approach is concerned primarily with the long-run. However, as Mussa (1976) points out, if the long-run consequences take a decade to materialize, then monetary approach will not be very useful. Therefore, the advocacy of a monetary approach to the balance of payments necessarily involves the assertion that the longer-run consequences materialize within a time horizon of two or three years.

Assumptions of the Monetary Approach

1. The essential assumption of the monetary approach, like the restated quantity theory of money is that there exists a stable demand for money.

2. A second implicit assumption in the "monetarists" writing is the endogeneity of money supply under a fixed exchange rate regime, so that a country cannot pursue sterilization policies over a long period; and its exogeneity under flexible exchange rates.

3. Another assumption is that the economies concerned are characterized by a situation of full employment. As Frenkel and Johnson (1976) argue:

> . . . The assumption of normally full employment reflects the passage of time and the accumulation of experience of reasonably full employment as the historical norm rather than the historical rarity that Keynes' theory and left-wing Keynesian mythology made it out to be (p. 25).

4. An efficient world market for goods, services, and securities is assumed. An implication of this assumption under a system of fixed exchange rates is that the long-run price levels and interest rates in all countries must move in line with one another. Under a system of freely floating rates, price levels could move at different rates between countries. However, as Kemp (1978) points out, the impact of these differential rates of change on individual relative prices between countries is offset by opposite movement in exchange rates.

Notice that the monetary approach does not imply that the balance of payments deficits or surplus are the result only of monetary policies. Other factors--i.e., OPEC pricing decision, trade and capital controls, fiscal policies, interest rates, level of income, etc.--matter to the extent that these factors have an effect either on the demand for or supply of money.

The Monetary Approach to Exchange Rate Determination

According to monetary approach, the exchange rates are regarded as the relative prices of different national monies. They are determined by equilibrium conditions between demand for and supply of the stock, rather than flows, of different national monies. Frenkel (1976) states the basis of the theory in the following words:

> Being a relative price of two assets (moneys), the equilibrium exchange rate is attained when the existing stocks of the two monies are willingly held. It is reasonable, therefore, that a theory of the determination of the relative price of two monies should be stated conveniently in terms of the supply of and demand for these moneys (p. 201).

The conclusions reached under fixed exchange rates is easily converted into a theory of exchange rate under freely flexible rates. As Mussa (1978) argues, under floating rates, the foreign component of money supply is fixed. Hence, if there is a change in one of the arguments of the money demand function or in the domestic component of the money supply, equilibrium cannot be achieved by changes in the foreign component of the money supply. Instead, the exchange rate adjusts to bring money demand into equilibrium with money supply.

According to the monetary approach, the exchange rate between two countries is determined by a relationship between the price levels of the two countries, which in turn depends, in each country, on the relation between the desired and actual stock of national money. Since the demand for money is a function of real income, interest rate and the price level, all these variables--along with expectations--enter into the monetary approach model of exchange rate determination.

Policy Implications

Assume real income in country A increases, the conventional prediction, all other things being held constant, is that under fixed exchange rates A's balance of trade deteriorates and under flexible rates A's exchange rate depreciates. The monetary approach's prediction is diametrically opposed to the conventional prediction. According to the monetary approach, as real income increases, people would like to hold more cash balances, given money supply. This increased desire for cash balances is satisfied under a fixed exchange rate by attracting funds from abroad (balance of payments surplus) and by A's exchange rate appreciation under a flexible rate regime.

Another diametrically opposed conclusion of the monetary approach is the relationship between interest rates and exchange rates. According to conventional analysis, low interest rates are associated with weak currencies and high interest rates with strong ones. This view, as Keleher (1980) points out, is correct under conditions of price stability, where a decrease in the central bank's discount rate represented a decrease in the real cost of borrowing and therefore led to an expansion of domestic credit. This in turn led to flows of funds out of country, hence the positive association of low interest rates and weak currencies. Under the circumstances of high growth rates of money as well as high rates of inflation, a different theoretical framework is appropriate. As "monetarists" point out, the fundamental determinant of a country's exchange rate is its growth rate of excess money and, hence, its own inflation rate relative to the analogous growth rates of excess money and inflation elsewhere. Under a flexible exchange rate as excess money grows faster in country A than in country B, the inflation rate would be higher in country A than in country B; this in turn will tend to lower A's currency value relative to B. Moreover, inflationary expectations will quickly dominate interest rate movements, and interest rate in country A should rise. Therefore, according to monetary approach, high interest rates are associated with weak currencies and low interest rates with strong currencies (the opposite of conventional view). Under a fixed exchange rate regime, an increase (decrease) in the domestic rate of interest results in a decrease (increase) in the demand for money. The stock equilibrium in the money market is restored through a balance of payments deficit (surplus) (again the opposite of conventional view).

Devaluation--according to the conventional view--a devaluation of A's currency relative to B's currency usually causes A's national income and employment to increase and B's national income and employment to fall. The implication is that countries should play the game of beggar-thy-neighbor in time of unemployment. Therefore in this view the use of exchange rate changes is seen as an important policy variable to cure unemployment.

According to the monetary approach to balance of payments, exchange rate changes are incapable of bringing a lasting effect on employment; according to this view a devaluation riases tradeables prices in devaluing country. This increase in prices is due to the hypothesis of an efficient world market for tradeable goods. Higher prices of tradeable goods results in an increase in desired cash balances (excess demand for money in stock terms). The excess demand for money is satisfied by attracting funds from abroad, thus, a balance of payments surplus, other things being equal. This balance of payments surplus raises gradually the real value of cash balances which, in turn, results in a gradual buildup of excess demand for nontradeable goods. Price increases for these, and presumably also for wages.[1] The resulting balance of payments surplus continues only until the stock money-market equilibrium is restored. Therefore, the effect of devaluation is strictly transitory. In the long run, devaluation has no effect on real economic variables: it only raises the price level.

Implication for Monetary Union

If exchange rates are mainly monetary phenomenon and are determined mainly by the demands and supplies of stocks of different national monies, factors which appear to give support to the use of

exchange rate changes should be considered for the most part as illusory. Indeed, if exchange rate changes are incapable of causing an effect on employment other than in the short run, and knowing that the frequent use of exchange rate depreciation will make the short run always shorter, then the loss of an exchange rate instrument for a country would be acceptable in view of sizable benefits resulting from monetary union. (For benefits of monetary union, see Chapter III.)

An implication for monetary union is the rule for coordination of member countries' monetary policies. Since the long run demand for money is a stable function of a few variables, and these variables are independent of the factors that influence the money supply, then the rule governing the coordination of national economic policies reduces to a rule governing the coordination of the supply of national monies.

As we will see later in this chapter, the exchange rate is determined by the following equation:

$$X = \frac{K^*}{K}\left[\frac{M/Y}{M^*/Y^*}\right]\left[\frac{(i^*)^a}{i^a}\right]$$

where X is the exchange rate, M, Y, and i are money supply, real output, and interest rate, respectively, and a is the interest elasticity of demand for money. If members of a monetary union pursue dissimilar monetary policies, resulting in divergent money/output ratios, then either the exchange rate has to be changed as indicated by the first bracket (and through creation of divergent inflation expectation as indicated by second bracket), or if member countries keep their exchange rates fixed, they will develop balance of payments disequilibria. Therefore, the rule governing the coordination of national economic policies reduces to coordination of monetary policies between member

states so as to keep the members' money/output ratios constant or growing at the same rate. Fiscal policies do not need to be coordinated. There is room for the development of independent fiscal policies to deal with regional problems of depression. However, independent fiscal policies must be such that the rule concerning national monetary policies is not violated, in other words, independently formulated fiscal policies would have to be financed in private markets. Since according to the monetary approach, the ptential short-run benefits of divergent monetary policies quickly evaoprate and monetary deviations are consequently pushed into nominal adjustments of prices and exchange rates, therefore coordinating monetary policies does not involve large-scale unemployment as the critics of monetary union argue.

The Model

In order to test the monetary approach to exchange rates determination, we will use a variant of the Humphrey and Lawler (1978) model to explain movement in exchange values of EEC countries during the period of flexible exchange rates running from roughly 1974 through 1979.

The model consists of two hypothetical national economies represented by a set of equations containing the following variables. Let M be the nominal money stock (assumed exogenous) and m the demand adjusted rate of growth of that stock, i.e., the difference between the respective growth rates of the nominal money supply and real money demand, this difference by defintion being equal to the rate of price inflation. Furthermore, let D be the real demand for money, i.e., the stock of real cash balances that the public desires to hold, Y the exogenous real income, and i and r, the nominal and real rates of

interest, respectively. Also, let X be the exchange rate (domestic currency price of a unit of foreign currency), P the price level, and E the expected future rate of price inflation. Asterisks are used to distinguish foreign-country variables from home-country variables, and the subscript w denotes the entire world economy.

The first part of the model consists of monetary equilibrium equations, one for each country:

$$P = \frac{M}{D} \qquad \text{and} \qquad P^* = \frac{M^*}{D^*} \tag{1}$$

stating that the price level in each country equates money supply and demand by deflating the real value of the nominal money stock to the level people desire to hold. This, of course, is the quantity theory of money.

National demand for money functions constitutes the second part of the model, written as follows:

$$D = K\,Y\,i^{-a} \qquad \text{and} \qquad D^* = K^*Y^*i^{*-a} \tag{2}$$

These equations express the public demand for real cash balances as the product of a constant K and two variables, namely, real income and nominal interest rate. The parameter -a is the interest elasticity of demand for money. For simplicity, the numerical magnitude of the interest elasticity parameter is assumed to be the same for both countries. For the same reason, the income elasticity of demand for money is assumed to possess a numerical value of unity.

The third equation of the model is the purchasing power parity relationship:

$$P = XP^* \tag{3}$$

showing how national price levels are linked together via exchange rate. As indicated by the equation, prices in both countries are identical when converted into a common currency unit at the equilibrium rate of exchange. This assumption can be justified (and will be tested in the next chapter) on the ground that the marked increase in intra-community trade and capital flows over the past 30 years has enforced a high degree of parallelism in national price and cost trends of the member countries, when measured in a common numeriare.

The fourth group of relationships in the model are nominal interest rate equations, one for each country, written as follows:

$$i = r + E \qquad \text{and} \qquad i^* = r^* + E^* \tag{4}$$

They define the nominal interest rate as the sum of the real rate of interest and the expected future rate of inflation, the latter variable being the premium added to real yields to prevent their erosion by inflation.

The fifth equation expresses the interest-parity condition:

$$r = r^* = r_w \tag{5}$$

according to which the real rate of return on capital assets tends to be everywhere the same and independent of the currency denomination of the asset. This equation reflects the hypothesis of a hihgly integrated efficient world market.

Completing the model are price expectations equations that describe how the public forms its anticipations of the future rate of inflation:

$$E = m = \frac{\dot{M}}{M} - \frac{\dot{D}}{D} \qquad \text{and} \qquad E^* = m^* = \frac{\dot{M}^*}{M^*} - \frac{\dot{D}^*}{D^*} \tag{6}$$

The price expectations equations state that the expected rate of inflation, E, is equal to the demand-adjusted rate of monetary expansion m, i.e., the different between the respective growth rates of the nominal money supply and real money demand.

Taken together, the foregoing relationships constitute a simple seven-equation model of exchange rate determination. The model is summarized below:

$$P = \frac{M}{D} \quad \text{and} \quad P^* = \frac{M^*}{D^*} \tag{1}$$

$$D = K\ Y\ i^{-a} \quad \text{and} \quad D^* = K^*Y^*i^{*-a} \tag{2}$$

$$P = XP^* \tag{3}$$

$$i = r + E \quad \text{and} \quad i^* = r^* + E^* \tag{4}$$

$$r = r^* = r_w \tag{5}$$

$$E = m = \frac{\dot{M}}{M} - \frac{\dot{D}}{D} \quad \text{and} \quad E^* = m^* = \frac{\dot{M}^*}{M^*} - \frac{\dot{D}^*}{D^*} \tag{6 and 7}$$

To repeat Humphrey and Lawler (1978, p. 139):

> The foregoing equations imply two unidirectional channels of influence--one direct, the other indirect--running from money and income (both exogenous variables) to prices to the exchange rate. Regarding the direct channel, the model implies that both exogenous variables affect prices and the exchange rate directly through monetary equilibrium and purchasing power parity equations. As for the indirect channel, the model implies that the rates of growth of the exogenous variables influence prices and the exchange rate indirectly via price expectations component of nominal interest rate variable that enters the demand for money function. More specifically, the model postulates the following causal chain:
>
> 1. The demand-adjusted money stock growth rate determines the expected rate of inflation.
>
> 2. Given the real rate of interest, the expected rate of inflation determines the nominal rate of interest.

3. The latter variable, together with the given level of real income, determines the demand for money.

4. Given the demand for money, the nominal money stock determines the price level.

5. Finally, the two price levels, foreign and domestic, together determine the exchange rate.

Substituting equations 1 and 2 into equation 3 and solving for the exchange rate, we get the following "reduced form" expression:

$$X = \left[\frac{K^*}{K}\right]\left[\frac{M}{M^*}\right]\left[\frac{Y^*}{Y}\right]\left[\frac{i}{i^*}\right]^a \tag{7}$$

Using equations 4 through 6, equation 7 can be alternatively expressed as

$$X = \left[\frac{K^*}{K}\right]\left[\frac{M}{M^*}\right]\left[\frac{Y^*}{Y}\right]\left[\frac{r+m}{r^*+m^*}\right]^a \tag{7'}$$

Equation 7 or 7' collects the determinants of the exchange rate into three groups, namely, relative money supply, relative real income, and relative nominal interest rates comprised of a fixed real rate component and a variable price expectations component. Of these groups, the first captures purely monetary influences on the exchange rate, while the second and third capture real and expectational influences, respectively.

Regarding monetary influence, the model predicts that the home country's exchange rate will depreciate (appreciate), if its money stock grows faster (slower) relative to the foreign country. Regarding real influence, it predicts that the home country's exchange rate will depreciate (appreciate), if its real income grows slower (faster) relative to the foreign country.

As for expectational influences, the model predicts that a rise (fall) in the expected rate of inflation in one country--as reflected

in its interest rate--relative to the other will cause the former's currency to depreciate (appreciate) on the foreign exchanges.

In order to make empirical application, equation 7 will be transformed into linear form by expressing the variables as logarithms. The resulting log-linear version of equation 7 is written as:

$$\ln X = a_0 + a_1 (\ln M - \ln M^*) + a_2 (\ln Y^* - \ln Y) + a_3 (\ln i - \ln i^*) \tag{8}$$

where ln stands for the logarithm of the attached variable and the a's are coefficients to be estimated from the statistical data. As is implied by equation 7, the a priori expected values of the coefficients attached to money and income variables are unity, whereas the coefficients attached to the interest rate variables should be between zero and .5, consistent with previous empirical estimates of the interest elasticity of demand for money.

Since quarterly data will be used in this research and the full effect of income and monetary variables on exchange rates take more than one quarter, because households must change their consumption habits and firms must change their production patterns, the researcher believes it is more appropriate to assume that the effect of income and monetary variables are distributed over four quarters. In contrast, exchange rates adjust relatively quickly to changes in interest rates. Therefore, equation (8) is modified as follows:

$$\ln X = a_0 + \sum_{n=1}^{4} a_n (\ln M - \ln M^*) + \sum_{m=1}^{4} a_m (\ln Y^* - \ln Y) + a_3 (\ln i - \ln i^*) \tag{9}$$

Equations (8) and (9) will be estimated with ordinary least square (OLS) using a polynomial distributed lag (PDL) for various EC countries.

ENDNOTE

[1]The impact effect for nontradeables is ambiguous; the fall in the relative price of nontradeables tends to create excess demand for these, while the fall in the real value of cash balances operates in the opposite direction. However, the positive effects on excess demand will gradually dominate as the real value of money balances are built up by way of the balance of payments surplus.

CHAPTER V

EMPIRICAL RESULTS

Introduction

Chapter IV presented the theoretical framework for analyzing the monetary model of the exchange rate. In this chapter, we present the statistical findings of the study. Since a very important and controversial assumption of the model developed in Chapter IV is the concept of purchasing power parity, we first test the assertion that movements in relative inflation and in exchange rates are correlated with one another (equation 3 of the model), and then estimate the model for various members of the community.

Purchasing Power Parity

The concept of Purchasing Power Parity was developed by Cassel (1921) who wrote:

> The purchasing power parities represent the true equilibrium of the exchanges, and it is of great political value to know those parities. It is in fact to them we have to refer when we wish to get an idea of the real value of currencies whose exchanges are subject to arbitrary and sometimes wild fluctuations (p. 38).

A thorough discussion of the concept is given by Balassa (1964), Officer (1976), and Katselipapaefstratiou (1979).

Very briefly, in its absolute version, the purchasing power parity implies that the equilibrium value of the exchange rate between the currencies of any pair of countries should be equal to the ratio of the

countries' price levels; in its relative version, it implies that the rate of change of the exchange rate should be equal to the difference in the rate of inflation.

There are many ways of presenting the evidence on purchasing power parity relationship. Recent empirical studies have increasingly used regression technique as the major methodological tool. In this research we present the evidence on PPP by using spectral analysis as the major tool; as Granger (1977) points out:

> The natural measure of the extent to which two variables are related is the coherence function from cross-spectral analysis, and the size and shape of this function is unaffected by applying filters to the two series involved (p. 22).

An Outline of Spectral Analysis

The main purpose of spectral analysis is to examine the variability of a series for different frequencies. (For more detail, see Granger and Hatanaka (1964).) This contrasts with ordinary statistical analysis, which examines the variability of the entire series. Spectral analysis decomposes each stationary time series into a set of frequency bands. The object of the analysis is to measure the relative importance of each frequency band in terms of its contribution to the variance (called power) of the entire series. When we plot the variance against frequency, we have a "power spectrum". The concept of variability, however, leads to the notion of covariability or correlation between two series. In spectral analysis, the measure of covariability between two series is given by the "coherency". Coherence measures the linear correlation between the two components of the bivariate process at different frequency bands and is analogous to the square of the usual correlation coefficient. The greater the coherence the greater

the correlation, two series that have a coherence of 1.0 implies that, at the particular frequency used, the series are not different. On the other hand, if the coherence coefficient is zero, the two series are said to be totally uncorrelated. (For a mathematical presentation of spectral analysis, see Appendix C.)

The Empirical Results on PPP

To investigate the relationship between exchange rates and relative prices among EC countries, we will use monthly data from 1974.01 to 1979.12. The choice of the base year is rationalized on the ground that the Bretton Wood era officially ended in 1973. The choice of the terminal year preferably is the end of 1978 when the new European Monetary System came into being, however, since in spectral analysis a large number of observations is needed, the terminal year therefore is chosen to be the end of 1979, so that we have 72 observations, large enough for spectral estimations. As regard to the choice of the price index, the consumer price index is used in the rest of this chapter. Finally, bilateral exchange rates will be used for all the empirical studies in this chapter. The following notations for exchange rates and relative prices are used:

XJK = exchange rate between country J and country K, defined as J's currency price of a unit of K's currency.

PJK = relative price between country J and K, defined as the consumer price index of country J over the consumer price of country K (P_J/P_K).

J and K = B, D, F, G, I, N, UK

where B, D, F, G, I, N, UK represent Belgium, Denmark, France, Germany, Italy, Netherlands, and United Kingdom, respectively. For example, XGF denotes the price of one French Franc in D-Mark (D-Mark per French

Franc); and PGF denotes the ratio of the $\frac{\text{Germany}}{\text{France}}$ consumer price indices.

Our task is to examine the coherency of XGK with PGK (Germany being the home country, K = B, D, F, I, N, UK) and the coherency of XFK with PFK (France being the home country, K = B, D, G, I, N, UK). Since the interpretation of the coherency can be fraught with danger unless one uses stationary time series, the first step therefore is to plot XGK and PGK against the time. This is demonstrated by Figures 5 through 10 where time is represented on the horizontal axis (72 monthly observations from 1974-01 to 1979-12) and XGK and PGK on the vertical axis. The exchange rate (XGK) is scaled to equal approximately the relative prices (PGK).

Figures 5 through 10 reveal that the XGK and PGK series have a trend thus indicating the need to detrend these series before estimating the coherence coefficients. (The plot of XFK and PFK against the time also showed trends in XFK and PFK, therefore, indicating the need to detrend these series also.) One method suggested by Granger and Newbold (1974) and used in this research, is to build single models for each series, using the method of Box and Jenkins, and then searching for relationships between series by relating the residuals from these single models. The approach taken in this research, therefore, is to identify and estimate autoregressive integrated moving average models, ARIMA, to the various series (XGK, PGK, XFK, PFK); and then estimate the coherence functions between the residuals from these single models. (Since an examination of the autocorrelation functions did not reveal strong seasonality in the series, we consider models of the general ARIMA form.)

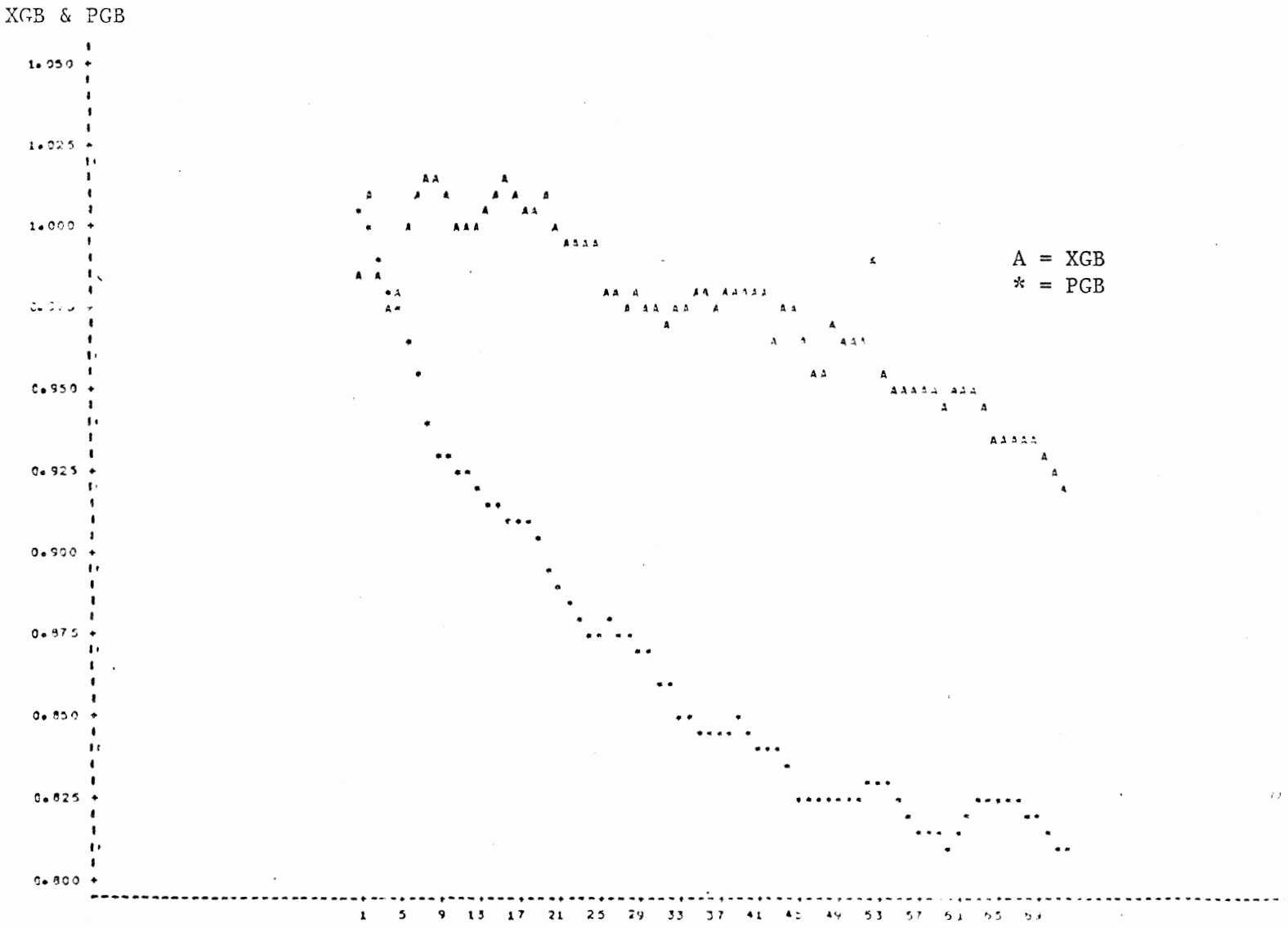

Figure 5. Monthly Observations of XGB and PGB: 1974-01 through 1979-12

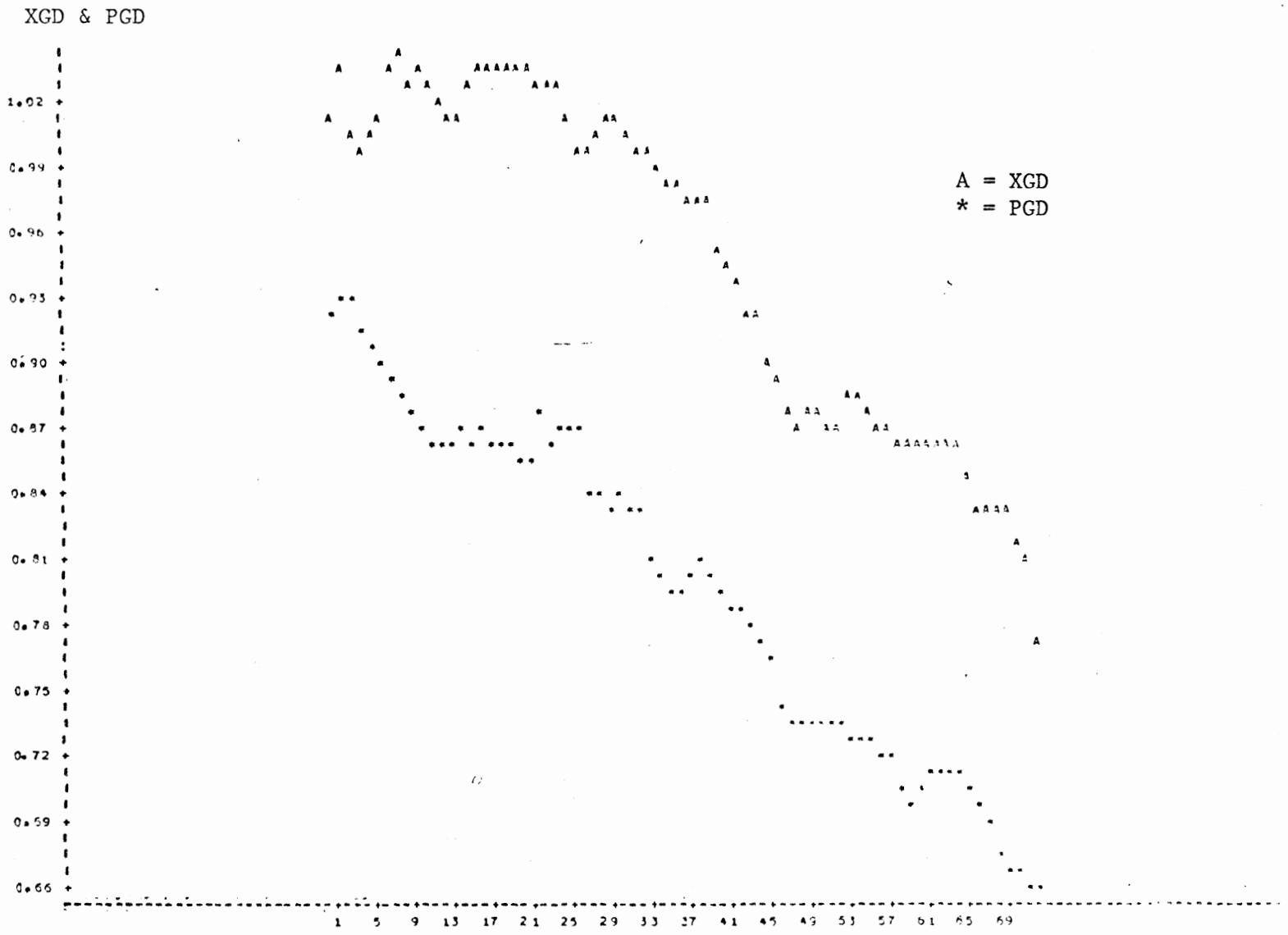

Figure 6. Monthly Observations of XGD and PGD: 1974-01 through 1979-12

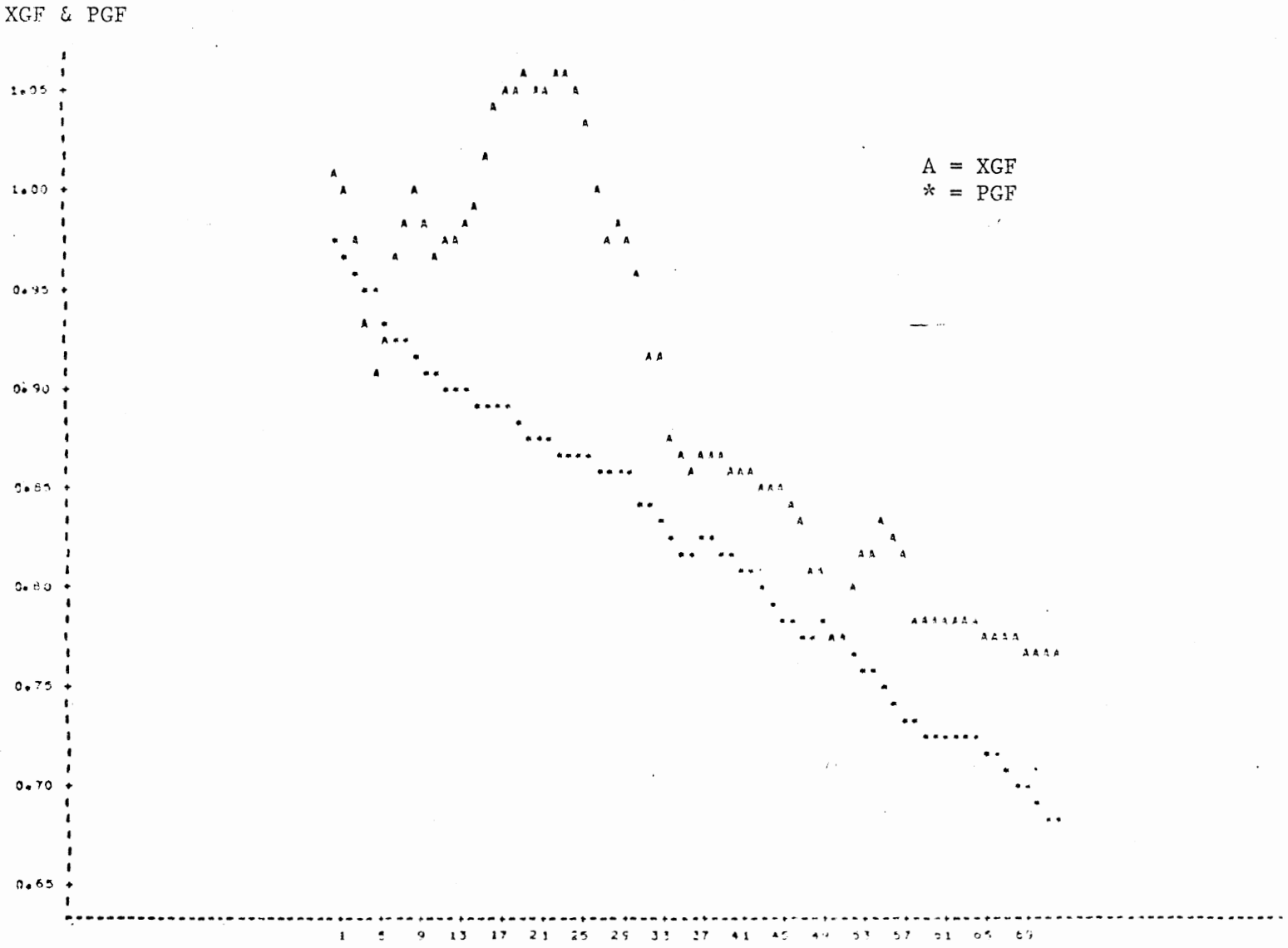

Figure 7. Monthly Observations of XGF and PGF: 1974-01 through 1979-12

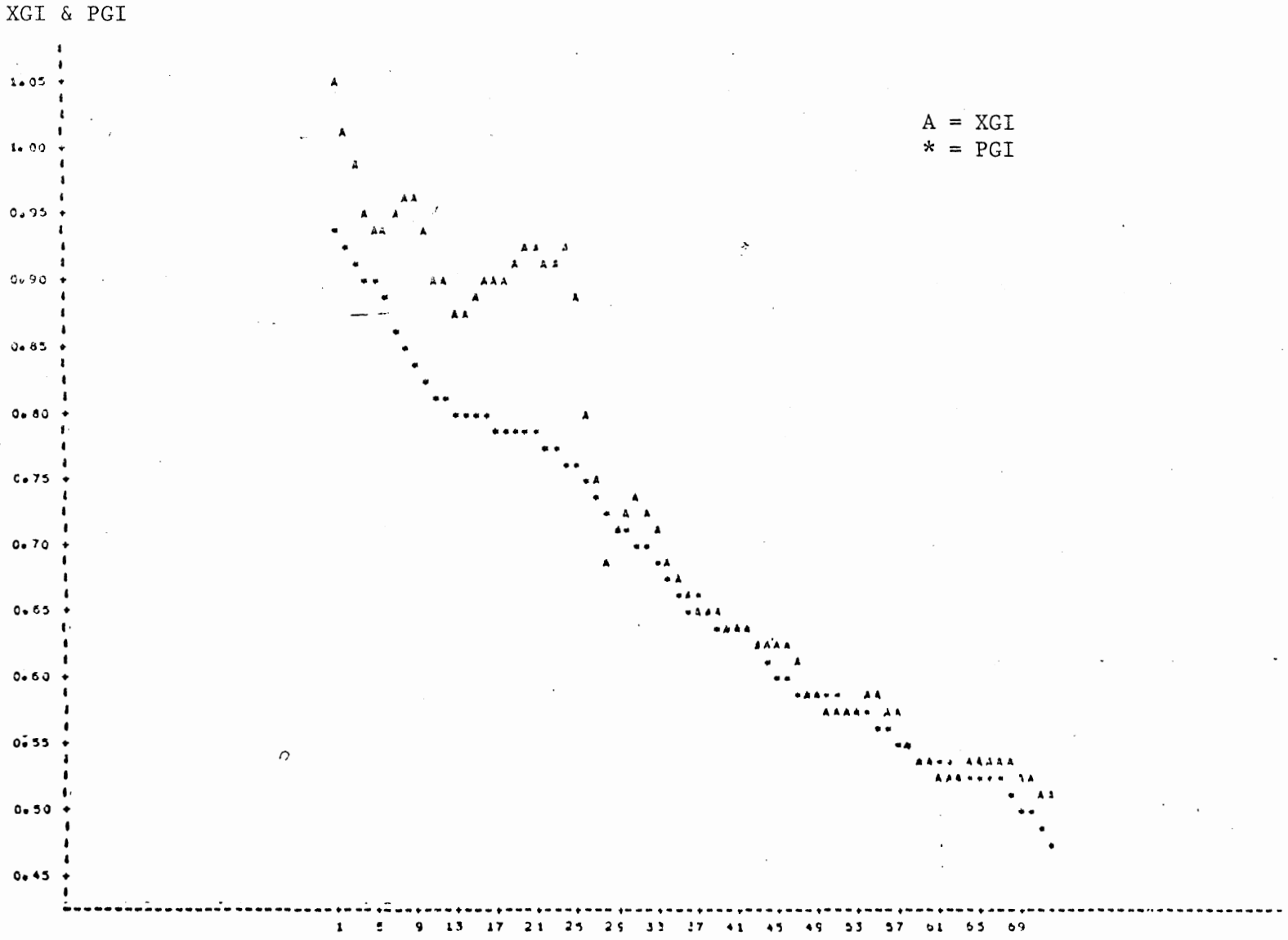

Figure 8. Monthly Observations of XGI and PGI: 1974-01 through 1979-12

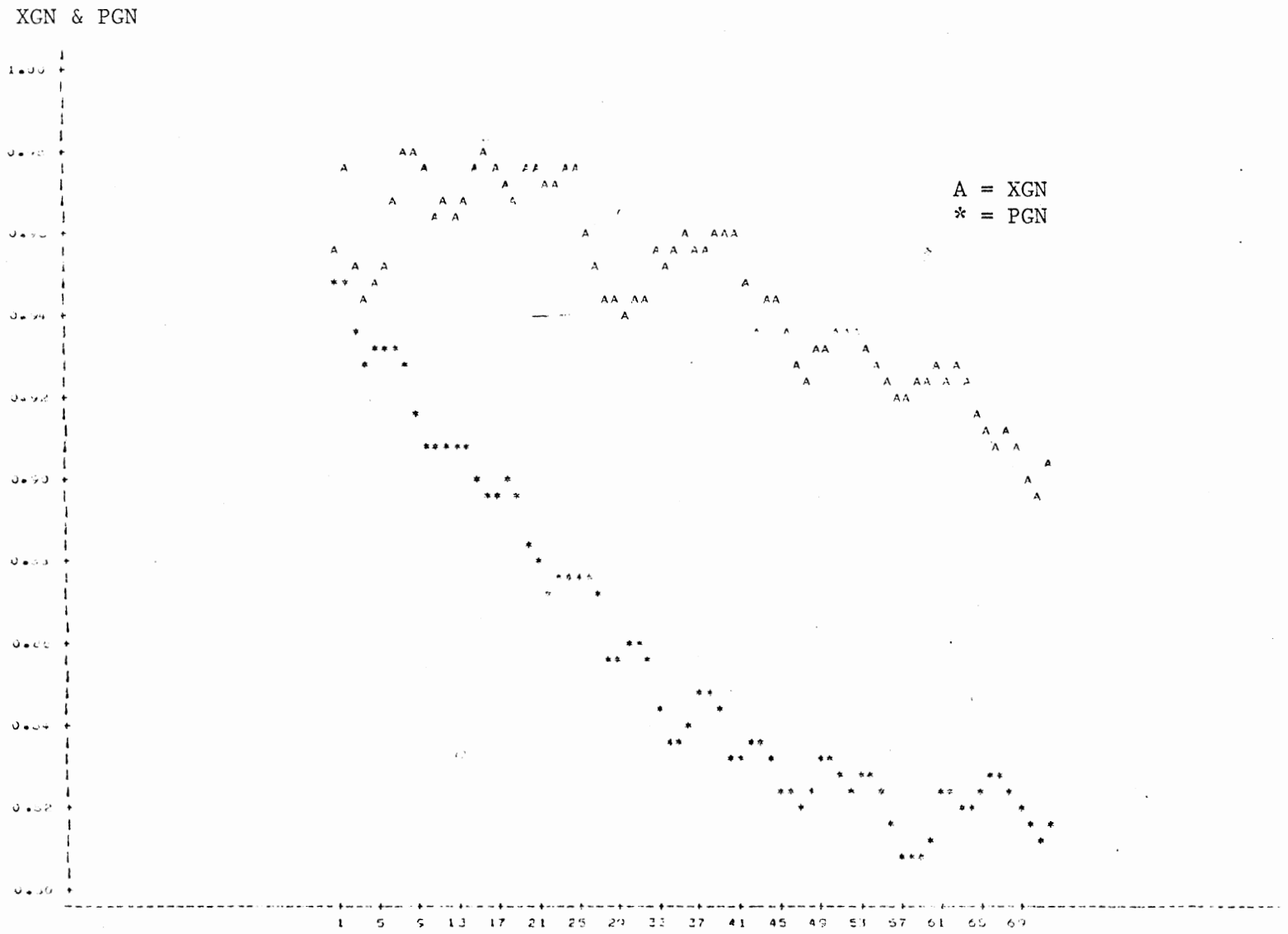

Figure 9. Monthly Observations of XGN and PGN: 1974-01 through 1979-12

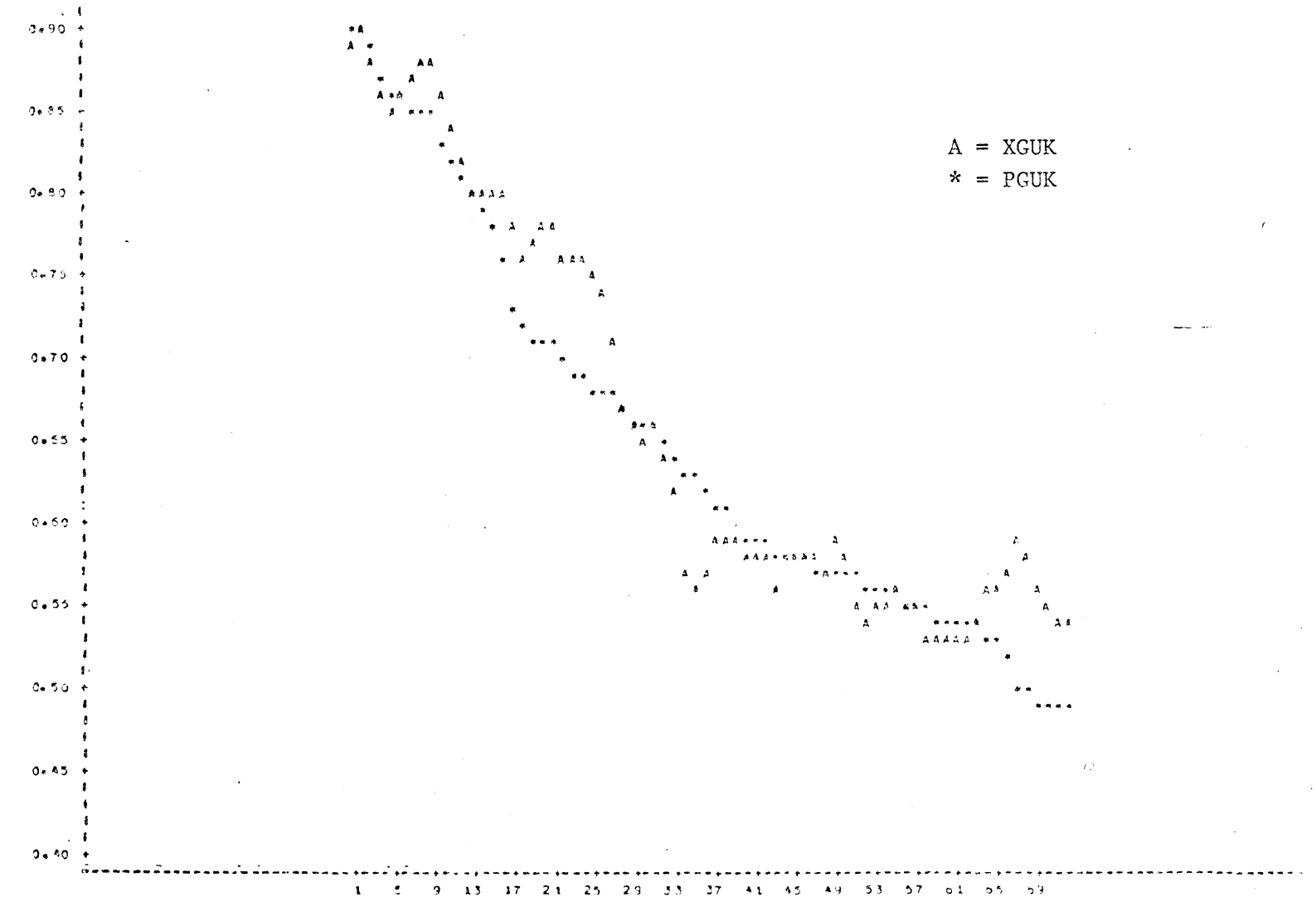

Figure 10. Monthly Observations of XGUK and PGUK: 1974-01 through 1979-12

An Outline of the Box-Jenkins Method

Authoregressive Integrative Moving Average (ARIMA) models had been studied extensively by Box and Jenkins (1970) and their names frequently have been used synonymously with general ARIMA processes applied to time series.

The autoregressive (AR) arm of an ARIMA model can be represented in the form:

$$W_t = \phi_1 W_{t-1} + \phi_2 W_{t-2} + \ldots + \phi_p W_{t-p} + e_t \qquad (1)$$

where e_t is a series of independent and identically distributed random variables with mean zero and constant variance, W_t denotes a time series which is stationary (it could represent deviation from some deterministic trend).

The general autoregressive model of order P AR(p) can take several forms depending upon the order P. For example, an AR(1) model can be written as

$$W_t = \phi_1 W_{t-1} + e_t$$

and an AR(2) may be written as

$$W_t = \phi_1 W_{t-1} + \phi_2 W_{t-2} + e_t$$

The moving average (MA) arm of an ARIMA model can be represented in the form

$$W_t = e_t - \theta_1 e_{t-1} - \theta_2 e_{t-2} - \ldots - \theta_q e_{t-q} \qquad (2)$$

Equation (2) is called a moving average of order q; a MA(1) model is

$$W_t = e_t - \theta_1 e_{t-1}$$

Equations (1) and (2) lead to the so-called mixed autoregressive moving average process,

$$W_t - \phi_1 W_{t-1} - \ldots - \phi_p W_{t-p} = e_t - \theta_1 e_{t-1} - \ldots - \theta_q e_{t-q} \qquad (3)$$

where p and q are the order of autoregressive and moving average respectively. To manipulate models of this kind it is convenient to define a backward shift operator B such that

$$BW_t = W_{t-1}$$

using the operator B, (3) can be written

$$\phi_p(B) W_t = \theta_q(B) e_t \qquad (4)$$

where

$$\phi_p(B) = 1 - \phi_1 B - \phi_2 B^2 - \ldots - \phi_p B^p \qquad (5)$$

$$\theta_q(B) = 1 - \theta_1 B - \theta_2 B^2 - \ldots - \theta_q B^q \qquad (6)$$

are polynomials in B of degree p and q respectively and $\phi_p(B)$ is called the autoregressive operator and $\theta_q(B)$ the moving average operator.

Suppose, now, that one has a given time series X_t. If X_t is not stationary, it must be transformed to a stationary series by taking the appropriate level of differences; that is, there exists an integer d such that

$$\nabla^d X_t = W_t \qquad (7)$$

is a stationary time series. Combining equations (4) and (7), the series X_t can be represented by the model,

$$\phi_p(B)\nabla^d X_t = \theta_q(B)e_t \qquad (8)$$

Equation (8) represents an autoregressive integrated moving average process of order (p, d, q), denoted as ARIMA (p, d, q).

The choice of the appropriate p and q values requires examining the autocorrelation and partial autocorrelation coefficients calculated from the sample. In general, where the autocorrelation function of an autoregressive process of order p tails off, its partial-autocorrelation function has a cut-off after lag p. Conversely, the autocorrelation function of a moving average process of order q has a cut-off after lag q, while its partial autocorrelation tails off. Furthermore, the autocorrelation function for a mixed process, containing a p^{th}-order autoregressive component and a q^{th}-order moving average component, is a mixture of exponential and damped sine waves after the first q-p lags.

Following the Box-Jenkins method the best fitting models were identified and estimated after analyzing the autocorrelation and parial autocorrelation functions and checking that residuals were white noise. The results of the estimation for the complete sample period (1974-01 through 1979-12) are reported in Table I for XGK and PGK and in Table II for XFK and PFK.[1] The analysis of residuals shows that the hypothesis of white noise cannot be rejected at the 5 percent level in all cases. The χ^2 statistic, developed by Box and Pierce (1970) provides an overall test on the autocorrelations of the estimated residuals. The procedure is to compare

$$\chi^2 = n \sum_{k=1}^{m} r_k^2$$

where n is the sample size and m denotes the largest time lag included, with tabulated values of the chi-squared statistic for m-p-q degrees of

TABLE I

ESTIMATES OF ARIMA MODELS FOR XGK AND PGK

Series	Model Type	d	Parameters ϕ_1	ϕ_2	ϕ_3	θ_1	χ^2_{20}
XGB	Random Walk	1					11.7
PGB	ARMA	1		.4612 (4.18)		-.2778 (-2.33)	20.1
XGD	Random Walk	1					9.4
PGD	Random Walk	1					22.2
XGF	AR	1	.4720 (4.48)				13.9
PGF	AR	1	.2985 (2.6)				24.8
XGI	AR	1	.5288 (5.25)				25.7
PGI	AR	1	.3700 (3.34)				16.8
XGN	Random Walk	1					13.4
PGN	AR	1	.3035 (3.00)		-.4581 (-4.6)		27.1
XGUK	MA	1				-.3300 (-2.9)	15.2
PGUK	MA	1				-.3660 (-3.3)	18.0

Note: Numbers in parentheses under each coefficient are t-statistics, all coefficients are significant at the 5 percent level; d represents number of differencing in ARIMA models. If X_t is a random walk, then $X_t - X_{t-1}$ is a white noise process.

TABLE II

ESTIMATES OF ARIMA MODELS FOR XFK AND PFK

Series	Model Type	d	Parameters ϕ_1	ϕ_3	θ_1	θ_2	χ^2_{20}
XFB	AR	1	.3197 (2.82)				16.4
PFB	ARMA	2	-.8862 (-11.35)			.8330 (9.22)	18.5
XFD	Random Walk	1					16.0
PFD	Random Walk	1					22.1
XFG	AR	1	.3996 (3.85)				13.1
PFG	AR	1	.3858 (3.50)				28.2
XFI	AR	1	.3224 (2.86)				9.0
PFI	Random Walk	1					14.9
XFN	MA	1			-.3950 (3.60)		12.6
PFN	ARMA	2		-.6677 (-7.20)	.8282 (13.00)		18.6
XFUK	MA	1			-.5224 (-5.11)		16.1
PFUK	AR	1	.3815 (3.45)				12.6

Note: Numbers in parentheses under each coefficient are t-statistics, all coefficients are significant at the 5 percent level; d represents number of differencing in ARIMA models. If X_t is a random walk, then $X_t - X_{t-1}$ is a white noise process.

freedom. If the computed value of the χ^2 of the residuals is smaller than the value from the χ^2 table, the hypothesis that the autocorrelations are not significantly different from zero is supported, indicating that the residuals are randomly distributed and that the model used is a good one. The computed values of the χ^2 of the residuals with 20 degrees of freedom are given in Tables I and II in the last column, the tabulated χ^2 value for 20 degrees of freedom is 31.4 at the 5 percent level, thus indicating that the models used are good, since only random errors remain.

Tested Relationships Between Exchange Rates and Relative Prices

We turn now our attention to the coherencies between exchange rates and relative prices. While a great deal of studies have been conducted on purchasing power parity, the writer is not aware of any study which has used spectral analysis to compare relative price and exchange rate relationship among all frequencies. Using the residuals from the fitted ARIMA models, we estimated the coherenceis between XGK and PGK (K = B, D, F, I, N, UK) and also between XFK and PFK (K = B, D, G, I, N, UK).[2]

The coherency between XGB (DM/BF) and PGB (P_G/P_B) is illustrated in Figure 11. Figures 12, 13, 14, 15, and 16 show the coherencies between XGD and PGD, XGF and PGF, XGI and PGI, XGN and PGN, and XGUK and PGUK, respectively. Note that in the frequency concept, the ideas of long-run, short-run, etc., may be defined specifically, e.g., long run $\equiv$ low frequencies (from 0 to $2\pi/30$, say, when using monthly data), short-run $\equiv$ high frequencies (from $\pi/2$ to π, say), and middle-run could correspond to the remaining frequencies (Granger and Hatanka, 1964).

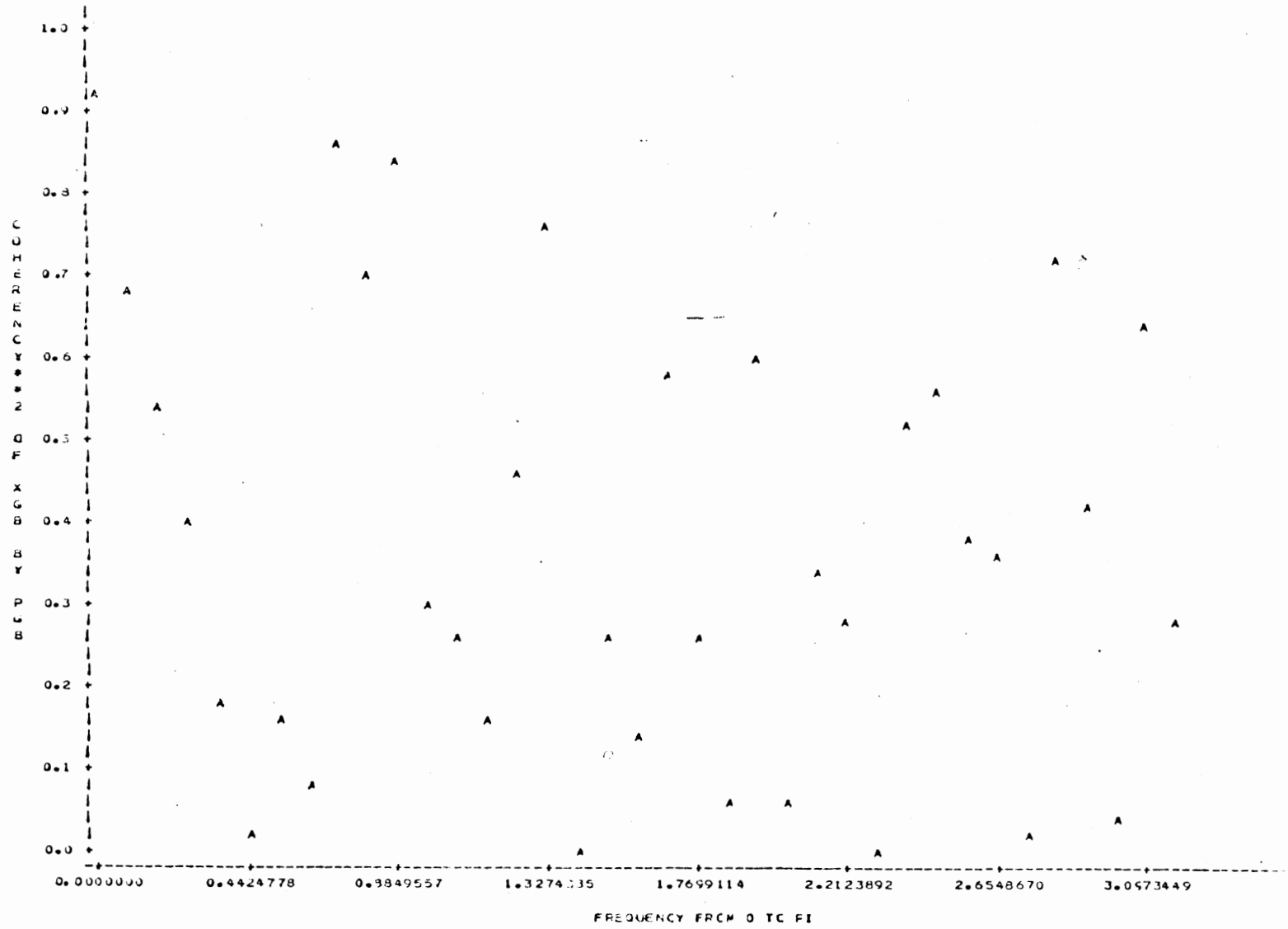

Figure 11. The Coherency Between XGB and PGB

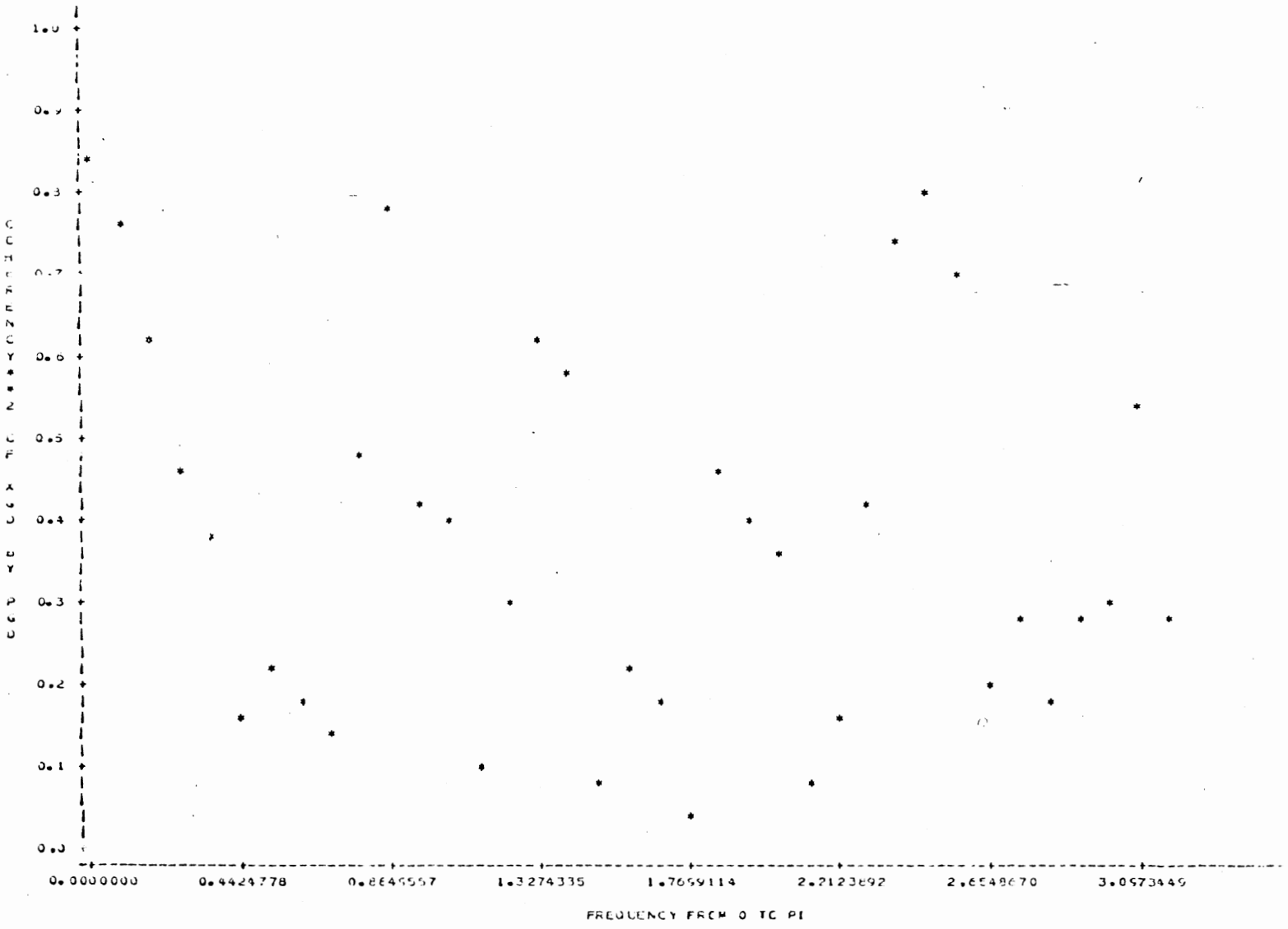

Figure 12. The Coherency Between XGD and PGD

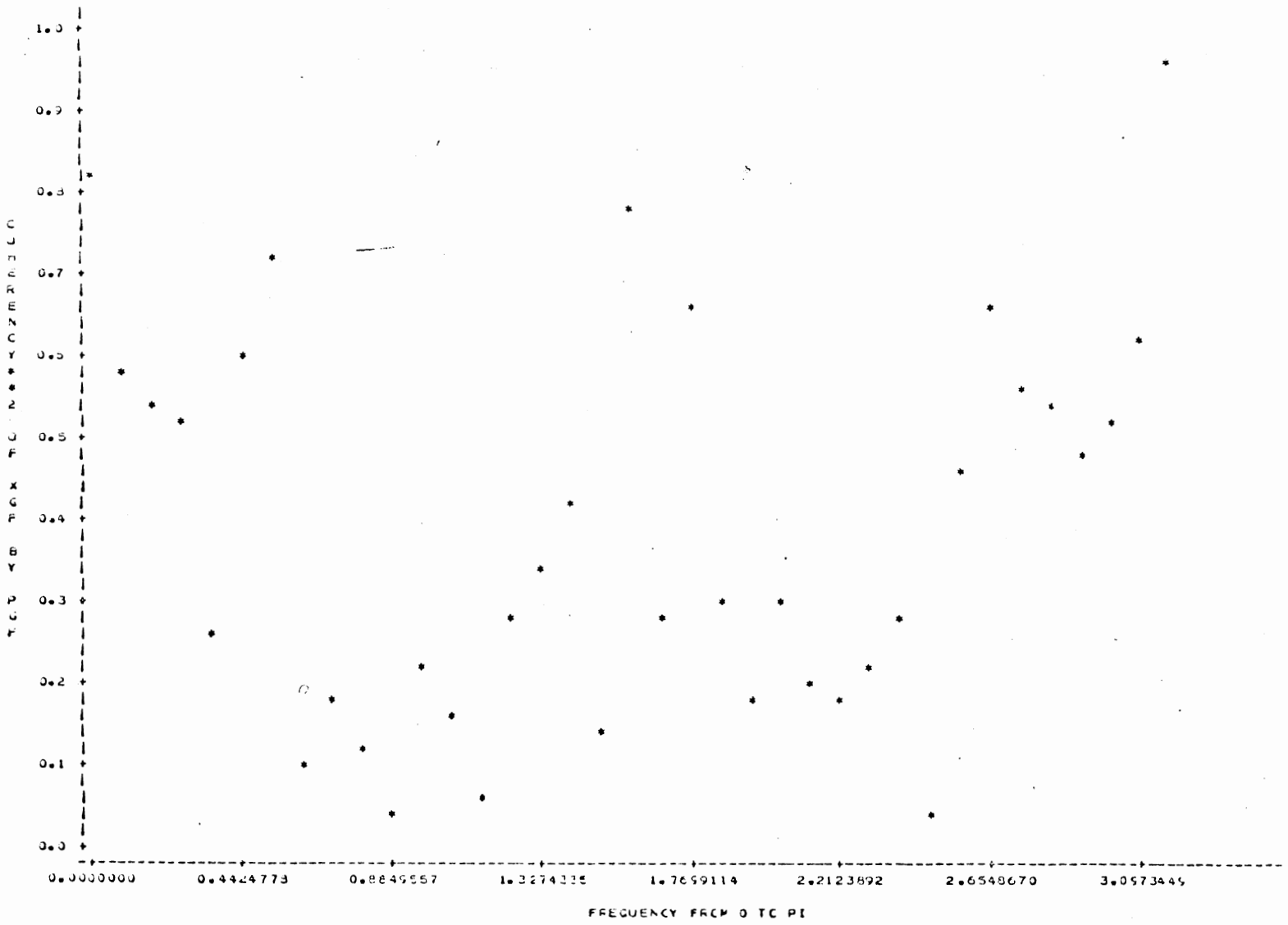

Figure 13. The Coherency Between XGF and PGF

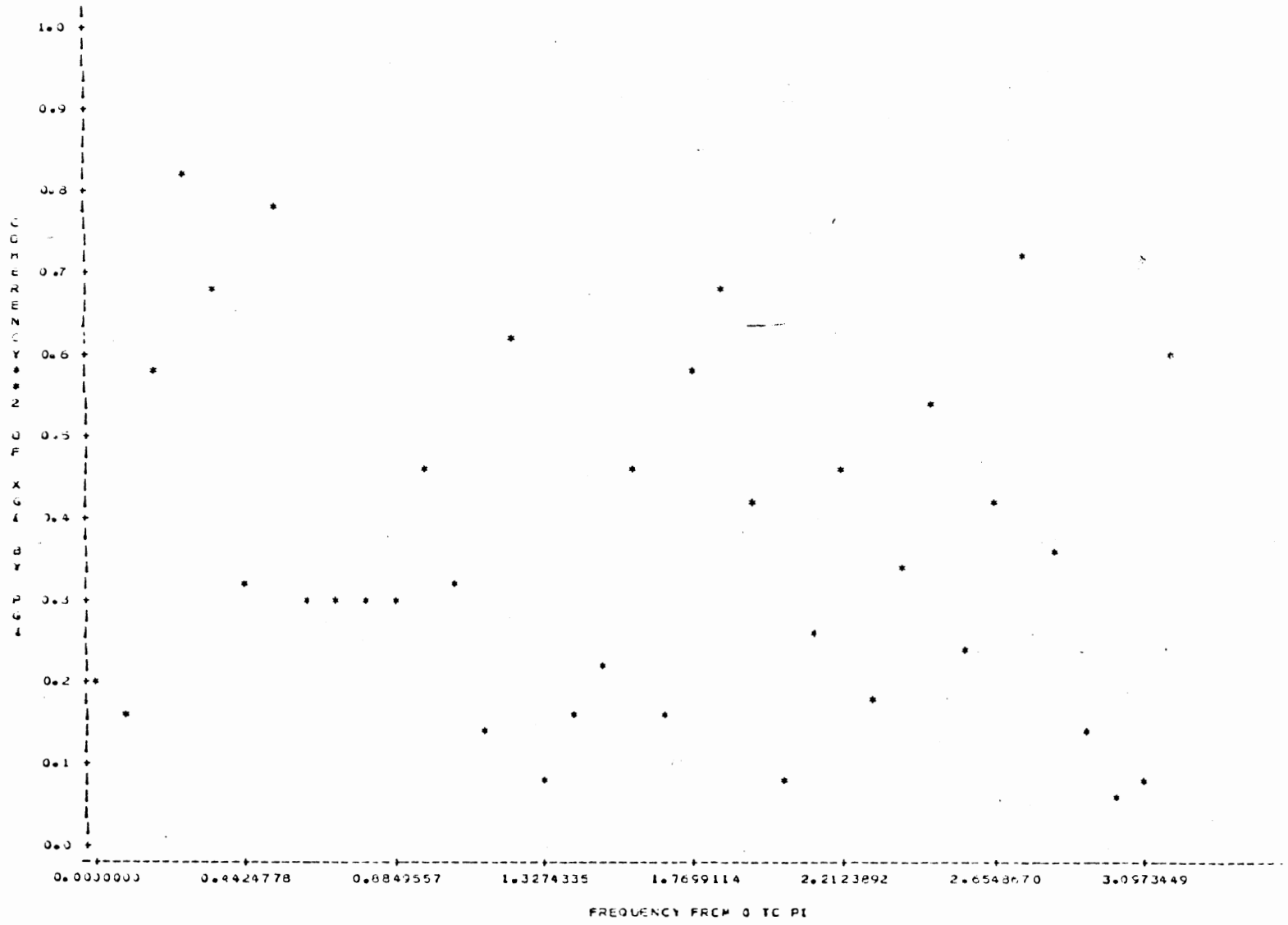

Figure 14. The Coherency Between XGI and PGI

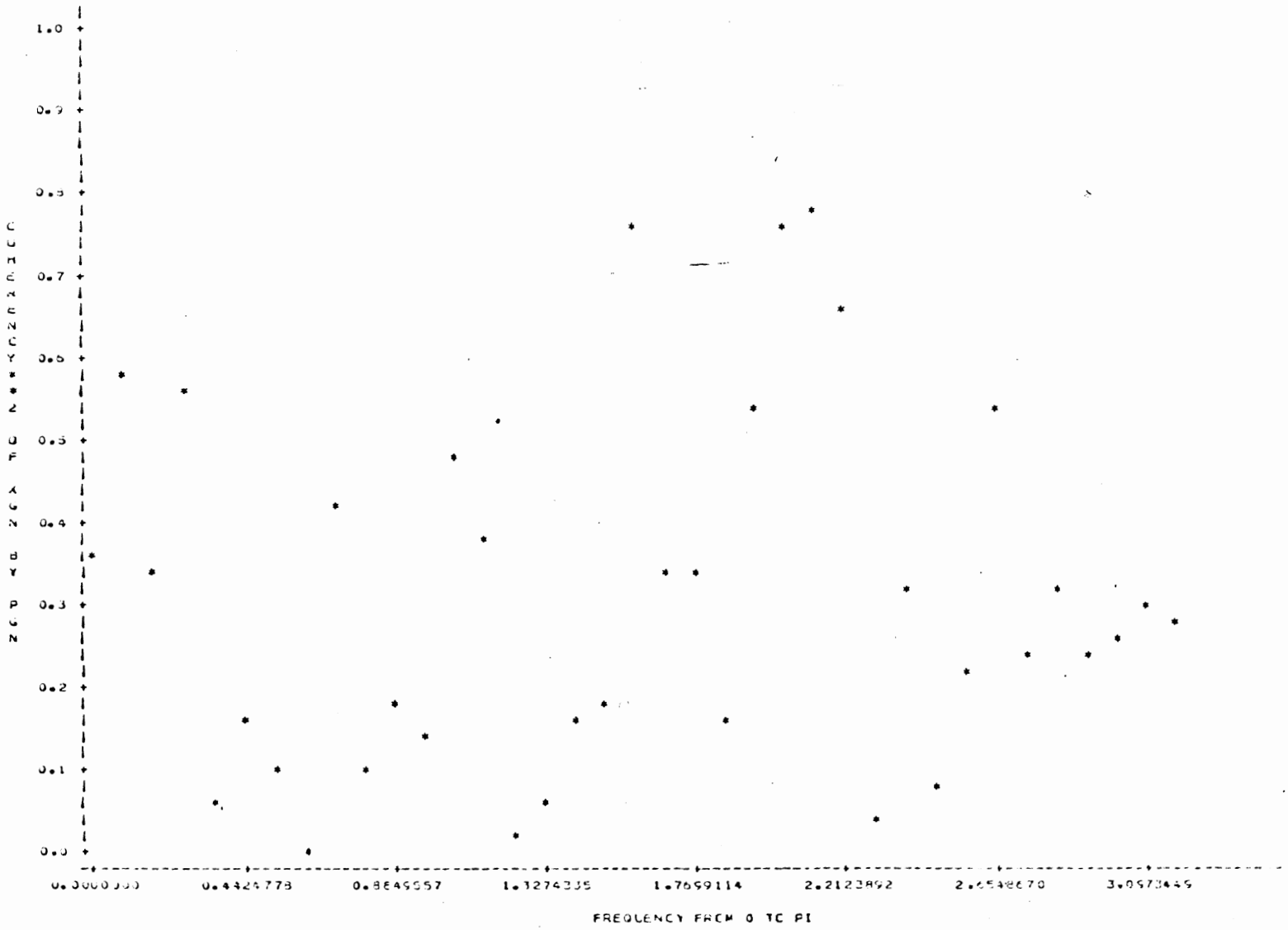

Figure 15. The Coherency Between XGN and PGN

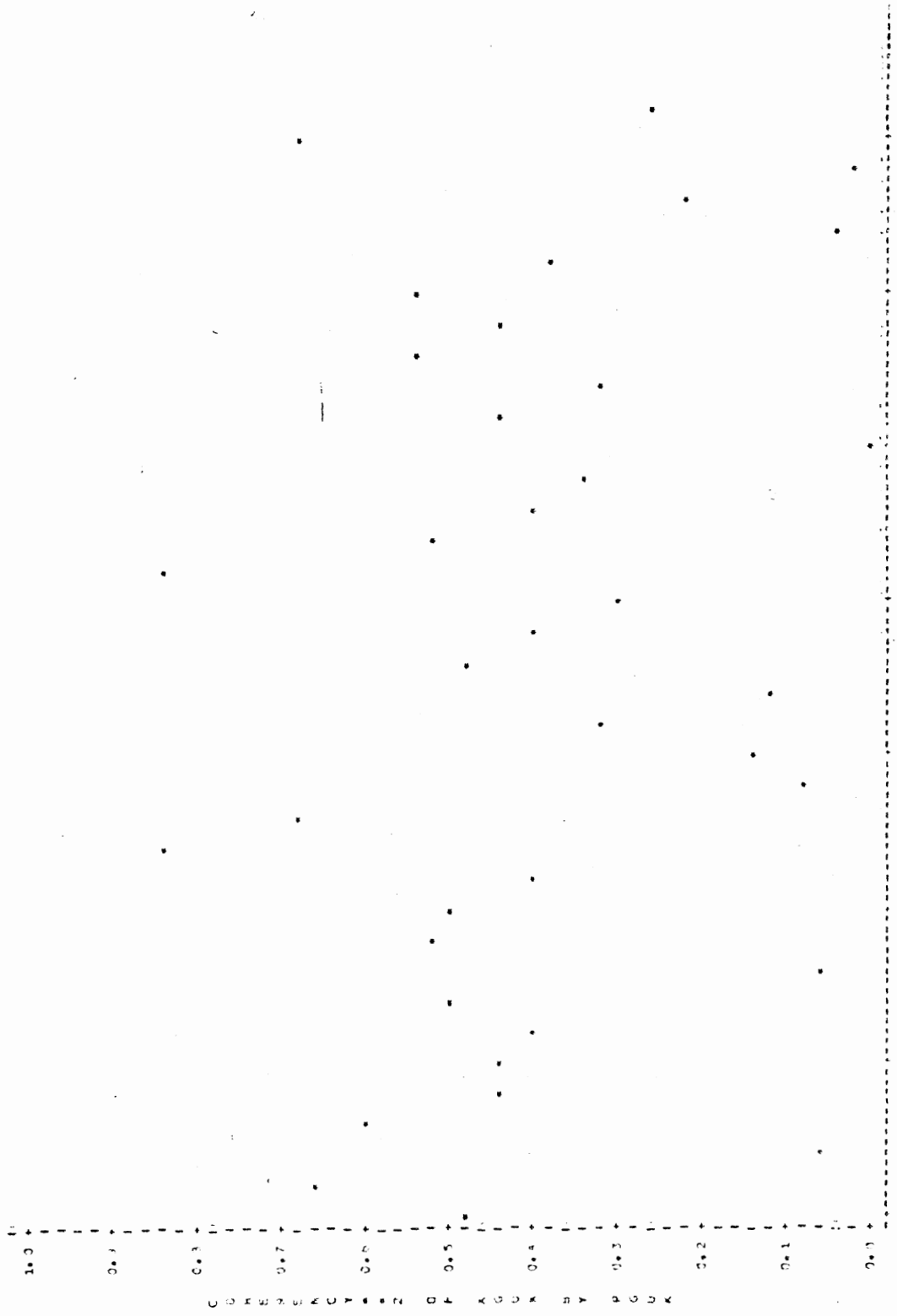

Figure 16. The Coherency Between XGUK and PGUK

Examination of Figures 11 through 16 reveals that the coherence is high in certain frequency bands but not high in all frequency bands, thus indicating high relationship between exchange rates and relative prices at those particular frequency bands.

The coherencies between XFB and PFB (FF/BF and the ratio of consumer price index $\frac{\text{France}}{\text{Belgium}}$), XFD and PFD, XFG and PFG, XFI and PFI, XFN and PFN, XFUK and PFUK, are shown in Figures 17 through 22. Again from Figures 17 through 22 it is apparent that the coherencies between exchange rates and relative prices are high in some frequency bands thus indicating that only in these particular frequency bands there is a strong relationship between exchange rates and relative prices.

In summary, the coherency analysis suggests that although there is high correlation between the exchange rate and relative price, the relationship is not consistent in the sense that it is high in certain frequency bands and low for some other frequency bands.

The Monetary Model of the Exchange Rate Determination

We turn now our attention to the monetary model of the exchange rate determination developed in Chapter IV. In the rest of this chapter we attempt to estimate the following two versions of the monetary model of the exchange rate determination:

$$\ln XJK = a + b(\ln MJ - \ln MK) + c(\ln YK - \ln YJ) + d(\ln IJ - \ln IK) \qquad \text{(Model I)}$$

$$\ln XJK = a + \sum_{m=1}^{4} b_m (\ln MJ - \ln MK) + \sum_{m=1}^{4} c_m (\ln YK - \ln YJ) + d(\ln IJ - \ln IK) \qquad \text{(Model II)}$$

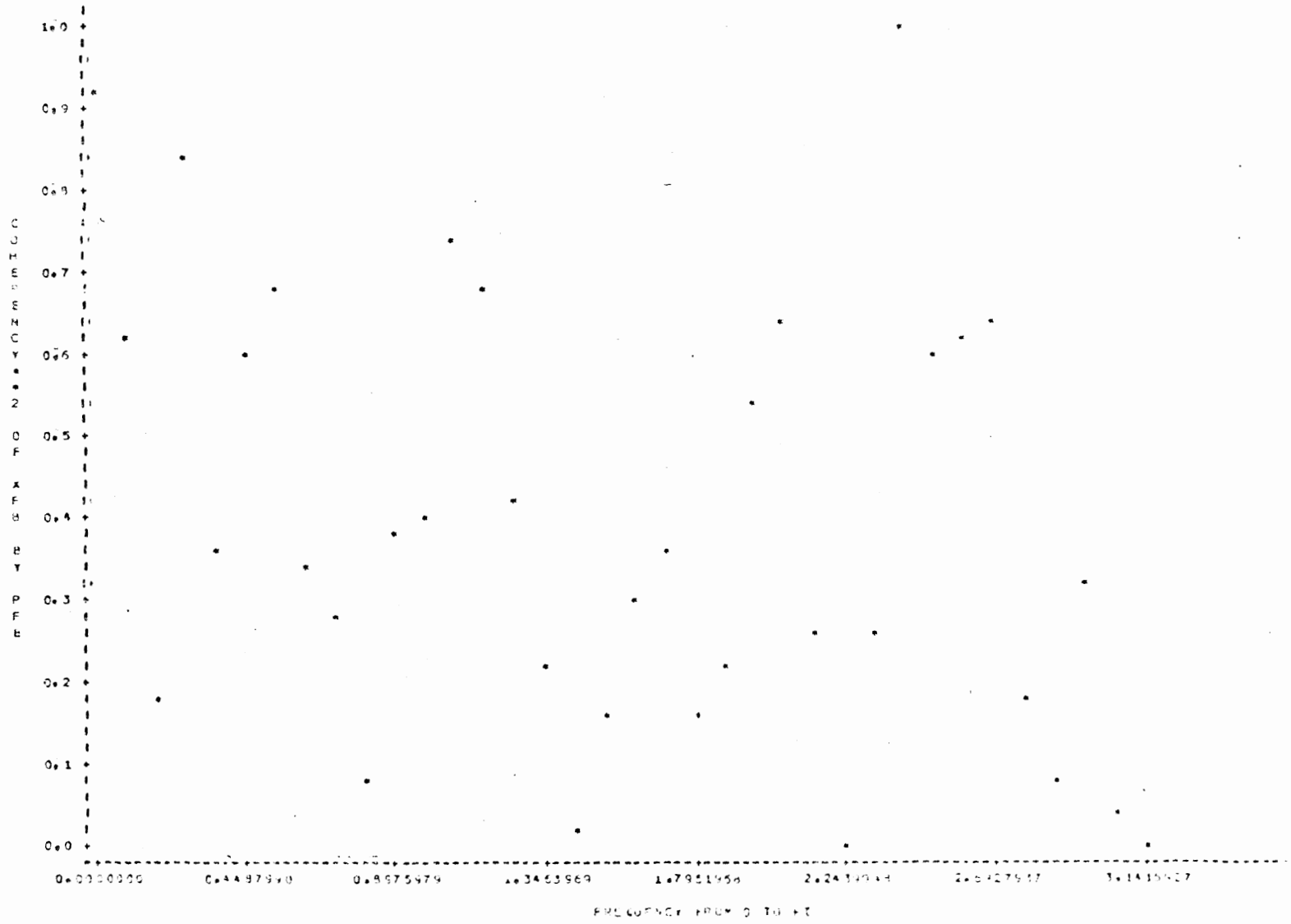

Figure 17. The Coherency Between XFB and PFB

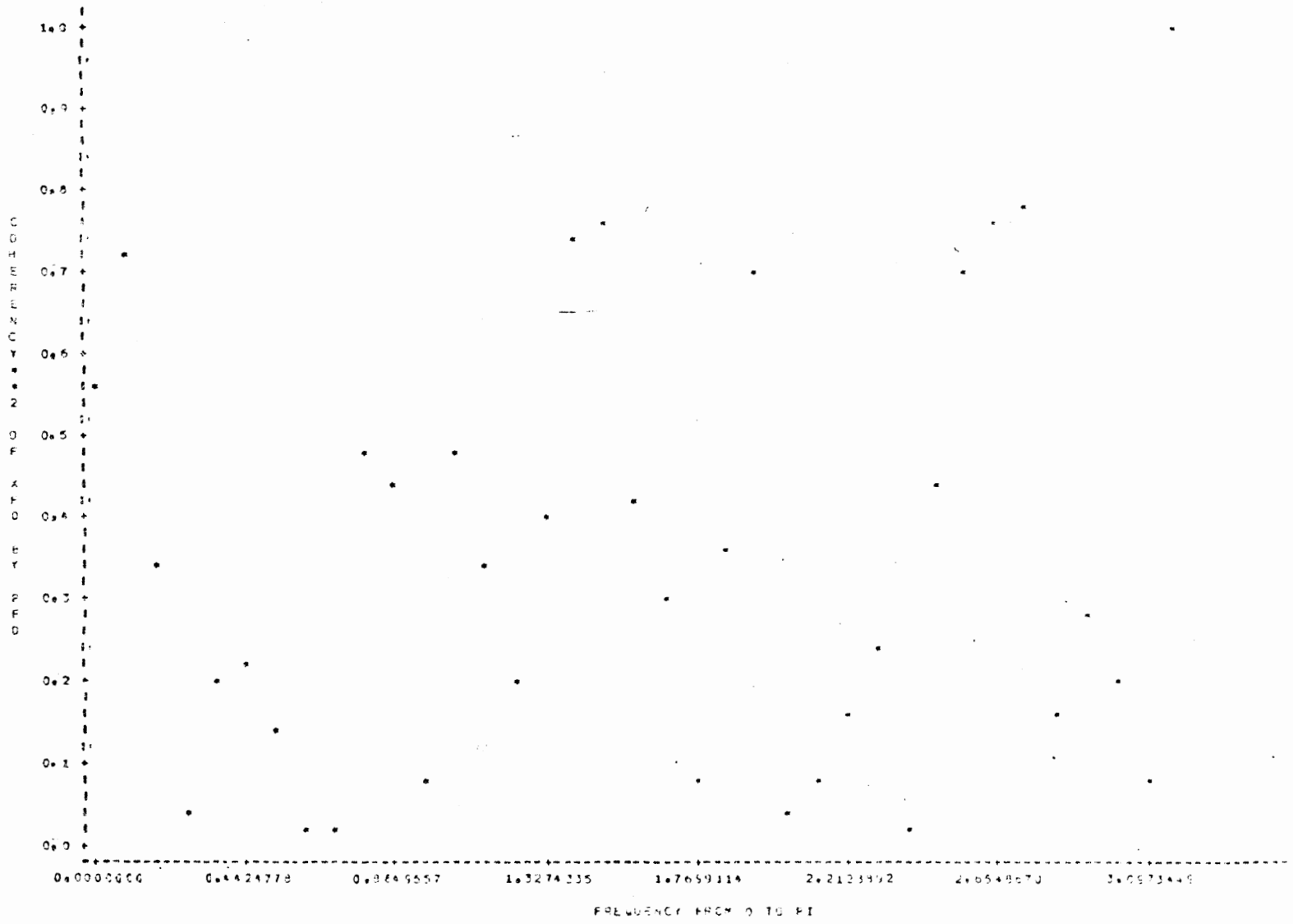

Figure 18. The Coherency Between XFD and PFD

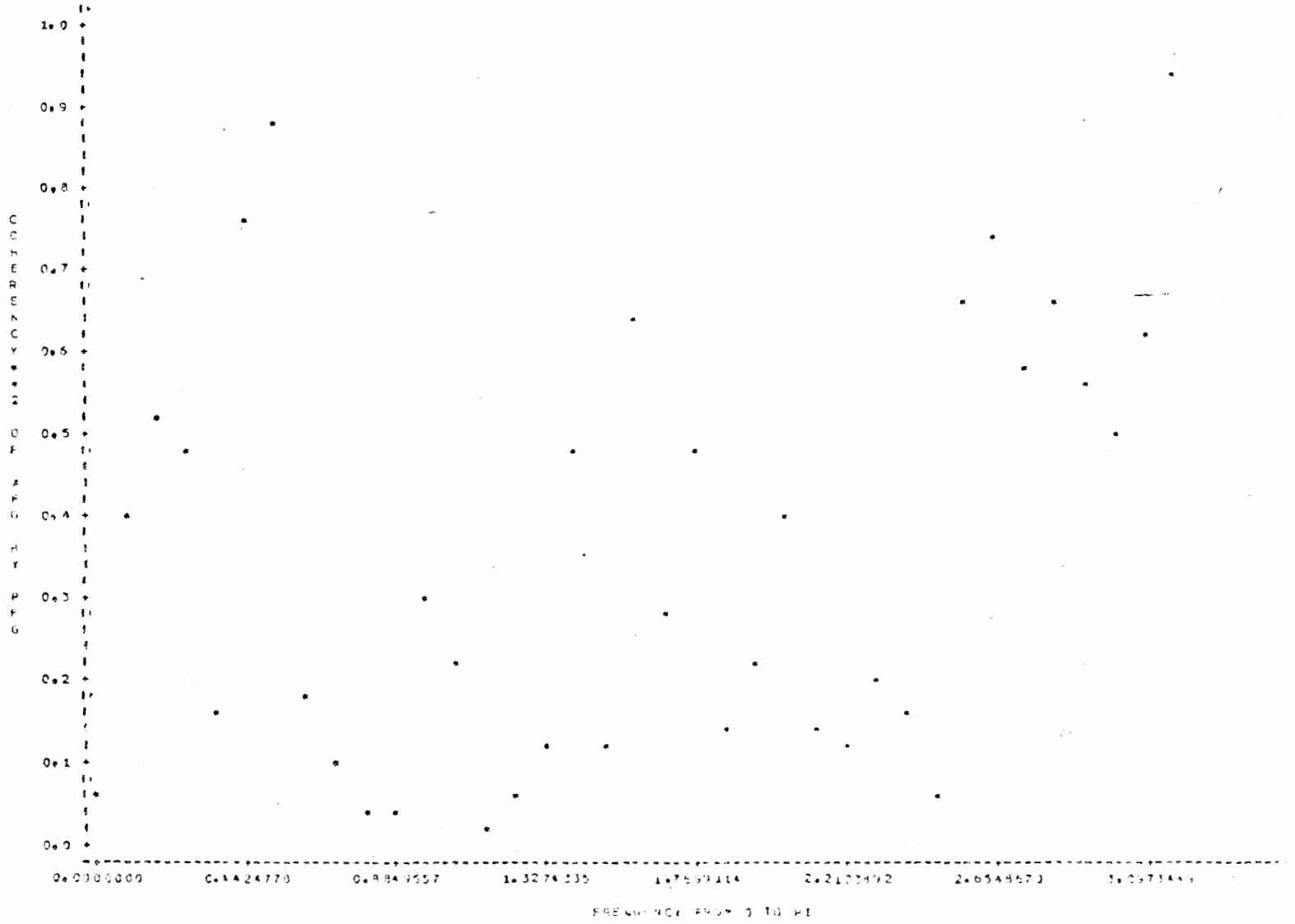

Figure 19. The Coherency Between XFG and PFG

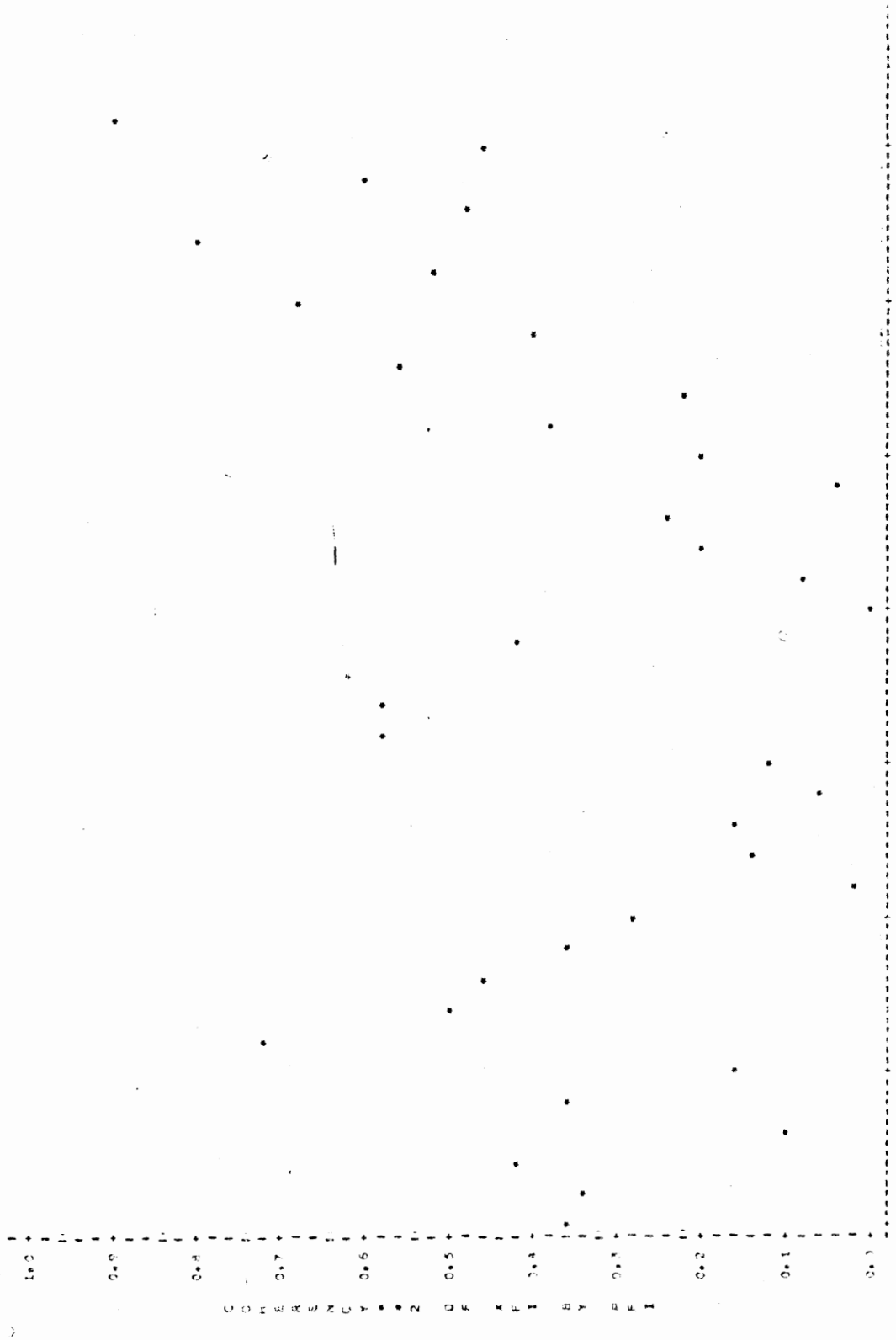

Figure 20. The Coherency Between XFI and PFI

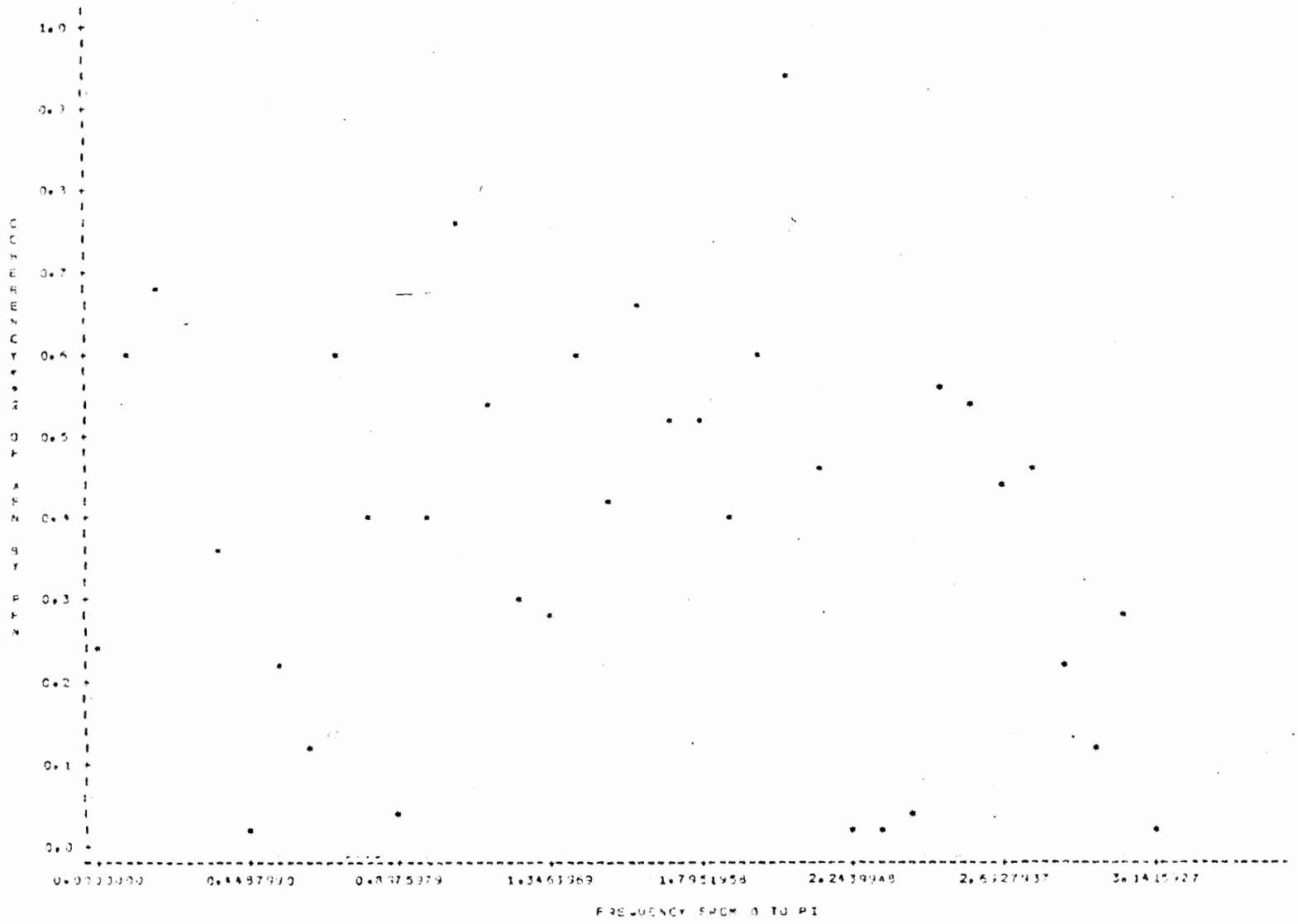

Figure 21. The Coherency Between XFN and PFN

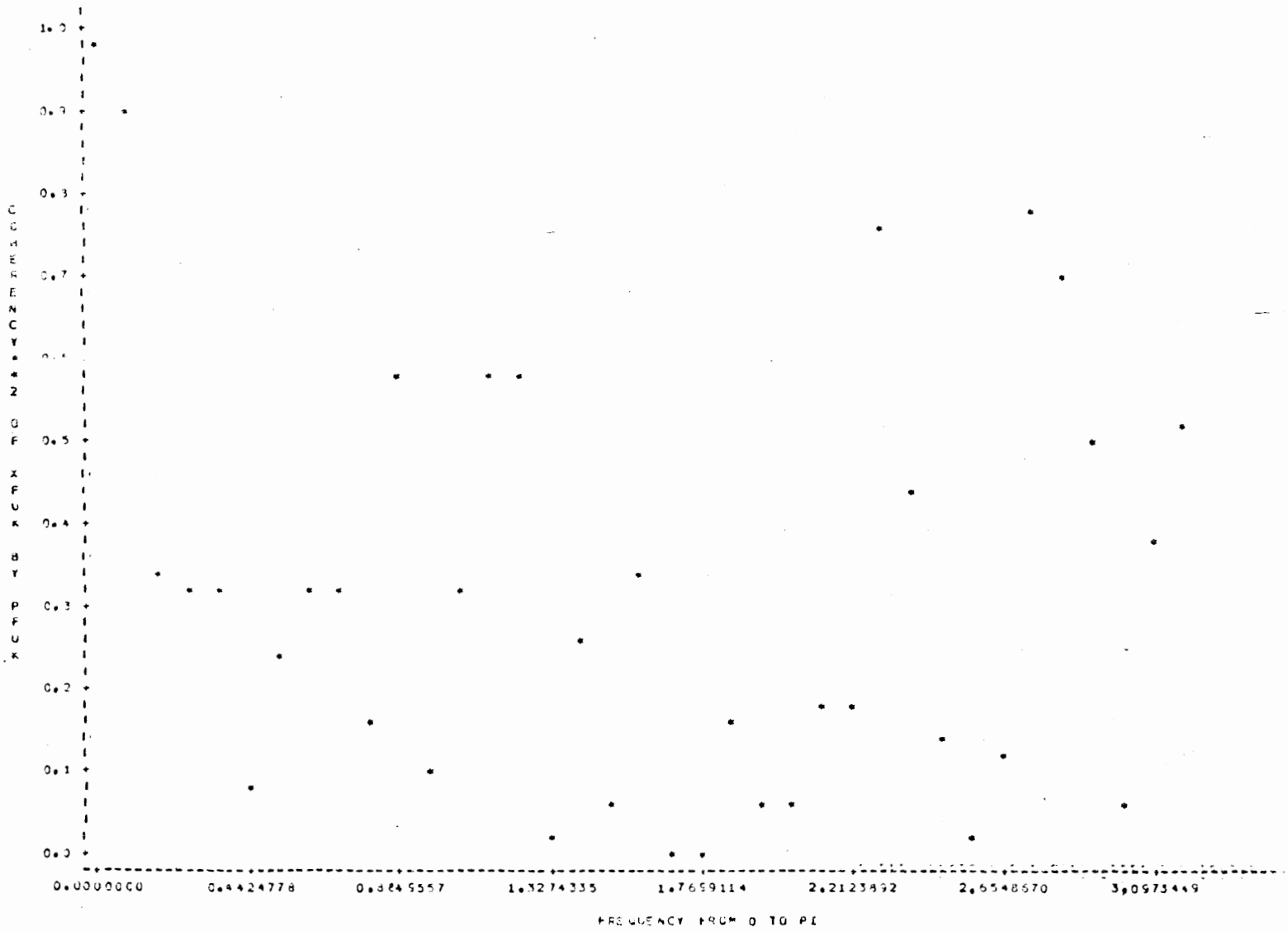

Figure 22. The Coherency Between XFUK and PFUK

where the following notations are used:

XJK = exchange rate between country J and country K, defined as J's currency price of a unit of K's currency,

MJ = country J's money supply,

MK = country K's money supply,

YJ = country J's real income,

YK = country K's real income,

IJ = country J's nominal interest rate, and

IK = country K's nominal interest rate.

ln stands for the logarithm of attached variable and the a's, b's, c's and d's are coefficients to be estimated from the statistical data. (The relevant data are described at the end of this study.) Note that according to the monetary model of the exchange rate determination the a priori expected values of the coefficients attached to the money and income variables are unity whereas the coefficient attached to the interest rate variables should lie between zero and .5, consistent with interest elasticity of the demand for money.

The two versions of the monetary model, equations (I) and (II) were estimated for Germany/Belgium, Germany/Denmark, Germany/France, Germany/Italy, Germany/Netherlands, Germany/UK, France/Belgium, France/Denmark, France/Germany, France/Italy, France/Netherlands, France/UK, UK/Belgium, UK/Denmark, UK/France, UK/Germany, UK/Italy, and UK/Netherlands, for the period 1974I to 1979II.

Germany/Belgium

Equation (I) was estimated for quarterly Germany/Belgium data for the period 1974I to 1979II. The money supply variable used for each country was the narrow defintion of money including currency and demand

deposits, M1. Since there is no quarterly data for Belgium gross domestic product, the index of industrial production was used as a proxy for real income. As for the interest rate variables, the discount rate was used for each country, and we obtained the following:[3]

$$\underset{\quad}{\ln XGB} = \underset{(-33.65)^*}{-2.79} - \underset{(-.50)}{.03}(\ln MG - \ln MB) + \underset{(.72)}{.08}(\ln YB - \ln YG) + \underset{(1.92)^{**}}{.02}(\ln IG - \ln IB)$$

$$R^2 = .84 \qquad D.W. = 2.19 \qquad \underset{(12.93)^*}{\rho = .94} \qquad \underset{(99)}{F(3,17) = 30.29}$$

Although the R^2 and F-statistic are high, thus indicating an overall goodness of fit, the money supply and real income coefficients are not significantly different from zero. The interest rate coefficient is significant at 10 percent level and is consistent with its hypothesized value.

In order to estimate the version II of the monetary model, equation II, data for the period 1973I to 1979II were used and the following estimated coefficients were obtained:[4]

$$\underset{(-56.38)^*}{a = -3.23} \qquad \underset{(-8.57)^*}{\sum_{m=1}^{4} b_m = -.34} \qquad \underset{(2.91)^*}{\sum_{m=1}^{4} c_m = .27} \qquad \underset{(1.90)^{**}}{d = .01}$$

$$R^2 = .95 \qquad D.W. = 2.61 \qquad \underset{(99)}{F(5,16) = 55.24}$$

The estimated coefficient for money supply variable has the wrong sign but the estimated coefficients for real income and interest rate both have the hypothesized positive signs.

Germany/Denmark

Equation I was estimated for quarterly Germany/Denmark data from

the period 1974I to 1979II. The money supply variable, real income variable and interest rate variable used for each country were M1, index of industrial production and discount rate respectively. The estimated equation is:

$$\underset{(-6.38)^*}{\ln XGD} = \underset{(-1.35)}{-.99 - .15(\ln MG - \ln MD)} - \underset{(-.75)}{.05(\ln YD - \ln YG)} + \underset{(.47)}{.02(\ln IG - \ln ID)}$$

$$R^2 = .96 \qquad D.W. = 1.36 \qquad \rho = \underset{(18.81)^*}{.97} \qquad F(3,17) = \underset{(99)}{131.90}$$

The above estimated equation does not support the monetary model of equation I, according to which the estimated coefficients of real income and money supply should be unity. Equation II was also estimated and the following coefficients were found:

$$a = \underset{(-3.82)^*}{-1.34} \qquad \sum_{m=1}^{4} b_m = \underset{(.41)}{.13} \qquad \sum_{m=1}^{4} c_m = \underset{(.42)}{.19} \qquad d = \underset{(.28)}{.01}$$

$$R^2 = .97 \qquad D.W. = 1.37 \qquad \rho = \underset{(18.91)^*}{.97} \qquad F(5,15) = \underset{(99)}{93.6}$$

Although the estimated coefficients all have the right signs, they are all insignificant both at 5 and 10 percent levels. Therefore in the case of Germany/Denmark, it can be seen that the monetary model does not work well.

Germany/France

Equation I was estimated for quarterly Germany/France data for the period 1974I to 1979II. The money supply, real income and interest rate variable used for each country were M1, real gross domestic product and discount rate respectively. The following was found:

$$\ln XGF = \underset{(-2.57)}{-.61} + \underset{(.46)}{.15}(\ln MG - \ln MF) - \underset{(-1.21)}{.20}(\ln YF - \ln YG) + \underset{(1.66)}{.13}(\ln IG - \ln IF)$$

$R^2 = .90$ D.W. = 1.59 $\rho = .96$ (16.79)* F(3,17) = 52.30 (99)

As we can see the estimated coefficients are not significant and therefore the above estimated equation is not satisfactory. However a more satisfactory result is obtained when using version II of the monetary model. Below the estimated coefficients of the equation II are presented:

$a = .05$ (.06) $\quad \sum_{m=1}^{4} b_m = 1.81$ (2.40)* $\quad \sum_{m=1}^{4} c_m = 3.2$ (2.11)* $\quad d = .11$ (1.62)

$R^2 = .95$ D.W. = 2.08 $\rho = .95$ (14.54)* F(5,15) = 52.90 (99)

The estimated coefficients for money supply and real income variables are not different from unity at 5 percent significance level as was hypothesized by the monetary model.

Germany/Italy

Equation I was estimated for quarterly Germany/Italy data for the period 1974I to 1979II. The money supply, real income and interest rate variable used for each country were M1, real gross domestic product and discount rate respectively. The following were obtained:

$$\ln XGI = \underset{(.07)}{-.11} + \underset{(10.75)*}{1.19}(\ln MG - \ln MI) + \underset{(1.33)}{.38}(\ln YI - \ln YG) + \underset{(5.85)*}{.18}(\ln IG = \ln II)$$

$R^2 = .96$ D.W. = 1.59 F(3,18) = 129.93 (99)

The money supply coefficient is not significantly different from unity at 5 percent level as was hypothesized. The interest rate coefficient is also consistent with the monetary model, however the real income coefficient is not significantly different from zero.

Equation II was also estimated using data for the period 1973I to 1979II and the following were found:

$$\underset{(-.45)}{a = -1.64} \qquad \underset{m=1}{\overset{4}{\Sigma}} b_m = \underset{(20.27)^*}{1.31} \qquad \underset{m=1}{\overset{4}{\Sigma}} c_m = \underset{(1.14)}{.88} \qquad \underset{(12.68)^*}{d = .25}$$

$$R^2 = .99 \qquad D.W. = 1.98 \qquad F(5,16) = \underset{(99)}{283.87}$$

The money supply coefficient is even greater than unity and has the right sign. (This might be explained by exchange rate overshooting.) The interest rate coefficient is consistent with its hypothesized value, the real income variable although having the right sign and close to its hypothesized value is not significant.

Germany/Netherlands

Equations I and II were estimated for quarterly Germany/Netherlands data for the period 1974I and 1973I to 1979II respectively. The money supply, real income and interest rate variables used for each county were M1, industrial production and discount rate respectively. The following was obtained for equation I:

$$\underset{}{\ln XGN = -.17 + \underset{(-3.34)^*}{.06}(\ln MG - \ln MN) + \underset{(1.48)}{.55}(\ln YN - \ln YG) + \underset{(5.48)^*}{.05}(\ln IG - \ln IN)}$$
$$\underset{(4.02)^*}{}$$

$$R^2 = .78 \qquad D.W. = 1.57 \qquad F(3,18) = \underset{(99)}{21.63}$$

As for the coefficients of the equation II, the following were found:

$$a = \underset{(-2.96)*}{-.26} \qquad \sum_{m=1}^{4} b_m = \underset{(1.78)**}{.13} \qquad \sum_{m=1}^{4} c_m = \underset{(6.34)*}{.61} \qquad d = \underset{(2.51)*}{.04}$$

$$R^2 = .85 \qquad D.W. = 2.08 \qquad F(5,16) = 17.77 \quad (99)$$

The real income and interest rate coefficients are consistent with the monetary model, the money supply coefficient although having the right sign is far from its hypothesized value of unity.

Germany/United Kingdom

Equations I and II were estimated for quarterly Germany/UK data for the period 1974I and 1973I to 1979II respectively. The money supply and real income variables used were M1 and real gross domestic product for each country. As for the interest rate, public authorities bond yield was used for Germany and government bond yield for UK. The following was obtained for equation I:

$$\underset{\quad}{\ln XGUK} = \underset{(2.37)*}{4.58} + \underset{(6.41)*}{1.26}(\ln MG - \ln MUK) + \underset{(2.05)**}{.64}(\ln YUK - \ln YG) + \underset{(4.58)*}{.46}(\ln IG - \ln IUK)$$

$$R^2 = .94 \qquad D.W. = 1.46 \qquad F(3,18) = 94.82 \quad (99)$$

All of the estimated coefficients are consistent with their hypothesized values of the monetary model. Equation II was also estimated and the following coefficients were obtained:

$$a = -5.84 \quad \sum_{m=1}^{4} b_m = .98 \quad \sum_{m=1}^{4} c_m = 2.50 \quad d = .53$$
$$(-.75) \quad (3.11)^* \quad (1.90)^{**} \quad (5.44)^*$$

$$R^2 = .96 \quad D.W. = 1.04 \quad F(5,16) = 82.85 \quad (99)$$

The above estimates are also in conformity with the monetary model and support the monetary nature of the exchange rate.

Tables III and IV report the regression results for France and each other EC member based upon equation forms I and II respectively. For version I single equation estimation (OLS) as well as Cochrane-Orcutt iterative estimation (CORC) were used. For version II a polynomial distributed lag (PDL) scheme was used. And when there is a first order serially correlated residuals, the Cochrane-Orcutt iterative (PDLCORC) estimation was used.

All money supply variables used for each country were M1. As for the real income variables, gross domestic product were used for France/Germany and France/Italy and the industrial production index was used for all others. The interest rate variables used were government bond yield for France/Denmark and France/UK and discount rate used for all other cases.

As we can see, the results of version II of the monetary model in Table IV are striking. The monetary effect, Σb, measures the combined effect of the current and lagged values of the monetary influence on the exchange rate. The coefficient values are statistically significant in all cases and all have the right signs. Moreover five of these coefficients are not statistically different from unity as was hypothesized by the monetary model prediction and the one which is statistically different from unity (.51) is very close to unity. As for the real income coefficients, Σc, the results are not as good

TABLE III

ESTIMATES OF THE EQUATION I OF THE MONETARY MODEL, FRANCE BEING THE HOME COUNTRY

Dependent Variable	Period	Equation Type	a	b	c	d	R^2	F	ρ	D.W.
XFB	1974I to 1979II	OLS	-1.70 (15.43)*	.88 (4.39)*	-.98 (-1.66)	.20 (2.35)*	.69	13.40 (99)		1.16
XFD	1974I to 1979II	CORC	-.29 (-.74)	.04 (.21)	-.02 (-.20)	.23 (.29)	.59	8.18 (99)	.77 (5.53)*	1.42
XFG	1974I to 1979II	CORC	.61 (1.57)	.15 (.46)	-.20 (-1.21)	.13 (1.66)	.90	52.36 (99)	.96 (16.79)*	1.59
XFI	1974I to 1979II	OLS	-13.84 (-6.30)*	.43 (6.00)*	2.54 (5.34)*	.19 (6.18)*	.94	93.58 (99)		1.36
XFN	1974I to 1979II	CORC	.46 (1.65)	.13 (1.08)	-.32 (-.86)	.04 (.72)	.87	38.50 (99)	.93 (11.46)*	1.72
XFUK	1974I to 1979II	OLS	5.95 (9.22)*	.92 (5.47)*	.66 (1.47)	.43 (2.69)*	.67	12.36 (99)		1.04

Note: Numbers in the parentheses below coefficients are t-statistics; D.W. is the Durbin-Watson statistic; numbers in parentheses below F-statistics are significance level; and * indicates significant at the 5 percent level and ** indicates significant at the 10 percent level.

TABLE IV

ESTIMATES OF THE EQUATION II OF THE MONETARY MODEL, FRANCE BEING THE HOME COUNTRY

Dependent Variable	Period	Equation Type	a	Σb	Σc	d	R^2	F	ρ	D.W.
XFB	1973I to 1979II	PDL	-1.42 (-11.47)*	1.37 (6.97)*	-.95 (1.73)	.15 (3.27)	.92	36.41 (99)		1.23
XFD	1973I to 1979II	PDLCORC	-3.44 (-2.69)*	1.64 (2.59)*	1.48 (2.07)**	.07 (.98)	.71	7.39 (99)	.93 (11.55)*	1.41
XFG	1973I to 1979II	PDLCORC	-.05 (-.06)	1.81 (2.39)*	3.21 (2.10)*	.11 (1.62)	.95	52.78 (99)	.95 (14.53)*	2.09
XFI	1973I to 1979II	PDL	-12.82 (-4.65)	.51 (6.53)*	2.39 (4.12)*	.24 (4.51)*	.96	81.11 (99)		1.32
XFN	1973I to 1979II	PDLCORC	-.57 (-.91)	.57 (1.97)**	-2.60 (-4.00)*	.03 (.85)	.94	46.31 (99)	.79 (5.84)	2.16
XFUK	1973I to 1979II	PDL	5.58 (8.48)*	.80 (4.48)*	1.04 (1.78)**	.47 (3.04)*	.75	9.36 (99)		1.43

Note: Numbers in the parentheses below coefficients are t-statistics; D.W. is the Durbin-Watson statistic; numbers in parentheses below F-statistics are significance level; * indicates significant at the 5 percent level; and ** indicates significant at the 10 percent level.

as in the case of money supply coefficients. Only four coefficients support the monetary model's prediction and the other two coefficients have the wrong signs. As for the interest rate coefficients, they generally support the monetary model's predictions.

Tables V and VI report the regression results for the United Kingdom and each other EC member based upon equation forms I and II respectively. All money supply variables used were M1. Real gross domestic product was used for UK/Germany and UK/Italy and industrial production index in all other cases. As for the interest rate variable government bond yield is used in all cases.

The results of version II of the monetary model in Table VI are very satisfactory. In all cases the coefficients attached to money supply variables have the expected positive signs. Moreover, in the case of UK/Belgium, UK/Frane, UK/Germany, and UK/Italy, these coefficients are not statistically different from their expected (theoretical) value of unity. The coefficients on real income variables also have all positive signs in accordance with the monetary model of the exchange rate determination. In addition for UK/Denmark, UK/France, and UK/Germany, they are not statistically different from unity. The interest rate coefficients are all significant and between zero and .5. Thus, they are consistent with their expected values.

Summary

Both versions of the monetary model of the exchange rate determination developed in Chapter IV have been estimated. In general, version II performed much better than version I and this is not surprising since in version II we have not only considered the current effect of money supply and real income but also their lagged values

TABLE V

ESTIMATES OF THE EQUATION I OF THE MONETARY MODEL, UNITED KINGDOM BEING THE HOME COUNTRY

Dependent Variable	Period	Equation Type	a	b	c	d	R^2	F	ρ	D.W.
XUKB	1974I to 1979II	OLS	-7.77 (-13.32)	1.09 (7.1)*	-.02 (-.04)	-.09 (-.40)	.85	35.30 (99)		1.13
XUKD	1974I to 1979II	CORC	-1.37 (-1.27)	-.16 (-.88)	.10 (.69)	.16 (2.30)*	.92	70.19 (99)	.89 (8.92)*	2.00
XUKF	1974I to 1979II	OLS	-5.95 (-9.22)	.92 (5.47)*	.66 (1.47)	.43 (2.69)*	.67	12.36 (99)		1.04
XUKG	1974I to 1979II	OLS	-4.57 (-2.37)*	1.26 (6.41)*	.64 (2.05)**	.46 (4.59)*	.94	94.90 (99)		1.46
XUKI	1974I to 1979II	OLS	-6.42 (-14.90)*	.63 (3.25)*	.16 (.29)	.09 (2.35)*	.67	12.37 (99)		1.45
XUKN	1974I to 1979II	CORC	-1.34 (-2.03)**	-.02 (-.15)	.09 (.30)	.21 (2.37)*	.96	139.64 (99)		1.71

Note: Numbers in parentheses below coefficients are t-statistics; D.W. is the Durbin-Watson statistic; numbers in parentheses below F-statistics are significance level; * indicates significant at 5 percent level; and ** indicates significant at the 10 percent level.

TABLE VI

ESTIMATES OF THE EQUATION II OF THE MONETARY MODEL, UNITED KINGDOM BEING THE HOME COUNTRY

Dependent Variable	Period	Equation Type	a	Σb	Σc	d	R^2	F	ρ	D.W.
XUKB	1973I to 1979II	PDLCORC	-6.98 (-6.29)*	.80 (2.47)*	.46 (.81)	.27 (2.18)*	.96	69.50 (99)	.84 (7.12)*	2.18
XUKD	1973I to 1979II	PDLCORC	-5.09 (-1.71)	.45 (.91)	.99 (2.02)**	.19 (2.42)*	.93	40.96 (99)	.83 (6.69)	2.20
XUKF	1973I to 1979II	PDL	-5.58 (-8.48)*	.80 (4.48)*	1.04 (1.78)**	.47 (3.04)*	.75	9.36 (99)		1.43
XUKG	1973I to 1979II	PDL	5.85 (.75)	.98 (3.11)*	2.50 (1.90)**	.53 (5.47)*	.96	82.85 (99)		1.04
XUKI	1973I to 1979II	PDL	-5.27 (-9.46)*	1.16 (5.30)*	1.30 (1.63)	.08 (2.65)*	.83	15.75 (99)		1.50
XUKN	1973I to 1979II	PDLCORC	-3.29 (-1.33)	.29 (.72)	.34 (.44)	.20 (2.39)*	.96	72.43 (99)	.91 (10.08)*	1.54

Note: Numbers in parentheses below coefficients are t-statistics; D.W. is the Durbin-Watson statistic; numbers in parentheses below F-statistics are significance level; * indicates significant at the 5 percent level; and ** indicates significant at 10 percent level.

up to one year. This is compatible with the long-run nature of the monetary model of exchange rate determination.

Another important point is that the model assumes that the exchange rates are permitted to float freely while in fact Belgium, Denmark, Germany and Netherlands never left the snake from 1973 to the creation of the EMS. (For a chronology of the snake, see Appendix B.) On the other hand, France, Italy, and the United Kingdom were mostly outside of the snake over the same period. In view of this, therefore, it is not surprising to find poor results for Germany/Belgium, Germany/Denmark, and Germany/Netherlands, who were all dedicated participants in the European snake.

In sum, except for a few cases, the equations reported above empirically support the monetary model of exchange rate determination developed in Chapter IV. It is without any doubt this monetary nature of the exchange rate that encouraged the launching of the EMS. As in the more inflation-prone countries of the community past attitiudes to the role of exchange rate change as an instrument of economic policy had been increasingly questioned since 1976 (Thygesen, 1979b).

An implication of the monetary nature of the exchange rate is that in order for a group of countries to fix their exchange rate together a necessary condition is a roughly similar monetary policy by all participant members. The convergence of monetary policies is an implicit feature of the EMS. (For more discussion of the EMS, see Chapter VI.)

ENDNOTES

[1]Estimations were performed with the Marquardt non-linear least squares algorithm by using T series--A User-Oriented Computer Program for Identifying, Fitting, and Forecasting ARIMA Time Series Models, developed by W. Q. Meeker, Jr., Statistical Laboratory, Iowa State University.

[2]The estimation was performed by using a finite Fourier transform to obtain periodograms and cross periodograms. The periodogram ordinates were smoothed by triangular weighting; since it is advisable to group the periodogram (or cross-periodogram) ordinates in set of size n/40 (see Appendix C), we decided to put ½ weight on current value, ¼ weight each on the values one lag preceding and following the current value (121). The SAS computer program was used for all estimation.

[3]t-statistics are given in parentheses beneath the estimated coefficients and * indicates statistical significance at 5 percent level, ** indicates statistical significance at 10 percent level. D.W. stands for Durbin-Watson statistics, if it is less than its theoretical lower limit, then we use a Cochrane-Orcutt iterative technique (CORC) in estimating the equation and present the final value of rho. Numbers in parentheses below F-statistics are significance levels.

[4]A polynomial distributed lag (PDL) of degree two was used, and since we had a priori reasons to believe that the lag structure will taper off to negligible value, we imposed only the far end zero restriction. Also, since in using a PDL technique we lose some degree of freedom, we therefore used data from the 1973I to 1979II. These specifications will also be used in all future estimations of the equation II of our model.

CHAPTER VI

EUROPEAN MONETARY SYSTEM

Introduction

The level of economic interpenetration between Community members does require as much stability as possible between their exchange rates if trade is to prosper; disenchantment of the floaters with the working of the floating rates; the diminishing faith in the Community of the role of exchange rate as a policy instrument; change of attitude in Germany with regard to the advantages of further real appreciation of DM; fears of instability of the dollar, as much for these reasons as for any desire to step again out on the road toward EMU, the Nine agreed during the course of 1978 on the creation of the European Monetary System (EMS) which came into force in March, 1979.

The EMS contains three parts: an exchange rate system; the creation of a European currency, the ECU; and the first steps toward a European Monetary Fund (Van Ypersele, 1979b).

The Exchange Rate System

The exchange rate system in the EMS specifies a band or margin, around bilateral central rates, within which market rates are free to move. The band is 2.25 percent on either side of the central rates for all EMS currencies except the Italian lira, which may move 6 percent on either side of its central rate and pound sterling which

float freely against all other currencies. (The United Kingdom, whilst participating in the EMS viewed as a whole, decided not to take part in the exchange rate at their outset.) The parity grid matrix, Tables VII and VIII, show the upper and lower intervention points for each pair of currencies. When the market rate for any currency pair reaches its limit, the two central banks must intervene to keep it within the band.

For example, assume the Belgian Franc has a tendency to fall below the bottom of its band vis-a-vis the German mark, i.e., below 1BF = .06099 DM. That means the German mark has a tendency to rise above the top of its band vis-a-vis the Belgian Franc, i.e., to rise above 1DM = 16.3955 BF. In order to keep the market rate within the band both central banks must intervene, by selling DM for BF, when the rate reaches its limit. Intervention is also allowed before the limits are reached, and such intervention, in principle, will be made in participating currencies, but intervention in dollars or in a third currencies is not excluded. However, when intervention points defined by the fluctuation margins are reached, intervention in participating currencies is compulsory (Costerg and Tardy, 1979).

In theory, the arrangement permits the rate between each pair of currencies to move through a maximum range of 4.5 percent. But there is very little chance that in practice any country could make full use of this 4.5 percent range in a short period of time. If DM and BF are at their bilateral central rate, one currency could appreciate 2.25 percent vis-a-vis the other before either central bank would be obliged to intervene in DM or BF. But before that full range is traversed, it is likely that one or both of the currencies would reach its respective limit against a third currency (Congress of the United States, Joint Economic Committee, 1979).

TABLE VII

THE ORIGINAL PARITY GRID, MARCH 13, 1979

	DM	FF	BF	L	DK	Fl	IP
DM		2.3521	16.074	485.576	2.8866	1.10835	.269937
		2.3095	15.7164	457.314	2.82237	1.0837	.263932
		2.2581	15.3665	430.698	2.7596	1.0596	.25806
FF	.44285		6.96	210.252	1.24985	.4799	.116881
	.432995		6.80512	198.015	1.22207	.469235	.114281
	.42335		6.65375	186.49	1.1949	.4588	.111739
BF	.06508	.15029		30.8961	.183665	.07052	.0171755
	.0636277	.146948		29.0979	.179581	.0689531	.0167934
	.06221	.14368		27.4044	.175585	.06742	.0164198
L	.002322	.005362	.03549		.006553	.002516	.000612801
	.00218668	.00505013	.0343668		.0061716	.0023697	.000577135
	.002059	.004756	.032365		.005813	.00223175	.000543545
DK	.36235	.8369	5.695	172.045		.3927	.0956424
	.354313	.818286	5.56852	162.033		.383967	.0935147
	.34645	.8801	5.4445	152.605		.375425	.0914343
Fl	.94375	2.1796	14.8325	448.074	2.66365		.249089
	.922767	2.13113	14.5026	421.995	2.60439		.243548
	.90225	2.0838	14.18	397.434	2.54645		.23813
IP	3.875	8.9495	60.9020	1839.78	10.9365	4.1995	
	3.78886	8.75034	59.5471	1732.7	10.6935	4.10597	
	3.705	8.5555	58.2225	1631.85	10.4555	4.0145	

Source: Congress of the United States, Joint Economic Committee, 1979, p. 36.

Note: DM = Deutsche Mark; FF = French Franc; BF = Belgian Franc; L = Italian Lira; DK = Danish Krone; Fl = Dutch Guilder; and IP = Irish Pound.

TABLE VIII

THE REALIGNED PARITY GRID, SEPTEMBER 24, 1979

	DM	FF	BF	L	DK	Fl	IP
DM		2.4093	16.3955	495.287	3.0309	1.1305	.27553
		2.35568	16.0307	466.46	2.96348	1.10537	.26921
		2.3033	15.6740	439.312	2.8976	1.080775	.26323
FF	.43415		6.96	210.252	1.28667	.4799	.116881
	.4245		6.80512	198.015	1.25801	.469235	.114281
	.41505		6.65375	186.49	1.230012	.4588	.111739
BF	.0638	.15029		30.8961	.189072	.07052	.0171755
	.06238	.146948		29.0979	.18486	.0689531	.0167934
	.06099	.14638		27.4044	.18075	.06742	.0164198
L	.002276	.005362	.03649		.0067457	.002516	.000612801
	.002144	.00505013	.0343668		.0063531	.0034697	.000577135
	.002019	.004756	.032365		.0059834	.00223175	.000543545
DK	.3451	.813	5.5325	167.13		.381475	.092909
	.337441	.794906	5.40942	157.403		.372998	.0908426
	.32995	.7772	5.289	148.242		.3647	.088822
Fl	.92525	2.1796	14.8325	448.074	2.74198		.249089
	.90467	2.13113	14.5026	421.995	2.68098		.234548
	.88455	2.0838	14.18	397.434	2.6214		.23813
IP	3.799	8.9495	60.9020	1839.78	11.2585	4.1995	
	3.7146	8.75034	59.5471	1732.7	11.00805	4.10597	
	3.632	8.5555	58.2225	1631.85	10.76322	4.0145	

Source: Congress of the United States, Joint Economic Committee, 1979, p. 37.

Note: DM = Deutsche Mark; FF = French Franc; BF = Belgian Franc; L = Italian Lira; DK = Danish Krone; Fl = Dutch Guilder; and IP = Irish Pound.

The parity grid described above is simple and unambiguous. The important point is that the responsibility for intervening in the exchange rate markets is shared by at least two countries (a weak and a strong currency country) rather than resting with one country alone. (Assuming that there is no neutralization policy, this by itself helps the convergence of inflation rates at the Community average.)

The European Currency Unit

The European Currency Unit (ECU) like the Special Drawing Right (SDR) of the International Monetary Fund is a basket of currencies, containing specific amounts of the nine member currencies. The amounts of each currency and their relative weights in the original ECU basket are shown in Table IX.

TABLE IX

THE AMOUNTS AND RELATIVE WEIGHTS OF EACH CURRENCY IN THE ECU

Currency	Amount	Weight
Deutsche Mark	.828	33.02
French Franc	1.15	19.89
Pound Sterling	.0885	13.25
Dutch Guilder	.286	10.56
Italian Lira	.109	9.58
Belgian Franc	3.66	9.23
Danish Krone	.217	3.10
Irish Pound	.00759	1.11
Luxenbourg Franc	.14	.35

Sources: Van Ypersele (1979b, p. 16); Costerg and Tardy (1979, p. 10).

The value of an ECU, therefore, is .828 DM plus 1.15 FF plus .0885 pound sterling, and so on. To calculate the value of ECU in terms of any single currency, convert the specific amounts of all the currencies in the ECU into that one currency.

The amounts or weights of currencies in the ECU are subject to change by unanimous agreement of the member governments. The ECU has four functions: (1) It serves as the denominator (numeraire) for the exchange rate mechanism; (2) as the basis for the divergence indicator; (3) as the denominator for operations in both the intervention and the credit mechanisms; and (4) as a means of settlement between monetary authorities of EC.

As a numeraire, the ECU is used to define the bilateral central rates. If the ECU is defined, that is, specific amounts of each currency are chosen to compromise an ECU, and if the bilateral central rates are established first, then the ECU central rates are determined. For example, the ECU central rate for DM is determined by converting the specific amount of each currency in the ECU into an equivalent of DM, using bilateral central rates to make the conversion, then adding those DM to the .828 DM component of the ECU. The result is 1 ECU = 2.48557 DM. The establishment of bilateral central rates and the definition of the ECU, therefore, imply a specific set of ECU central rates. If, instead, ECU central rates are established first, one can derive bilateral central rates directly from them, without any reference to the definition of the ECU.

For example, assume we have the following ECU central rates: 1 ECU = 2.5 DM; 1 ECU = 6 FF; and 1 ECU = 40 BF. Then by division we can derive, for example, the deutsche mark-Belgian Franc bilateral central rates as: 1 DM = 16 BF or 1 BF = .0625 DM. Therefore,

bilateral central rates can be calculated for each pair of currencies from ECU central rates, or ECU central rates can be derived from bilateral central rates and the definition of ECU. The EMS arrangement, as well as much of the literature on EMS, speaks of bilateral central rates being derived from ECU central rates.

The second function of the ECU is its role as an indicator of divergence in intera-EC-currency relationships. As Thygesen (1979a) points out, although this role of the ECU was watered down considerably in the course of the EMS negotiations, it is still the most significant move towards a more communitarian system visible in the EMS.

As market exchange rates fluctuate daily, the market determined ECU value of each currency fluctuates, given a set of ECU central rates, the difference hetween the market ECU value of each currency and its ECU central rate reflects that currency's divergent indicator. When a currency's divergent indicator passes a specified "threshold", the issuing central bank is expected to intervene or take other action to counter the divergence. If one currency is at its upper (lower) intervention limit simulatneously against all the other participating currencies, then it is at maximum divergence from its ECU central rate. The specified threshold is fixed at 75 percent of the maximum divergent so that it may alarm an early warning.

In the parity grid, if currency A is at the top of its band against currency B, then B will be at the bottom of its band against A; therefore, both central banks are obliged to intervene. This symmetry does not hold for an ECU system; currency A may reach its threshold of divergence against its ECU central rate without any other currency moving outside its respective threshold of divergence.

The importance of the divergence indicator is that it is an objective indicator or a trigger for policy coordination. It is a trigger for policy coordination because it signals to the country whose policies are out of step with the majority of EMS members to bring its policies into line with those of other members.

As Thgesen (1979b) points out, the resolution of the European Council on December 5, 1978, states that:

> . . . when a currency crosses its threshold of divergence, this results in a presumption that the authorities concerned will correct this situation by adequate measures, namely, (a) diversified intervention; (b) measures of domestic monetary policy; (c) changes in central rates; and (d) other measures of economic policy. In case such measures, on account of special circumstances, are not taken, the reasons for this shall be given to the other authorities, especially in the 'concertation between central banks' (p. 111).

As Thygesen (1979b) points out:

> . . . this sounds vague in a double sense: (1) the nature of the adjustment is not well defined, indeed, it is not mandatory to take action at all; and (2) it is very difficult to assess a priori how often currencies will in practice reach their ECU threshold. Yet this flexibility may be a considerable asset, by enabling the EMS to modify and sharpen its procedures if and when the need arises (pp. 111-112).

The need to coordinate national monetary policies to manage the EMS has certainly been recognized at the official level, but it has not been reflected in any formal decisions (Thgesen, 1979b). The theoretical and empirical considerations developed in Chapters IV and V of this research suggest that if the EMS is to represent a step forward towards the establishment of conditions leading to a zone of monetary stability and, eventually, to European monetary unification, the emphasis must be on coordination of national monetary policies. This in turn suggests a clear adjustment action in the ECU system when a currency crosses the threshold of divergence, namely, measures of

monetary policy in the divergent country so as to bring its monetary policy into line with those of other members. In this way the divergence indicator as a trigger for policy coordination should become mainly a divergence indicator as a trigger for monetary coordination.

Beyond its numeraire and divergent indicator functions, the ECU also serves not only as the denominator for operations in both the intervention and credit mechanisms, but also as a means of settlement between monetary authorities of the EC.

In stabilizing the bilateral exchange rates in the parity grid, central banks are required to intervene in member currencies rather than in dollars. Since, however, central banks do not in general accumulate member currencies as reserves, such interventions require mutual credit operations between the two central banks concerned. Central banks grant each other through the European Monetary Cooperation Fund (EMCF) unlimited very short-term financing for their interventions and short-term monetary support, which can be supplemented further by medium-term financial assistance, granted by the Council under appropriate conditions (Triffin, 1980). The ECU is used as a unit of account in these interventions and credit mechanisms.

To serve as a means of settlement, an initial supply of ECUs will be provided by the European Monetary Cooperation Fund against each central bank's deposit of 20 percent of its gold and 20 percent of its dollar reserves on a three-month swap. The ECU, however, can be used to settle claims between Community central banks only with a 50 percent limit at the creditor's option. For any portion not settled in ECUs, the general rule is to settle in reserve components in the same proportions as those in which the debtor central banks hold its reserves, gold, however, being excluded.

The European Monetary Fund and Present Credit Mechanisms

The present credit facilities involve three mechanisms: (1) the very short-term financing facility; (2) the short-term monetary support; and (3) the medium-term financial assistance.

Apart from the increase in duration and size, these mechanisms are taken over by the EMS from the old snake.

The very short-term financing is available to EMS members accepting the intervention obligations of the parity grid in unlimited amounts. The claims and obligations resulting from these interventions normally should be settled 45 days after the end of the month during which the intervention took place. (Extensions are, however, possible.)

The short-term monetary support and the medium-term financial assistance were expended as can be seen from Tables X and XI at the start of the EMS (Padoa-Schioppa, 1980).

The Resolution of the European Council of December, 1978, called for the creation of a European Monetary Fund (EMF) to replace the European Monetary Cooperation Fund. The aim is to consolidate the credit mechanisms into a single fund in the final phase of the EMS. It shall evolve to supra-nation monetary authority for the Community with power to create new international reserves.

Summary

The European Monetary System consists of a parity grid within which bilateral market rates are permitted to move 2.25 percent on either side of their central rates. While pegged tightly to each other, the EMS currencies float as a group against other currencies. When one

TABLE X

INCREASE IN THE SHORT-TERM MONETARY SUPPORT
(MILLION ECUs)

	Quotas			
	Debor		Creditor	
	Old	New	Old	New
Bank National de Belgique	200	580	400	1160
Denmarks National Bank	90	260	180	520
Deutsche Bundesbank	600	1740	1200	3480
Banque de France	600	1740	1200	3480
Central Bank of Ireland	35	100	70	200
Banca d'Italia	400	1160	800	2320
Nederlandsche Bank	200	580	400	1160
Bank of England	600	1740	1200	3480
Total Quotas	2725	7900	5450	15800

Source: Padoa-Schioppa (1980, p. 321).

TABLE XI

INCREASE IN MEDIUM-TERM FINANCIAL ASSISTANCE
(MILLION ECUs)

	Commitment Ceilings	
	Old	New
Belgium/Luxembourg	400	1035
Denmark	180	465
France	1200	3105
Germany	1200	3105
Ireland	70	180
Italy	800	2070
Netherlands	400	1035
United Kingdom	1200	3105

Source: Padoa-Schioppa (1980, p. 322).

currency reaches its upper (or lower) limit against another, and necessarily the other reaches its lower (or upper) limit against the first, the authorities in both countries are obliged to intervene to prevent their currencies moving outside their permitted range.

Since the automatic working of the parity grid mechanism does not necessarily produce the desirable policy adjustments, it is supplemented by policy rules linked to the ECU; a threshold of divergence has been defined. This is where a currency's market value against the ECU diverges from its central ECU rate by more than 75 percent of the agreed maximum margin of fluctuations (also expressed in ECU). This crossing of the threshold of divergence will trigger automatic interventions or at least consultation on a possible need for policy coordination.

The Resolution of the European Council in Brussels states that the authority of the divergent currency is expected to correct this situation by (1) diversified intervention, (2) measure of domestic monetary policy, (3) changes in central rates, and (4) other measures of economic policy.

Since the empirical findings in this research seem to support the monetary nature of the exchange rates, our recommendation for a divergent currency is very clear, namely, measures of monetary policy (inflationary policies in the case of a strong currency and deflationary in the case of a weak one) so as to bring its monetary policy closer to the other members.

On the other hand, it may be argued that some kind of flexibility is needed for an ambitious design like EMS, so that, although this research emphasizes complusory monetary measures for a successful functioning of the EMS, it does not rule out the use of other policies,

such as changes in central rates or other measures of economic policy as is recommended in the Resolution of the European Council in Brussels.

To enable countries with limited reserves to support their currencies, a system of bilateral and multinational credit has been devised. It is hoped that these credit arrangements will be consolidated under the management of a European Monetary Fund with the power to create new international reserves.

CHAPTER VII

SUMMARY AND CONCLUSIONS

Although the origins for some sort of European union are fairly distant, it is only after the Second World War that a great progress has been made. Negative integration--the removal of discrimination between the economic agents of the member countries--was virtually completed by July, 1968.

By 1970 a first step toward positive integration--the formation and application of coordinated and common policies in order to fulfill welfare objectives--was made by the introduction of The Werner Report which called for the establishment of an Economic and Monetary Union (EMU) by the end of 1980. But 1980 has come and gone without an economic and monetary union of nine EC member states. However it is a mistake to assert that further progress toward EMU is a remote prospect.

The purpose of this research has been to evaluate the potential costs and benefits of using a "monetarist" strategy to help development toward full economic union. The "monetarist" strategy emphasizes a quick introduction of monetary union among countries aiming at economic union in order to minimize the inefficiencies inherent in the use and control of money within the union and foster the drive toward a full economic union. An important element of a monetary union is the fixity of exchange rates within the union, and from a technical point of view, it is not a matter whether the currencies of the member

countries, which form the monetary union, are retained or whether they are replaced by a new common currency.

The benefits and costs of monetary union are described in Chapter III, the most important benefits seem to be: (a) it contributes to economic union, and thereby improves the allocation of economic resources; (b) it reduces or even eliminates the uncertainty in the fluctuation of the exchange rates among national currencies of the members of the union, thereby, reducing the cost of information about exchange rates and exchange market prospects and transaction costs and hopefully encourages trade among participating members.

The main cost of a monetary union seems to be the sacrifice of domestic economic objectives. Keynesian economists argue that the imposition of some sort of fixed exchange rate among member states results in the loss of control over the money supply for individual member countries, which, prevents them from each attaining their optimum combination of inflation and unemployment on the so-called Phillips Curve. According to the critics of the "monetarist" strategy, this results in a higher rate of unemployment in some member states which would not be acceptable to them.

This study maintains that the above objection to a "monetarist" strategy to help development toward full economic union is, economically, weak.

To show that the real cost of using a "monetarist" strategy for relatively open economies of member states is small, we have used the monetary approach to the balance of payments theory. Two versions of a simple monetary approach to exchange rate determination have been developed and estimated. The empirical evidence presented in this study suggests that exchange rates are mainly monetary phenomena and

that exchange rate changes mainly affect money prices, and have no lasting effects on employment.

An implication of the results derived in this study is that to maintain fixed exchange rates, the participating members should mainly aim at ex ante harmonization of their monetary expansion. This ex ante harmonization, of course, limits the monetary independence of national economies; but since the monetary approach of exchange rate determination follows from two theories, namely the domestic monetary theory of the price level and the purchasing power parity theory of the exchange rate, any empirical support for the monetary approach of exchange rate determination is also, but implicitly, an empirical support for the domestic monetary theory of the price level. Therefore this study also supports the domestic monetary tenet that monetary policy mainly affects the price level and has no lasting effect on employment. In other words, the results in this study support not only the monetary nature of the exchange rates but also the lack of a trade-off between inflation and employment for individual member countries.

In view of the above, this research maintains that the cost of the loss of national control over the money stock (unemployment) is very small and negligible after a year. Given the sizeable benefits resulting from monetary union, we believe that there is a strong case for a quick introduction of monetary union in the community.

Another implication of this study concerns the successful functioning of the European Monetary System. Although the prime objective of the EMS seems to be to increase monetary stability in the community, it cannot be confined to that. It is also a basic strategy designed to facilitate the convergence of economic development and therefore assist in giving fresh impetus to the process of European

Union. To be successful, the EMS, first of all, will have to be accompanied by policies designed to achieve greater convergence of national monetary policy.

In summary, the results of this study are important for both theoretical and policy purposes. Monetary union, which represents an intermediate stage, is still far from complete. A major stride in that direction requires closer coordination of the monetary policies of all the Member States.

REFERENCES

Abott, G. C. "Recent Development in the International Monetary System and Their Implications for International Economic Relations." Journal of Economic Studies (May, 1979), 129-154.

Abrams, R. K. "International Trade Flows Under Flexible Exchange Rates." Federal Reserve Bank of Kansas City Economic Review (March, 1980), 3-10.

Aliber, R. Z. "Uncertainty Currency Areas and the Exchange Rate System." Economica (November, 1972), 432-441.

Artus, J. R. and J. H. Young. "Fixed and Flexible Exchange Rates: A Renewal of the Debate." Staff Papers. Washington, D.C.: International Monetary Fund, 1979, 654-698.

Balassa, B. The Theory of Economic Integration. Homewood, IL: Irwin, 1961.

_____. "The Purchasing Power Parity Doctrine: A Reappraisal." Journal of Political Economy (December, 1964), 584-596.

Basevi, G. and P. DeGrauwe. "Vicious and Virtuous Circles and the Optica Proposal: A Two-Country Analysis." In One Money for Europe, M. Fratianni and T. Peeters (eds.). New York: Praeger Publishers, 1979.

Bilson, J. F. "The Vicious Circle Hypothesis." Staff Papers. Washington, D.C.: International Monetary Fund, March, 1979a, 1-37.

_____. "Recent Developments in Monetary Models of Exchange Rate Determination." Staff Papers. Washington, D.C.: International Monetary Fund, June, 1979b, 201-223.

Bloomfield, A. I. "European Monetary Integration: The Historical Setting." In European Monetary Union and Its Meaning for the United States, L. Krause and W. Salant (eds.). Washington, D.C.: The Brookings Institute, 1973.

Box, G. E. P. and G. M. Jenkins. Time Series Analysis, Forecasting and Control. San Francisco: Holden-Day, 1970.

Box, G. E. P. and D. A. Pierce. "Distribution of Residual Autocorrelations in Autoregressive Integrated Moving Average Time Series Models." Journal of American Statistical Association (December, 1970), 1509-1526.

Boyer de la Giroday, F. "Myths and Reality in the Development of International Monetary Affairs." Essay in International Finance. Princeton: Princeton University Press, 1974.

Bromberger, M. and S. Bromberger. Jean Monet and the United States of Europe. New York: Coward-McCann, 1969.

Bulletin of the European Communities. Brussels: January, 1967.

_____. Brussels: Supplement to March, 1969.

_____. Brussels: Supplement to July, 1970.

_____. Brussels: Supplement to November, 1970.

_____. Brussels: April, 1972, 24-38.

Burtle, J. and S. Mooney. "International Trade and Investment Under Floating Rate System." In Exchange Rate Flexibility, J. S. Dreyer, G. Haberler, and T. D. Willett (eds.). Washington, D.C.: American Enterprise Institute, 1978.

Carse, S., J. Williamson, and G. E. Wood. Financing Practices in U. K. Foreign Trade. Cambridge: Cambridge University Press, 1980.

Cassel, G. The World's Monetary Problems. London: Constable, 1921.

Chacholiades, M. International Monetary Theory and Policy. New York: McGraw-Hill, 1978.

Chatfield, C. The Analysis of Time Series: Theory and Practice. New York: Wiley, 1975.

Congress of the United States, Joint Economic Committee. The European Monetary System: Problems and Prospects. Washington, D.C.: U.S. Government Printing Office, 1979.

Corden, W. M. "Monetary Integration." Essay in International Finance. Princeton: Princeton University Press, 1972.

Costerg, P. and G. Tardy. Le System Monetaire Europeen. Paris: Etudes et Perspective Europeennes, 1979.

Crokett, A. D. and M. Goldstein. "Inflation Under Fixed and Flexible Exchange Rates." Staff Papers. Washington, D.C.: International Monetary Fund, November, 1976, 522-537.

De la Mahotiere, S. Towards One Europe. Middlesex: Penguin Books, 1970.

Dornbusch, R. "Expectations and Exchange Rate Dynamics." Journal of Political Economy (December, 1976), 1161-1176.

Dorsch, H., M. Michiels, and J. V. Louis. L'Union Economique et Monetaire 1970-1973. Brussels: Université de Bruxelles, 1977.

The Economist. "The All Saints' Day Manifesto for European Monetary Union: A Currency for Europe." November 1, 1975, 33-38.

ECSC, High Authority. Toward European Integration: First Results for Coal and Steel. Luxemburg, 1956.

EEC Commission. First General Report on the Activities of the Communities, 1967. Brussels, 1968.

Emerson, M. "The European Monetary System in the Broader Setting of the Community's Economic and Political Development." In The European Monetary System: Its Promise and Prospects, P. H. Trezise (ed.). Washington, D.C.: The Brookings Institute, 1979.

Feld, W. J. "Implementation of the European Community's Common Agricultural Policy: Expectation, Fear, Failures." International Organization (Summer, 1979), 335-363.

Fleming, M. J. "On Exchange Rates Unification." Economic Journal (September, 1971), 467-488.

Frenkel, J. A. "A Monetary Approach to the Exchange Rate: Doctrinal Aspects and Empirical Evidence." Scandinavian Journal of Economics, Vol. 78 (1976), 200-224.

Frenkel, J. A. and H. G. Johnson. "The Monetary Approach to the Balance of Payments: Essential Concepts and Historical Origins." In The Monetary Approach to the Balance of Payments, A. J. Frenkel and H. G. Johnson (eds.). Toronto: The University of Toronto Press, 1976.

Friedman, M. "The Case for Flexible Exchange Rates." In Essays in Positive Economics, M. Friedman (ed.). Chicago: University of Chicago Press, 1953.

Granger, C. W. J. "Comment." Journal of American Statistical Association (March, 1977), 22-23.

Granger, C. W. J. and . Hatanka. Spectral Analysis of Economic Time Series. Princeton: Princeton University Press, 1964.

Granger, C. W. J. and P. Newbold. "Spurious Regressions in Econometrics." Journal of Econometrics (May, 1974), 111-120.

Haberler, G. "Integration and Growth of the World Economy in Historical Perspective." American Economic Review (March, 1964), 1-22.

_____. "The International Monetary Systems: Some Recent Developments and Discussion." In Approaches to Greater Flexibility of Exchange Rates, G. N. Halm (ed.). Princeton: Princeton University Press, 1970.

Hass, E. B. Beyond the Nation-State. Standford: Standford University Press, 1964.

_____. The Uniting of Europe. Standford: Standford University Press, 1968.

Heller, R. "International Stabilization Policy Under Flexible Exchange Rates." In Stabilization Policies: Lesson from the 1970s and Implications for the 1980s. St. Louis: Center for the Study of American Business, 1980.

Hooper, P. and S. W. Kohlhagen. "The Effect of Exchange Rate Uncertainty on the Prices and Volume of International Trade." Journal of International Economics (November, 1978), 483-511.

Humphrey, T. M. and T. A. Lawler. "Factors Determining Exchange Rates A Simple Model and Empirical Tests." In The Monetary Approach to International Adjustment, B. H. Putnam and D. W. Wilford (eds.). New York: Praeger Publishers, 1978.

Ingram, J. C. "State and Regional Payment Mechanisms." Quarterly Journal of Economics (November, 1959), 619-632.

_____. "The Case for European Monetary Integration." Essay in International Finance. Princeton: Princeton University Press, 1973.

International Monetary Fund. International Financial Statistics. Washington, D.C.: various issues used for data.

Ishiyama, Y. "The Theory of Optimum Currency Areas: A Survey." Staff Papers. Washington, D.C.: International Monetary Fund, July, 1975, 344-383.

Jenkins, R. "European Monetary Union." Lloyds Bank Review (January, 1978), 1-14.

Johnson, H. G. "Problems of European Monetary Union." Journal of World Trade Law (July-August, 1971a), 377-387.

_____. "Problems of European Monetary Union." Euromoney (April, 1971b), 39-43.

_____. "The Monetary Approach to Balance of Payments Theory." Journal of Financial and Quantitative Analysis (March, 1972), 1555-1572.

_____. "Money, Balance of Payments Theory and the International Monetary Problem." Essay in International Finance. Princeton: Princeton University Press, 1977.

Katseli-Papaefstratiou, L. T. "The Reemergence of the Purchasing Power Parity Doctrine in the 1970s." Special Papers in International Economics. Princeton: Princeton University Press, 1979.

Keleher, R. "Monetary Policy and Interest Rates." Federal Reserve Bank of Atlanta Economic Review (July-August, 1980), 26-29.

Kemp, D. S. "A Monetary View of the Balance of Payments." In The Monetary Approach to International Adjustment, B. H. Putnam and D. S. Wilford (eds.). New York: Praeger Publishers, 1978.

Kenen, P. B. "The Theory of Optimal Currency Areas: An Eclectic View." In Monetary Problems of International Economy, R. A. Mundell and A. K. Swoboda (eds.). Chicago: University of Chicago Press, 1969.

Keran, M. and S. Zeldes. "Effects of Monetary Disturbances on Exchange Rates, Inflation and Interest Rates." Federal Reserve Bank of San Francisco Economic Review (Spring, 1980), 7-29.

Kindleberger, C. P. "The Benefits of International Money." Journal of International Economics (1972), 425-442.

Kouri, P. J. "The Exchange Rate and the Balance of Payments in the Short-Run and the Long-Run: A Monetary Approach." Scandinavian Journal of Economics, Vol. 78 (1976), 280-304.

Kreinin, M. E. International Economics, A Policy Approach. New York: Harcourt, Brace, Jovanovich, 1975.

Kreinin, M. E. and L. H. Officer. "The Monetary Approach to the Balance of Payments: A Survey." Princeton Studies in International Finance. Princeton: Princeton University Press, 1978.

Laffer, A. B. "Two Arguments for Fixed Rates." In The Economies of Common Currencies, H. J. Johnson and A. K. Swoboda (eds.). London: George Allen and Unwin, 1973.

Lanfalussy, A. "An Overview of the Problems." In U.S.-European Monetary Relations, S. A. Katz (ed.). Washington, D.C.: American Enterprise Institute, 1979.

Lindberg, L. N. and S. A. Scheingold. Europ's Would-Be Polity. New Jersey: Prentice-Hall, 1970.

Magnifico, G. European Monetary Unification. London: Macmillian, 1973.

Maillet, P. Vers L´Union Economique et Monetaire (Plan Barre, Rapports Werner et Marjolin). Paris: Etudes et Perspectives Europeennes, 1976.

Masera, R. S. "Floating Exchange Rates, International Trade and Domestic Stability." In Floating Exchange Rates--The Lessons of Recent Experience, H. Fournier and J. E. Wadsworth (eds.). Amesterdam: Sijthoff-Layden, 1976.

McKinnon, R. I. "Optimal Currency Areas." American Economic Review (September, 1963), 717-725.

Mundell, R. A. "A Theory of Optimal Currency Areas." American Economic Review (September, 1961), 657-665.

_____. International Economics. New York: Macmillan, 1968.

_____. "Uncommon Arguments for Common Currencies." In The Economics of Common Currencies, H. G. Johnson and A. K. Swoboda (eds.). London: George Allen and Unwin, 1973.

Mussa, M. "Tariffs and the Balance of Payments: A Monetary Approach." In The Monetary Approach to the Balance of Payments, A. J. Frenkel and H. G. Johnson (eds.). Toronto: University of Toronto Press, 1976.

_____. "The Exchange Rate, The Balance of Payments, and The Monetary and Fiscal Policy Under a Regime of Controlled Floating." In The Economics of Exchange Rates, J. A. Frankel and H. G. Johnson (eds.) Boston: Addison-Wesley, 1978.

Nurkse, R. International Currency Experience: Lessons of the Interwar Period. Geneva: The League of Nations, 1944.

OECD. Quarterly National Account Bulletin. Paris: various issues used for data.

Officer, L. H. "The Purchasing Power Parity Theory of Exchange Rates: A Review Article." Staff Papers. Washington, D.C.: International Monetary Fund, March, 1976, 1-61.

Oort, C. J. "Managed Floating in the European Community." In U.S.-European Monetary Relations, S. I. Katz (ed.). Washington, D.C.: American Enterprise Institute, 1979.

Oppenheimer, P. Business Views on Exchange Rate Policy: An Independent Study by a Group of Leading Economists. London: Confederation of British Industry, 1978.

Padoa-Schioppa, T. "The EMF: Topics for Discussion." Banca Nazionale del Lavaro (September, 1980), 317-343.

Paige, D. and G. Bombach. A Comparison of National Output and Productivity of the United Kingdom and the United States. Paris: OCED, 1959.

Polak, J. "Monetary Analysis of Income Formation and Payments Problems." Staff Papers. Washington, D.C.: International Monetary Fund, November, 1957, 1-50.

Polak, J. and V. Argy. "Credit Policy and the Balance of Payments." Staff Papers. Washington, D.C.: International Monetary Fund, March, 1971, 1-24.

Polak, J. and L. Boissoneault. "Monetary Analysis and Policy in Financially Dependent Economies." Staff Papers. Washington, D.C.: International Monetary Fund, April, 1960, 349-415.

Salant, W. S. "Implication for International Reserves." In European Monetary Unification and Its Meaning for the United States, L. B. Krause and W. S. Salant (eds.). Washington, D.C.: The Brookings Institute, 1973.

Salin, P. "La Zone Monetaire Optimale." in L'Unification Monetaire Europeenne, P. Salin (ed.). Pairs: Calmann-Levy, 1974.

Scammell, W. M. International Monetary Policy. London: Macmillian, 1961.

Schmitt, H. A. The Path to European Union. Baton Rouge, Louisiana: Louisiana State University Press, 1962.

_____. European Union: From Hitler to DeGaulle. New York: Van Nostrand Reinhold, 1969.

Scitovsky, T. Money and the Balance of Payments. Chicago: Rand-McNally, 1969.

Smith, A. An Inquiry into the Nature and Causes of the Wealth of Nations. New York: Random House, 1937.

Sohmen, E. "International Monetary Problems and the Foreign Exchanges," Special Papers in International Economics. Princeton: Princeton University Press, 1963.

Teitgen. P. H. Origines objectifs et Nature des Communautés Europeennes. Paris: Etudes et Perspectives Europeennes, 1975.

Thygesen, N. "Community Decision Making on Exchange Rate and Money." Journal of Common Market Studies (June, 1979a), 313-331.

_____. "The Emerging European Monetary System: Procedures, First Steps and Policy Options." In EMS, The Emerging Monetary System, R. Triffin (ed.). Brussels: National Bank of Belgium, 1979b.

Tower, E. and T. D. Willett. "The Concept of Optimum Currency Areas and the Choice Between Fixed and Flexible Exchange Rates." In Approaches to Greater Flexibility of Exchange Rates, C. N. Halm (ed.). Princeton: Princeton University Press, 1970.

_____. "The Theory of Optimum Currency Areas and Exchange-Rate Flexibility." Special Papers in International Economics. Princeton: Princeton University Press, 1976.

Triffin, R. "The Future of the International Monetary System." Banca Nazionale del Lavoro (March, 1980), 29-51.

Tsoukalis, L. The Politic and Economics of European Monetary Integration. London: George Allen and Unwin, 1977.

Van Ypersele de Strihou, J. "European Monetary System and Its International Implication." Remarks made at the Mid-Atlantic Club of Washington, D.C., April, 1979a.

Van Ypersele de Strihou, J. "Operating Principles and Procedures of the European Monetary System." In The European Monetary System: Its Promise and Prospects, P. H. Trezise (ed.). Washington, D.C: The Brookings Institute, 1979b.

Vaubel, R. "Real Exchange Rate Changes in the European Community: The Empirical Evidence and Its Implications for European Currency Unification." Weltwirtschaftliches Archiv, No. 3 (1976), 429-470.

Vaughan, R. Twentieth-Century Europe. New York: Barnes and Noble Books, 1979.

Wanniski, J. "The Case for Fixed Exchange Rates." Wall Street Journal (June 14, 1974), p. 10.

Weil, G. L. A Handbook on the European Economic Community. New York: Praeger Publishers, 1965.

Werner, P. L'Europe Monetarie Reconsidereé. Lausanne: Centre de Recherches Europeennes, 1977.

Whitman, M. "International and Interregional Payments Adjustment: A Synthetic View." Studies in International Finance. Princeton: Princeton University Press, 1967.

Yeager, L. B. "Discipline, Inflation, and the Balance of Payments." In Money, The Market, and the State: Economic Essays in Honor of James Muir Waller, N. A. Beales and L. Aubrey Drewry, Jr. (eds.). Athens: University of Georgia Press, 1968.

APPENDICES

APPENDIX A

THE HISTORY OF THE SHORT-TERM MONETARY SUPPORT UP TO THE CREATION OF EMS

TABLE XII

THE HISTORY OF THE SHORT-TERM MONETARY SUPPORT
UP TO THE CREATION OF EMS

Countries Quota[1]	Period: From 9-2-70 To 7-1-73 Debtor Quota	From 7-1-73 To 17-2-74 Debtor Quota	On or After 18-2-74 Debtor Quota	On or After 18-2-74 Creditor Quota
Germany	300	300	600	1200
France	300	300	600	1200
Italy	200	200	400	800
Netherland	100	100	200	400
BLUE[2]	100	100	200	400
U.K.	--	300	600	1200
Denmark	--	45	90	180
Ireland	--	17.5	35	70
Total	1000	1362.5	2725	5450
Unity	million $	million units of account	million units of account	million units of account
Extension[3]	1000	1362.5	1500	--

Source: Dersch, Michiels and Louis (1977, p. 65).

[1]Quota = Contribution of each central bank Automatic Drawing.

[2]Belgium/Luxembourg (one single central bank).

[3]Conditional drawing, above the individual quota.

Example: Italy could get a total credit (quota and available extention) of $1200 from 9-2-70 to 7-1-73; of 1562.5 million units of account from 7-1-73 to 17-2-74, which she actually obtained, and of 1900 million units of account since the 18-2-74.

APPENDIX B

BIOGRAPHY OF THE ATTEMPTS TOWARD MONETARY UNION

Date	Crisis	Proposition and Decision
1968 - 1969	Financial crisis in France	
August 1969		Devaluation of French franc.
October 1969		Revaluation of German mark.
February 1970		Agreement between central banks for short-term monetary support.
October 1970		Proposal by Werner Group on implementation by stages toward EMU.
February 1971		Agreement on the implementation of the first stage.
May 1971	The D.M. crisis	The D.M. and guilder were floated jointly.
August 1971	End of the gold convertibility	Italian lira was floated. France and Belgium adopted a two-tier market. The commercial B.F. joined the D.M. and guilder.
December 1971		Smithsonian Agreement (realignment and increased margins of fluctuations). France and Belgium maintained their two-tier market.
April 1972		Basle Agreement, Snake in the Tunnel is launched; participants: Beligum, France, Germany, Italy, Luxembourg, the Netherlands
May 1972		U.K., Denmark, and Ireland join.
June 1972	Sterling crisis	U.K., Ireland, and Denmark leave the snake.
October 1972		Denmark returns.
January 1973		Italy withdraws and adopts two-tier market.
March 1973	$-D.M. crisis	The snake leaves the tunnel (joint float). U.S., Ireland, and Italy continue to float independently; D.M. revalued by 3 percent.
April 1973		Establishment of European Cooperation Fund.
June 1973		D.M. revalued by 5.5 percent.
September 1973		Guilder revalued by 5 percent.
January 1974		France leaves the snake.
September 1974		Fourcade Plan.
March 1975		Marjolin Report.

Date	Crisis	Proposition and Decision
July 1975		France rejoins the snake.
November 1975		Duisenberg Proposal.
October 1976		The Danish krone devalued by 6.5 percent, the guilder and B.F. by 2 percent.
April 1976		Danish krone devalued by 3 percent.
October 1977		Jean Monet lecture by Roy Jenkins in Florence.
October 1978		The D.M. is revalued by 4 percent, the guilder and B.F. by 2 percent.
December 1978		Establishment of EMS.
September 1979		Technical readjustment within the EMS.

Source: Compiled by the author.

APPENDIX C

SPECTRAL THEORY

The following summary of the spectral theory is taken from Granger and Hatanka (1964) and Chatfield (1975).

It is usual to attempt to explain the properties of a stationary stochastic process in terms of its autocovariance (or autocorrelation) function. In spectral analysis the natural tool for considering the frequency properties of a time series is the spectral density function.

If we suspect that a time series contains a periodic component at a known frequency, then the natural model is

$$X_t = R \cos(wt + \Theta) + Z_t \tag{1}$$

where w is called the frequency of the periodic variation, R is called the amplitude of the variation, Θ is called the phase, and Z_t denotes some stationary random series. w is called the angular frequency, but in keeping with most authors we will simply call w the frequency. However, some authors refer to frequency as

$$f = \frac{w}{2\pi} = \text{the number of cycles per unit of time}$$

The period of a sinusoidal cycle, called the wavelength, is $\frac{2\pi}{w}$ or $\frac{1}{f}$.

If the series is suspected to contain periodic component corresponding to several different specified frequency, say, w_1, w_2, ... w_k, then it is natural therefore to generalize (1) to:

$$X_t = \sum_{i=1}^{k} R_i \cos(w_i t + \Theta_i) + Z_t \tag{2}$$

Letting $k \to \infty$, it can be shown that (2) may be represented in the form:

$$X_t = \int_0^{\pi} \cos wt \, du(w) + \int_0^{\pi} \sin wt \, dv(w) \tag{3}$$

where u(w) and v(w) are random continuous process with uncorrelated

increments. Equation (3) is called the spectral representation of the real valued processes. More generally, all stationary processes (real-valued or complex-valued) can be represented in the form

$$X_t = \int_{-\pi}^{\pi} e^{itw}\, dZ(w) \tag{4}$$

where X(w) is a complex random function called a process of non-correlated increments such that:

$$E[\overline{dZ(w_i)}]dZ(w_2) = 0 \qquad w_1 \neq w_2$$
$$= dF(w) \qquad w_1 = w_2 = w$$

An important theorem in spectral analysis says that the sequence of autocovariances μ_t for a stationary process can always be represented in form

$$\mu_t = \int_{-\pi}^{\pi} e^{itw}\, dF(w) \tag{5}$$

or if the process is real-valued, in the form

$$\mu_t = \int_{0}^{\pi} 2 \text{ Cos } t \text{ w } dF(w) \tag{6}$$

F(w) has a direct physical interpretation, namely, it is the contribution to the variance of the series which is accounted for by frequencies in the range (0,w), and is called the spectral distribution function. Its derivative with respect to w is called spectral density function or simply the spectrum:

$$f(w) = \frac{dF(w)}{dw} = \text{(power) spectral density function}$$

The physical meaning of the spectrum is that f(w)dw represents the contribution to variance of components with frequencies in the range

(w,w+dw). A peak in the spectrum indicates an important contribution to variance at frequencies in the appropriate region.

Replacing dF(w) by f(w)dw in (5) and (6) results is:

$$\mu_t = \int_{-\pi}^{\pi} e^{itw} f(w)dw \tag{7}$$

$$\mu_t = \int_{0}^{\pi} 2 \text{ Cos } t \text{ w } f(w)dw \tag{8}$$

Estimation of the Spectrum

From the relationship for real, stationary process (8), the inverse relationship is given by

$$f(w) = \frac{1}{2\pi} (\mu_0 + \sum_{J=1}^{\infty} \mu_j \text{ Cos } j \text{ w}) \tag{9}$$

so that for a finite amount of data $\{\chi_t, t = 1, 2, \ldots, m\}$ a sensible estimate would appear to be

$$\hat{f}(w) = \frac{1}{2\pi} (C_0 + 2 \sum_{J=1}^{n-1} C_j \text{ Cos } j \text{ w}) \tag{10}$$

where the estimated covariances, C_j, are given by

$$C_j = \frac{1}{n-j} \sum_{t=1}^{n-j} (\chi_t - \bar{\chi})(\chi_{t+j} - \bar{\chi}) \tag{11}$$

It is possible to partition the variability of a series into components at different frequencies; if we plot the contribution of each component to the variance against different ranges of frequencies we obtain the periodogram, represented by

$$I(w) = \frac{1}{2\pi} (C_0 + 2 \sum_{J=1}^{m-1} C_j \text{ Cos } j \text{ w}) \tag{12}$$

Therefore it appears that the periodogram is the obvious estimate of the power spectrum. However, it can be shown that the periodogram is asymptotically unbiased but is not a consistent estimator for f(w).

The failure of the periodogram as an estimate for the power spectrum has led to consideration of estimates of the form

$$\hat{f}(w) = \frac{1}{2\pi} \{C_0\lambda_0 + 2 \sum_{J=1}^{m-1} \lambda_j C_j \text{ Cos } j\ w\} \tag{13}$$

where λ_j are a set of weights called the lag window, and $m < n$ is called the truncation point.

The above method is based on transforming the sample autocovariance function. A considerable amount of discussion has occurred in deciding how to choose the weighting factors λ_j. An alternative method, also used in this research, is to smooth the periodogram by simply grouping the periodogram ordinates in sets of siz m and finding their average value. There is little advice in the literature on the choice of m. It seems advisable to try several values, in the region of n/40.

Cross-Spectral Analysis

For a univariate process, the moment up to second order are the mean and autocovariance function. For a bivariate process, the moments up to second order consist of the mean and autocovariance functions for each of the two process plus a new function, called the cross-covariance function. For a real bivariate random process $\{X_t, Y_t\}$ the spectral representation is given by

$$\mu_{xx}(t) = 2 \int_0^{\pi} \text{Cos } t\ w\ f_x(w)dw \tag{14}$$

$$\mu_{yy}(t) = 2 \int_0^{\pi} \text{Cos } t\ w\ f_y(w)dw \tag{15}$$

$$\mu_{xy}(t) = \int_{-\pi}^{\pi} e^{itw}\ Cr(w)dw \tag{16}$$

Equations (14) and (15) are spectral representation of autocovariance functions of the processes $\{X_t\}$ and $\{Y_t\}$ respectively.

Equation (16) is the spectral representation of the cross-covariance function between $\{X_t\}$ and $\{Y_t\}$. $f_x(w)$ and $f_y(w)$ are the power spectra of the processes $\{X_t\}$ and $\{Y_t\}$ respectively and

$$Cr(w) = c(w) + iq(w) \tag{17}$$

is known as the power cross-spectrum between $\{X_t\}$ and $\{Y_t\}$; $c(w)$ is knwon as the co-spectrum and $q(w)$ as the quadrature spectrum.

$$c(w) = \frac{1}{2\pi} \mu_{xy}(0) + \frac{1}{\pi} \sum_{t=1}^{\infty} \{\mu_{xy}(t) + \mu_{yx}(t)\} \quad \text{Cos } t\, w \tag{18}$$

$$q(w) = \frac{1}{\pi} \sum_{t=1}^{\infty} \{\mu_{xy}(t) - \mu_{yx}(t)\} \quad \text{Sin } t\, w \tag{19}$$

A useful function derived from the cross-spectrum is the coherence which is given by

$$C(w) = \frac{c^2(w) + q^2(w)}{f_x(w)\ f_y(w)} \tag{20}$$

The coherence is essentially the square of the correlation coefficient between corresponding frequency components of X_t and Y_t, and it can be shown that

$$0 \leq C(w) \leq 1 \tag{21}$$

As with the power spectrum, there are two basic approaches to estimating the cross-spectrum. One is based on transforming the sample cross-covariance function and the second approach is to smooth a function called the cross-periodogram, the later method is used in this study.

Summary

Cross-spectral technique is a method for examining the relationship

between two series over a range of frequencies. The coherence measures the correlation between two series at each frequency and is analogous to the square of the usual correlation coefficient. It is the natural measure of the extent to which two variables are related.

APPENDIX D

DATA SOURCES

The data utilized in this study are, for the most part, taken from various issues of the International Financial Statistics. The exact sources of the data used are given below.

Exchange Rates

All exchange rates are taken from various issues of the IFS (line rf). The IFS expresses the exchange rates in U.S. dollars per national currency unit or vice versa. By a simple division we obtained the exchange rate between any two European countries.

Consumer Price Index

All consumer Price Indixes are taken from various issues of the IFS (line 64, 1970=100).

Money Supply

The money stocks are all taken from various issues of the IFS (line 34) except for Belgium, which are taken from the OECD's Main Economic Indicators.

Index of Industrial Production

Industrial production indices are taken from various issues of IFS (line 66, 1970=100).

Real Gross Domestic Product

For France, Germany and United Kingdom, the real gross domestic product are taken from various issues of the OCED's Quarterly National Account Bulletin (1970=100). Italy's real gross domestic product are presented in Table XIII which were kindly supplied by Banca d'Italia.

Discount Rates

All discount rates are taken from various issues of the IFS (line 60).

Government Bond Yield

All government bond yields are taken from various issues of the IFS (line 61).

TABLE XIII

ITALY'S QUARTERLY REAL DOMESTIC PRODUCT
(1970=100, BILLIONS OF LIRE)

Year	I	II	III	IV
1973	16,821	17,399	18,013	18,368
1974	18,550	18,615	18,443	17,517
1975	17,721	17,520	17,650	17,960
1976	18,357	18,661	18,796	19,197
1977	19,354	19,025	19,016	19,040
1978	19,352	19,437	19,585	20,114
1979	20,357	20,218		

VITA

Massoud Metghalchi

Candidate for the Degree of

Doctor of Philosophy

Thesis: THE CASE FOR EUROPEAN MONETARY UNION

Major Field: Economics

Biographical:

Personal Data: Born in Rasht, Iran, August 15, 1949, the son of Mr. and Mrs. Metghalchi.

Education: Graduated from Shahpoor High School, Rasht, Iran, in June, 1967; received Certificate from Institut National des Sciences Appliquées, Rennes, France, in 1971; received Master of Business Administration from Oklahoma City University, in 1976; completed requirements for the Doctor of Philosophy degree at Oklahoma State University in December, 1981.

Professional Experience: Graduate Research Assistant, Department of Economics, Oklahoma State University, 1978-1981.