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by F. Altissimo, D. J. Marchetti and G. P. Oneto

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THE ITALIAN BUSINESS CYCLE: COINCIDENT AND LEADING INDICATORS AND SOME STYLIZED FACTS

by Filippo Altissimo*, Domenico J. Marchetti* and Gian Paolo Oneto**

Abstract

This paper analyses the business cycle properties of 183 time series relevant to the Italian economy, including real, monetary and international variables. We propose new monthly coincident and leading composite indicators for the Italian business cycle; the leading indicator anticipates the turning points of the coincident indicator on average by six months. On the methodological side, the study provides a scheme for constructing cyclical indicators on a sound statistical basis through iterative steps, combining the use of traditional NBER methods with that of more recent techniques of cyclical analysis. A number of stylized facts of the Italian business cycle emerge. Among them, money and financial variables are found to lead the cycle, chronologically, by an average of between one year and sixteen months. There is also strong evidence of synchronization of international cycles, with the US and UK cycles leading the Italian cycle by two to three quarters. The main linking channel seems to be trade, with Italian exports to EU countries leading the cycle by six months on average.

JEL classification: C8, E2, E3, E4.

Keywords: business cycles, cyclical indicators, leading indicators, Italian stylized facts.

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* Banca d'Italia, Research Department

** ISAE

Contents

1. Introduction[1]

This paper attempts to provide a thorough descriptive analysis of the Italian business cycle over the past three decades and proposes two synthetic indicators - one coincident and one leading - that, respectively, summarize and anticipate the evolution of aggregate economic activity. From the methodological point of view, the study follows the NBER approach to the measurement of business cycle fluctuations (as founded in Burns and Mitchell, 1946, and summarized in Zarnowitz, 1992), focusing on the empirical properties of a large set of economic indicators in order to identify their cyclical co-movements. At the same time, the work closely follows recent contributions to the literature on business cycle measurement (see in particular Stock and Watson, 1990 and 1998) which utilize techniques derived from time series analysis to characterize the behavior of economic indicators at business cycle frequencies. A number of stylized facts of the Italian business cycle emerge, some of which confirm and pinpoint the existing views, while others shed new light on controversial issues.

The starting point of the research project was the lack of a system of economic indicators that could help economists both to monitor current economic conditions in Italy and to forecast their short-term evolution. The demand for this kind of indicator seems to have grown in recent years among analysts of the Italian macroeconomic situation, particularly those involved in policy-making. In fact, the relatively frequent cyclical fluctuations that have characterized the Italian economy during the nineties have renewed the interest of economists in empirical tools that might permit the early detection and, if possible, the prediction of upturns and downturns in economic activity. Moreover, the need for reliable measures of cyclical fluctuations is enhanced at the European and international

[1] We are grateful to Carlo Giannini, Marco Lippi and participants at the workshop «Cyclical Indicators for the European Economies» held in Rome at the Bank of Italy on March 8, 1999, the twenty-fifth CIRET congress held in Wellington (New Zealand) on March 20-25, 1999 and a seminar held at ISAE for useful comments and suggestions. A number of colleagues at the Research Department of the Bank of Italy provided useful discussions and comments or help with the data, including Paolo Angelini, Andrea Brandolini, Luigi Buttiglione, Piero Casadio, Piero Cipollone, Giuseppe Grande and, particularly, Luca Dedola. We remain, however, solely responsible for any omissions and mistakes, as well as for the views expressed in the paper, which do not necessarily reflect those of the Bank of Italy and ISAE. Correspondence may be sent to altissimo.filippo@insedia.interbusiness.it, marchetti.domenicojunior@insedia.interbusiness.it, and g.oneto@isae.it.

levels by the adoption of the single currency and the corresponding centralization of the European monetary policy, which makes cyclical divergences across member countries relevant for the area as a whole.

The starting point for the measurement of cyclical co-movements is the identification of the «reference cycle». In the NBER approach the empirical counterpart of this concept was represented by the reference dating (i.e. the dating of the turning points of the economy-wide business cycle), while the practice prevalent in the modern literature is the use of reference variables, normally chosen from the available aggregate measures of economic activity (such as GDP or the composite coincident index).

Unlike researchers of the U.S. economy, we could not rely on well-established empirical facts as a basis for designing a system of indicators of business cycle movements in Italy, because the available measures of cyclical fluctuations were either out of date or not systematic enough to provide a sound basis to build upon. The cyclical chronology maintained by ISCO since the sixties is regarded as fairly accurate; however, in recent years the ISCO composite index of coincident indicators has not been tested appropriately, nor has a comprehensive and documented analysis of economic indicators been made available. Overall, the only viable approach was to scrutinize all the potentially useful information, by measuring the cyclical properties of as comprehensive as possible a set of indicators. In fact, the preliminary step in our research was the construction of a large data base including 183 variables (monthly or quarterly time series spanning between 20 and 40 years) representing all the main real and monetary aspects of Italian macroeconomic conditions.

Given the lack of reliable measures of the reference cycle, we proceeded by stages in the construction of a new composite index of coincident indicators. First, we scrutinized all the available individual series in search of those characterized by the highest degree of coherence at business cycle frequencies with a small set of «tentative» reference variables. Second, we backed the analysis by comparing the timing of the turning points of the candidate indicators. Finally, the selected variables were aggregated to form a composite coincident indicator. In order to verify that such an indicator represents a satisfactory proxy of the Italian business cycle, its cyclical properties were reviewed against a newly proposed cyclical chronology based on the dating of the turning points of a set of selected indicators.

The coincident indicator was then utilized to characterize the business cycle properties of the variables included in our data set. This exercise was performed to provide a description of the behavior of each single variable included in our data set over the cycle, and to pinpoint some stylized facts that can possibly contribute to our understanding of the Italian economy. The co-movements of each indicator with the reference variable were measured using techniques recently introduced in business cycle analysis; in particular, we made extensive use of a class of linear filters able to isolate the cyclical components of each series.

The screening of the cyclical properties of a large number of variables allowed us to identify a set of indicators characterized by good performance in leading the business cycle (as represented by the coincident index). Other elements were gathered using both the NBER approach (based on leads at turning points) and econometric testing of the marginal predictive content of each variable in forecasting the reference cycle. The different results were compounded to select a list of indicators showing satisfactory leading properties. These were finally aggregated into a leading index whose performance was assessed through the same procedures already used in the previous steps of the analysis.

The existence of a common driving force underlying the set of coincident and leading variables was confirmed by a dynamic principal components analysis, which goes beyond the scope of this paper and whose results are reported in Altissimo, Marchetti and Oneto (1999). Quite interestingly, this analysis validated the heuristic procedures followed in the construction of the coincident and leading indicators.

The outline of this paper is as follows. The next section provides a review of the literature on measuring business cycle fluctuations; it discusses the NBER approach, as well as recent developments in econometrics and time series analysis. The construction of a new coincident indicator for the Italian economy, by aggregating a number of coincident variables, is reported in Section Three, together with a newly proposed chronology of the Italian business cycle. The composite index was used to analyze the cyclical properties of the 183 variables included in our dataset; these properties are briefly summarized in Section Four. Section Five describes the selection of a set of leading variables and proposes an aggregation of some of them into a leading indicator. The last Section contains the conclusions.

2. Measurement issues in business cycles analysis

The measurement of business cycles is probably the only issue in empirical economics to have undergone a thorough exploration before the second World War whose results are still regarded as highly relevant to modern analysis. A comprehensive investigation of the features of the business cycle in the U.S. was undertaken in the thirties by the team headed by Wesley Mitchell (summarized in Burns and Mitchell, 1946, BM hereafter) and then completed in the fifties and sixties at the National Bureau of Economic Research. Since then, the NBER approach has played a central role in business cycle analysis. Above all, it has provided the methodological framework utilized by institutions that establish at national and international levels the «official» chronology of the business cycle and routinely release data on cyclical indicators.

In recent years, there has been a revival of empirical research on business cycles. The burgeoning theoretical literature on the determinants of business cycles has given birth to a body of applied analysis dealing with the measurement of the cyclical component of economic variables. This literature departs from the NBER tradition in terms of measurement techniques, as it relies on standard tools of time series analysis to quantify cyclical co-movements. Furthermore, and more crucially, the modern approach is based almost exclusively on the «growth cycle» definition: the cycle is identified with the deviations of economic activity from its long-term trend. While this definition was already present in the traditional literature, it should be stressed that the procedures embodied in the original NBER methodology were based on the «classical cycle» concept, which focuses on fluctuations in the absolute level of economic activity.

The development of new approaches has not given rise to a unified framework, able to substitute the NBER methodology in dealing with the various aspects of measuring the economic cycle. For instance, in the U.S. the «official» composite indexes and the NBER chronology maintain the role of reference variables in applied analysis. Moreover, recent contributions that propose «alternative» methodologies to build business cycle indicators have neither challenged this role nor questioned the theoretical underpinning of the NBER approach.[2]

In undertaking an empirical analysis aimed at developing a system of cyclical indicators and reviewing the chronology and the main features of the business cycle in Italy, we chose to explore the traditional approach as well as some of the new tools available in the literature. This implies that we have to clarify first the relationship between the different ways of characterizing the business cycle, trying to identify possible inconsistencies that may arise from resorting to different approaches based on partially conflicting definitions of what constitutes cyclical fluctuations.

2.1 The NBER methodology

We start from a synthetic review of the NBER approach to the quantitative analysis of the economic cycle, focusing mainly on the underlying methodological aspects. While this approach has a long-standing tradition and is still used to derive synthetic measures of the business cycle, some of its crucial implications often seem to have been overlooked in the more recent literature.

As stated in almost every work devoted to the identification and measurement of the economic cycle, the cornerstone is Mitchell's definition, quoted at the outset of BM contribution. Business cycles were defined as fluctuations in aggregate economic activity persistent over time and widespread across sectors; they were meant to be «recurrent but not periodic», with a duration ranging from «more than one year to ten or twelve years». This characterization hinges on the crucial idea that cycles are movements common across economic processes, identified by upturns and downturns in many economic variables «concentrated around certain points in time». Therefore, the cycle is a kind of latent factor implicit in the co-movement of a wide array of variables. By the same token, the empirical counterpart of the business cycle cannot be identified in any single measure of aggregate economic activity.

[2] See in particular Stock and Watson (1989) and Diebold and Rudebusch (1996).

The above definition of the cycle, which shaped the NBER approach, was developed almost exclusively on empirical grounds, leaving its economic and statistical underpinnings quite undefined.

The starting point of the NBER analysis is the identification of the reference cycle, i. e. the process of establishing, in the BM wording, «the turning points of the cyclical movements in general business activity». These turning points (whose sequence makes up the cyclical chronology) are adopted as a benchmark against which the behavior of all economic variables is scrutinized. In the BM work and the later NBER studies, the identification of reference turning points was preliminary to the overall analysis of the features of the business cycle and to the construction of coincident and leading indicators. In fact, in the U.S. tradition the process of establishing the reference cycle has been independent from other stages of cyclical analysis (since 1980 the dating of turning points has been made by the NBER Committee on Business Cycle Dating). The identification of turning points is judgmental and is based on a thorough analysis of a small but comprehensive set of indicators that are deemed to represent accurately the evolution of overall economic activities (Moore and Zarnowitz, 1986, and Zarnowitz, 1992). Typically, this set includes output, employment, sales and income variables.

It should be stressed that in the NBER approach, which is still utilized in the U.S. to establish the official chronology of the business cycle, the dating of the reference cycle is based on the classical definition. Upturns and downturns are identified with respect to the absolute levels of the economic variables used in the analysis, without removing their secular component. Casting the problem in the framework of the modern time series techniques, this definition implies that the identification of cyclical movements is not made conditional on the filtering out of the low frequency component (i.e. the trend) that is often present in economic variables. Moreover, the dating of the reference cycle results from the clustering of the turning points of a set of variables that typically includes both trended and non-trended time series.

The original NBER program of research on the business cycle was devoted to a systematic examination of a very large set of variables covering all the aspects of a market economy, including both real and monetary phenomena. The analysis was aimed at testing the «common movement» hypothesis through the identification of empirical regularities in the behavior of economic variables along the business cycle. The «specific» cyclical movements of each indicator were identified and confronted with the reference cycle in order to assess their degree of «conformity» with the business cycle.

The empirical measures used in the analysis were based on two main concepts: the timing of turning points and the shape (or pattern, in the BM terminology) of cyclical fluctuations. While the former is still utilized extensively in the literature, the «cyclical pattern» concept played an important role only in the early development of the NBER program, when the analysis was mainly focused on identifying the empirical regularities present in the common movements of the economic indicators. Later on, the use of such a complex technique to measure the shape of cyclical fluctuations was dropped, being partly replaced by synthetic measures of correlation and coherence. However, it should be mentioned that in the measurement of «cyclical patterns» BM introduced a peculiar treatment of the trend component. They removed the drift between subsequent cycles («inter-cycle» portion of the trend) but did not eliminate the trend component present in each single cyclical episode (intra-cycle portion).[3]

The study of the timing of specific turning points of a large set of economic variables was the first building block of the «cyclical indicators approach», which is probably the most important legacy of the NBER methodology. In this approach each indicator is classified according to the results of the comparison between the dating of its turning points and the reference dating (i.e. the established chronology of the general business cycle).[4] Variables showing a cyclical timing very close (both in pro-cyclical or anti-cyclical fashion) to the

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[3] The technique was based on calculating the so-called «cyclical relatives», i.e. the ratio between the level of the variable and its mean over the single cyclical episode (defined as a trough-to-trough wave), and then identifying the cyclical pattern as the average of cyclical relatives across different episodes. While discussing at length the issues concerning the treatment of the secular component of economic indicators, BM stated that «the ‘intra-cycle’ portion of the trend we make no effort to eliminate, because we wish to reproduce as faithfully as may be the ‘cyclical units’ of actual economic experience».

[4] The classification of a very large set of economic indicators according to their behavior in terms of cyclical timing was one of the major results of the pioneering work carried out by the NBER team. Since Shiskin (1961) the whole set of information concerning the cyclical features of economic indicators has been published in monthly reports (Business Condition Digest) issued by U.S. government agencies (the Bureau of the Census and, since 1972, the BEA). The underlying analysis was developed in collaboration with the NBER. The publication was partly discontinued in 1990 (only a condensed version being included in the Survey of Current Business) and then at the end of 1995 the program was handed over to a private organisation (the Conference Board; see Beckman, 1997).

reference variable over a long span of observations are termed roughly coincident and can be utilized to choose or to confirm the chronology of the business cycle. The indicators that tend to turn before the turning points of the general cycle are classified as leading and are very useful to anticipate the beginning of recessions or expansions. In turn, indicators that turn after the reference cycle are termed lagging and play a relatively minor role in the analysis.

The development of a system of cyclical indicators was completed during the sixties with the introduction of the composite indexes of coincident and leading indicators. Starting from the evidence gathered through analysis of the timing properties of economic variables at turning points, two relatively narrow sets of roughly coincident and leading indicators can be selected and then aggregated in two synthetic indexes (the methodological issues concerning the aggregation will be examined later on).[5] The choice of the variables to be included in the two composite indexes takes into account many features characterizing the behavior of each indicator.[6] On the one hand, the judgment is based on the empirical record of the series in tracking (or anticipating) the reference business cycle, assessed by compounding the regularity of the timing at turning points, the general coherence over the cycle and the smoothness (or presence of irregular or extra fluctuations resulting in false signals). On the other hand, the economic role of the variable in the business cycle must be well established and the corresponding indicator must be statistically sound and promptly available. In the U.S. tradition, the selection of indicators included in the coincident and, even more, in the leading indexes has undergone frequent revisions due to the deterioration in the performance of the previously chosen variables (see the appendix of Beckman, 1997).

While derived from a unified framework aimed at providing reliable measures of the evolution of the business cycle, the coincident and leading composite indicators have played very different roles. The meaning of the leading index is well known among economists

[5] Actually, in the NBER tradition also a composite index of lagging indicators was present; it was mainly used to gather subsidiary signals about the timing of the business cycle.

[6] The NBER literature (see for instance Zarnowitz and Boschan, 1977) has identified the following six criteria to be used in selecting the most reliable cyclical indicators: economic significance, statistical adequacy, timing at recessions and revivals, conformity, smoothness, currency. Those criteria were in fact organized in a scoring system utilized to rank the performance of single indicators and even to calculate a set of weights embodied in the aggregation procedure.

interested in the analysis of short-term developments in economic activity: in fact, it is designed to identify signals that may be useful in predicting upswings and downswings of the economy in the short term (typically less than six months). The scope and utilization of the coincident index are probably less intuitive, or even puzzling. Actually, the composite index of coincident indicators is intended to measure the cyclical movements in aggregate economic activity; in particular, it is designed to track very closely turning points in the reference business cycle. In other words, the aim of the coincident indicator is to provide a single proxy of the cyclical co-movement of economic variables; it is not that of helping to identify the chronology of the economic cycle, which rather acts as an *a priori* in the construction of the coincident indicator.[7] Hence the coincident index is sometime preferred in empirical works to other variables representing the aggregate economic activity (e.g. the real GDP) because of its ability to measure the business cycle (and because of its monthly frequency).

It is perhaps useful to stress again that a system of cyclical indicators embodies, by construction, the definition of the business cycle that underpins the dating of the reference cycle. The system maintained in the U.S., derived from the NBER tradition, corresponds to the «classical cycle» approach, while other systems (like the one developed by the OECD) use as a de–trended variable the reference cycle and therefore correspond to the «growth-cycle» definition.

In Italy, the NBER methodology was introduced since the end of the fifties by a research group working at ISCO. They published the first comprehensive exploration of the Italian business cycle in 1962, applying the empirical strategy proposed by BM to a set of over 120 indicators (ISCO, 1962). Building on this work, ISCO started to identify the Italian cyclical chronology and proceeded to develop the various tools of cyclical analysis proposed by the NBER (coincident and leading indicators, diffusion indexes, etc.).[8] While research work on business cycle measurement was later almost abandoned, ISCO has continued to

[7] As already noted, in the U.S. decisions concerning the dating of the cycle are taken by an independent committee that, so far as is known, does not directly utilize the composite index of coincident indicators, but rather a set of variables.

[8] See ISCO (1962) .

update the cyclical dating based on the classical definition. As a matter of fact, this chronology is still considered the official one in Italy.

2.2 New approaches to business cycle measurement

The long period of strong economic growth experienced during the post-war era in the U.S. and western Europe brought about a rethinking of the definition of the business cycle. As the downturns in the level of economic activity – and in the indicators representing it - became rarer and more short-lived, almost disappearing during the sixties, some of the leading specialists of the NBER research group developed a new approach, based on the growth-cycle definition.[9] While remaining within the framework of the NBER methodology as far as the measurement techniques are concerned, they proposed to identify the cyclical movements of indicators as deviations from the secular component of each variable. In this respect, the introduction of the growth-cycle approach implied a substantial departure from the original BM approach, which posited that separating the secular and the cyclical components was «artificial» and potentially misleading in empirical applications. As for the issue of filtering out the trend component from economic indicators, the techniques adopted in the early growth-cycle studies were mainly based on moving averages and obviously suffered from computational limitations and methodological drawbacks that at the time were insurmountable.

The revival of research activity on business cycle theories at the beginning of the eighties renewed interest in measuring the economic cycle. On the one hand, the BM definition, which hinges on the concept of comovement in multiple variables, has been accepted as a stylized fact to be explained by competing theories. In particular, the co-movement tenet was endorsed, on theoretical grounds, by Lucas (1977) and, on empirical grounds, by Sargent (1987) and Stock and Watson (1989).[10] On the other hand, the new generation of business cycle theories has focused on explaining the movements (deviations)

[9] The foundations of this approach were developed in Moore and Shiskin (1967) and Mintz (1969).

[10] Sargent (1987) provided a very clear reinterpretation of the BM approach based on frequency domain concepts: «the following definition seems to capture what experts refer to as the business cycle: the business cycle is the phenomenon of a number of important economic aggregates (..) being characterized by high

of economic activity around (from) the long-term trend. In this respect, modern approaches to business cycle measurement have given up the classical definition while accepting that based on the growth-cycle concept.

In the real business cycle literature, empirical analysis devoted to pinning down the cyclical behavior of economic variables has resorted almost routinely to some kind of pre-filtering of the trend component.[11] However, progress in the filtering techniques and developments in decomposing of time series into permanent and transitory components have determined a proliferation of detrending procedures that are used to identify the cyclical component of economic indicators. As demonstrated by methodological work aimed at comparing the properties of different procedures, business cycle facts extracted from them can vary widely, leading to conflicting and confusing results.[12] In this respect, the modern approaches to business cycle measurement, while improving our understanding of the behavior of economic indicators over the cycle, have not provided any unified framework able to replace the NBER approach.

Recently, Stock and Watson (1990 and 1998) produced an interesting body of empirical work that, in line with the original NBER research project, focuses on the description of the business cycle properties of a large set of indicators. In their approach the cyclical movements are defined as the fluctuations that take place at «business cycle frequencies»; the latter are defined as the frequencies corresponding to the periodicity of economic cycles according to the NBER historical record, i.e. between six quarters and eight years.[13] However, since the low frequency movements of economic variables are removed

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pairwise coherences at the low business cycle frequencies». In Stock and Watson (1989) the co-movement definition was made operative through a dynamic latent factor model. See also Diebold and Rudebusch (1996).

[11] See, for instance, Backus and Kehoe (1992) and Fiorito and Kollintzas (1994).

[12] To date the most comprehensive scrutiny of detrending procedures in the light of business cycle measurement is in Canova (1998). However, his analysis interestingly includes a comparison between the turning points of cyclical components identified utilizing different detrending methodologies and the turning points established by the NBER (which is based on the classical cycle concept). On the pitfalls of detrending in business cycle measurement see also Harvey and Jaeger (1993), Canova (1994) and Burnside (1998).

[13] The typical duration of cyclical movements, i.e. the counterpart of the hypothesis retained to identify the cyclical frequencies (or periodicity), actually depends on the methods chosen to decompose the business cycle from the trend. In fact, the definition prevailing in the literature is based on the known stylized facts, largely coming from the NBER tradition (see Sargent, 1987). In Canova (1998) the effects of different detrending procedures on the average duration of cyclical movements are made clear.

using optimal linear filtering techniques, the definition of the business cycle retained in their case is indeed the one corresponding to growth cycle.

The Stock and Watson approach also systematizes another important element in the analysis of the business cycle that has undergone a substantial change with respect to the NBER tradition: the measurement of the comovement of economic indicators. In this respect, they propose a toolkit of modern methodologies by integrating time domain and frequency domain statistics, such as cross-correlations and coherences at cyclical frequencies. In their work the measures of conformity based on comparison of the timing of turning points are therefore replaced by measures that focus on the second moments of the joint distribution of the series.

2.3 The empirical strategy used to measure the Italian business cycle

The objective of the empirical work presented in this paper is twofold: to provide a descriptive analysis of the co-movements of a large set of Italian economic indicators in the last three decades, and to measure the main features of the business cycle in Italy. An important by-product of the analysis is the definition of a system of cyclical indicators that includes both a composite coincident indicator and a composite leading indicator.

In the literature on business cycle measurement reviewed in the previous section the starting point of the analysis is the reference cycle. The empirical counterpart of this concept was identified by the NBER tradition in the reference dating which, as seen above, was used as a benchmark to construct the coincident index still maintained in the U.S.. In modern approaches, the role of the reference variable has often been played by aggregate measures of the economic activity (GDP or industrial production) but also by the composite coincident indicator (Stock and Watson, 1990). In the present work, which aims to present a thorough review of the measurement process, we have chosen to proceed by stages, utilizing and comparing different sets of instruments.

As in the current Italian situation the available coincident indicator is not reliable and the «official» cyclical chronology deserves a careful scrutiny, the first step of the process is the investigation of the statistical properties of 183 time series relevant for the Italian economy and the selection of a small set of variables presenting a high degree of conformity and a coincident timing with the aggregate cycle. These variables can be then aggregated in a new composite coincident indicator which provides the reference variable to be used in the subsequent steps of the analysis. Indeed, this approach can be undermined by a «circularity flaw» as the identification of the «best» coincident indicators itself needs some kind of reference variable. To tackle this issue we broaden the set of indicators used in the selection procedure, compounding the results obtained with three different reference variables (i.e. GDP, the industrial production index and the ISCO coincident indicator). While none of them can be deemed as the correct proxy of the cycle, it seems fair to maintain that a variable characterized by a high degree of conformity with all of them does co-move with the aggregate cycle.[14]

An important methodological problem raised by our empirical strategy concerns the utilization of analytical tools drawn from different approaches to business cycle analysis. The coherence of the cyclical movements of each indicator with the reference variables is mainly measured utilizing the instruments developed in the modern literature. The choice of the transformation applied to each variable is based on the standard characterization of its stochastic properties; we resort to a class of linear filters able to isolate from the series the components moving at cyclical frequencies. Indeed, the co-movements identified and measured using this technique are based on a definition of the business cycle which is operationally very close to that of the growth-cycle approach. However, we supplement the results concerning the cyclical component of the candidate indicators with the turning-points analysis featured in the NBER tradition. This approach introduces in the selection of coincident indicators some elements based on the «classical cycle» definition.

In the next step of the analysis, the series characterized by the best performance as coincident indicators are aggregated into a composite indicator intended to represent a satisfactory proxy of the evolution of the business cycle in Italy. In choosing the aggregation procedure, we try to investigate some relevant issues that lie behind the composite indicator

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[14] None of these series, alone, appeared to be completely satisfactory. The index of industrial production, by definition, measures economic activity in only one albeit important sector of the economy whereas the ISCO composite index was assembled many years ago and the selection of the components may no longer be valid. Finally, data on gross domestic product are available only at quarterly frequency; also, the estimates are based on national accounting procedures, some of which do not seem very appropriate from the point of view of measuring fluctuations in economic activity.

methodology; in particular, we focus on the standardization procedure, which we consider the crucial aspect of this technique. With regard to the underlying definition of the cycle, we stick to the traditional approach used in the U.S. and build an indicator consistent with the classical definition.

The new composite coincident indicator is checked against a revised cyclical chronology based on the dating of the turning points of a set of selected indicators. The composite index is then used to characterize once again the business cycle properties of all the 183 variables included in our data set, in order to identify some stylized facts and regularities about the cyclical behavior of the Italian economy. Finally, we used these results to select a set of leading variables and construct a composite leading indicator.

3. Construction of a composite coincident indicator and dating of the Italian business cycle

3.1 Selection of a set of coincident variables

In order to select the variables to be included in the coincident indicator, we thoroughly analyzed the business cycle properties of 183 time series (monthly or quarterly) that we considered as potentially relevant to the cyclical behavior of the Italian economy. The list of variables is reported in Table 1, with data description and sources. The variables scrutinized include measures of labor market conditions, output and capacity utilization, demand conditions, prices, wages and labor costs, monetary aggregates and interest rates, foreign trade, as well as relevant international variables. The series were seasonally adjusted when necessary and transformed according to standard pre-testing.[15] Following Stock and Watson (1990), for each variable we analyzed both (i) the basic univariate characteristics and the comovement properties with aggregate activity, and (ii) the predictive content for forecasting the evolution of the aggregate business cycle. In this section we focus on the analysis of comovement properties; in particular, we describe the selection of a set of series

[15] When raw data were available, which was the case of most series, the seasonal adjustment was carried out using the routine TRAMO-SEATS by Gomez and Maravall (1997). In the case of national account data we used the data seasonally adjusted by the National statistical institute (ISTAT). In pretesting for log-

which turned out to be coincident, in a systematic way, with the economy-wide business cycle, as represented by the reference series.

As mentioned in the previous section, in the first stage of our research, since there was no single monthly measure of the Italian business cycle which we regarded as completely satisfactory, we used three different reference series: the index of industrial production (PROIS), the composite coincident indicator computed by ISCO (ISNEW) and GDP (PILTT). We considered two measures of comovement at cyclical frequencies of each of the 183 variables scrutinized with respect to each of the reference series; one measure is in the frequency domain and the other in the time domain. The former is the spectral squared coherence at business cycle frequencies (defined as those which correspond to a period longer than two years and shorter than eight years). The coherence at a given frequency can be interpreted as the correlation between two variables at the associated periodicity. In the time domain we examined the cross-correlation at several leads and lags. In both cases, we had to filter the series, in order to identify their cyclical components and analyze the comovement among these components alone. We used two different types of filter (both applied to data seasonally adjusted and/or log-transformed, if necessary). The first type is a transformation of the series on the basis of the results of some standard pre-testing, aimed at identifying the need to difference it properly. Hereafter in the paper we refer to series transformed in this way as ‘transformed series’. The second type of filter is a band pass, which removes the components of the series that correspond to a band of given frequencies (see Baxter and King, 1994, and Appendix 1). In our case, we removed the components that oscillate at intervals of less than two and more than eight years. Hereafter we refer to band pass filtered series as ‘filtered series’. We then computed the coherence and the autocorrelogram for each pair of trial series and reference series. The analysis was carried out at monthly frequency when possible; when either the trial variable or the reference series was quarterly, the analysis was performed quarterly, taking quarterly averages of monthly series.

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transformation - and for identifying the integration order to be used throughout the analysis - we resorted to the output of TRAMO.

We reviewed the comovement properties of each of the 183 time series, according to all the mentioned criteria. This enabled us to single out a first subset of twelve series can be regarded as approximately coincident with the business cycle, according to all or nearly all the reference series and the test statistics considered. This subset was identified by choosing, for each category of 183 series scrutinized, the variable(s) with the most desirable comovement properties. Some categories are overrepresented, as they contain many variables potentially qualifying as coincident indicators (e.g., measures of activity in the industrial sector); other categories are absent, since no series satisfied the minimum requirements of comovement with the aggregate cycle (e.g., money, credit and interest rates). The twelve series selected are the following: the ratio of overtime hours to total hours worked in large industrial firms (STRGI), the index of real industrial sales (FATIS), railway transport of goods (MERFS), margins of producer prices over unit costs in manufacturing (MARTI), imports of goods and services according to national accounting (IMPTT), imports of investment goods (IMPD1), capacity utilization rate in industry (GUIIS), industrial value added (VAIND), value added market services (VASDV), plant and machinery investment (INVIM) and merchandise imports (IMPTB). Also one reference series - i.e. the index of industrial production (PROIS) - was included in the short list of coincident indicators, since the comovement measures confirmed, as expected, its high degree of coherence with the other two reference series.

Some univariate characteristics of these twelve variables and their comovement properties with respect to each reference series are summarized in Table 2. The first three columns of statistics report the point estimates of the density of the spectrum of each series over three frequency bands, corresponding, respectively, to periods of more than eight years, eight-two years and less than two years. The next six columns report the estimates of the coherence with the reference series over the same frequency bands, respectively for the transformed series (the type of transformation for each series is specified in the second column of the table, after the series acronym) and for those filtered with bandpass. For each series, the reference series are GDP (first row), industrial production (second row) and the ISCO composite coincident indicator (third row). The next three columns contain some statistics of cross-correlation with the reference variables, computed on transformed series. The seventh column reports the contemporaneous cross-correlation; the eighth and ninth columns report, respectively, the maximum cross-correlation (absolute value) and the lead(+) or lag(-) at which it occurs. The final three columns report the same statistics for bandpass-filtered series, where the band corresponds to cyclical frequencies (ranging from two to eight years).

Although we present statistics computed both on bandpass-filtered series and on the series transformed with logarithms or first differences, we put more emphasis on the former because they are independent of the noise component of each series that can blur the coherence measures. The tables show that all the selected series exhibit a relatively high coherence with the aggregate cycle, equal to or greater than .6 considering bandpass-filtered series; in the case of many variables and reference series, this statistic is equal to .8 or .9. The maximum values of the cross-correlogram are very high for all variables, and are very often in the .8-.9 range for bandpass-filtered series. The peak of the cross-correlogram is often reached with zero lag or lead, in few cases with a lead or lag of one month; the only exception is merchandise imports, whose maximum correlation with industrial production and gross domestic output occurs with a lead of three months (which is the maximum lead - and, symmetrically, lag - allowed in a coincident variable, within the traditional NBER approach).

The next step, in order to select the final set of coincident indicators, was to evaluate their comovement properties with the aggregate cycle examining the timing of their turning points. In other words, we have examined the timing of peaks and troughs of each of the twelve variables, seasonally adjusted, and compared it with the ‘official’ chronology of the Italian business cycle published by ISCO. However, what matters for the analysis is the clustering of turning points at specific dates while the difference with respect to a given (*a priori*) dating can become irrelevant to the extent that a new chronology deemed more accurate is chosen. It should be stressed that the analysis is carried out by measuring the variables in level terms, and is therefore consistent with the classical cycle definition.[16] We

[16] This is analogous to what the NBER Committee on Business Cycle Dating does for the U.S. economy; see Zarnowitz (1992, pp. 284-85). In Italy, the reference series were selected judgementally by ISCO. On the occasion of the most recent turning point, i.e. the January 1997 peak, the series scrutinized were the index of industrial production, capacity utilization rate in industry, the ISCO composite coincident indicator, the level of industrial production from survey data and gross domestic product (ISCO, 1997).

also include a dating analysis consistent with a growth cycle definition; in this case, however, the dating of the cyclical component is not invariant to the definition of trend.

The identification of peaks and troughs of the twelve series was performed using the Bry-Boschan routine, which has become standard within the NBER approach to cyclical analysis. The routine is described in detail in Bry and Boschan (1971). In brief, the method works as follows. A preliminary set of potential turning points of a given series is selected from a very smooth transformation of the original series. By iterative steps, the corresponding turning points are identified on the original series; the selection of the turning points at each step and their 'survival' across steps follow some basic rules. The most important concern the required minimum length of a cycle and a single phase (expansion or recession), set to fifteen and five months respectively. This routine, which has a uniquely determined output (i.e., a sequence of turning points), has several advantages. First, it consistently provides results which can be regarded as very reasonable, in many respects. Second, it does so by means of an automatic procedure which implements a set of steps and rules that were selected *a priori* as optimal or desirable.

For each series, having identified the specific peaks and troughs, it was possible to compute the lead and lag of each turning point with respect to the corresponding one in the reference cycle.[17] The results are reported in Table 3. Cycles of the official chronology missed by a given series are denoted by a dash; conversely, cycles which are observed in a given series but not in the economy as a whole are denoted as 'extra-cycles' and reported in the last rows of the table. Perhaps the most striking result is that one variable, namely the value added of market services, has gone through almost no cycles at all, the only cycle reported being that of the mid-seventies. This result reflects the tendency of overall service activity in industrialized economies to exhibit very smooth fluctuations, if any at all. Also, it is due to the highly heterogeneous composition of the variable itself, which refers to value added of all market services; clearly, a reduction of activity in one branch of services may be offset by an expansion in another branch. Another interesting result is that in most variables the occurrence of turning points is characterized by an alternation of short leads and lags

[17] In order to apply the Bry-Boschan routine, we used the computer program provided by Giuseppe Schlitzer (see Schlitzer, 1993a).

with respect to the corresponding turning points of the reference cycle. This implies that the fluctuations of the variables analyzed do not consistently lag or lead those of the economy, which is a desirable property for coincident variables. In this regard there are some exceptions: the turning points of merchandise imports (IMPTB), industrial sales (FATIS), and machinery investment (INVIM) always anticipate those of the aggregate cycle. The first two variables can be regarded as potentially leading, at least according to this criterion, since in many cases they anticipate the aggregate cycle by a not negligible amount of months. On the other hand, the lead of the turning points of machinery investment is negligible in most cases (zero or one month).

By combining the information provided in Tables 2 and 3 we finally selected a set of six series to be included in the composite indicator. In addition to the comovement properties, a further selection criterion was that of extending the coverage of the composite indicator to as many sectors and aspects of economic activity as possible, while avoiding giving too much weight to any single sector or aspect. Also, we tried to keep to a minimum the number of series selected (for example, the U.S. composite coincident indicator has only four component series).

The six variables selected include one indicator of the evolution of labor demand (i.e., the ratio of overtime hours to total hours worked in large industrial firms, STRGI); one indicator of activity in the industrial sector (i.e., the index of industrial production, PROIS); two measures of activity in other sectors of the economy (i.e., railway transport of goods, MERFS, and value added of market services, VASDV); one component of aggregate demand (i.e., machinery investment, INVIM) and one indicator of foreign trade (i.e., imports of investment goods, IMPD1). STRGI was chosen as it was the only labor market variable on the previous list of twelve variables. Among the several measures of industrial activity, we selected PROIS because it is by far the most representative, and is coincident with the aggregate cycle on all respects. The index of industrial sales (FATIS), as already mentioned, is not completely satisfactory from the point of view of the dating of turning points whereas industrial value added (VAIND) is estimated mainly on the basis of PROIS data, and has the disadvantage of being a quarterly series. The rate of capacity utilization (GUIIS) also has the disadvantage of being available only at quarterly frequencies; furthermore, a couple of its turning points occurred very far from the corresponding ones of the aggregate cycles. The same drawbacks characterize the margins of producer prices over unit costs in manufacturing (MARTI). Among the indicators of foreign trade, total imports of goods and services (IMPTT) has the disadvantage of being a quarterly series as well as an 'indirect' statistic, based on several elementary indicators, such as other national account variables. As to merchandise imports (IMPTB), it is a useful monthly indicator, but appears to lead the aggregate cycle by around three months, according to several comovement statistics; for this reason, imports of investment goods (IMPD1) was preferred.

3.2 Construction of the composite coincident indicator

Having selected a small set of economic indicators that seem to perform very satisfactorily in tracking the fluctuations of the Italian business cycle, it was possible to build a composite index that should summarize the underlying cyclical co-movements. While the methodology employed to construct composite indicators is well established, there are a number of technical choices that bear upon the final properties of the resulting indicator and that should be scrutinized carefully.[18] Here we present the basic features of the methodology, while the technical details can be found in Appendix 2.

First of all, we chose to filter the series for inclusion in the composite indicator by aiming to remove the high frequency fluctuations (corresponding to the irregular component) that tend to blur the detection of cyclical swings in the composite variable. Instead of using the moving average approach prevailing in the NBER tradition[19] we stick to the band-pass filter methodology introduced in previous stages of the analysis. These filters, being symmetric, do not induce phase shifts in the variables and do not alter the lead-lag relationship among variables.[20]

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[18] A comprehensive review of the issues involved in the construction of composite indicators is in Boschan and Banerji (1990).

[19] In the NBER approach (as in the U.S. coincident index) the order of the moving average used to remove the irregular component from a given time series is selected in an *ad hoc* manner or using the MCD (months for cyclical dominance) rule. The MCD is the number of terms in the moving average resulting in a variance in the trend-cycle component greater than that in the high frequency movements (to be removed by the moving average).

[20] The filter used here is a band-pass removing the very high frequencies (corresponding to a periodicity of up to six months). The length of the symmetric filter is twelve observations; in order to include the most recent observations, the series are projected twelve steps ahead by using a four-order autoregression. Since the

Following the approach developed in the U.S.,[21] the composite indicator is constructed by aggregating the monthly percentage changes of each component (computed utilizing the «symmetrical» formula) weighted through appropriate standardizing factors. The central feature of the aggregation procedure is the standardization method employed to weight the different indicators entering the composite indicator. The aim of standardization is to «equalize the average cyclical amplitude of the series» (Moore, 1961) so as to prevent the variables characterized by wider fluctuations from dominating the movement of the composite. This normalization is obtained by dividing each variable by the standard deviation of its rate of growth. However, in choosing the standardization technique it should also be considered that not only the cyclical amplitude, but also the slope of the trend component may change over time. In this case, keeping the standardization parameter fixed would induce improper changes in the relative importance of the components.[22] This issue turned out to be quite relevant in our set of coincident variables; to deal with it we resorted to moving standardization factors (both the mean rate of change and the standard deviation), calculated over a 12-year time span. The resulting monthly changes were then cumulated to obtain the index, which is shown in Figure 1. Table 4 reports the weights used in the aggregation of the variables in selected years.

We did not perform trend or amplitude adjustment procedures to force the average rate of change of the composite index to be equal to that of GDP or some other target variable. This adjustment is usually introduced because the aggregation procedure by itself produces an index characterized by a trend and an amplitude that are a weighted average of those of the single components and therefore do not have an easily recognizable economic meaning.[23] We did not pursue this strategy because the average growth rate of GDP and that of the

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weights of the filter are concentrated in the three central elements, the procedure ensures an acceptable degree of approximation for the construction of the indicator up to the observation preceeding the latest data release. We quantified the loss of information derived from this approximation in the order of .02 per cent for the indicator computed with data up to time t-1 over the period 1980.01-1997.12.

[21] The procedure currently used by the Conference Board is described in its web site; for the method formerly used at BEA see Green and Beckman (1992). The methodology developed by the OECD (1987) to build composite indicators based on de-trended series is the main alternative to the one derived from the NBER approach.

coincident indicator over the last two decades are very close to each other. Furthermore, since the cyclical variability of GDP was much smaller than that of the components of the indicator, normalizing with respect to the variability of GDP would dampen the oscillations of the composite indicator.

The indicator appears to exhibit a satisfactory degree of cyclical variability and, by construction, a limited amount of volatility. It reports the two cycles of the seventies and the prolonged expansion of the eighties, followed by the deep but short recession of 1993. It also reports, in more recent years, the alternation of short-lived recoveries and mild recessions. Having determined the turning points of the indicator through the Bry-Boschan routine it turns out, very encouragingly, that the cycles identified correspond closely to those of the official chronology (see Table 5). In other words, the indicator neither misses any aggregate cycle, nor reports extra-cycles. Furthermore, the dates of the individual turning points coincide with or are close to those of the official chronology.

3.3 Dating of the Italian business cycle

In this section we present a review of the dating of the Italian cycle over the whole period of interest (i.e. starting from 1970), by analyzing jointly the peaks and troughs of the indicators singled out in the previous steps of the analysis as the most appropriate to measure the Italian business cycle. We scrutinized a total of eight series having added to the six components of the composite indicator the indicator itself and gross domestic product, which represent the most comprehensive gauges of economic activity. The turning points of all the series are reported in Table 5, together with the existing official chronology and that proposed in this paper.

Some comments are needed to explain the judgmental choices taken to define the chronology.[24] The peak in the early months of 1974 shows up clearly in the evolution of the

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[22] It should also be considered that the variability of each series is affected by the size of the irregular component; in our procedure this issue is overcome by the high frequency filtering.

[23] The trend adjustment was used up to 1991 by the BEA in the construction of the U.S. index of coincident indicators (the revision is described by Green and Beckman).

[24] A detailed example of the use of cyclical indicators for the dating of business cycle peaks and troughs can be found in Zarnowitz (1992, pp. 283-85).

main variables scrutinized, in particular the composite index, gross domestic product and the index of industrial production; it is also the only downturn in the whole sample posted by the value added of market services.[25] The turning points of the series considered scatter around the month of March, when the composite indicator peaks, and which was chosen as the turning point. The following trough also appears pronounced. Value added of market service turns as early as the first quarter of 1975, the railway transport of goods as late as October of the same year. The trough date chosen is May, since both gross domestic product and machinery investment turn in the second quarter; the upturns of the composite index and industrial production occur only a few months later, respectively in July and August.

The peak of February 1977 is very easy to date, since nearly all the series considered peak in that month or one month earlier; the subsequent trough, which was very close to the previous turning points, since it occurred towards the end of the same year was slightly more difficult to determine. Gross domestic product turned during the summer, industrial production in October and the composite index in December. The latter month was chosen as the turning point, since a couple of series (namely, railway transport of goods and imports of capital goods) turned at the beginning of 1978. The next peak is again easy to identify, since almost all the series peaked in the first half of 1980. In particular, since gross domestic product and industrial production peaked, respectively, in the first quarter and in March, the turning point was set to this month. Later, an extra cycle is reported by industrial production and gross domestic product, with a trough in the third quarter of 1980 and a peak, respectively, in October 1981 and the second quarter of 1982. Since this cycle is not present in any other variable or in the composite indicator, we did not include it in the chronology; it was also not reported in the existing chronology.

The dating of the following trough is somewhat difficult, since the turnings of the series examined are widely dispersed. Gross domestic product turned up as early as the last quarter of 1982, whereas industrial production turned in July 1983 (and the railway transport of goods in September 1983). A median date was chosen, namely March 1983, when the composite indicator reached its trough. A prolonged expansion followed, from the rest of the

[25] Monthly turning points of quarterly series are conventionally set to the middle month of the quarter in which the turning point occurred.

eighties up to the early nineties. During this long period, which lasted almost ten years, a couple of extra cycles were reported by a few variables, but neither involved GDP or the composite indicator and they were therefore not considered economy-wide cycles.

The expansion ended, according to most variables, in the first half of 1992. The composite indicator peaked in February 1992, gross domestic product in the second quarter; the turning point was therefore set to March 1992, when industrial production reached its local maximum. The dating of the following trough is an easy one, since almost all variables turned in July or August 1993; the trough was set to the latter date, which coincides with the turning point of both the composite indicator and industrial production. The turning points of the variables examined at the following peak are slightly more dispersed. The composite indicator and industrial production peaked as early as September 1995, whereas gross domestic product turned in the first quarter of 1996; we set the peak at an intermediate date, November 1995, when machinery investment peaked. Finally, the most recent trough was set in November 1996. Industrial production and gross domestic product turned at the end of the year, respectively in December and in the fourth quarter of 1996; the composite indicator turned earlier, in June (the railway transport of goods as early as April). We therefore set the trough in an intermediate date, namely November, when imports of capital goods turned.

Overall, the differences between the existing official chronology and the one we have just commented are very limited. Out of ten turning points in the whole period considered, for seven of them there is either no proposed change or the change involves a postponement or an anticipation of just one or two months. In the remaining three turning points the change is only marginally larger, at three or four months. The thorough investigation of the business cycle properties of a very large set of variables has thus produced results that substantially confirm those of dating done in the past, often on the basis of information selected on judgmental grounds. According to the chronology proposed in this paper, the average duration of each business cycle in the last twenty five years was fifty-two months; that of single expansions and recessions was thirty-three and nineteen months respectively.

In order to complete the analysis of the Italian business cycle we replicated the dating procedure according to the growth-cycle definition which focuses on the fluctuations of economic variables around their secular trend (see section two). To separate the trend and cyclical components we applied the same technique already introduced in the early stages of the analysis, i.e. the band-pass filtering. In other words, we identified the turning points of each indicator directly on its cyclical component, defined as the fluctuations with a periodicity between one and half years and eight years. The de-trending approach chosen to remove the secular movements is therefore fully consistent with the definition of the business cycle that was retained when selecting the variables best suited to measure cyclical comovements. In turn, it is worth mentioning that isolating the cyclical fluctuations by means of band-pass filtering removes from the series high frequency noise that may affect the identification of the turning points.

The exercise was performed on the same set of indicators used to establish the chronology based on the classical cycle definition. Once again, following the NBER method, the timing of the turning points of the aggregate (growth) cycle was defined by scrutinizing the clustering of upturns and downturns in the individual series, including the composite indicator (results are reported in Table 6). The latter variable was constructed as a weighted average of the six de-trended components, according to the weighting scheme used for the classical cycle composite indicators (see Figure 2).

In the majority of the cases, the choice of dating was straightforward and, as expected, often corresponded to the turning points of the composite coincident indicator. However, in some cases, corresponding to the sequence of accelerations and slowdowns in economic growth that took place in the second half of the eighties, the identification of common turning points is much less clear-cut. The proposed chronology for that period is therefore open to discussion.

As far as the period between 1973 and 1983 is concerned, the sequence of cycles identified on de-trended (filtered) indicators is very close to that based on the trended indicators and the shifts in the chronology are very small. As for the peak of the early months of 1974 and the following trough, all the series examined turn in the same quarter: accordingly, the central dates (February 1974 and August 1975) were chosen. The next peak is to be placed between the end of 1976 and the beginning of the following year, since four series turn in November and two in February, while the composite coincident indicator turns in December. The turning point was therefore set in November 1976, when GDP and industrial production also peaked. The dating of the following trough is less clear, since the up-turns are scattered between the fourth quarter of 1977 (value added of market services) and the third quarter of 1998 (machinery investment). We chose April, i.e. the turning point of industrial production, but June, when the composite coincident indicator turned, could be accepted as well. As for the end of the expansion, the situation is similar; peaks show up between the third quarter of 1979 (value added of market services) and September 1980 (imports of investment goods). Again, one can choose between the down-turn of industrial production (February 1980) and that of the composite coincident indicator (April); we stuck to the former. The following trough is more neatly defined. The turning points of all series cluster at the beginning of 1983, the earliest signal emerging in January (share of overtime hours) and the latest in the second quarter (machinery investment). Hence, we chose March, which lies in the middle of that range and coincides with the turning point of the composite coincident indicator.

The long expansion of economic activity experienced from 1983 to the beginning of the nineties was characterized by a relatively stable rate of growth. However, when the business cycle is measured as a deviation from the long-term trend of the relevant variables - as we do here - a sequence of mild fluctuations emerges for every indicator examined. This feature makes a common dating, based on the growth cycle definition, rather problematic. A peak can easily be pinned down in the second half of 1984, with almost every series (except value added of market services) turning down between the second quarter (when GDP peaks) and November. As industrial production shows a peak in September, this central date was chosen. The following cycle is very difficult to identify because the dating of the individual series hardly provides recognizable clusters. In particular, the GDP cycle turns up in the first quarter of 1985, hits a peak in the first quarter of 1986 and shows a new upturn in the first 1987, but the amplitude of those fluctuations is very small. As for industrial production, the trough is reached in November 1985 and the peak appears as late as in mid-1989. Given these conflicting signals, we decided to date the cycle according to the movements of the composite indicator, which by construction averages the behaviors of individual series. As a result, the aggregate trough is placed in September 1986 and the following peak in July 1989. The former date is particularly doubtful while the latter is close enough to the turning points of some individual series; in fact, railway transport of goods shares the same dating and industrial production turns down just one month earlier.

A short cyclical fluctuation is present in the majority of indicators at the beginning of the nineties. Whilst this cycle is missed by two important variables, namely industrial production and value added of market services, we decided to include this episode in the chronology of the aggregate growth-cycle because the degree of synchronization of the turning points of all the other variables is high. The identification of the turning points is quite straightforward. The trough was set in December 1990 and the peak in February 1992 because these dates are median with respect to the cluster of turning points and also correspond, respectively, to the downturn and the upturn of the composite coincident indicator. The dating of the following cycle is also not very difficult. Turning points are present in every single series and lie in narrow ranges. Again, the trough and the peak were dated according to the turning points of the composite coincident indicator (respectively, September 1993 and June 1995) which are very close to those of industrial production and GDP. Finally, as for the most recent trough, the only shortcoming is the lack of an upturn in the machinery investment series. All the other indicators turn in a very limited period of time (between August and November 1996); we set the trough in October 1996, once again following the dating of the composite coincident indicator.

Summing up, analysis of the Italian business cycle over the last three decades identified five complete cycles (from trough to trough) according to the classical definition and two more cycles (for a total of seven) according to the growth-cycle definition; in both chronologies the current expansion started at the end of 1996. For all the five fluctuations reported by both chronologies the corresponding turning points coincide or are relatively close. As already pointed out, the main difference between the results of the two approaches is due to the two cyclical slowdowns in the second half of the eighties, which are classified as recessions only when fluctuations around the trend are considered. These episodes substantially shortened the average duration of the cycle, which is forty-two months in the «deviation from the trend» approach, ten months less than according to the classical definition. Aside from this difference, the duration of the cycles identified in both approaches is very similar. In fact, the lead at the peaks and the delay at the trough that typically characterize the growth-cycle turning points with respect to the classical-cycle ones is very limited in our chronology (on average, there is a 2.2 months lead at peaks and a 1.6 months lag at troughs).

4. Business cycle properties of 183 time series relevant for the Italian economy

In this section we report the results of the analysis of business cycle properties of the 183 variables included in our data set. The series were chosen following several criteria. Most variables were included since they are relevant from the point of view of business cycle theory and economic theory in general. We also selected any other variables that seemed to be potentially relevant for the measurement and prediction of business cycle conditions in Italy, according to the consolidated experience of U.S. researchers (see, for example, the list of 165 series analyzed by Stock and Watson, 1991, and the list of variables routinely scrutinized by the Conference Board) and Italian analysts. As previously mentioned, for each variable we analysized (i) the basic univariate properties, (ii) the coherence and cross-correlation with the reference series, and (iii) the predictive content with respect to the same reference series. Coherences and cross-correlations are examined both on transformed series and those filtered with band-pass; the predictive content is analyzed mainly on the basis of transformed series (although statistics were computed also with respect to the filtered series).

As reference series we used the composite coincident indicator described in the previous section, which appeared to us the most preferable monthly indicator available of economic activity in Italy. It is by construction more representative than the index of industrial production, with which is nonetheless closely correlated (coherence equal to .74, highest correlation with a lead of one month equal to .87, with regard to bandpass filtered series); indeed the composition of the indicator used here is much more up-to-date and well documented than the old composite indicator computed by ISCO. Finally, the indicator that we propose exhibits an extremely high correlation with gross domestic product (coherence as high as .92, contemporaneous correlation is equal to .95).

The results of the analysis are reported in Tables 7 and 8. In particular, Table 7 contains some univariate statistics and estimates of coherence and cross-correlation with respect to the composite coincident indicator, whereas Table 8 reports a number of statistics measuring the predictive content with respect to the same indicator.

In the following pages we briefly summarize the business cycle properties of the main variables of each category considered. This is the first exercise of this type for the

Italian economy, to the best of our knowledge (a more focused statistical analysis of post-war economic fluctuations in Italy was reported in Schlitzer, 1993b). In many cases, the evidence that we find confirms the standard results of the literature on business cycles in industrial countries and those specific for the Italian economy (see Backus and Kehoe, 1992, and Fiorito and Kollintzas, 1994). Some of our findings, on the other hand, qualify or challenge the consensus view and existing evidence on the fluctuations of the Italian economy.

4.1 Labor force and employment

The most relevant employment-related variables slightly lag the aggregate cycle, as predicted by theories based on adjustment costs and labor hoarding. Total employment (OCCTT) is found to lag the composite indicator by two quarters, according to statistics based on both transformed and filtered series.[26] Similarly, employment in manufacturing (ULATI), which is one of the more cyclical variables in this category, lags aggregate fluctuations by one quarter, job losers (DISIS) by two quarters (according to statistics based on a filtered series, which are those emphasized in this section). Another prediction of labor hoarding theories confirmed by the data is that firms initially accommodate a demand shock by increasing the rate of utilization of the existing payroll. In fact, the percentage of overtime hours in large industrial firms (STRGI) is found to be contemporaneous with the aggregate cycle. Since the correlation is very strong (the coherence among filtered series is as high as .90), this variable was included in the composite indicator, as mentioned in the previous section. Furthermore, the utilization of the Wage Supplementation Fund by industrial firms (CIGIS and CIOIS) leads the aggregate cycle by three months, with a coherence greater than .7. The Fund, whose utilization is strongly anticyclical, subsidizes wages and salaries paid by firms for temporarily laid-off workers. Another interesting variable in this category is the change in total hours worked in industrial firms (OREIS), drawn from the monthly business

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[26] As reported in Table 6, with filtered series the highest cross-correlation of total employment with the composite indicator occurs with a lead of six quarters. However, the correlation is negative; therefore, in all likelihood, this result reflects a lagged correlation with the previous cycle. In fact, the cross-correlogram also exhibits a local peak with a lag of two quarters, presumably reflecting a lag with respect to the current cycle. This is also the case of employment in market services (OCCSD) and other variables.

survey carried out by ISAE;[27] this series slightly leads the composite indicator (by one quarter), with a coherence equal to .80.

4.2 Output and capacity utilization

The stylized fact behind the notion of the business cycle is that fluctuations in economic activity in different sectors occur roughly at the same time. This is confirmed by the disaggregated data on output available in our dataset, although unfortunately most of them concern only the industrial sector of the economy. In all the fifteen industrial branches considered, the index of production (PRO02-PRO16) is highly correlated with aggregate activity at cyclical frequencies (the cross-correlation peaks for each single branch are included in the range .62-.85). In most branches the maximum correlation with the composite index is either contemporaneous or occurs with a lag or lead of only one or two months; in no sector is the lag or lead longer than five months. The index of overall industrial output (PROIS) is characterized by a strong contemporaneous correlation with the composite index, as already stressed in the previous section.

Confirming the specification of several macroeconometric models, the pressure of demand on industrial capacity was also found to be highly correlated with the aggregate cycle, either being contemporaneous or slightly leading it. We considered two different sets of measures of capacity utilization, based respectively on (i) ISAE survey data and (ii) the Wharton method of interpolating peaks of actual output, used by the Bank of Italy (see Klein, 1969; the corresponding variables for the whole industrial sector are GUIIS and GUWIS). According to both measures the rate of capacity utilization exhibits very high coherence with aggregate fluctuations (equal to, respectively, .79 and .90); it leads the composite indicator by one quarter, according to the survey data, whereas is contemporaneous according to the Wharton measure. We have also examined other measures of demand pressure, also drawn from ISAE survey data, namely the share of firms whose activity is constrained by insufficient demand (CARIS) or insufficient capacity

[27] ISAE is a public institute founded at the beginning of 1999 from the merger of ISCO with another economic research institution, ISPE. ISAE has taken over the business and consumer surveys previously carried out by ISCO which, as already pointed out, was also maintaining an index of coincident indicators as well as the chronology of the Italian business cycle.

(INSIS). Not surprisingly, the former share turned out to be anticyclical and the latter procyclical; both appear to lead the aggregate cycle. CARIS is particularly interesting, leading the composite indicator by two quarters, with a maximum (absolute value) correlation equal to -.87. This category of variables includes two other leading indicators: total electricity consumption (ELETT) and firms' expectations of their own production (PRAIS). The forecasting properties of ELETT are known in the empirical literature on the Italian business cycle.[28] As to PRAIS, it is one of the variables with the longest and strongest lead with respect to the composite indicator (respectively, eight months and a maximum correlation at cyclical frequencies equal to .79).

4.3 Consumption, orders and market services

As expected, given its large weight on aggregate demand and the evidence available for Italy and other industrialized countries, household consumption (COFTT) was found to be strongly correlated and contemporaneous with aggregate activity; on the other hand, government consumption (COGTT) exhibits a very low correlation with the composite indicator, again confirming international evidence (see the references cited earlier in this section), suggesting that stabilization policies play a minor role in the determination of cyclical fluctuations. One of the very few monthly indicators related to household consumption is the index of consumer confidence based on ISAE surveys (CLIMA); according to our results this variable is highly correlated with the composite indicator with a lead of four months.[29] The few other short-term indicators available on demand developments are based on business survey data and concern the industrial sector; they were also found to be strongly correlated with the aggregate cycle and to lead it. The various indicators on current order books (ORITT, etc.) lead the composite indicator by four to six months, that of order expectations (TORTT) by eight months.

The information on output in the services sector is unfortunately very limited, due to well-known factors which include difficulties in data collection and measurement issues. The

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[28] This variable can be successfully employed to predict industrial production (see for example Marchetti and Parigi, 1998) and gross domestic product itself (Parigi and Schlitzer, 1995).

[29] The confidence index was used to forecast household consumption by Parigi and Schlitzer (1995).

value added of overall market services (VASDV) has been found to be closely correlated and coincident with the aggregate cycle; this is not surprising, given its aggregate weight as well as the evidence already available in the literature. The results of the few branch-specific monthly indicators available confirm the evidence reported in the previous section, according to which cyclical fluctuations of economic activity in the different sectors occur roughly at the same time. In particular, railway transport of goods (MERFS) leads the composite index by only one month (with a correlation as high as .87), and the index of retail sales lags it by two months (with a much lower degree of coherence, i.e. .46).

4.4 Investment and inventories

Fixed investment (INVTT) was found to be contemporaneous and highly correlated with the composite indicator, again confirming existing evidence. Purchases of machinery and equipment (INVIM) and of transportation equipment (INVMT) are both contemporaneous, whereas construction investment appears to lead aggregate fluctuations by two quarters; however, only equipment investment shows a high degree of correlation with the reference cycle. Industrial inventories of finished goods measured by business survey data (SCPIS) are found to be strongly anticyclical; they lead the composite indicator by five months, providing evidence in favor of inventory models of the business cycle. A variable used in the literature for predicting business fixed investment is the indicator drawn from business surveys concerning industrial firms' expectations regarding the overall economy (ANEIS); this variable leads the aggregate cycle by eight months, but its coherence is as low as .29.

4.5 Prices and margins

It is an open issue in the economic literature whether prices should be procyclical or anticyclical. In principle, the former outcome appears more likely with demand shocks (and is consistent with business cycle models *à la* Lucas, 1977), the latter with supply shocks. Furthermore, at a disaggregated level the price dynamics are highly sensitive to sector-specific characteristics. Also, results may differ significantly according to whether one considers price levels or first and second differences, and the level of aggregate activity or its growth. Most recent contributions have challenged the traditional stylized fact of aggregate price procyclicality, finding negative correlations between prices and output, concerning both levels and rates of growth, in the post-war period (Kydland and Prescott, 1990, Cooley and Ohanian, 1991, Backus and Kehoe, 1992, Todd Smith, 1992 and Fiorito and Kollintzas, 1984; see Schlitzer, 1993b, on the Italian economy). On this matter we obtained mixed evidence. In particular, consumer price inflation and the growth of the consumption deflator were found to be positively associated with the growth of the coincident indicator. On the other hand, producer price inflation appears to be countercyclical[30].

Some potentially interesting results emerge at a disaggregated level. For example, a relevant series for the purpose of this study is producer prices in paper and printing (PRE24), whose rate of growth is highly correlated with fluctuations in aggregate activity, with a lead of five months. This result is presumably due to the activation of this sector during the early stages of expansions, because of the use of paper products in packaging and the like, and is confirmed by the leading properties of the corresponding sectoral production index (PRO14). More in general, differenced producer prices of total intermediate goods (PREIN) lead the aggregate cycle by four months. The price of oil was found to be substantially acyclical, confirming that the impact of this variable on economic fluctuations in industrialized countries decreased sharply in the eighties and nineties. Another leading variable in this category is industrial firms' expectations regarding their own prices (PREAT), drawn from business survey data, which was found to lead the aggregate cycle by five months (with a relatively high cross-correlation value, i.e. .74).

4.6 Labor costs, productivity, wages and income

With the exception of productivity, no variable in this group exhibits significant comovements with the aggregate cycle. The fluctuations at cyclical frequencies of both nominal and real wages show low coherence with the reference variable. Real (consumer) wages in the whole economy were found to be weakly procyclical, being characterized by a

[30] The results mentioned are not included in Table 7 but are available from the authors; the reason is that the results reported in the Table reflect our strategy of computing statistics based on variables transformed according to pre-testing results, rather than *a priori* specifications. In particular, in the price section, pre-testing led to correlating the first difference of filtered consumer prices (PRECO) and the consumption deflator (DEFCO) with the level of the filtered coincident indicator; the correlation was found to be positive and contemporaneous, although with relatively low coherence.

contemporaneous correlation of .26; this result seems to be in line with empirical findings confirming the existence of a short-run Phillips curve in Italy.[31] Unit labor costs in manufacturing (CUVTI) appear to lead the composite indicator, but with weak coherence (.25). As expected from the macroeconomic literature, productivity is strongly procyclical and roughly contemporaneous, particularly in industry (PRISS) but also in market services (PRSDV). Given some of the results reported above concerning the cyclical behavior of employment and labor input variables, this evidence is likely to reflect mostly labor hoarding phenomena. Real disposable income (REDIS) leads by one quarter but the coherence is again relatively low (.37); this result is probably affected by measurement problems, as REDIS is estimated from indirect information.

4.7 Money, credit and interest rates

Our results largely support the view that money leads economic activity, in a chronological sense. In particular, M1 and M2 in real terms (M1REA and M2REA) are found to lead the aggregate cycle by ten and eleven months, respectively, with a cross-correlation slightly above .5 (but a very low coherence). This is roughly consistent with much of the international evidence available, particularly with regard to M2 (see for example Kydland and Prescott, 1990; Stock and Watson, 1991, and Cochrane, 1994). Analogously, bank deposits (DEPRE and the like) lead the aggregate cycle by about one year, with a relatively high correlation, particularly when measured in real terms (.62). We also found a clear statistical link between nominal interest rates and the aggregate cycle. The four interest rates considered (i.e. the rate on medium-long term and short term government bonds, respectively, TABTP and TABOT; the interest rate on bank loans, TAIMP, and the official discount rate set by the Bank of Italy, TATUS) were found to be strongly countercyclical and to lead aggregate growth by between one year and sixteen months. Although one can always think of some economic mechanism according to which interest rates move endogenously and react to expectations on future output dynamics, some of the evidence found, particularly regarding the official discount rate, seems to suggest that monetary policy matters. In this sense the results may be seen as providing a rough estimate, on purely

[31] See for example Fabiani *et al.* (1997).

statistical grounds, of monetary policy lags, which is not very different from the estimates obtained from structural models.

In general, the highest coherence and correlation with aggregate activity was found with the (nominal) interest rate on bank loans. Less clear-cut is the evidence obtained with real interest rates, whose measures (and corresponding results) are very sensitive to the method of deflation used.[32] We also considered interest rate spreads. Very interesting results were obtained with the spread between the interest rate charged on bank loans and that associated with medium-long term government bonds (SPRE2, calculated as the difference between TAIMP and TABTP). This spread should correspond to the risk premium associated with holding private vs. public debt; it was found to be strongly countercyclical and to lead the aggregate cycle by four quarters, providing evidence in favor of the credit channel as the transmission mechanism.[33]

4.8 Foreign trade

Our results confirm the strong positive correlation of imports with aggregate activity and demand, enhanced by the openness of the Italian economy, the procyclicality of the propensity to import and the existence of supply bottlenecks in some manufacturing sectors.[34] Imports of goods and services, according to national account data (IMPTT), are found to be strongly correlated with aggregate activity, with a lead of one quarter; merchandise imports (IMPTB) lead by four months. Imports of investment goods (IMPD1) are roughly contemporaneous. The timing of the comovement differs across manufacturing branches, depending on the characteristics, including the role in intersectoral transactions, that determine the cyclical response of prices and output within each sector. For example, imports of semimanufactured products (IMPSL) have a particularly high correlation with the composite indicator and a lead of three to four months; other leading categories of imports

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[32] In this study we used a twelve terms moving average of the 12-month rate of change of consumer prices.

[33] Another potentially relevant type of spread is that between the interest rates of long-term and short-term bonds, which corresponds to the term premium, or the slope of the yield curve. Unfortunately, it is not easy to construct such a variable for the Italian economy for an extended period, since the financial market developed fully only in the late eighties. This affects the results obtained with the variable SPREA, computed here as the difference between TABOT and TABTP.

[34] See the evidence reported by Cipollone and Marchetti (1998).

include purchases of energy and raw materials. On the other hand, the evidence concerning exports is much more varied and somewhat different from the consensus view. Overall exports of goods and services measured by national account data (EXPTT) were found to be poorly correlated with the aggregate cycle, with respect to which they appear to be lagging; merchandise exports according to customs data are also characterized by a very low correlation with the composite indicator (with a lead of five months). Whereas sectoral detail does not seem to provide relevant information, some interesting insight is provided by the data disaggregated by geographical area. Merchandise exports to EU-countries (EXPEU) were found to be highly correlated (.8) with the aggregate cycle, with a lead of six months (this result is roughly consistent with the evidence on comovements of the Italian cycle and that of other major European countries reported in the next paragraph). On the other hand, exports to non-EU-countries (EXPRW) appear substantially acyclical, presumably reflecting the lack of cyclical synchronization with most non-European economies.

4.9 International output and prices, exchange rates

The analysis of international data suggests that the cycle of the Italian economy is closely synchronized with those of the major European countries and the United States. The gross domestic product of all OECD countries (PILOC) and that of the Euro-area (PILEU) are strongly correlated with the composite indicator, leading it by one quarter. With regard to individual countries, a similar result is found for French gross domestic product (PILFR), whereas a longer lead is reported by the gross domestic product of the United Kingdom (PILUK) and the United States (PILUS; respectively, three and two quarters), although with a slightly lower coherence. A parallel pattern emerges from analysis of the data on industrial output; the index of industrial production in Germany (PROGE) and France (PROFR) is strongly correlated with the Italian cycle, with a lead of two or three months; the same index in the United Kingdom (PROUD) and the United States (PROS) exhibits a lead of roughly six months, but with a somewhat weaker correlation. Overall world imports (IMP) are also strongly correlated with the composite indicator, with a lead of one quarter. Exchange rates turn out to be approximately acyclical. In fact, both multilateral effective exchange rates (TCERE and TCENO) and the bilateral rates between the Lira and the U.S. dollar (EXCUS) and the German mark (EXCGE) are characterized by a very low coherence with the Italian cycle.

5. Construction of a composite leading indicator for the Italian economy

This section describes the construction of a composite leading indicator according to the NBER methodology based on the analysis presented in the previous section. Analogously to the procedure used to calculate the composite coincident indicator reported in the third section, we followed two steps. We first selected a broad set of variables that appear to be leading according to a number of comovement statistics and tests of predictive power; we then examined the timing of the turning points and, finally, chose the components of the aggregate leading indicator. There are, however, two main differences with respect to the analysis carried out for the composite coincident indicator. One concerns the reference series used; here we did not have to use three different measures since we could rely on the composite coincident indicator just described. The other difference relates to the properties of the variables being reviewed. We considered not only comovement properties, such as those summarized in Table 7, but also the predictive power of each series with respect to the coincident indicator. Again following Stock and Watson (1991), a variable is considered leading if, among other properties, it helps to forecast the growth rate of the reference series, according to a number of different models. The statistics examined, all referred to transformed data, are reported in Table 8. The first six columns of statistics refer to the test as to whether each variable enters significantly into a regression, which includes twelve lags of the growth rate of the composite coincident indicator (COIN) and, respectively, six or twelve lags of the transformed variable (where the transformation is described in the second column of the Table; see also Section 3.1). The following six columns report the results of regressing the log-change of COIN over, respectively, one, six or twelve months ahead, on six lags of the log-change of COIN and six lags of the transformed variable. In other words, defining Y and X as, respectively, the level of COIN and the transformed variable, the regressions considered are those of $\ln(Y_{t+k})-\ln(Y_t)$ (for k = 1,6 or 12) on $\ln(Y_t)-\ln(Y_{t-1})$, $\ln(Y_{t-1})-\ln(Y_{t-2})$, ..., $\ln(Y_{t-5})-\ln(Y_{t-6})$ and X_t, X_{t-1}, ..., X_{t-6} plus a constant. The statistics reported refer to the R^2 of this regression and the corresponding rank of each variable among the 183 series scrutinized (with 183 indicating that the variable is associated with the highest

R^2, 182 with the second-highest R^2, and so on).

We selected a set of twenty-six variables that appear to be leading according to both comovement properties and predictive power. In particular, we singled out the variables that exhibit a high peak of correlation with a lead of at least three months; most of them also feature relatively high coherence and a good forecasting performance in relative terms. In the case of categories including several variables with leading features, we selected the series with the most significant leading and forecasting properties. Only a couple of categories are not represented in the list of selected variables (namely, wages and labor costs and income). The twenty-six variables, many of which have already been discussed in the previous section, are the following: hours of Wage Supplementation Fund (total and ordinary) in manufacturing (respectively, CIGIS and CIOIS); the indexes of production of chemicals (PRO05), food products (PRO11) and paper and printing (PRO14); the rate of industrial capacity utilization (GUIIS); the share of industrial firms reporting insufficient demand (CARIS); total electricity consumption (ELETT); production expectations of industrial firms (PRAIS); the level of orders reported by industrial firms (total orders and domestic orders of consumer goods and intermediate goods; respectively, ORITT, ORICO e ORIIN); demand expectations in industrial firms (TORTT); households' confidence climate (CLIMA); industrial firms expectations of aggregate economic developments (ANEIS); inventories of finished goods in industrial firms (SCPIS); producer price indexes of non-food consumer goods (PRENA) and paper and printing products (PRE24); industrial firms expectations of own prices (PREAT); bank deposits at constant prices (DEPRE); interest rate on bank loans (TAIMP); spread between the interest rate on bank loans and the rate on long-term government bonds (SPRE2); imports of overall merchandise (IMPTB) and semimanufactured goods (IMPSL); German industrial production (PROGE) and the U.S. gross domestic product (PILUS).[35] The statistics of comovement and the predictive power of these variables are reported in Table 9. Furthermore, for each of these variables we identified peaks and troughs using the Bry-Boschan routine and then calculated the leads and lags with respect to the turning points of the composite coincident indicator. The results are reported in Table 10. They largely confirm the leading properties of the series selected. In fact, the turning points of nearly all the series consistently lead the peaks and throughs of the composite coincident indicator. In twenty-four variables out of twenty-six the average lead ranges from approximately two to thirteen months.

The next step was to select a subset of about ten series to be included in the composite leading indicator. The selection was based on two criteria. A first criterion is clearly that of choosing the series that feature the highest correlation, longest lead and best forecasting properties. However, it is also desirable to construct an indicator as balanced and diversified as possible. We therefore tried to include at least one series for each category, while at the same time avoiding overrepresentation of any group. Among labor market variables we selected the hours of Wage Supplementation Fund (ordinary) in manufacturing (CIOIS); it seemed preferable to CIGIS both in principle, because it does not include the structural (extraordinary) use of the Fund, and on forecasting ground. With regard to measures of industrial activity, we chose the survey data on manufacturing firms' production expectations (PRAIS) and inventories of finished goods (SCPIS); these variables seemed preferable to sectoral indexes of industrial production because of the larger lead and better forecasting performance. A couple of demand indicators were selected to enter the composite indicator. The first is the level of domestic orders of consumer goods reported by industrial firms (ORICO), whose leading properties appear marginally stronger than those of the other two variables from survey data on orders (ORITT and ORIIN), which are also remarkable in this regard. The second indicator of demand conditions is households' confidence climate (CLIMA), which is the main, if not the only, monthly leading indicator of consumption available for the Italian economy. We also included in the composite indicator one credit variable, bank deposits in real terms (DEPRE), and one premium spread of interest rates, namely the spread between the interest rate on bank loans and the rate on long-term government bonds (SPRE2).[36] Among foreign trade indicators we selected total merchandise imports (IMPTB); this was preferred to imports of semimanufactured goods

[35] The presence of industry-related variables in the above list is overwhelming; we attempted to reduce it in the final composition of the indicator.

[36] The interest rate on bank loans (TAIMP) also exhibits strong leading comovement properties; it was not included in the composite indicator mainly to avoid an over-representation of monetary and financial variables. However, sensitivity exercises proved that its inclusion in the composite index would not significantly modify it.

(IMPSL), which featured very similar comovement and forecasting properties, mainly on the basis of their larger coverage. Finally, with regard to international variables, we included the index of German industrial production (PROGE), which is characterized by a shorter lead but a much stronger correlation and predictive power than U.S. gross domestic product (PILUS). Overall, the following nine variables were therefore included into the composite leading indicator: CIOIS, PRAIS, SCPIS, ORICO, CLIMA, DEPRE, SPRE2, IMPTB and PROGE.[37]

The data on single components were transformed and aggregated according to the same computational steps followed to construct the composite coincident indicator, reported in Section 4. The indicator thus obtained is compared with the composite coincident indicator in Figure 3. Encouragingly, on visual inspection the former seems consistently to lead the latter. This is confirmed by analysis of the turning points of the aggregate leading indicator (see the bottom line of Table 10). Its peaks and troughs lead those of the turning points of the coincident indicator in nearly all cases, with the lead ranging from one to nine months (only in the case of the March 1992 peak did the two indicators turn contemporaneously). Furthermore, the length of the lead is very regular, averaging five months for both peaks and troughs. With regard to the composition of the indicator, we also experimented a large number of different combinations, adding any single excluded variable to the nine series mentioned, but the leading properties of the turning points of the aggregate indicator remained roughly unchanged in a few cases and worsened significantly in most cases. The leading features of the indicator were also confirmed by the statistics of comovement properties and predictive content already reviewed for each trial variable. In particular, the correlation of the leading and the coincident indexes (both filtered) shows a peak of .84 corresponding to a lead of five months (with the transformed series the peak is equal to .63 with a six months lead). The results of the tests of marginal predictive content strongly reject the null hypothesis that the leading indicator has no forecasting power. Finally, the R^2 of the regressions of the growth of the coincident indicator - 1, 6 and 12 steps-ahead - on the lagged rates of growth of the leading indicator are higher than those

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[37] SCPIS and PRAIS were also included in the composite leading indicator of the industrial cycle calculated by Schlitzer (1993a) according to a growth-cycle definition. The other components of Schlitzer's leading

reported by any of the 183 variables examined.[38]

6. Conclusions

In this paper we have examined the behavior over the business cycle of almost every economic variable that is generally considered as potentially useful in measuring or predicting the evolution of economic activity in Italy. In effect, we make available to analysts of the Italian economy a catalogue of statistics able to summarize the cyclical properties of a fairly comprehensive set of variables, possibly providing new insights into their co-movements with the aggregate cycle. In this respect, our analysis belongs to the body of literature focusing on the measurement of the business cycle facts that was initiated by the NBER research program and was revived recently in the U.S. by studies proposing new empirical characterizations of the cyclical movements of economic time series.

The empirical work developed in this paper aims at measuring the Italian cycle but, at the same time, provides a general scheme for constructing cyclical indicators through iterative steps. These steps combine the use of traditional NBER methods with more recent techniques of cyclical analysis in order to select the variables best suited to play the role of coincident and leading indicators. Overall, the paper proposes a methodology for measuring the business cycle that seems suitable when it is not possible to rely on a well established reference cycle (or reference variable) as a benchmark in the empirical analysis – a situation relevant to many countries not sharing the US tradition.

As a result of a complex selection procedure, we built two composite indicators. The first one is a new index of coincident variables, which we consider an adequate measure of the Italian business cycle and, as such, suitable to play the role of reference variable in the analysis of the cyclical co-movements. The coincident gauge includes six variables representing a fairly wide variety of economic phenomena: a proxy of labor inputs (overtime hours), the output of the industrial sector, two indicators measuring activity in the service

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indicator are the index of production of petroleum products and chemicals, real money (M2), and the indexes of industrial production in the U.S. and the U.K..

[38] More extensive econometric analyses of the leading properties of the leading indicator, especially in terms of its composition, are currently being performed.

sectors, one component of aggregate demand (investment in plant and machinery) and one indicator of imports of goods.

The second cyclical indicator we propose is a leading composite index that shows a good historical record in anticipating the turning points of the Italian business cycle (with an average lead of six months), and is characterized by a high predictive power with respect to the changes in the composite coincident indicator. The leading index synthesizes nine variables accounting for different economic determinants and sources of information. There are three indicators drawn from industrial business survey data (production expectations, inventories of finished goods, domestic orders of consumer goods) and one drawn from the ISAE consumer survey (the consumer confidence index). As for monetary variables, the leading indicator includes one measure of credit (bank deposits in real terms) and one premium spread of interest rates. There is also one variable representing the international cycle, namely the index of German industrial production. Finally, a labor input proxy (hours of Wage Supplementation Fund in manufacturing) and a foreign trade indicator (total merchandise imports) are included.

The results obtained using an aggregation procedure consistent with the traditional and heuristic NBER techniques, are confirmed by an analysis of dynamic principal components, which goes beyond the scope of this paper and whose results are reported in Altissimo, Marchetti and Oneto (1999).

An important by-product of our analysis of cyclical indicators is the revision of the chronology of the Italian business cycle. Our results closely confirm the dating proposed in the past by ISCO, on the basis of judgemental procedures derived from the NBER approach. Overall, in the period considered (from 1970 to 1997) there are ten cyclical turning points corresponding to the classical definition of the business cycle. The chronology confirms the well-known picture of the Italian economy characterized by short and pronounced cycles during the seventies, a very long expansion lasting from 1983 to the beginning of the nineties, and a new sequence of frequent cyclical fluctuations in recent years.

Another by-product of our analysis, particularly relevant for the literature on business cycle models, is the identification of a number of stylized facts concerning fluctuations in the Italian economy. Some of these largely confirm existing views, such as the synchronization of cycles across different sectors of the economy, the lagging behavior of employment and the contemporaneous procyclicality of consumption and investment. Other results shed light on controversial issues or are useful in assessing empirically alleged relationships. In particular, monetary and financial variables are clearly found to lead the aggregate cycle, at least in a chronological sense, by between one year and sixteen months on average. There is also evidence of a relatively strong synchronization of the Italian cycle with those of other major western economies, with respect to which the Italian economy appears to be lagging. The average lag is more pronounced with respect to the US and the UK economies (two to three quarters) and somewhat shorter with respect to the German and French economies (approximately one quarter). Consistently, our results confirm that exports (specifically those to the countries mentioned) play a leading role in the Italian economy.

Appendix I : Measuring the business cycle by approximate band-pass filters

This appendix describes the methodologies applied throughout the paper in decomposing time series into trend, cyclical and irregular components. This is achieved by constructing proper moving averages which isolate the component of an economic time series lying in a specific band of frequencies. In doing this, we closely followed the work of Baxter and King (1995) and Forni and Reichlin (1998), in which this type of linear filters is described at length and their properties compared with those deriving from other procedures applied in macroeconomics to isolated trend and cyclical components of time series.

Having defined, according to the NBER tradition, the business cyclical components of a time series as fluctuations with a periodicity between two and eight years, the filter designed to extract them should pass through the components of the time series that fluctuate over this interval, while it should remove components at higher and lower frequencies. In the jargon of time series analysis, the desired filter is a band-pass filter, which should extract the range of periodicity specified by the researcher.

At the same time, the desired filter should not affect the properties of the cyclical component extracted, nor alter the timing relationship between it and other series at any period, i.e. it should not induce phase shifting. The final requirement of the filter is that the cyclical component should produce in a stationary time series even when applied to data which have deterministic and/or stochastic trend components.[39] The resulting ideal linear moving average associated with the band-pass is of infinite order with symmetric weights on leads and lags. The immediate drawback of the implementation of the exact band-pass filter in the time domain is that a finite approximation of an ideal moving average of infinite order is needed to render this procedure operative; the goodness of the approximation has to be evaluated with respect to a specific loss function for discrepancies between the exact and the approximate filters.

In constructing the filter and the associated moving average we used the frequency domain method, even though the ultimate implementation of the filter is in the time domain.

Starting from a series y_t we aim to produce a new filtered series $y_t^* = \sum_{-\infty}^{\infty} a_k y_{t-k}$, associated with a particular set of frequencies in the original series. To construct the polynomial operator $a(L) = \sum_{-\infty}^{\infty} a_k L^k$ properly, we start from the spectral density function of the stationary time series y_t , $f_y(w)$. The spectral density of the filtered series is $f_{y^*}(w)$, which is equal to $|\alpha(w)|^2 f_y(w)$ with $\alpha(w)$ being the transfer function that indicates the extent to which the filtered series responds to the original y_t at frequency w. The relation between the transfer function and the coefficients of the moving average $a(L)$ can be found using the inverse Fourier transform relation evaluating the following integral:

(A1) $$a_k = \frac{1}{2\pi} \int_{-\pi}^{\pi} \alpha(w)\, e^{iwk} dw$$

If the researcher is interested in retaining only the very slow-moving components of the data, the ideal low-pass filter would isolate only frequencies $-\underline{w} \leq w \leq \underline{w}$ and the implied transfer function $\alpha(w)$ is given by $\alpha(w)=1$ for $|w| \leq \underline{w}$ and zero otherwise. By evaluating the above integral for the given $\alpha(w)$, the low-pass filters weights a_k are $a_0 = \frac{\underline{w}}{\pi}$ and $a_k = \sin(k\underline{w})/k\underline{w}$ for $k=\pm 1, 2, \ldots$. High-pass and band-pass filter can easily be constructed from the low-pass filter. The ideal high-pass filter for $|w| > \underline{w}$ passes components of the data with periodicity lower than $\underline{w}/2\pi$; given the a's coefficients for the low-pass filter, the weight of the high-pass moving average is $1-a_0$ for $k=0$ and $-a_k$ for $k=\pm 1, 2, \ldots$. Finally, the ideal band-pass filter passes only frequencies in the range $\underline{w} \leq |w| \leq \overline{w}$; it is therefore constructed as the difference between two low-pass filters with cut-off frequencies of respectively $\underline{w}$ and $\overline{w}$, and the transfer function of the filter is the difference between the transfer functions of the two low pass filters. As a natural result, the weights of the band-pass filter are constructed as the difference between the weights of the low-pass filters. If we let $\underline{a}^k$ and $\overline{a}_k$ be the

[39] These requirements are very similar to that discussed by Prescott (1986) and King and Rebelo (1993) in justifying the use of the Hodrick-Prescott filter.

moving averages associated with the low-pass with cut off, respectively, $\underline{w}$ and $\overline{w}$, then the band-pass filter weights are $\underline{a}^k - \overline{a}^k$.

As the ideal filter requires an infinite moving average in the time domain, we have to consider an approximation of the ideal filter with a finite moving average $a_h(L)=\sum_{-H}^{H} a_k(h)L^k$ of order H. Following Baxter and King (1995), given a maximum lag of order H the choice of the approximating filter can be framed within the problem of finding the coefficients associated with the filter $a_H(L)$ so that the discrepancy, measured as

(A2) $$\int_{-\pi}^{\pi} \left|\alpha(w) - \alpha_H(w)\right|^2 dw ,$$

between the ideal and the approximating filters, is minimized. The result of this minimization problem is remarkable, for the optimal approximating filter is the one constructed by truncating the ideal filter's weights at lag H (a general reference on the approximation of linear filters is Koopmans, 1974). However, it should be noted that the ideal low-pass and band-pass filters take the value of one and zero, respectively, at zero frequency, while this is not still true in the case of approximating filters. To preserve this property a side constraint has to be incorporated into the minimization problem and leading to the presence of a normalization factor in the coefficients of the approximating filter. In the case of the low-pass filter, the coefficient of the optimal approximating moving average of order H constrained to put unitary weight at zero frequency is $a_k(H)=a_k+\theta$, where θ is a constant depending on the specified maximum lag length, H, and equal to $\left(1-\sum_{-H}^{H} a_k\right)/(2H+1)$. The effect of the constraint on the coefficient of the high-pass and band-pass is easily derivable.

The presence of an approximation in the construction of the filter clearly calls for the choice of the maximum lag length, H; in practice there is no optimal length because an increase in H on one hand improves the accuracy of the approximation, while on the other it worsens the problem due to the loss of observations at the beginning and end of the sample. The trade off present in the choice of H has to be solved in relation to the sample length and the necessity of obtaining a good proxy of the ideal filter. In the following figure, we show the ideal transfer function of a band-pass filter for isolating fluctuations between eight and thirty-two quarters and the transfer function associated with an approximate filter with *H=6, 12, 18* lags. Clearly for lower lags there is a sizable leakage effect from the frequencies that the filter is designed to suppress those it retains, while it is almost negligible for higher lags.

The filter used to highlight the cyclical component in the empirical application presented in this work is a band-pass filter that passes cycles with periods between two and eight years. It seems worth comparing the properties of this filter with some other alternative procedures proposed in the literature:the linear trend, first difference and Hodrick-Prescott (HP) filters.

In the light of the set of characteristics of proper filtering described above, the removal of the linear trend does not induce a phase shift, nor does it re-weight frequencies; however, it fails to remove the stochastic trend component in the series, a quite undesirable property in most cases. On the contrary, the first-difference filter removes unit root components from the data, but there are other problems associated with this widespread procedure. First, since it is not symmetric, the filter alters the timing relationships between variables by inducing phase shifts; this is not a desirable property if one is interested in identifying comovement properties of variables, as we are. Second, this filter operates a strong re-weighting of the frequencies in favor of higher ones; the cyclical signal extracted in this way is therefore dominated by high frequencies and noisy components. The last filter considered in this comparison is the HP filter. This filter is widely applied in the «Real Business Cycle» literature and can be described as a high-pass filter that eliminates all frequencies lower than eight years; this is self-explanatory if we look at the transfer function of the HP filter as reported in King and Rebelo (1993). As in the case of the high-pass filter, the filtered series are stationary and the filter does not operate phase shifts or re-weighting. While the HP filter nicely satisfies the indicated properties, there are two important drawbacks. First, HP filtering does not allow for a clear cut distinction among components of the series other than trend, and so does not allow us to discriminate between cyclical and erratic term as the band-pass filter does. Secondly, in its routine application the HP does not allow for an appropriate treatment of observations near the endpoints of the sample.

Appendix II: Calculating the composite indexes

The procedure for calculating the composite indexes has six distinct steps. Consider the presence of *n* components and let Y_{it} denote the *i*-th monthly component of the index. Quarterly series have been interpolated monthly by assuming a constant rate of growth within each quarter.

1. *Smoothing.* The components Y_t are smoothed by a low pass filter that removes from the series the erratic components with a period up to six months. The filter belongs to the family described in the previous appendix. An approximation up to 12 periods of the filter is used; this number was chosen as a satisfactory trade-off between the precision of the filter and the loss of information at the end of the sample. In order to avoid loss of observations, in the computation of the filtered variables the components were projected out of sample for twelve periods by an ARMA model and the projected values were used to compute the filtered variable up to the end of the sample.

2. *Month-to-month changes are computed for each components***.** Following the NBER tradition, the month to month changes are computed by means of a symmetric alternative to the usual percent change formula; the formula used treats positive and negative changes symmetrically as follows: $y_{it}=200 \times (Y_{it} - Y_{it-1}) / (Y_{it} + Y_{it-1})$. For interest rate variables, simple arithmetic difference are calculated.

3. *Standardization.* The mean, μ_{it}, and the standard deviation, s_{it}, of the month to month changes of each component are computed over a rolling window of 12 years (144 observations). In order to avoid jumps in the computed moments, the upper and lower two percent of the empirical distribution of the changes in the 12 year windows were discharged in the computations, leaving a total of 138 observations. The use of a rolling window is intended to capture the variability of the moments empirically observed within the sample.

4. *The growth rate of the index.* The monthly changes in the single components are aggregated at each period in the growth rate of the composite index c_t as:

(A3)
$$c_t = \sum_{i=1}^{n} \beta_i y_{it}$$

where the weights sum to unity and are defined as $\beta_i = \frac{\frac{1}{s_i}}{\sum_i \frac{1}{s_i}}$.

5. *Adjustment to a target series.* Sometimes it is useful to adjust the trend and amplitude of the composite index to match a target series. In this case the growth rate of the coincident index is defined as:

(A4)
$$\tilde{c}_t = \mu_{R_t} + \frac{s_{R_t}}{s_{C_t}}(c_t - \mu_{C_t})$$

where s_C and μ_C are, respectively, the standard deviation and the mean of the growth rate computed in step 4, while s_R and μ_R are those of the growth rate of the target series. In constructing the coincident indicator we did not perform any adjustment of the target series, while in the construction of the leading indicator we adjusted it to the coincident indicator.

6. *The level of the index.* The level of the composite index CI_t is computed using the symmetric percent change formula previously described, as follows:

(A5)
$$CI_t = CI_{t-1}\frac{(200 + c_t)}{(200 - c_t)},$$

or using $\tilde{c}_t$ in the case of target series adjustment. The series were normalized to equal 100 in January 1978.

Appendix III: Time series plots, cross-correlograms and coherences

The pages at the end of the paper contain the plot of the level of each series, plus the cross-correlogram and the coherence of the series itself with the composite coincident indicator described in section three of the text. There are three plots for each variable and five variables for each page; the plots concerning a given variable are reported next to each other in the same row. The acronym of the variable is reported on top of the first plot. Next, in parenthesis, we indicated the frequency - ex: OCCTT (Q). For each variable, the three plots reported refer to, respectively, (i) the level of the series; (ii) the cross-correlogram of the series with the composite coincident indicator, and (iii) the estimated coherence of the series with the composite coincident indicator. More precisely, for each variable the content of the three plots is the following:

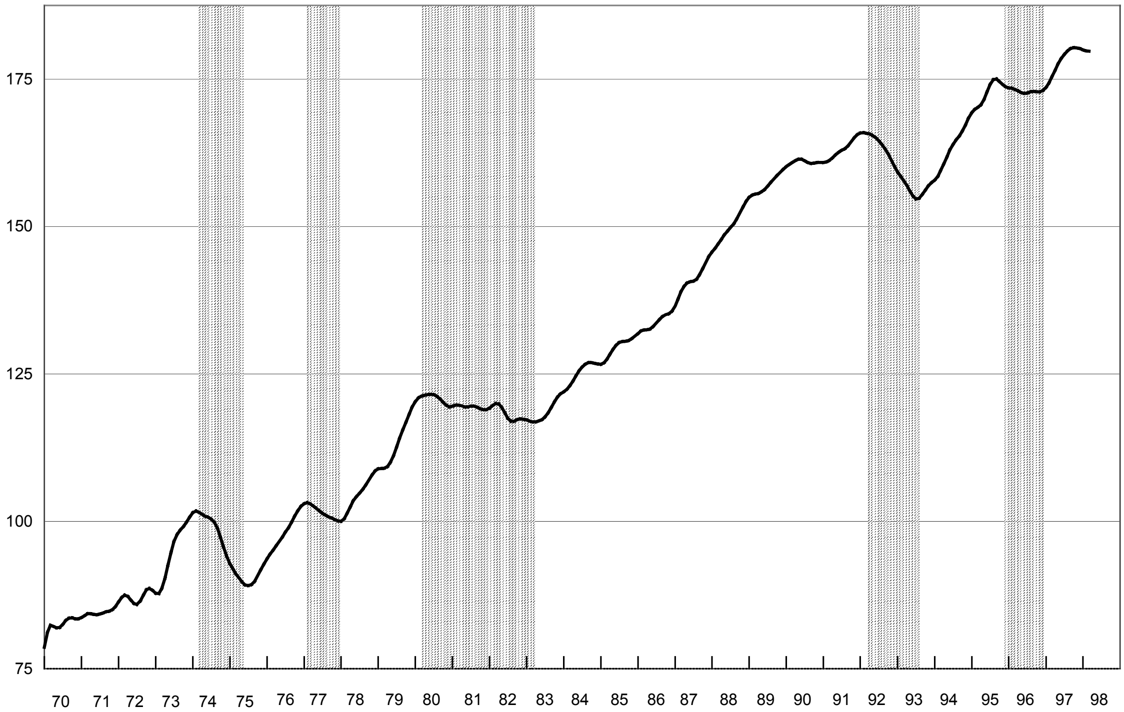
(i) *Plot of the series*. Figures in the first column report the historical plot of the level of each variable. For some variables - those whose transformation is either ‘ln’ or ‘d ln’ or ‘d^2 ln’ (see transformation codes in Tables 6 and 7) - the plot in the figure refers to the logarithm of the series; in the latter case, ‘ln’ is indicated next to the frequency code. Ex.: PERTT (Q - ln).

(ii) *Cross-correlogram*. The second plot for each variable reports the cross-correlogram of the variable itself with the composite coincident indicator. The continuos line represents the correlogram of series filtered at business cycle frequencies; the filter is a band-pass which removes high and very low frequency components of each series, i.e those corresponding to, respectively, periods smaller than two years and greater than eight years (see Appendix 1). Filters are applied to the level of each series, or - if the transformation is ‘ln’ or ‘d ln’ - to the logarithm. For series whose transformation is ‘d^2’ or ‘d^2 ln’ the filter is applied to, respectively, the first difference of the series and the first logarithmic difference. The transformation of the composite coincident indicator is the log-difference (‘d ln’), therefore the filter is applied to the logarithm of the indicator. The dotted line represents the cross-correlogram of transformed series. The cross-correlogram is defined so that an ordinate of, say, +3 represents the correlation of the trial variable at time t with the composite indicator at time t+3.

(iii) *Coherence*. The third plot for each variable reports the coherence of the variable itself with the composite coincident indicator. The continuos line represents the coherence between filtered series, the dotted one between transformed series. The horizontal axis is in radians and ranges from 0 to π. It should be stressed, however, that the coherence of the filtered series is a meaningful statistics only at business cycle frequencies, while over the remaining frequencies the estimated value mainly reflects the leakaging effects of the filter.

Figure 1

A COMPOSITE COINCIDENT INDICATOR
FOR THE ITALIAN ECONOMY

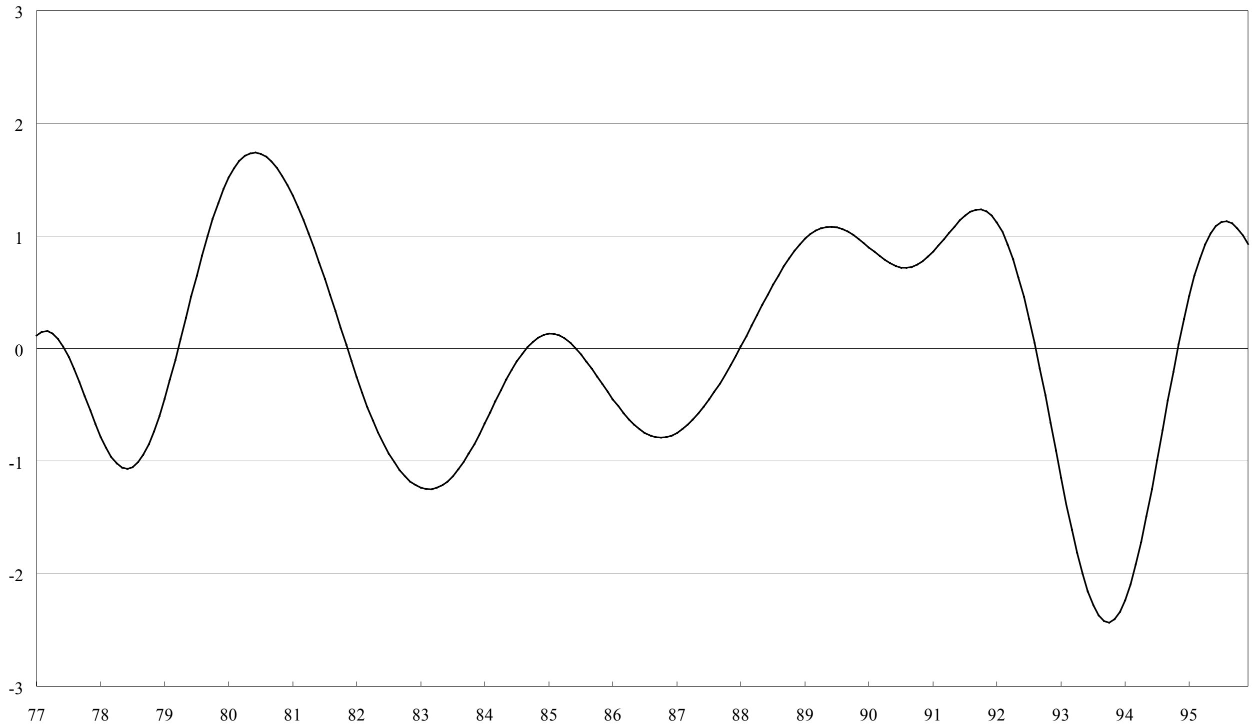


Note: Gray-shaded areas correspond to recessions as defined by the chronology proposed in this article (see table 5): 1974:03-1975:05, 1977:02-1977:12, 1980:03-1983:03, 1992:03-1993:07 and 1995:11 -1996:11.

Figure 2

A COMPOSITE COINCIDENT INDICATOR FOR THE ITALIAN BUSINESS CYCLE

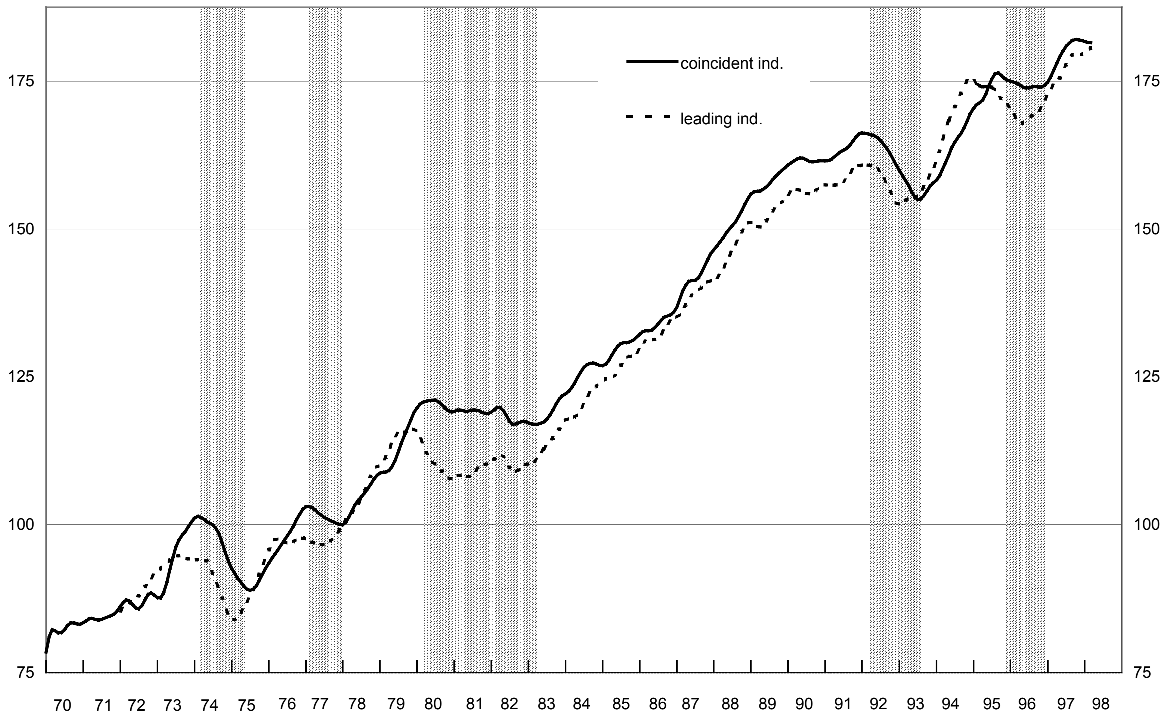
(Growth-cycle approach)



Note: The indicator is obtained by aggregation after applying a band-pass filter for periods between two and eight years to the individual components.

Figure 3

A COMPOSITE LEADING INDICATOR FOR THE ITALIAN ECONOMY



Note: Gray-shaded areas correspond to recessions as defined by the chronology proposed in this article (see table 5): 1974:03-1975:05, 1977:02-1977:12, 1980:03-1983:03, 1992:03-1993:07 and 1995:11 -1996:11.

Table 1

DATA DESCRIPTION AND SOURCES

N.	Acronym	Freq.	Description	Range	Source
Labor force and employment					
1	OCCTT	Q	Total employment	1959:01 1998:02	Bank of Italy elaborations on Istat labour force survey
2	PERTT	Q	Total unemployment	1959:01 1998:02	Bank of Italy elaborations on Istat labour force survey
3	FORTT	Q	Labor force	1959:01 1998:02	Bank of Italy elaborations on Istat labour force survey
4	TAPTT	Q	Ratio of employment to population of working age (activity rate)	1959:01 1998:02	Bank of Italy elaborations on Istat labour force survey
5	ULATI	Q	Employment in manufacturing, standard labor units	1970:01 1998:01	Istat, national accounts
6	ULAEN	Q	Employment in energy, standard labor units	1970:01 1998:01	Istat, national accounts
7	ULAPA	Q	Employment in public administration, standard labor units	1970:01 1998:01	Istat, national accounts
8	OCCAG	Q	Employment in agriculture	1959:01 1998:02	Istat labour force survey
9	OCCED	Q	Employment in construction	1965:01 1998:02	Istat labour force survey
10	OCCEN	Q	Employment in energy	1977:01 1998:02	Istat labour force survey
11	OCCTI	Q	Employment in manufacturing	1977:01 1998:02	Istat labour force survey
12	OCCSD	Q	Employment in market services	1959:01 1998:02	Istat labour force survey
13	OCCPA	Q	Employment in public administration	1977:01 1998:02	Istat labour force survey
14	INCIS	Q	Unemployment, first job seekers	1959:01 1998:02	Istat labour force survey
15	DISIS	Q	Unemployment, job losers (re-entrants)	1959:01 1998:02	Istat labour force survey
16	ALTIS	Q	Unemployment, other job seekers	1959:01 1998:02	Istat labour force survey
17	CIGIS	M	Hours of Wage Supplementation fund (total) in manufacturing	1965:01 1998:05	Social Security Service (INPS)
18	CIOIS	M	Hours of Wage Supplementation fund(ordinary) in manufacturing	1965:01 1998:05	Social Security Service (INPS)
19	CIGED	M	Hours of Wage Supplementation fund (total) in construction	1965:01 1998:05	Social Security Service (INPS)
20	OREGI	M	Hours per employee in large industrial firms (1988=100)	1972:01 1998:03	Istat survey data on large firms
21	STRGI	M	Ratio of overtime hours to total hours in large industrial firms (percent)	1972:01 1998:03	Istat survey data on large firms
22	OCCGI	M	Employees in large industrial firms (1988=100)	1972:01 1998:03	Istat survey data on large firms
23	OREIS	Q	Variation in hours worked in industrial firms	1969:01 1997:03	Isae survey data
Output and capacity utilization					
24	PILTT	Q	Gross domestic product at 1990 prices	1954:01 1998:01	Istat, national accounts; 1954-1969: Prometeia
25	PROIS	M	Industrial production index (1990=100), total	1953:01 1998:04	Bank of Italy elaborations on Istat data
26	PROTI	M	Industrial production index (1990=100), manufacturing.	1953:01 1998:04	Bank of Italy elaborations on Istat data
27	PRO02	M	Industrial production index (1990=100), energy	1953:01 1998:03	Bank of Italy elaborations on Istat data
28	PRO03	M	Industrial production index (1990=100), ferrous and non-ferr. ores and metals	1953:01 1998:03	Bank of Italy elaborations on Istat data
29	PRO04	M	Industrial production index (1990=100), non metallic mineral products	1953:01 1998:03	Bank of Italy elaborations on Istat data
30	PRO05	M	Industrial production index (1990=100), chemicals	1953:01 1998:03	Bank of Italy elaborations on Istat data

Table 1, continued

N.	Acronym	Freq.	Description	Range	Source
31	PRO06	M	Industrial production index (1990=100), metal products	1953:01 1998:03	Bank of Italy elaborations on Istat data
32	PRO07	M	Industrial production index (1990=100), agricultural and industrial machines	1953:01 1998:03	Bank of Italy elaborations on Istat data
33	PRO08	M	Industrial production index (1990=100), office mach. and precision instruments	1953:01 1998:03	Bank of Italy elaborations on Istat data
34	PRO09	M	Industrial production index (1990=100), electrical goods	1953:01 1998:03	Bank of Italy elaborations on Istat data
35	PRO10	M	Industrial production index (1990=100), transportation equipment	1953:01 1998:03	Bank of Italy elaborations on Istat data
36	PRO11	M	Industrial production index (1990=100), food products, beverages and tobacco	1953:01 1998:03	Bank of Italy elaborations on Istat data
37	PRO12	M	Industrial production index (1990=100), textiles, clothing, leather and footwear	1953:01 1998:03	Bank of Italy elaborations on Istat data
38	PRO13	M	Industrial production index (1990=100), timber and furniture	1953:01 1998:03	Bank of Italy elaborations on Istat data
39	PRO14	M	Industrial production index (1990=100), paper and printing	1953:01 1998:03	Bank of Italy elaborations on Istat data
40	PRO15	M	Industrial production index (1990=100), rubber and plastic products	1953:01 1998:03	Bank of Italy elaborations on Istat data
41	PRO16	M	Industrial production index (1990=100), miscellaneous products	1971:01 1998:03	Bank of Italy elaborations on Istat data
42	PROD1	M	Industrial production index (1990=100), investment goods	1953:01 1998:04	Bank of Italy elaborations on Istat data
43	PROD2	M	Industrial production index (1990=100), consumer goods	1953:01 1998:04	Bank of Italy elaborations on Istat data
44	PROND	M	Industrial production index (1990=100), non durables	1953:01 1998:03	Bank of Italy elaborations on Istat data
45	PRODU	M	Industrial production index (1990=100), durables	1953:01 1998:03	Bank of Italy elaborations on Istat data
46	PROD3	M	Industrial production index (1990=100), intermediate goods	1953:01 1998:04	Bank of Italy elaborations on Istat data
47	GUWIS	Q	Capacity utilization rate (Wharton method), total industry	1953:01 1998:01	Bank of Italy elaborations on Istat data
48	GUWTI	Q	Capacity utilization rate (Wharton method), manufacturing	1953:01 1998:01	Bank of Italy elaborations on Istat data
49	GUWD1	Q	Capacity utilization rate (Wharton method), investment goods	1953:01 1998:01	Bank of Italy elaborations on Istat data
50	GUWD2	Q	Capacity utilization rate (Wharton method), consumer goods	1953:01 1998:01	Bank of Italy elaborations on Istat data
51	GUWD3	Q	Capacity utilization rate (Wharton method), intermediate goods	1953:01 1998:01	Bank of Italy elaborations on Istat data
52	GUIIS	Q	Capacity utilization rate (percent, survey data), total industry	1968:04 1998:01	Isae surveys
53	GUITI	Q	Capacity utilization rate (percent, survey data), manufacturing	1978:01 1998:01	Isae surveys
54	GUID1	Q	Capacity utilization rate (percent, survey data), investment goods	1978:01 1998:01	Isae surveys
55	GUID2	Q	Capacity utilization rate (percent, survey data), consumer goods	1978:01 1998:01	Isae surveys
56	GUID3	Q	Capacity utilization rate (percent, survey data), intermediate goods	1978:01 1998:01	Isae surveys
57	CARIS	Q	Obstacles to production in industrial firms, insufficient demand	1966:03 1998:01	Isae surveys
58	INSIS	Q	Obstacles to production in industrial firms, insufficient plant	1966:03 1998:01	Isae surveys
59	ELETT	M	Total electricity consumption	1969:01 1998:06	National electricity company (ENEL)
60	PRAIS	M	Production expectations in industrial firms	1962:03 1998:05	Isae surveys
61	VAIND	Q	Value added in industry at 1990 factor costs	1970:01 1998:01	Istat, national accounts

Table 1, continued

N.	Acronym	Freq.	Description	Range	Source
Consumption, orders and market services					
62	FATIS	M	Industrial sales at constant prices (1990=100)	1973:01 1998:12	Bank of Italy elaborations on Istat data
63	ORDIS	M	Industrial orders at constant prices (1990=100)	1981:01 1998:07	Bank of Italy elaborations on Istat data
64	ORITT	M	Level of orders in industrial firms, total	1962:03 1998:05	Isae surveys
65	ORIIV	M	Level of domestic orders of investment goods	1971:01 1998:05	Isae surveys
66	ORICO	M	Level of domestic orders of consumption goods	1971:01 1998:05	Isae surveys
67	ORIIN	M	Level of domestic orders of intermediate goods	1971:01 1998:05	Isae surveys
68	ORIES	M	Level of foreign orders in industrial firms	1962:03 1998:05	Isae surveys
69	TORTT	M	Orders expectations in industrial firms	1962:03 1998:05	Isae surveys
70	CLIMA	M	Households confidence index	1982:01 1998:12	Isae surveys
71	COFTT	Q	Households consumption at 1990 prices	1954:01 1998:01	Istat, national accounts; 1954-1969: Prometeia
72	COCTT	Q	Government consumption at 1990 prices	1954:01 1998:01	Istat, national accounts; 1954-1969: Prometeia
73	VASDV	Q	Value added in market services at 1990 factor costs	1970:01 1998:01	Istat, national accounts
74	VENDI	M	Retail sales at current prices (*Grande distribuzione*), index	1966:01 1998:04	Elaborations on Istat data
75	FALLI	M	Bankrupcies	1970:01 1997:06	Istat
76	MERFS	M	Railway transport of goods	1949:01 1997:09	National railways (FFSS)
77	ISOLD	M	Isae composite coincident indicator	1978:01 1997:12	Isae
78	ISNEW	M	Isae composite coincident indicator, revised version	1978:01 1997:12	Authors' calculations
Investment and inventories					
79	INVTT	Q	Fixed capital investment at 1990 prices, total	1954:01 1998:01	Istat, national accounts; 1954-1969: Prometeia
80	INVMT	Q	Fixed capital investment at 1990 prices, transportation equipment	1970:01 1998:01	Istat, national accounts
81	INVIM	Q	Fixed capital investment at 1990 prices, machinery and equipment	1970:01 1998:01	Istat, national accounts
82	INVCO	Q	Fixed capital investment at 1990 prices, buildings	1970:01 1998:01	Istat, national accounts
83	SCOTT	Q	Change in inventories at 1990 prices	1970:01 1998:01	Istat, national accounts
84	ANEIS	M	Industrial firms' expectations on the aggregate economic developments	1962:01 1998:05	Isae surveys
85	SCPIS	M	Inventories of finished goods in industrial firms	1962:03 1998:05	Isae surveys
86	SCMIS	Q	Inventories of raw materials in industrial firms	1978:01 1998:01	Isae surveys

Table 1, continued

N.	Acronym	Freq.	Description	Range	Source
Prices and margins					
87	PRETI	M	Producer price index (1980=100), manufacturing	1971:01 1998:05	Bank of Italy elaborations on Istat data
88	PREIN	M	Producer price index (1980=100), intermediate goods	1971:01 1998:05	Bank of Italy elaborations on Istat data
89	PREAL	M	Producer price index (1980=100), food products	1971:01 1998:05	Bank of Italy elaborations on Istat data
90	PRENA	M	Producer price index (1980=100), non-food consumer goods	1971:01 1998:05	Bank of Italy elaborations on Istat data
91	POILM	M	Oil price (1980=100)	1957:01 1998:05	IMF
92	PRE03	M	Producer price index (1980=100), coke	1971:01 1998:05	Bank of Italy elaborations on Istat data
93	PRE04	M	Producer price index (1980=100), petroleum and petroleum products	1971:01 1998:05	Bank of Italy elaborations on Istat data
94	PRE07	M	Producer price index (1980=100), ferrous and non-ferrous ores and metals	1971:01 1998:05	Bank of Italy elaborations on Istat data
95	PRE08	M	Producer price index (1980=100), non metallic mineral products	1971:01 1998:05	Bank of Italy elaborations on Istat data
96	PRE24	M	Producer price index (1980=100), paper and printing	1971:01 1998:05	Bank of Italy elaborations on Istat data
97	PRE25	M	Producer price index (1980=100), rubber and plastic products	1971:01 1998:05	Bank of Italy elaborations on Istat data
98	PRECO	M	Consumer price index (1995=100)	1966:12 1998:05	Istat
99	DEFCO	Q	Deflator of household consumption	1954:01 1998:01	Bank of Italy elaborations on Istat data
100	PREAT	M	Expectations on own prices in industrial firms	1962:03 1998:05	Isae surveys
101	CUVTI	Q	Unit variable costs in manufacturing (1980=100)	1971:01 1997:04	Bank of Italy elaborations on Istat data
102	MARTI	Q	Margins of producer prices over unit variable costs in manufacturing	1971:01 1998:04	Bank of Italy elaborations on Istat data
Wages and labor costs, productivity					
103	RETOR	M	Hourly contractual compensation per worker (blue collar) (Dec. 1995=100)	1959:01 1998:05	Istat
104	RETDO	M	Total contractual compensation per worker (Dec. 1995=100)	1976:01 1998:05	Istat
105	REFTT	M	*De facto* compensation in large industrial firms (1988=100)	1972:01 1998:03	Istat survey data on large firms
106	RELCN	Q	Gross real compensation per standard labor unit	1970:01 1998:01	Istat, national accounts
107	CLUIS	Q	Unit labor costs in industry	1970:01 1998:01	Istat, national accounts
108	CLUTI	Q	Unit labor costs in manufacturing	1970:01 1998:01	Istat, national accounts
109	CLUCO	Q	Unit labor costs in construction	1970:01 1998:01	Istat, national accounts
110	CLUSD	Q	Unit labor costs in market services	1970:01 1998:01	Istat, national accounts
111	CLUTT	Q	Unit labor costs, total economy	1970:01 1998:01	Istat, national accounts
112	PRISS	Q	Productivity in industry, value added per standard labor unit	1970:01 1998:02	Istat, national accounts
113	PRSDV	Q	Productivity in market services, value added per standard labor unit	1970:01 1997:04	Istat, national accounts

Table 1, continued

N.	Acronym	Freq.	Description	Range	Source
Income					
114	RETRE	Q	Gross real compensation of employees, deflated with consumer price index	1970:01 1998:01	Bank of Italy elaborations on Istat national account data
115	REDIS	Q	Real gross disposable income	1970:01 1997:04	Bank of Italy elaborations on Istat data
Money, credit and interest rates					
116	M1NOM	M	M1	1974:12 1998:05	Bank of Italy
117	M2NOM	M	M2 (net of CD beyond 18 months)	1974:12 1998:04	Bank of Italy
118	CIRCO	M	Currency in circulation	1962:01 1998:06	Bank of Italy
119	M1REA	M	M1, deflated with consumer price index	1974:12 1998:05	Bank of Italy
120	M2REA	M	M2, deflated with GDP deflator	1974:04 1998:01	Bank of Italy
121	VELOC	Q	Velocity of circulation, ratio of consumption to M1	1974:04 1998:01	Bank of Italy
122	VELOP	Q	Velocity of circulation, ratio of gross domestic product to M2	1974:04 1998:01	Bank of Italy
123	IMPIE	Q	Bank loans to the private sector	1969:04 1997:04	Bank of Italy
124	IMPEC	M	Bank loans	1974:12 1998:05	Bank of Italy
125	DEPEC	M	Bank deposits, end -of- period data	1974:12 1998:05	Bank of Italy
126	DEPRE	M	Real bank deposits, monthly average data deflated with consumer price index	1974:12 1998:05	Bank of Italy
127	DEPEN	M	Real bank deposits, end -of- period data deflated with consumer price index	1974:12 1998:05	Bank of Italy
128	RAPEC	M	Ratio, bank loans to deposits	1974:12 1998:05	Bank of Italy
129	RAPBC	M	Ratio, loans to deposits in banks accepting short-term funds	1974:12 1998:05	Bank of Italy
130	TABTP	M	Interest rate on medium-long term government bonds (BTP)	1949:12 1998:06	Bank of Italy
131	TATUS	M	Official discount rate	1958:07 1998:06	Bank of Italy
132	TABOT	M	Interest rate on Treasury bills (BOT)	1971:01 1998:06	Bank of Italy
133	TAIMP	Q	Interest rate on bank loans	1962:01 1997:04	Bank of Italy
134	BTPNE	M	Real interest rate on medium-long term government bonds (BTP)	1968:11 1998:05	Authors' elaborations on Bank of Italy data
135	TUSNE	M	Real official discount rate, deflated with consumer price index	1968:11 1998:05	Authors' elaborations on Bank of Italy data
136	BOTNE	M	Real interest rate on Treasury bills (BOT), deflated with consumer price index	1971:01 1998:05	Authors' elaborations on Bank of Italy data
137	IMPNE	Q	Real interest rate on bank loans, deflated with consumer price index	1973:01 1997:04	Authors' elaborations on Bank of Italy data
138	SPREA	M	Spread between short term and medium-long term int. rates (TABOT-TABTP)	1971:01 1998:06	Authors' elaborations on Bank of Italy data
139	SPRE2	Q	Spread between interest rates on private and public debt (TAIMP-TABTP)	1962:01 1997:04	Authors' elaborations on Bank of Italy data
140	SPRE3	Q	Spread between interest rates on private and public debt (TAIMP-TABOT)	1971:01 1997:04	Authors' elaborations on Bank of Italy data

Table 1, continued

N.	Acronym	Freq.	Description	Range	Source
Foreign trade					
141	IMPTT	Q	Imports of goods and services at 1990 prices	1954:01 1998:01	Istat, national accounts; 1954-1969, Prometeia
142	EXPTT	Q	Exports of goods and services at 1990 prices	1954:01 1998:01	Istat, national accounts; 1954-1969, Prometeia
143	IMPTB	M	Merchandise imports at 1980 prices, total	1970:01 1997:12	Istat
144	IMPD1	M	Merchandise imports at 1980 prices, investment goods	1970:01 1998:01	Isae elaborations on Istat data
145	IMPD2	M	Merchandise imports at 1980 prices, consumer goods	1970:01 1998:01	Isae elaborations on Istat data
146	IMPD3	M	Merchandise imports at 1980 prices, intermediate goods	1970:01 1998:01	Isae elaborations on Istat data
147	IMPRE	M	Merchandise imports at 1980 prices, petroleum and petroleum products	1970:01 1997:12	Istat
148	IMPME	M	Merchandise imports at 1980 prices, ferrous and non-ferrous ores and metals	1970:01 1997:12	Istat
149	IMPMA	M	Merchandise imports at 1980 prices, agricultural and industrial machines	1970:01 1997:12	Istat
150	IMPCA	M	Merchandise imports at 1980 prices, paper and printing	1970:01 1997:12	Istat
151	IMPEN	M	Merchandise imports at 1980 prices, energy	1970:01 1997:12	Istat
152	IMPMP	M	Merchandise imports at 1980 prices, other raw materials	1970:01 1997:12	Istat
153	IMPSL	M	Merchandise imports at 1980 prices, semifinished goods	1970:01 1997:12	Bank of Italy elaborations on Istat data
154	IMPIN	M	Merchandise imports at 1980 prices, investment goods	1970:01 1997:12	Bank of Italy elaborations on Istat data
155	EXPTB	M	Merchandise exports at 1980 prices, total	1970:01 1997:12	Istat
156	EXPD1	M	Merchandise exports at 1980 prices, investment goods	1970:01 1998:03	Isae elaborations on Istat data
157	EXPD2	M	Merchandise exports at 1980 prices, consumer goods	1970:01 1998:03	Isae elaborations on Istat data
158	EXPD3	M	Merchandise exports at 1980 prices, intermediate goods	1970:01 1998:03	Isae elaborations on Istat data
159	EXPMA	M	Merchandise exports at 1980 prices, agricultural and industrial machines	1970:01 1997:12	Istat
160	EXPTE	M	Merchandise exports at 1980 prices, textiles, clothing, leather and footwear	1970:01 1997:12	Istat
161	EXPUE	M	Merchandise exports, EU countries	1970:01 1998:10	Istat
162	EXPRW	M	Merchandise exports, rest of the world	1970:01 1998:10	Istat
163	TERMS	M	Terms of trade, ratio of deflator of merchandise imports to exports	1970:01 1998:08	Istat
International output and prices, exchange rates					
164	PROUS	M	Industrial production index (1990=100), United States	1950:01 1998:06	Bank of Italy elaborations on national statistics
165	PROGE	M	Industrial production index (1990=100), Germany	1970:01 1998:05	Bank of Italy elaborations on national statistics
166	PROFR	M	Industrial production index (1990=100), France	1960:01 1998:03	Oecd
167	PROUK	M	Industrial production index (1990=100), U.K.	1968:01 1998:04	Bank of Italy elaborations on national statistics
168	PREUS	M	Consumer price index, United States	1950:01 1998:06	Bank of Italy elaborations on national statistics
169	PREOC	M	Consumer price index, OECD	1960:01 1998:04	OECD

Table 1, continued

N.	Acronym	Freq.	Description	Range	Source
170	PREGE	M	Consumer price index, Germany	1970:01 1998:06	Bank of Italy elaborations on national statistics
171	PREFR	M	Consumer price index, France	1970:01 1998:06	Bank of Italy elaborations on national statistics
172	PREUK	M	Consumer price index, U.K.	1975:01 1998:05	Bank of Italy elaborations on national statistics
173	PILUS	Q	Gross domestic product at constant prices, United States	1959:03 1998:01	Bank of Italy elaborations on national statistics
174	PILOC	Q	Gross domestic product at constant prices, OECD	1960:01 1997:04	OECD
175	PILEU	Q	Gross domestic product at constant prices, Euro-area	1970:01 1997:04	Eurostat
176	PILFR	Q	Gross domestic product at constant prices, France	1970:01 1998:01	Bank of Italy elaborations on national statistics
177	PILUK	Q	Gross domestic product at constant prices, U.K.	1955:01 1998:01	Bank of Italy elaborations on national statistics
178	PILSP	Q	Gross domestic product at constant prices, Spain	1970:01 1998:01	Bank of Italy elaborations on national statistics
179	TCERE	M	Real effective exchange rate (1993=100)	1970:01 1998:05	Bank of Italy elaborations on national statistics
180	TCENO	M	Nominal effective exchange rate (1993=100)	1970:01 1998:05	Bank of Italy elaborations on national statistics
181	EXCUS	M	Exchange rate It. Lira/USD	1973:03 1998:06	Bank of Italy
182	EXCGE	M	Exchange rate It. Lira/DM	1973:03 1998:06	Bank of Italy
183	IMPWO	Q	World imports (net of Italian imports)	1968:03 1995:04	Bank of Italy elaborations on IMF and OECD data

COMOVEMENT PROPERTIES OF TWELWE SELECTED COINCIDENT SERIES

Series	Characteristics			Spectrum (Transformed series)			Coherence (1)				Cross-correlation (1)					
							Transformed series			Filt. series (2)	Transformed series			Filtered series (2)		
	Deseas.	Transf.	Freq.	>8 ys	8-2 ys	<2 ys	>8 ys	8-2 ys	<2 ys	8-2 ys	r_0	r_{max}	t_{max} (3)	r_0	r_{max}	t_{max} (3)
STRGI	yes	d ln	M	0,23	0,24	0,53	0,12	0,51	0,18	0,73	0,41	0,42	+1	0,84	0,84	0
							0,34	0,39	0,16	0,70	-0,16	0,22	+1	0,84	0,85	-1
							0,51	0,51	0,19	0,77	0,02	0,21	+1	0,87	0,87	0
PROIS	yes	d ln	M	0,16	0,17	0,68	0,83	0,80	0,40	0,81	0,70	0,70	0	0,87	0,87	0
							1,00	1,00	1,00	1,00	1,00	1,00	0	1,00	1,00	0
							0,74	0,76	0,45	0,88	0,56	0,56	0	0,94	0,94	0
GUIIS	yes	d ln	Q	0,20	0,35	0,45	0,20	0,60	0,38	0,82	0,60	0,60	0	0,87	0,87	0
							0,41	0,74	0,44	0,82	0,66	0,66	0	0,89	0,89	0
							0,58	0,80	0,37	0,88	0,67	0,67	0	0,91	0,91	0
VAIND	yes	d	Q	0,20	0,37	0,43	0,78	0,86	0,74	0,89	0,87	0,87	0	0,94	0,94	0
							0,84	0,86	0,45	0,91	0,74	0,74	0	0,95	0,95	0
							0,82	0,87	0,48	0,92	0,76	0,76	0	0,96	0,96	0
FATIS	yes	d ln	M	0,20	0,20	0,60	0,73	0,84	0,49	0,86	0,76	0,76	0	0,91	0,91	0
							0,68	0,69	0,44	0,81	0,53	0,53	0	0,90	0,90	0
							0,57	0,62	0,36	0,77	0,37	0,37	0	0,88	0,89	+1
VASDV	yes	d ln	Q	0,35	0,39	0,26	0,90	0,88	0,49	0,89	0,82	0,82	0	0,94	0,94	0
							0,56	0,72	0,19	0,80	0,59	0,59	0	0,89	0,89	0
							0,50	0,68	0,31	0,79	0,68	0,68	0	0,89	0,89	0
MERFS	yes	d ln	M	0,10	0,12	0,78	0,09	0,41	0,09	0,55	0,29	0,29	0	0,72	0,72	0
							0,29	0,42	0,23	0,71	0,39	0,39	0	0,84	0,84	0
							0,53	0,54	0,27	0,82	0,45	0,45	0	0,91	0,91	0
INVIM	yes	d ln	Q	0,29	0,43	0,29	0,75	0,73	0,25	0,79	0,66	0,66	0	0,88	0,88	0
							0,71	0,73	0,17	0,77	0,53	0,53	0	0,86	0,86	0
							0,79	0,72	0,20	0,79	0,62	0,62	0	0,88	0,88	0
MARTI	yes	d	Q	0,22	0,38	0,39	0,23	0,58	0,16	0,58	0,46	0,46	0	0,68	-0,77	-7
							0,41	0,70	0,18	0,67	0,45	0,45	0	0,78	0,78	0
							0,38	0,63	0,20	0,58	0,54	0,54	0	0,70	-0,73	-6
IMPTT	yes	d ln	Q	0,16	0,28	0,55	0,64	0,46	0,16	0,53	0,45	0,45	0	0,73	0,73	0
							0,65	0,55	0,12	0,61	0,33	0,34	-1	0,77	0,77	0
							0,75	0,77	0,34	0,86	0,61	0,61	0	0,91	0,91	0
IMPTB	yes	d ln	M	0,12	0,15	0,73	0,44	0,58	0,15	0,77	0,45	0,45	0	0,79	0,89	+1
							0,50	0,46	0,16	0,76	0,19	0,19	0	0,83	0,91	+3
							0,63	0,59	0,24	0,85	0,33	0,33	0	0,88	0,96	+3
IMPD1	yes	d ln	M	0,09	0,09	0,81	0,42	0,53	0,11	0,72	0,35	0,35	0	0,83	0,83	0
							0,38	0,37	0,11	0,66	0,21	0,21	0	0,79	0,79	0
							0,57	0,53	0,33	0,77	0,52	0,52	0	0,87	0,88	-1

Note: (1) Coherence and cross-correlation are computed with respect to a reference series. For each series, the reference series is GDP in the first row, industrial production in the second row and the Isco composite coincident indicator in the third row – (2) The filter is applied to the level of each series or, if the transformation of the variable (described in the second column) is ln or d ln, to the logarithm. For series whose transformation is d^2 or d^2 ln, the filter is applied, respectively, to the first difference of the variable or to the first logarithmic difference – (3) + (-) sign corresponds to lead (lag) with respect to the reference variables.

Table 3

LEADS AND LAGS OF A GROUP OF TWELVE COINCIDENT INDICATORS WITH RESPECT TO THE OFFICIAL CHRONOLOGY OF TURNING POINTS, 1971-1997

		STRGI	PROIS	FATIS	GUIIS	VAIND	MERFS	VASDV	MARTI	INVIM	IMPTT	IMPD1	IMPTB
Trough	71.10	n.a.	-3	n.a.	+16	-5	-1	-	-	-	-2	0	-3
Peak	74.06	-8	-4	-6	-7	-1	-4	-1	-4	-4	-4	-1	-4
Trough	75.09	+1	-1	-8	+2	-4	+1	-7	-1	-1	-4	-5	-7
Peak	77.02	-4	-1	-2	-3	0	0	-	0	0	-	-1	-
Trough	77.12	-1	-2	-3	-1	-1	+2	-	+2	-1	-	+1	-
Peak	80.03	+1	0	-1	-1	-1	+2	-	-19	-6	-1	+6	-2
Trough	83.06	-5	+1	-11	-1	-7	-9	-	+2	-1	-3	-3	-3
Peak	92.05	-7	-2	-7	-33	0	-2	-	0	-6	0	-1	-2
Trough	93.08	-3	-1	-1	0	0	-1	-	0	0	+3	-1	-3
Peak	95.12	-8	-3	-6	-7	+2	-4	-	-10	-1	-1	+1	-6
Trough	97.01	-3	-1	-10	-2	+1	-9	-	-	-2	-5	-7	-7
Overall average		-3.7	-1.6	-5.5	-3.4	-1.5	-2.3	-4.0	-3.3	-2.2	-1.9	-1.0	-4.1
Aver. at peaks		-5.2	-2.0	-4.4	-10.2	0.0	-1.6	-1.0	-6.6	-3.4	-1.5	+0.8	-3.5
Aver. at troughs		-2.2	-1.2	-6.6	+2.3	-2.7	-2.8	-7.0	+0.8	-1.0	-2.2	-2.5	-4.6
Extra-cycles		89.10 - 90.11	80.09 - 81.09				85.4 - 86.7		86.08 - 87.08	85.05 - 86.02			
			89.09 - 91.03						88.02 - 91.05	90.05 - 90.11			

Note: - (+) sign corresponds to lead (lag) with respect to the official chronology.

Table 4

WEIGHTS OF THE COMPOSITE COINCIDENT INDICATOR

	STRGI	PROIS	MERFS	VASDV	INVIM	IMPD1
1975	0.050	0.178	0.096	0.532	0.106.	0.048
1980	0.053	0.138	0.075	0.569	0.113	0.052
1985	0.054	0.141	0.072	0.559	0.120	0.053
1990	0.047	0.138	0.066	0.573	0.125	0.052
1995	0.042	0.140	0.060	0.590	0.109	0.058

Table 5

TURNING POINTS OF A GROUP OF SELECTED VARIABLES AND DATING OF THE ITALIAN BUSINESS CYCLE, 1974-1997

1974-1983

	Peak	Trough	Peak	Trough	Peak	Trough	Peak	Trough
Composite coincident indicator	74:03	75:07	77:02	77:12	80:06	-	-	83:03
Gross domestic product (1)	74:05	75:05	77:02	77:08	80:02	80:08	82:05	82:11
Share of overtime hours (STRGI)	73:10	75:09	76:11	77:11	80:03			82:12
Industrial production index (PROIS)	74:02	75:08	77:01	77:10	80:03	80:09	81:10	83:07
Railway transport of goods (MERFS)	74:02	75:10	77:02	78:02	80:06	-	-	82:09
Investment in machinery and equip (1)	73:11	75:05	77:02	77:11	80:05	-	-	83:05
Imports of investment goods	74:05	75:04	77:01	78:01	80:09	-	-	83:02
Market services value added (1)	74:05	75:02	-	-	-	-	-	-
A. Chronology proposed in this study	74:03	75:05	77:02	77:12	80:03	-	-	83:03
B. Existing chronology (2)	74:06	75:09	77:02	77:12	80:03	-	-	83:06
Leads and lags of A w.r.t. B	-3	-4	0	0	0	-	-	-3

1984-1997

	Peak	Trough	Peak	Trough	Peak	Trough	Peak	Trough
Composite coincident indicator	-	-	-	-	92:02	93:07	95:09	96:06
Gross domestic product (1)	-	-	-	-	92:05	93:08	96:02	96:11
Share of overtime hours (STRGI)	-	-	-	-	91:11	93:05	95:04	96:10
Industrial production index (PROIS)	-	-	89:09	91:03	92:03	93:07	95:09	96:12
Railway transport of goods (MERFS)	85:04	86:07	-	-	92:03	93:07	95:08	96:04
Investment in machinery and equip (1)	85:05	86:02	90:05	90:11	91:11	93:08	95:11	96:11
Imports of investment goods	-	-	-	-	92:04	93:07	96:01	96:06
Market services value added (1)	-	-	-	-	-	-	-	-
A. Chronology proposed in this study	-	-	-	-	92:03	93:07	95:11	96:11
B. Existing chronology (2)	-	-	-	-	92:05	93:08	95:12	97:01
Leads and lags of A w.r.t. B	-	-	-	-	-2	-1	-1	-2

Summary statistics

Average duration of recoveries (trough-to-peak)	: 33 months
Average duration of recessions (peak-to-trough)	: 19 months
Average duration of cycles (trough-to-trough)	: 52 months

Note: (1) Peaks and troughs of quarterly series are collocated in the median month of the quarter in which the turning point occurred – (2) See Isco (1998).

Table 6

TURNING POINTS OF A GROUP OF SELECTED VARIABLES AND DATING OF THE ITALIAN BUSINESS CYCLE, 1974-1997
(Growth-cycle approach)

1974-1986	Peak	Trough	Peak	Trough	Peak	Trough	Peak	Trough
Composite coincident indicator	74:02	75:08	76:12	78:06	80:04	83:03	84:11	86:09
Gross domestic product (1)	74:02	75:08	76:11	78:02	79:11	83:02	84:05	85:02
Share of overtime hours (STRGI)	74:02	75:08	77:02	78:06	80:05	83:01	84:06	85:03
Industrial production index (PROIS)	74:01	75:07	76:11	78:04	80:02	83:05	84:09	85:11
Railway transport of goods (MERFS)	74:02	75:08	77:02	78:06	79:12	83:02	84:12	86:08
Investment in machinery and equip (1)	74:02	75:08	76:11	78:08	80:05	83:05	84:11	86:05
Imports of investment goods	74:03	75:09	76:10	78:02	80:09	83:04	84:11	86:08
Market services value added (1)	74:02	75:08	76:11	77:11	79:08	83:05	85:11	87:02
Chronology proposed in this study	74:02	75:08	76:11	78:04	80:02	83:03	84:09	86:09
Classical-cycle chronology (Table 5)	74:03	75:05	77:02	77:12	80:03	83:03	-	-

1986-1997	Peak	Trough	Peak	Trough	Peak	Trough	Peak	Trough
Composite coincident indicator	-	-	89.07	90.12	92:02	93:09	95:06	96:10
Gross domestic product (1)	86.02	87:02	90:02	91:02	91:11	93:08	95:08	96:11
Share of overtime hours (STRGI) -	86.07	88:01	89:08	91:01	92:01	93:10	95:05	96:08
Industrial production index (PROIS) -	-	-	89:06	-	-	93:08	95:05	96:11
Railway transport of goods (MERFS)	-	-	89:07	90:08	91:11	93:08	95:03	96:08
Investment in machinery and equip (1)	88:08	89:02	89:11	90:08	92:02	93:08	95:08	-
Imports of investment goods	-	-	89:11	90:12	92:02	93:10	95:06	96:10
Market services value added (1)	-	-	90:02	-	-	93:11	95:08	96:08
Chronology proposed in this study	-	-	89:07	90:12	92:02	93:09	95:06	96:10
Classical-cycle chronology (Table 5)	-	-	-	-	92:03	93:07	95:11	96:11

Summary statistics

Average duration of recoveries (trough-to-peak) : 21 months
Average duration of recessions (peak-to-trough) : 22 months
Average duration of cycles (trough-to-trough) : 42 months

Note : (1) Peaks and troughs of quarterly series are collocated in the median month of the quarter in which the turning point occurred – (2) See Isco (1998).

Table 7

UNIVARIATE DESCRIPTIVE STATISTICS AND BIVARIATE CORRELATIONS WITH THE COMPOSITE COINCIDENT INDEX

Series	Characteristics			Spectral density (Transformed series)				Squared Coherence					Cross-correlation					
								Transformed series				Filter. (1)	Transformed series			Filtered series (1)		
	Deseas.	Transf.	Freq.	>8 ys	8-2 ys	2-1 ys	<1 ys	>8 ys	8-2 ys	2-1 ys	<1 ys	8-2 ys	r_0	r_{max}	t_{max} (2)	r_0	r_{max}	t_{max} (2)
Labor Force and Employment																		
1 OCCTT	yes	d	Q	1.18	0.94	0.81	1.07	0.18	0.33	0.06	0.01	0.43	0.25	0.27	-1	0.42	-0.73	+6
2 PERTT	yes	d ln	Q	1.08	1.08	0.61	1.24	0.12	0.31	0.10	0.16	0.40	-0.14	-0.34	-1	-0.27	0.64	+5
3 FORTT	yes	d	Q	0.92	0.73	0.88	1.47	0.10	0.15	0.02	0.03	0.26	0.16	0.16	0	0.41	-0.58	+6
4 TAPTT	yes	d ln	Q	0.96	0.75	0.82	1.48	0.11	0.16	0.02	0.03	0.28	0.17	0.17	0	0.45	-0.55	+6
5 ULATI	yes	d ln	Q	1.95	1.37	0.45	0.23	0.32	0.40	0.09	0.02	0.49	0.43	0.48	-1	0.64	0.70	-1
6 ULAEN	yes	d	Q	1.97	1.37	0.52	0.13	0.13	0.09	0.01	0.00	0.19	0.17	0.22	-1	0.17	-0.51	+5
7 ULAPA	yes	d	Q	2.80	1.00	0.16	0.04	0.01	0.00	0.03	0.01	0.00	0.07	0.08	-8	-0.05	-0.09	-8
8 OCCAG	yes	d ln	Q	0.42	0.76	1.35	1.46	0.03	0.11	0.03	0.04	0.10	0.13	-0.17	-7	0.28	-0.30	-6
9 OCCED	yes	d	Q	0.85	0.62	0.92	1.62	0.11	0.19	0.01	0.09	0.39	0.04	-0.24	+4	-0.23	-0.64	+3
10 OCCEN	yes	d ln	Q	0.48	0.50	1.35	1.68	0.37	0.35	0.04	0.04	0.59	0.19	-0.22	+6	0.68	0.73	-1
11 OCCTI	yes	d ln	Q	1.06	0.78	0.80	1.36	0.26	0.14	0.03	0.14	0.24	0.10	0.20	-3	0.46	0.59	-3
12 OCCSD	yes	d ln	Q	1.88	1.02	0.33	0.77	0.06	0.11	0.05	0.07	0.18	0.20	-0.21	+8	0.28	-0.69	+7
13 OCCPA	yes	d ln	Q	1.26	0.85	0.71	1.19	0.09	0.11	0.05	0.03	0.17	0.15	0.21	-1	0.36	0.38	-1
14 INCIS	yes	d ln	Q	1.14	1.31	0.83	0.72	0.08	0.12	0.01	0.03	0.24	-0.09	0.24	+5	-0.31	0.62	+6
15 DISIS	yes	d ln	Q	1.05	1.07	0.74	1.14	0.30	0.41	0.22	0.08	0.61	-0.30	-0.31	-1	-0.48	-0.82	-2
16 ALTIS	yes	ln	Q	3.00	0.84	0.11	0.04	0.00	0.03	0.01	0.05	0.18	0.04	-0.17	+7	0.06	0.46	+3
17 CIGIS	yes	d ln	M	0.94	0.84	0.45	1.77	0.25	0.30	0.22	0.03	0.54	-0.12	-0.13	-1	-0.68	-0.74	+3
18 CIOIS	yes	d ln	M	1.14	1.07	0.52	1.26	0.40	0.50	0.37	0.03	0.58	-0.18	-0.20	+2	-0.71	-0.78	+3
19 CIGED	yes	level	M	1.98	1.40	0.50	0.12	0.05	0.06	0.08	0.01	0.05	0.15	0.20	+2	-0.09	-0.30	-8
20 OREGI	yes	d ln	M	0.47	0.49	0.62	2.42	0.18	0.28	0.27	0.05	0.38	0.15	0.15	+1	0.61	0.62	+1
21 STRGI	yes	d ln	M	0.93	0.98	0.81	1.29	0.57	0.56	0.38	0.03	0.82	0.26	0.28	+1	0.90	0.90	0
22 OCCGI	yes	d	M	2.19	1.42	0.29	0.10	0.12	0.13	0.06	0.01	0.28	0.21	0.28	-3	0.46	0.60	-7
23 OREIS	yes	d	Q	0.43	0.69	1.06	1.82	0.13	0.43	0.21	0.09	0.70	0.20	0.34	+1	0.61	0.80	+1
Output and capacity utilization																		
24 PILTT	yes	d ln	Q	1.19	1.69	0.78	0.34	0.78	0.89	0.61	0.22	0.92	0.80	0.80	0	0.95	0.95	0
25 PROIS	yes	d ln	M	0.63	0.68	0.53	2.17	0.69	0.72	0.56	0.06	0.74	0.21	0.21	0	0.86	0.87	+1
26 PROTI	yes	d ln	M	0.80	0.88	0.70	1.62	0.73	0.77	0.62	0.07	0.74	0.29	0.29	0	0.86	0.87	+1
27 PRO02	yes	d ln	M	0.57	0.63	0.71	2.09	0.26	0.30	0.11	0.01	0.39	0.10	0.10	0	0.54	0.68	+4/+5
28 PRO03	yes	d ln	M	0.51	0.70	0.84	1.96	0.40	0.41	0.27	0.04	0.39	0.18	0.18	+1	0.64	0.64	0
29 PRO04	yes	d ln	M	0.62	0.62	0.54	2.22	0.65	0.61	0.29	0.02	0.72	0.15	0.15	-1	0.85	0.85	0
30 PRO05	yes	d ln	M	0.49	0.58	0.62	2.31	0.47	0.51	0.32	0.05	0.56	0.15	0.16	-1	0.68	0.78	+3
31 PRO06	yes	d ln	M	0.69	0.78	0.70	1.83	0.58	0.62	0.45	0.06	0.64	0.26	0.26	0	0.79	0.81	-2/-1
32 PRO07	yes	d ln	M	0.59	0.62	0.65	2.14	0.35	0.39	0.31	0.07	0.49	0.19	0.19	0	0.66	0.74	-3
33 PRO08	yes	d ln	M	0.59	0.66	0.61	2.14	0.43	0.38	0.19	0.04	0.51	0.15	0.15	0	0.71	0.72	-1
34 PRO09	yes	d ln	M	0.26	0.33	0.47	2.94	0.32	0.33	0.26	0.05	0.59	0.12	0.12	0	0.76	0.77	-1
35 PRO10	yes	d ln	M	0.33	0.40	0.58	2.69	0.32	0.30	0.20	0.04	0.50	0.11	0.12	+1	0.70	0.70	0
36 PRO11	yes	ln	M	2.46	1.39	0.13	0.02	0.02	0.01	0.01	0.04	0.43	-0.06	-0.12	+8	0.61	0.70	+3

Table 7, continued

Series	Characteristics			Spectral density (Transformed series)				Coherence					Cross-correlation					
								Transformed series				Filter. (1)	Transformed series			Filtered series (1)		
	Deseas.	Transf.	Freq.	>8 ys	8-2 ys	2-1 ys	<1 ys	>8 ys	8-2 ys	2-1 ys	<1 ys	8-2 ys	r_0	r_{max}	t_{max}(2)	r_0	r_{max}	t_{max}(2)
37 PRO12	yes	d ln	M	0,43	0,53	0,51	2,52	0,30	0,37	0,30	0,03	0,40	0,11	0,13	-2	0,60	0,65	+2
38 PRO13	yes	d ln	M	0,49	0,54	0,52	2,45	0,55	0,52	0,25	0,03	0,59	0,14	0,14	0	0,77	0,78	+1
39 PRO14	yes	d ln	M	0,63	0,77	0,62	1,98	0,22	0,38	0,30	0,03	0,42	0,12	0,13	+1	0,51	0,72	+5
40 PRO15	yes	d ln	M	0,41	0,47	0,52	2,59	0,36	0,38	0,19	0,04	0,51	0,13	0,13	0	0,64	0,75	+4
41 PRO16	yes	d ln	M	0,41	0,41	0,69	2,49	0,21	0,19	0,06	0,01	0,39	0,05	0,07	+3	0,61	0,62	+1
42 PROD1	yes	d ln	M	0,36	0,41	0,53	2,69	0,46	0,44	0,28	0,05	0,66	0,14	0,14	0	0,78	0,84	-3
43 PROD2	yes	d ln	M	0,58	0,67	0,59	2,17	0,61	0,64	0,43	0,05	0,68	0,20	0,20	0	0,81	0,83	+2
44 PROND	yes	ln	M	2,47	1,39	0,12	0,02	0,02	0,01	0,00	0,06	0,40	-0,08	-0,10	+7	0,60	0,68	+3
45 PRODU	yes	d ln	M	0,39	0,44	0,49	2,68	0,52	0,56	0,40	0,04	0,68	0,15	0,15	0	0,81	0,83	+1
46 PROD3	yes	d ln	M	0,77	0,83	0,57	1,83	0,60	0,67	0,52	0,04	0,65	0,22	0,22	0	0,78	0,83	+2
47 GUWIS	yes	d	Q	0,60	1,44	0,98	0,98	0,62	0,83	0,54	0,30	0,90	0,69	0,69	0	0,93	0,93	0
48 GUWTI	yes	d	Q	0,59	1,40	1,01	1,00	0,61	0,83	0,54	0,30	0,91	0,68	0,68	0	0,93	0,93	0
49 GUWD1	yes	d ln	Q	0,76	1,09	1,22	0,93	0,58	0,66	0,33	0,28	0,72	0,56	0,56	0	0,78	0,85	-1
50 GUWD2	yes	d	Q	0,58	1,36	0,96	1,10	0,66	0,77	0,41	0,22	0,84	0,61	0,61	0	0,89	0,89	0
51 GUWD3	yes	d	Q	0,80	1,57	0,77	0,86	0,61	0,81	0,50	0,28	0,87	0,68	0,68	0	0,87	0,92	+1
52 GUIIS	yes	d ln	Q	0,82	1,42	0,89	0,88	0,45	0,68	0,34	0,09	0,79	0,54	0,54	0	0,83	0,86	+1
53 GUITI	yes	d ln	Q	0,98	1,03	0,88	1,11	0,50	0,54	0,35	0,03	0,65	0,41	0,41	0	0,72	0,80	+1
54 GUID1	yes	d ln	Q	1,14	0,91	0,87	1,08	0,29	0,30	0,14	0,06	0,39	0,30	0,30	0	0,63	0,63	0
55 GUID2	yes	d	Q	0,51	0,62	1,29	1,58	0,26	0,31	0,22	0,02	0,42	0,24	0,24	0	0,50	0,61	+2
56 GUID3	yes	d	Q	0,79	1,02	0,84	1,35	0,46	0,42	0,16	0,07	0,60	0,34	0,34	0	0,68	0,77	+1
57 CARIS	yes	d	Q	1,09	1,56	0,68	0,67	0,44	0,63	0,18	0,08	0,72	-0,39	-0,60	+1	-0,63	-0,87	+2
58 INSIS	yes	d ln	Q	0,56	0,87	1,16	1,40	0,20	0,36	0,05	0,06	0,56	0,22	-0,27	-5	0,61	0,72	+1
59 ELETT	yes	d ln	M	0,78	0,78	0,64	1,80	0,43	0,44	0,22	0,02	0,64	0,15	0,15	0	0,74	0,84	+3
60 PRAIS	yes	d	M	1,10	1,11	0,88	0,91	0,09	0,43	0,33	0,04	0,45	0,07	0,25	+3	0,30	0,79	+8
61 VAIND	yes	d	Q	0,80	1,51	1,07	0,61	0,81	0,86	0,50	0,21	0,91	0,71	0,71	0	0,93	0,93	0
Consumption, orders and market services																		
62 FATIS	yes	d ln	M	0,80	0,81	0,58	1,81	0,60	0,66	0,59	0,03	0,79	0,21	0,23	+1	0,87	0,91	+2
63 ORDIS	yes	d ln	M	0,37	0,40	0,40	2,83	0,40	0,35	0,20	0,02	0,69	0,11	0,11	0	0,80	0,86	+3
64 ORITT	yes	d	M	1,50	1,49	0,66	0,35	0,30	0,56	0,44	0,06	0,51	0,37	0,40	+1	0,51	0,79	+6
65 ORIIV	yes	d	M	1,13	1,10	0,59	1,18	0,52	0,62	0,36	0,01	0,64	0,23	0,25	0	0,72	0,84	+4
66 ORICO	yes	d	M	1,10	1,19	0,75	0,95	0,33	0,57	0,34	0,04	0,60	0,26	0,28	+7	0,55	0,89	+6
67 ORIIN	yes	d	M	1,07	1,11	0,72	1,10	0,41	0,58	0,36	0,02	0,60	0,24	0,26	+1	0,63	0,85	+5
68 ORIES	yes	d	M	1,37	1,34	0,74	0,55	0,15	0,38	0,26	0,03	0,35	0,24	0,30	+6	0,35	0,63	+6
69 TORTT	yes	d	M	0,99	1,10	0,93	0,98	0,04	0,40	0,28	0,03	0,39	0,07	0,21	+8	0,10	0,75	+9
70 CLIMA	yes	d	M	0,89	0,92	0,97	1,22	0,40	0,36	0,22	0,02	0,55	0,21	0,21	0	0,72	0,82	+4
71 COFTT	yes	d ln	Q	2,00	1,36	0,57	0,07	0,58	0,64	0,21	0,09	0,74	0,64	0,64	0	0,84	0,84	0
72 COCTT	yes	d	Q	2,56	1,02	0,32	0,11	0,06	0,01	0,04	0,03	0,05	0,06	0,19	-7	-0,15	0,27	+6
73 VASDV	yes	d ln	Q	1,41	1,56	0,70	0,33	0,64	0,76	0,50	0,15	0,84	0,72	0,72	0	0,91	0,91	0
74 VENDI	yes	d ln	M	0,88	0,63	0,35	2,14	0,13	0,15	0,08	0,01	0,20	0,06	0,10	-4	0,43	0,46	-2
75 FALLI	yes	d ln	M	0,55	0,50	0,41	2,55	0,20	0,15	0,03	0,01	0,27	-0,03	-0,09	-3	-0,49	-0,52	-2
76 MERFS	yes	d ln	M	0,41	0,48	0,56	2,55	0,45	0,49	0,37	0,09	0,76	0,18	0,19	-1	0,87	0,87	+1
77 ISOLD	no	d ln	M	1,37	1,32	0,90	0,42	0,73	0,72	0,61	0,09	0,79	0,51	0,51	0	0,88	0,88	0

Series	Characteristics			Spectral density (Transformed series)				Coherence					Cross-correlation					
								Transformed series				Filter. (1)	Transformed series			Filtered series (1)		
	Deseas.	Transf.	Freq.	>8 ys	8-2 ys	2-1 ys	<1 ys	>8 ys	8-2 ys	2-1 ys	<1 ys	8-2 ys	r_0	r_{max}	t_{max}(2)	r_0	r_{max}	t_{max}(2)
78 ISNEW	no	d ln	M	1,35	1,30	0,89	0,46	0,73	0,72	0,61	0,09	0,80	0,50	0,50	0	0,89	0,89	0
Investment and stocks																		
79 INVTT	yes	d ln	Q	1,55	1,51	0,70	0,24	0,78	0,69	0,52	0,14	0,76	0,71	0,71	0	0,85	0,85	0
80 INVMT	yes	d ln	Q	0,63	0,92	1,61	0,85	0,37	0,33	0,31	0,13	0,38	0,42	0,42	0	0,60	0,60	0
81 INVIM	yes	d ln	Q	1,16	1,72	0,65	0,46	0,91	0,87	0,56	0,08	0,91	0,72	0,72	0	0,95	0,95	0
82 INVCO	yes	d ln	Q	1,69	1,30	0,72	0,28	0,43	0,19	0,14	0,05	0,33	0,31	0,37	-5	0,50	0,63	-2
83 SCOTT	yes	d	Q	0,33	0,95	1,36	1,36	0,19	0,56	0,20	0,03	0,64	0,35	0,35	0	0,75	0,75	0
84 ANEIS	yes	d	M	0,98	1,09	1,03	0,91	0,02	0,19	0,10	0,02	0,29	0,08	0,15	+6	0,08	0,61	+10
85 SCPIS	yes	d	M	1,28	1,30	0,78	0,63	0,22	0,42	0,26	0,02	0,46	-0,19	-0,30	+7	-0,49	-0,75	+5
86 SCMIS	yes	d	Q	0,69	0,95	0,75	1,61	0,04	0,16	0,07	0,05	0,26	-0,06	-0,20	+6	0,01	0,51	-3
Prices and margins																		
87 PRETI	yes	d	M	1,92	1,46	0,50	0,12	0,04	0,13	0,17	0,01	0,08	0,22	0,26	-3/-2	0,24	0,30	-4
88 PREIN	yes	d^2	M	0,29	0,39	0,49	2,84	0,12	0,17	0,07	0,01	0,29	0,05	0,07	+2	0,43	0,58	+4
89 PREAL	yes	d^2	M	0,24	0,30	0,36	3,09	0,03	0,05	0,04	0,00	0,04	0,02	0,04	+3	0,21	0,23	+1
90 PRENA	yes	d^2	M	0,24	0,26	0,31	3,19	0,06	0,18	0,09	0,00	0,27	0,03	0,05	+8	0,29	0,54	+5
91 POILM	yes	d ln	M	0,93	1,02	1,16	0,88	0,09	0,13	0,05	0,01	0,16	0,06	0,19	-7	0,27	0,44	-6
92 PRE03	yes	d^2 ln	M	0,16	0,19	0,33	3,32	0,06	0,06	0,02	0,00	0,32	0,01	0,03	+5	0,55	0,59	+2
93 PRE04	yes	d ln	M	1,46	1,35	0,83	0,36	0,01	0,18	0,12	0,01	0,19	0,05	0,28	-7/-6	0,03	-0,59	+8
94 PRE07	yes	d ln	M	1,51	1,44	0,88	0,16	0,15	0,18	0,14	0,02	0,14	0,31	0,31	0	0,35	0,38	+2/+3
95 PRE08	yes	d	M	1,64	1,36	0,62	0,38	0,00	0,02	0,06	0,00	0,02	0,07	0,11	-3	0,02	-0,22	-8
96 PRE24	yes	d^2 ln	M	0,41	0,62	0,74	2,23	0,19	0,31	0,12	0,01	0,45	0,07	0,11	+2	0,51	0,75	+5
97 PRE25	yes	d^2	M	0,22	0,30	0,46	3,02	0,04	0,06	0,04	0,01	0,09	0,03	0,05	+2	0,29	0,31	+2
98 PRECO	yes	d^2 ln	M	0,32	0,46	0,56	2,66	0,25	0,21	0,08	0,01	0,34	0,05	0,06	+2	0,60	0,60	0
99 DEFCO	yes	d^2	Q	0,85	1,22	1,16	0,76	0,10	0,18	0,03	0,03	0,24	0,18	0,22	+1	0,46	0,46	0
100 PREAT	yes	d	M	0,95	1,20	1,06	0,78	0,22	0,35	0,14	0,03	0,45	0,10	0,25	+8	0,49	0,74	+5
101 CUVTI	yes	d	Q	1,71	1,18	0,57	0,54	0,13	0,17	0,07	0,08	0,25	-0,24	-0,24	+3	-0,26	-0,52	+3
102 MARTI	yes	d	Q	0,91	1,55	0,77	0,77	0,37	0,66	0,38	0,11	0,60	0,56	0,56	0	0,68	-0,81	-6
Wages and labor costs																		
103 RETOR	yes	d^2 ln	M	0,44	0,50	0,59	2,47	0,00	0,01	0,03	0,07	0,24	-0,11	-0,11	0	0,48	0,48	+1
104 RETDO	yes	d^2	M	0,20	0,22	0,29	3,30	0,01	0,01	0,01	0,01	0,13	0,01	0,03	+6	0,32	0,35	-7
105 REFTT	yes	d ln	M	1,05	0,81	0,56	1,58	0,01	0,04	0,06	0,03	0,11	0,08	0,09	+1	-0,03	-0,53	+8
106 RELCN	yes	d	Q	1,45	1,33	0,71	0,51	0,18	0,09	0,11	0,03	0,07	0,22	0,25	+1	0,26	-0,26	+7
107 CLUIS	yes	d	Q	1,53	1,07	0,49	0,91	0,10	0,22	0,13	0,05	0,29	-0,28	0,31	-6	-0,41	0,51	-6
108 CLUTI	yes	d	Q	1,41	1,05	0,56	0,98	0,13	0,25	0,13	0,06	0,33	-0,29	0,31	-6	-0,45	-0,54	+2
109 CLUCO	yes	d	Q	1,77	0,96	0,73	0,54	0,10	0,05	0,01	0,01	0,15	-0,08	-0,17	+5	-0,29	-0,46	+3
110 CLUSD	yes	d^2	Q	0,34	0,34	0,82	2,49	0,06	0,03	0,01	0,04	0,10	0,06	-0,07	+1	0,27	0,36	-2
111 CLUTT	yes	d^2	Q	0,74	0,65	0,74	1,87	0,06	0,04	0,04	0,03	0,12	0,00	0,13	-1	0,26	0,41	-2

Table 7, continued

Series	Characteristics			Spectral density (Transformed series)				Coherence					Cross-correlation					
								Transformed series				Filter. (1)	Transformed series			Filtered series (1)		
	Deseas.	Transf.	Freq.	>8 ys	8-2 ys	2-1 ys	<1 ys	>8 ys	8-2 ys	2-1 ys	<1 ys	8-2 ys	r_0	r_{max}	t_{max}(2)	r_0	r_{max}	t_{max}(2)
112 PRISS	yes	ln	Q	3,07	0,80	0,10	0,03	0,02	0,03	0,01	0,00	0,82	-0,03	-0,13	+4	0,82	0,88	+1
113 PRSDV	yes	ln	Q	2,98	0,86	0,12	0,04	0,03	0,03	0,01	0,01	0,47	-0,03	-0,17	+4	0,64	0,66	+1
Income																		
114 RETRE	yes	d ln	Q	1,90	1,12	0,62	0,36	0,23	0,19	0,11	0,02	0,31	0,32	0,32	0	0,50	0,52	-1
115 REDIS	yes	d ln	Q	1,30	1,01	0,79	0,90	0,27	0,33	0,16	0,05	0,37	0,26	0,36	+2	0,58	0,59	+1
Money, credit and interest rates																		
116 M1NOM	yes	d ln	M	2,00	1,37	0,36	0,26	0,09	0,13	0,18	0,01	0,08	0,15	0,27	+4	0,20	0,34	+7
117 M2NOM	yes	d ln	M	2,18	1,44	0,26	0,12	0,03	0,07	0,16	0,01	0,07	0,05	0,29	+10	-0,13	0,24	+13
118 CIRCO	yes	d ln	M	1,71	1,18	0,40	0,71	0,00	0,03	0,10	0,01	0,04	0,06	0,09	+4	-0,15	-0,25	-8
119 M1REA	yes	d	M	1,53	1,23	0,62	0,62	0,05	0,16	0,20	0,01	0,13	0,08	0,21	+10	0,21	0,52	+10
120 M2REA	yes	d	M	1,82	1,39	0,48	0,31	0,02	0,16	0,25	0,01	0,13	0,01	0,36	+11	0,09	0,56	+11
121 VELOC	yes	d ln	Q	1,69	1,47	0,59	0,25	0,06	0,37	0,24	0,03	0,33	-0,08	0,45	-2	0,29	-0,58	+4
122 VELOP	yes	ln	Q	2,96	0,92	0,09	0,03	0,04	0,07	0,02	0,00	0,41	-0,11	-0,21	+3	0,43	0,63	-3
123 IMPIE	yes	d ln	Q	2,60	1,07	0,25	0,08	0,04	0,18	0,11	0,02	0,21	0,27	-0,30	+6	0,27	-0,65	+6
124 IMPEC	yes	d ln	M	1,97	1,37	0,35	0,32	0,05	0,07	0,07	0,02	0,06	0,10	-0,20	+19	0,08	-0,60	+16
125 DEPEC	yes	d ln	M	2,16	1,47	0,30	0,07	0,01	0,03	0,11	0,01	0,12	-0,03	0,27	+11	-0,29	+0,39	+16
126 DEPRE	yes	d	M	1,79	1,41	0,52	0,28	0,00	0,11	0,24	0,01	0,12	-0,09	0,32	+11	-0,05	0,62	+13
127 DEPEN	yes	d	M	1,84	1,45	0,52	0,20	0,00	0,11	0,23	0,01	0,12	-0,10	0,36	+11	-0,08	0,61	+13
128 RAPEC	yes	d^2 ln	M	0,24	0,26	0,32	3,18	0,06	0,08	0,07	0,01	0,34	0,03	-0,05	-7	0,51	0,65	+4
129 RAPBC	yes	d^2 ln	M	0,21	0,25	0,36	3,19	0,04	0,06	0,04	0,01	0,22	0,03	0,04	-1	0,37	0,55	+5
130 TABTP	no	level	M	2,42	1,41	0,16	0,02	0,03	0,04	0,05	0,05	0,12	-0,16	-0,16	+1	0,09	-0,56	+13
131 TATUS	no	level	M	2,42	1,41	0,16	0,02	0,04	0,06	0,09	0,09	0,23	-0,18	-0,21	+5	0,31	-0,70	+14
132 TABOT	no	level	M	2,24	1,50	0,24	0,02	0,07	0,07	0,08	0,04	0,18	-0,22	-0,25	+2	0,21	-0,82	+16
133 TAIMP	no	level	Q	2,91	0,93	0,12	0,03	0,05	0,23	0,11	0,03	0,56	-0,28	-0,29	+1	0,05	-0,86	+4
134 BTPNE	no	d	M	1,20	1,52	1,05	0,24	0,03	0,11	0,12	0,01	0,12	0,19	0,20	-1	0,20	-0,37	-8
135 TUSNE	no	d	M	1,15	1,49	1,07	0,30	0,12	0,21	0,21	0,02	0,16	0,24	0,29	-1	0,37	0,41	+2
136 BOTNE	no	d	M	1,00	1,15	1,08	0,77	0,05	0,09	0,16	0,02	0,02	0,16	0,18	-1	0,13	-0,18	+16
137 IMPNE	no	d	Q	0,87	2,16	0,79	0,17	0,14	0,31	0,09	0,05	0,36	-0,24	0,63	-8	-0,41	0,74	-8
138 SPREA	no	d	M	0,70	0,76	0,98	1,55	0,09	0,10	0,08	0,01	0,20	0,10	0,10	0	0,36	0,55	-7
139 SPRE2	no	d	Q	0,68	1,39	1,26	0,67	0,09	0,35	0,07	0,04	0,40	-0,05	-0,34	+3	0,00	-0,64	+4
140 SPRE3	no	d	Q	0,44	1,11	1,11	1,34	0,18	0,31	0,13	0,08	0,33	-0,27	-0,28	+2	-0,44	-0,55	+1
Foreign trade																		
141 IMPTT	yes	d ln	Q	0,66	1,15	0,97	1,22	0,63	0,65	0,30	0,08	0,77	0,45	0,45	0	0,85	0,86	+1
142 EXPTT	yes	d ln	Q	0,52	0,83	1,06	1,60	0,04	0,14	0,10	0,06	0,19	0,22	0,22	0	0,32	-0,50	-5
143 IMPTB	yes	d ln	M	0,49	0,61	0,62	2,28	0,49	0,49	0,24	0,05	0,64	0,12	0,15	-1	0,73	0,85	+4
144 IMPD1	yes	d ln	M	0,38	0,38	0,35	2,90	0,57	0,53	0,30	0,04	0,73	0,11	0,12	-1	0,85	0,85	-1
145 IMPD2	yes	d ln	M	0,40	0,50	0,66	2,45	0,37	0,34	0,13	0,02	0,47	0,11	0,11	0	0,63	0,72	+4
146 IMPD3	yes	d	M	0,24	0,28	0,40	3,08	0,21	0,27	0,19	0,02	0,52	0,07	0,08	-1	0,65	0,76	+4
147 IMPRE	yes	d ln	M	0,18	0,20	0,36	3,25	0,03	0,05	0,03	0,02	0,26	0,00	0,05	+2	0,41	0,58	+5/+6

Series	Characteristics			Spectral density (Transformed series)				Coherence					Cross-correlation					
								Transformed series				Filter. (1)	Transformed series			Filtered series (1)		
	Deseas.	Transf.	Freq.	>8 ys	8-2 ys	2-1 ys	<1 ys	>8 ys	8-2 ys	2-1 ys	<1 ys	8-2 ys	r_0	r_{max}	t_{max}(2)	r_0	r_{max}	t_{max}(2)
148 IMPME	yes	d ln	M	0,34	0,48	0,54	2,64	0,28	0,30	0,23	0,04	0,42	0,12	0,12	0	0,59	0,67	+3
149 IMPMA	yes	d ln	M	0,47	0,45	0,37	2,72	0,50	0,44	0,24	0,03	0,59	0,11	0,13	-1	0,75	0,77	-2/-1
150 IMPCA	yes	d ln	M	0,40	0,56	0,61	2,43	0,28	0,32	0,21	0,02	0,40	0,11	0,11	+1	0,58	0,67	+3
151 IMPEN	yes	d ln	M	0,18	0,19	0,34	3,29	0,05	0,06	0,04	0,03	0,29	0,00	0,04	+2	0,43	0,61	+5/+6
152 IMPMP	yes	d ln	M	0,34	0,44	0,50	2,72	0,16	0,25	0,16	0,03	0,34	0,09	0,10	-1	0,43	0,61	+5
153 IMPSL	yes	d ln	M	0,48	0,61	0,64	2,27	0,54	0,56	0,33	0,04	0,66	0,16	0,16	0	0,74	0,86	+3/+4
154 IMPIN	yes	d ln	M	0,47	0,47	0,38	2,68	0,48	0,38	0,14	0,02	0,60	0,10	0,13	-1	0,76	0,76	-1
155 EXPTB	yes	d ln	M	0,36	0,43	0,48	2,73	0,05	0,11	0,11	0,03	0,13	0,06	0,08	-1	0,26	0,37	+5
156 EXPD1	yes	d ln	M	0,24	0,29	0,35	3,12	0,07	0,10	0,16	0,06	0,14	0,10	0,10	-1	0,38	0,38	0
157 EXPD2	yes	d ln	M	0,24	0,29	0,36	3,10	0,01	0,04	0,06	0,03	0,08	0,05	0,06	-1	0,08	-0,31	-8
158 EXPD3	yes	d ln	M	0,22	0,25	0,35	3,19	0,00	0,03	0,04	0,03	0,06	0,02	0,05	-1	0,05	-0,29	-8
159 EXPMA	yes	d ln	M	0,23	0,29	0,39	3,09	0,09	0,10	0,11	0,05	0,21	0,09	0,09	0	0,46	0,48	-2
160 EXPTE	yes	d ln	M	0,27	0,33	0,45	2,95	0,01	0,09	0,03	0,01	0,27	0,01	0,04	+8	-0,06	-0,62	-8
161 EXPUE	yes	d ln	M	0,38	0,41	0,40	2,80	0,16	0,27	0,18	0,04	0,36	0,09	0,10	-1	0,43	0,64	+6
162 EXPRW	yes	d ln	M	0,38	0,43	0,45	2,73	0,00	0,01	0,06	0,04	0,01	0,06	0,08	-1	0,09	0,28	-24
163 TERMS	yes	d ln	M	0,83	0,82	0,67	1,68	0,18	0,23	0,11	0,03	0,17	0,06	-0,15	+16	0,40	-0,63	+18
International output and prices, exchange rates																		
164 PROUS	yes	d ln	M	1,40	1,30	0,91	0,39	0,23	0,27	0,19	0,02	0,25	0,26	0,26	0	0,40	0,54	+5/+6
165 PROGE	yes	d ln	M	0,82	0,80	0,59	1,79	0,51	0,47	0,18	0,02	0,53	0,14	0,14	0	0,69	0,76	+3
166 PROFR	yes	d ln	M	0,95	0,94	0,58	1,53	0,55	0,56	0,32	0,04	0,62	0,23	0,23	0	0,77	0,81	+2
167 PROUK	yes	d ln	M	0,57	0,62	0,61	2,19	0,14	0,12	0,04	0,01	0,26	0,03	0,09	+5	0,41	0,54	+6
168 PREUS	yes	d^2 ln	M	0,30	0,31	0,35	3,05	0,27	0,20	0,07	0,01	0,37	0,04	0,05	+5	0,61	0,61	+1
169 PREOC	yes	d^2	M	0,24	0,30	0,53	2,93	0,09	0,06	0,02	0,01	0,20	-0,01	0,04	-3	0,44	0,45	+1
170 PREGE	yes	d	M	1,92	1,26	0,49	0,33	0,12	0,07	0,01	0,01	0,17	-0,09	-0,14	+5	-0,37	-0,49	+8
171 PREFR	yes	d^2	M	0,20	0,26	0,38	3,15	0,06	0,04	0,02	0,01	0,13	0,03	0,04	+1	0,32	0,39	-4
172 PREUK	yes	d	M	1,90	1,39	0,48	0,23	0,00	0,05	0,04	0,02	0,12	0,04	0,20	-8	-0,12	-0,49	+8
173 PILUS	yes	d ln	Q	1,34	1,35	0,71	0,59	0,28	0,31	0,12	0,05	0,37	0,22	0,40	+2	0,40	0,65	+2
174 PILOC	yes	d ln	Q	1,41	1,24	0,61	0,74	0,64	0,51	0,22	0,06	0,59	0,38	0,46	+2	0,69	0,81	+1
175 PILEU	yes	d ln	Q	1,55	1,39	0,58	0,48	0,54	0,71	0,29	0,11	0,79	0,58	0,58	0	0,85	0,88	+1
176 PILFR	yes	d ln	Q	1,56	1,25	0,61	0,58	0,41	0,50	0,21	0,11	0,52	0,48	0,48	0	0,70	0,71	+1
177 PILUK	yes	d ln	Q	1,40	1,05	0,70	0,85	0,26	0,30	0,12	0,11	0,41	0,08	0,39	+2	0,37	0,72	+3
178 PILSP	yes	d	Q	2,46	1,22	0,25	0,07	0,20	0,27	0,09	0,01	0,29	0,38	0,40	-1	0,51	0,51	0
179 TCERE	no	d	M	0,91	1,02	1,35	0,72	0,07	0,08	0,03	0,01	0,15	0,09	0,12	-7	0,33	0,42	-6
180 TCENO	no	d ln	M	1,14	1,11	1,14	0,61	0,00	0,01	0,02	0,00	0,03	-0,03	-0,06	+2	0,04	0,28	-8
181 EXCUS	no	d ln	M	1,36	1,20	0,95	0,49	0,04	0,02	0,01	0,01	0,09	-0,06	-0,10	-8	-0,25	-0,36	-8
182 EXCGE	no	d ln	M	1,16	1,09	1,05	0,70	0,01	0,02	0,04	0,02	0,02	0,08	0,11	-2	0,08	-0,20	-8
183 IMPWO	yes	d ln	Q	1,16	1,31	0,82	0,70	0,31	0,55	0,18	0,09	0,73	0,43	0,43	0	0,77	0,84	+1
184 CLEAD(3)	yes	d ln	M	1,54	1,54	0,85	0,07	0,35	0,59	0,39	0,20	0,64	0,48	0,62	+6	0,58	0,91	+6

(1) The filter is applied to the level of each series or, if the transformation of the variable (described in the second column) is ln or d ln, to the logarithm. For series whose ln transformation is d^2 or d^2 ln, the filter is applied, respectively, to the first difference of the variable or the first logarithmic difference. For the composite coincident indicator, whose transformation is d ln, the filter is applied to the level of the series - (2) The + (-) sign corresponds to a lead (lag) with respect to the coincident indicator - (3) CLEAD = composite leading indicator, based on the following nine series: CIOIS, PRAIS, ORICO, CLIMA, SCPIS, DEPRE, SPRE2, IMPTB and PROGE.

Table 8

BIVARIATE PREDICTIVE CONTENT FOR THE COMPOSITE COINCIDENT INDEX

(Transformed series)

Series	Characteristics			Marginal predictive content						Predictive content					
				6 lags			12 lags			1-step ahead		6-steps ahead		12-steps ahead	
	Deseas.	Transf.	Freq.	F-value	p-value	cusum	F-value	p-value	cusum	R^2	rank	R^2	rank	R^2	rank
Labor force and Employment															
1 OCCTT	yes	d	Q	2.46	0.652	0.862	0.04	0.293	0.764	0.46	5	0.18	24	0.17	42
2 PERTT	yes	d ln	Q	2.26	0.689	0.693	0.69	0.324	0.688	0.47	19	0.21	48	0.23	60
3 FORTT	yes	d	Q	1.10	0.894	0.729	0.40	0.576	0.691	0.46	1	0.17	8	0.13	12
4 TAPTT	yes	d ln	Q	0.96	0.915	0.731	0.36	0.618	0.710	0.46	2	0.17	7	0.13	10
5 ULATI	yes	d ln	Q	6.22	0.183	0.769	3.74	0.045	0.697	0.47	21	0.20	41	0.16	38
6 ULAEN	yes	d	Q	2.35	0.672	0.655	2.01	0.309	0.636	0.47	16	0.19	34	0.15	35
7 ULAPA	yes	d	Q	3.40	0.493	0.451	3.31	0.182	0.436	0.47	27	0.20	40	0.18	47
8 OCCAG	yes	d ln	Q	4.74	0.315	0.792	0.31	0.094	0.761	0.46	6	0.17	18	0.14	26
9 OCCED	yes	d	Q	15.56	0.00	0.70	7.55	0.00	0.68	0.50	48	0.20	39	0.21	52
10 OCCEN	yes	d ln	Q	1.88	0.76	0.80	1.18	0.39	0.77	0.49	37	0.15	4	0.09	6
11 OCCTI	yes	d ln	Q	12.25	0.02	0.85	11.00	0.00	0.81	0.54	62	0.15	6	0.07	4
12 OCCSD	yes	d ln	Q	4.82	0.31	0.66	2.58	0.09	0.62	0.48	32	0.17	9	0.14	18
13 OCCPA	yes	d ln	Q	0.59	0.96	0.80	0.31	0.75	0.76	0.48	35	0.15	3	0.07	3
14 INCIS	yes	d ln	Q	2.70	0.61	0.75	1.46	0.26	0.79	0.47	7	0.18	25	0.18	44
15 DISIS	yes	d ln	Q	5.31	0.26	0.82	3.74	0.07	0.81	0.50	45	0.23	52	0.18	45
16 ALTIS	yes	ln	Q	3.71	0.45	0.55	1.00	0.16	0.66	0.47	13	0.17	20	0.14	29
17 CIGIS	yes	d ln	M	7.59	0.816	0.880	6.00	0.270	0.857	0.98	112	0.44	105	0.29	112
18 CIOIS	yes	d ln	M	11.11	0.519	0.916	7.96	0.085	0.949	0.98	138	0.46	141	0.32	140
19 CIGED	yes	level	M	11.34	0.500	0.676	5.74	0.078	0.706	0.98	101	0.44	110	0.29	98
20 OREGI	yes	d ln	M	16.93	0.152	0.607	13.45	0.010	0.677	0.98	181	0.53	176	0.37	161
21 STRGI	yes	d ln	M	15.70	0.206	0.754	9.92	0.016	0.830	0.98	182	0.53	175	0.37	162
22 OCCGI	yes	d	M	15.12	0.235	0.853	5.78	0.019	0.789	0.98	180	0.53	173	0.38	164
23 OREIS	yes	d	Q	6.92	0.140	0.637	6.26	0.032	0.661	0.50	47	0.17	11	0.13	13
Output and capacity utilization															
24 PILTT	yes	d ln	Q	13.60	0.009	0.678	10.44	0.001	0.557	0.52	58	0.20	42	0.14	25
25 PROIS	yes	d ln	M	13.90	0.307	0.766	10.57	0.031	0.792	0.98	132	0.44	104	0.28	91
26 PROTI	yes	d ln	M	9.22	0.684	0.809	6.69	0.161	0.791	0.98	113	0.45	128	0.30	115
27 PRO02	yes	d ln	M	13.97	0.302	0.832	7.03	0.030	0.750	0.98	114	0.45	127	0.31	135
28 PRO03	yes	d ln	M	12.34	0.419	0.800	10.27	0.055	0.774	0.98	133	0.45	134	0.31	129
29 PRO04	yes	d ln	M	10.18	0.600	0.855	4.36	0.117	0.748	0.98	102	0.43	95	0.28	88
30 PRO05	yes	d ln	M	12.60	0.399	0.772	1.97	0.050	0.731	0.98	91	0.44	115	0.28	78
31 PRO06	yes	d ln	M	12.46	0.409	0.478	6.38	0.052	0.586	0.98	126	0.47	153	0.35	160
32 PRO07	yes	d ln	M	20.87	0.052	0.636	17.91	0.002	0.615	0.98	155	0.48	156	0.31	137
33 PRO08	yes	d ln	M	11.51	0.486	0.778	6.50	0.074	0.833	0.98	115	0.44	108	0.29	109
34 PRO09	yes	d ln	M	23.97	0.021	0.862	16.35	0.001	0.798	0.98	154	0.50	165	0.32	142
35 PRO10	yes	d ln	M	10.06	0.611	0.800	6.73	0.122	0.780	0.98	127	0.46	137	0.29	110
36 PRO11	yes	ln	M	35.03	0.001	0.489	19.64	0.000	0.466	0.98	147	0.47	154	0.32	141

Table 8, continued

Series	Characteristics			Marginal predictive content						Predictive content					
				6 lags			12 lags			1-step ahead		6-steps ahead		12-steps ahead	
	Deseas.	Transf.	Freq.	F-value	p-value	cusum	F-value	p-value	cusum	R^2	rank	R^2	rank	R^2	rank
37 PRO12	yes	d ln	M	9.69	0.643	0.829	4.56	0.138	0.795	0.98	92	0.43	90	0.28	79
38 PRO13	yes	d ln	M	11.99	0.446	0.778	7.68	0.062	0.759	0.98	116	0.43	84	0.28	80
39 PRO14	yes	d ln	M	28.23	0.005	0.800	9.26	0.000	0.758	0.98	139	0.45	133	0.30	113
40 PRO15	yes	d ln	M	21.15	0.048	0.834	5.64	0.002	0.799	0.98	117	0.44	117	0.29	106
41 PRO16	yes	d ln	M	10.11	0.606	0.731	5.46	0.120	0.740	0.98	161	0.46	136	0.30	117
42 PROD1	yes	d ln	M	27.56	0.006	0.757	23.60	0.000	0.749	0.98	165	0.49	163	0.33	143
43 PROD2	yes	d ln	M	14.12	0.293	0.794	7.66	0.028	0.775	0.98	107	0.43	93	0.28	77
44 PROND	yes	ln	M	35.91	0.000	0.470	15.18	0.000	0.480	0.98	140	0.47	146	0.31	131
45 PRODU	yes	d ln	M	11.96	0.449	0.756	8.06	0.063	0.744	0.98	134	0.46	140	0.29	105
46 PROD3	yes	d ln	M	18.39	0.105	0.831	12.08	0.005	0.747	0.98	148	0.44	106	0.29	99
47 GUWIS	yes	d	Q	7.24	0.124	0.593	3.43	0.027	0.627	0.47	14	0.18	31	0.14	23
48 GUWTI	yes	d	Q	8.19	0.085	0.557	4.11	0.017	0.623	0.47	18	0.19	33	0.14	27
49 GUWD1	yes	d ln	Q	9.63	0.047	0.675	9.65	0.008	0.684	0.52	57	0.27	57	0.20	51
50 GUWD2	yes	d	Q	2.21	0.697	0.688	0.55	0.331	0.744	0.47	15	0.17	10	0.14	15
51 GUWD3	yes	d	Q	3.29	0.511	0.922	0.42	0.193	0.731	0.46	10	0.21	46	0.16	41
52 GUIIS	yes	d ln	Q	1.85	0.764	0.787	1.63	0.397	0.755	0.48	33	0.17	15	0.14	22
53 GUITI	yes	d ln	Q	2.13	0.713	0.716	1.32	0.345	0.679	0.51	50	0.15	5	0.09	8
54 GUID1	yes	d ln	Q	3.08	0.545	0.720	3.01	0.215	0.720	0.51	53	0.12	2	0.05	1
55 GUID2	yes	d	Q	0.63	0.960	0.699	0.42	0.729	0.705	0.50	42	0.12	1	0.05	2
56 GUID3	yes	d	Q	3.97	0.410	0.761	1.44	0.137	0.707	0.51	51	0.20	43	0.09	9
57 CARIS	yes	d	Q	24.78	0.000	1.117	21.76	0.000	0.934	0.59	67	0.36	67	0.32	139
58 INSIS	yes	d ln	Q	4.51	0.341	0.870	0.40	0.105	0.770	0.47	34	0.22	65	0.19	65
59 ELETT	yes	d ln	M	12.69	0.392	0.446	5.60	0.048	0.602	0.98	118	0.47	147	0.34	148
60 PRAIS	yes	d	M	23.74	0.022	0.889	20.55	0.001	0.795	0.98	158	0.51	166	0.38	163
61 VAIND	yes	d	Q	3.02	0.554	0.753	0.91	0.221	0.773	0.47	24	0.17	17	0.13	11
Consumption, orders and market services															
62 FATIS	yes	d ln	M	14.17	0.290	0.748	3.78	0.028	0.749	0.98	168	0.53	171	0.36	157
63 ORDIS	yes	d ln	M	15.18	0.232	0.823	13.10	0.019	0.770	0.97	88	0.42	77	0.28	82
64 ORITT	yes	d	M	22.40	0.033	1.028	17.67	0.001	0.992	0.98	159	0.59	183	0.48	182
65 ORIIV	yes	d	M	18.17	0.111	1.037	15.45	0.006	0.915	0.98	177	0.54	177	0.38	166
66 ORICO	yes	d	M	27.80	0.006	0.870	11.04	0.000	0.743	0.98	175	0.58	182	0.45	180
67 ORIIN	yes	d	M	24.01	0.020	1.008	14.81	0.001	0.818	0.98	178	0.56	181	0.42	176
68 ORIES	yes	d	M	38.75	0.000	0.813	21.65	0.000	0.910	0.98	163	0.52	170	0.38	165
69 TORTT	yes	d	M	12.20	0.430	0.880	7.17	0.058	0.813	0.98	141	0.50	164	0.39	170
70 CLIMA	yes	d	M	9.57	0.654	1.406	4.70	0.144	1.312	0.97	83	0.43	80	0.33	146
71 COFTT	yes	d ln	Q	19.97	0.001	0.917	18.24	0.000	0.665	0.54	64	0.31	62	0.27	69
72 COCTT	yes	d	Q	4.82	0.306	0.539	0.37	0.090	0.655	0.46	4	0.19	37	0.18	46
73 VASDV	yes	d ln	Q	9.44	0.051	0.468	8.01	0.009	0.468	0.51	52	0.19	38	0.16	39
74 VENDI	yes	d ln	M	7.62	0.814	0.633	3.02	0.267	0.648	0.98	93	0.43	91	0.28	81
75 FALLI	yes	d ln	M	5.95	0.919	0.723	4.27	0.429	0.710	0.98	94	0.44	118	0.28	96
76 MERFS	yes	d ln	M	11.73	0.468	0.837	3.53	0.068	0.627	0.98	95	0.44	109	0.28	90
77 ISOLD	no	d ln	M	15.93	0.195	0.767	9.03	0.014	0.773	0.97	84	0.40	72	0.24	64

Table 8, continued

Series	Characteristics			Marginal predictive content						Predictive content					
				6 lags			12 lags			1-step ahead		6-steps ahead		12-steps ahead	
	Deseas.	Transf.	Freq.	F-value	p-value	cusum	F-value	p-value	cusum	R^2	rank	R^2	rank	R^2	rank
78 ISNEW	no	d ln	M	15.13	0.234	0.745	8.48	0.019	0.772	0.97	85	0.40	70	0.24	62
Investment and stocks															
79 INVTT	yes	d ln	Q	12.02	0.017	0.808	7.66	0.003	0.758	0.50	44	0.17	16	0.14	24
80 INVMT	yes	d ln	Q	12.11	0.017	0.828	10.22	0.002	0.837	0.49	43	0.20	44	0.15	37
81 INVIM	yes	d ln	Q	31.80	0.000	0.681	16.69	0.000	0.728	0.54	61	0.18	29	0.15	31
82 INVCO	yes	d ln	Q	2.20	0.700	0.758	1.68	0.334	0.758	0.46	3	0.17	12	0.13	14
83 SCOTT	yes	d	Q	6.62	0.157	0.610	0.11	0.036	0.769	0.47	12	0.18	26	0.15	32
84 ANEIS	yes	d	M	11.57	0.481	0.800	5.65	0.072	0.779	0.98	103	0.45	130	0.34	150
85 SCPIS	yes	d	M	26.15	0.010	0.833	20.35	0.000	0.904	0.98	156	0.54	180	0.36	158
86 SCMIS	yes	d	Q	6.59	0.159	0.878	3.02	0.037	0.774	0.52	54	0.19	32	0.08	7
Prices and margins															
87 PRETI	yes	d	M	11.22	0.510	0.834	4.11	0.082	0.795	0.98	160	0.49	159	0.36	159
88 PREIN	yes	d^2	M	10.13	0.605	0.812	4.76	0.119	0.794	0.98	170	0.48	155	0.31	128
89 PREAL	yes	d^2	M	12.13	0.436	0.809	4.68	0.059	0.794	0.98	171	0.47	148	0.31	132
90 PRENA	yes	d^2	M	7.69	0.809	0.820	2.29	0.262	0.802	0.98	169	0.48	157	0.31	123
91 POILM	yes	d ln	M	11.99	0.447	0.773	5.01	0.062	0.725	0.98	96	0.45	131	0.31	136
92 PRE03	yes	d^2 ln	M	7.91	0.792	0.797	3.28	0.245	0.803	0.98	172	0.48	151	0.31	125
93 PRE04	yes	d ln	M	25.82	0.011	0.975	10.75	0.000	0.782	0.98	176	0.54	178	0.45	181
94 PRE07	yes	d ln	M	13.66	0.323	0.565	3.48	0.034	0.610	0.98	162	0.46	138	0.30	118
95 PRE08	yes	d	M	7.81	0.800	0.773	2.52	0.252	0.765	0.98	157	0.47	142	0.31	127
96 PRE24	yes	d^2 ln	M	8.24	0.766	0.852	2.78	0.221	0.797	0.98	173	0.49	161	0.32	138
97 PRE25	yes	d^2	M	17.69	0.125	0.805	5.14	0.007	0.788	0.98	174	0.47	150	0.31	124
98 PRECO	yes	d^2 ln	M	24.31	0.019	0.762	14.07	0.001	0.781	0.98	152	0.44	114	0.29	104
99 DEFCO	yes	d^2	Q	3.01	0.556	0.756	3.04	0.222	0.748	0.48	38	0.18	30	0.14	28
100 PREAT	yes	d	M	25.59	0.012	0.817	21.22	0.000	0.802	0.98	164	0.53	172	0.35	152
101 CUVTI	yes	d	Q	4.16	0.384	0.738	1.44	0.125	0.692	0.48	36	0.25	56	0.26	68
102 MARTI	yes	d	Q	0.90	0.925	0.650	0.03	0.639	0.665	0.46	11	0.17	22	0.15	33
Wages and labor costs															
103 RETOR	yes	d^2 ln	M	18.56	0.100	0.775	10.36	0.005	0.764	0.98	128	0.43	97	0.29	108
104 RETDO	yes	d^2	M	10.24	0.595	0.849	8.34	0.115	0.851	0.97	70	0.41	75	0.23	59
105 REFTT	yes	d ln	M	30.51	0.002	1.179	23.71	0.000	0.900	0.98	183	0.55	179	0.41	175
106 RELCN	yes	d	Q	3.91	0.419	0.714	2.35	0.142	0.619	0.47	26	0.18	28	0.14	19
107 CLUIS	yes	d	Q	2.68	0.612	0.829	1.12	0.261	0.765	0.47	23	0.20	45	0.21	53
108 CLUTI	yes	d	Q	2.65	0.618	0.844	1.11	0.266	0.778	0.47	29	0.21	49	0.21	54
109 CLUCO	yes	d	Q	4.24	0.375	0.706	2.35	0.120	0.717	0.47	28	0.23	53	0.24	63
110 CLUSD	yes	d^2	Q	1.95	0.745	0.733	1.74	0.377	0.747	0.47	25	0.17	14	0.14	20
111 CLUTT	yes	d^2	Q	4.03	0.402	0.713	2.62	0.133	0.736	0.46	8	0.17	21	0.14	17

Series	Characteristics			Marginal predictive content						Predictive content					
				6 lags			12 lags			1-step ahead		6-steps ahead		12-steps ahead	
	Deseas.	Transf.	Freq.	F-value	p-value	cusum	F-value	p-value	cusum	R^2	rank	R^2	rank	R^2	rank
112 PRISS	yes	ln	Q	3.72	0.445	0.434	2.07	0.156	0.414	0.47	22	0.18	27	0.16	36
113 PRSDV	yes	ln	Q	3.97	0.411	0.396	2.05	0.138	0.415	0.47	17	0.21	47	0.19	50
Income															
114 RETRE	yes	d ln	Q	8.15	0.086	0.667	4.90	0.017	0.468	0.47	30	0.19	36	0.14	21
115 REDIS	yes	d ln	Q	18.09	0.001	0.462	15.88	0.000	0.454	0.51	56	0.21	50	0.15	30
Money, credit and interest rates															
116 M1NOM	yes	d ln	M	11.99	0.447	0.767	7.68	0.062	0.711	0.97	80	0.44	112	0.27	71
117 M2NOM	yes	d ln	M	13.44	0.338	0.643	7.41	0.037	0.624	0.97	79	0.43	81	0.27	72
118 CIRCO	yes	d ln	M	29.27	0.004	0.906	12.58	0.000	0.625	0.98	135	0.45	125	0.30	119
119 M1REA	yes	d	M	18.16	0.111	0.843	8.87	0.006	0.810	0.97	86	0.49	162	0.40	174
120 M2REA	yes	d	M	18.85	0.092	0.647	9.51	0.004	0.668	0.97	82	0.51	167	0.50	183
121 VELOC	yes	d ln	Q	10.84	0.028	1.071	8.34	0.004	0.884	0.59	68	0.37	69	0.35	154
122 VELOP	yes	ln	Q	12.29	0.015	0.487	10.18	0.002	0.509	0.57	66	0.37	68	0.39	169
123 IMPIE	yes	d ln	Q	2.90	0.575	0.651	1.01	0.235	0.606	0.48	31	0.19	35	0.18	48
124 IMPEC	yes	d ln	M	4.13	0.981	0.936	0.89	0.659	0.964	0.97	74	0.41	73	0.23	61
125 DEPEC	yes	d ln	M	10.22	0.597	0.557	2.59	0.116	0.515	0.97	77	0.43	79	0.26	70
126 DEPRE	yes	d	M	13.24	0.352	0.645	8.65	0.039	0.563	0.97	81	0.48	160	0.42	179
127 DEPEN	yes	d	M	21.62	0.042	0.717	6.80	0.001	0.600	0.97	78	0.48	158	0.41	178
128 RAPEC	yes	d^2 ln	M	4.13	0.981	0.902	3.19	0.659	0.889	0.97	75	0.40	71	0.21	57
129 RAPBC	yes	d^2 ln	M	5.82	0.925	0.887	2.77	0.444	0.893	0.97	76	0.41	74	0.21	55
130 TABTP	no	level	M	10.49	0.573	1.019	6.74	0.105	0.994	0.98	119	0.46	139	0.34	149
131 TATUS	no	level	M	19.73	0.073	1.095	11.38	0.003	0.986	0.98	142	0.48	152	0.40	173
132 TABOT	no	level	M	12.18	0.431	0.870	3.50	0.058	1.074	0.97	73	0.47	149	0.40	172
133 TAIMP	no	level	Q	9.03	0.060	1.020	5.20	0.011	0.991	0.50	49	0.33	64	0.33	145
134 BTPNE	no	d	M	6.93	0.862	0.767	4.55	0.327	0.768	0.98	104	0.43	85	0.28	89
135 TUSNE	no	d	M	15.53	0.214	0.786	8.36	0.017	0.759	0.98	129	0.44	100	0.28	92
136 BOTNE	no	d	M	6.70	0.877	0.914	4.41	0.349	0.876	0.97	72	0.42	76	0.26	67
137 IMPNE	no	d	Q	2.15	0.708	0.533	0.98	0.341	0.530	0.61	69	0.29	59	0.21	56
138 SPREA	no	d	M	7.80	0.801	0.736	2.69	0.253	0.772	0.97	71	0.42	78	0.28	73
139 SPRE2	no	d	Q	4.91	0.297	0.754	2.80	0.086	0.689	0.50	46	0.27	58	0.26	66
140 SPRE3	no	d	Q	3.32	0.505	0.610	3.01	0.190	0.618	0.53	59	0.18	23	0.08	5
Foreign trade															
141 IMPTT	yes	d ln	Q	3.14	0.534	0.792	0.43	0.208	0.801	0.47	20	0.17	13	0.15	34
142 EXPTT	yes	d ln	Q	1.85	0.763	0.764	1.13	0.396	0.737	0.46	9	0.17	19	0.14	16
143 IMPTB	yes	d ln	M	14.26	0.284	0.917	4.78	0.027	0.777	0.98	97	0.44	107	0.30	121
144 IMPD1	yes	d ln	M	30.83	0.002	0.883	11.87	0.000	0.866	0.98	143	0.44	101	0.29	103
145 IMPD2	yes	d ln	M	19.15	0.085	0.866	6.39	0.004	0.790	0.98	120	0.44	126	0.30	122
146 IMPD3	yes	d	M	23.63	0.023	0.788	15.85	0.001	0.699	0.98	149	0.44	122	0.30	116
147 IMPRE	yes	d ln	M	17.34	0.137	0.764	10.66	0.008	0.735	0.98	136	0.44	120	0.28	97

Series	Characteristics			Marginal predictive content						Predictive content					
				6 lags			12 lags			1-step ahead		6-steps ahead		12-steps ahead	
	Deseas.	Transf.	Freq.	F-value	p-value	cusum	F-value	p-value	cusum	R^2	rank	R^2	rank	R^2	rank
148 IMPME	yes	d ln	M	16.45	0.171	0.801	8.04	0.012	0.791	0.98	105	0.44	116	0.28	87
149 IMPMA	yes	d ln	M	20.65	0.056	0.963	4.48	0.002	0.873	0.98	89	0.43	89	0.28	84
150 IMPCA	yes	d ln	M	21.81	0.040	0.788	12.63	0.001	0.757	0.98	144	0.44	98	0.28	86
151 IMPEN	yes	d ln	M	21.48	0.044	0.750	13.54	0.002	0.728	0.98	145	0.44	121	0.28	94
152 IMPMP	yes	d ln	M	10.44	0.577	0.805	4.72	0.107	0.786	0.98	98	0.43	96	0.29	100
153 IMPSL	yes	d ln	M	28.89	0.004	0.876	9.78	0.000	0.765	0.98	121	0.43	94	0.30	114
154 IMPIN	yes	d ln	M	26.16	0.010	0.967	10.63	0.000	0.875	0.98	108	0.44	113	0.29	111
155 EXPTB	yes	d ln	M	16.05	0.189	0.776	6.91	0.014	0.863	0.98	109	0.43	87	0.28	74
156 EXPD1	yes	d ln	M	18.90	0.091	0.777	7.89	0.004	0.770	0.98	122	0.43	88	0.28	93
157 EXPD2	yes	d ln	M	20.59	0.057	0.819	6.23	0.002	0.771	0.98	123	0.43	82	0.28	83
158 EXPD3	yes	d ln	M	23.98	0.021	0.795	15.88	0.001	0.771	0.98	150	0.44	102	0.29	102
159 EXPMA	yes	d ln	M	17.16	0.144	0.794	12.81	0.009	0.785	0.98	151	0.44	103	0.29	101
160 EXPTE	yes	d ln	M	13.70	0.320	0.748	6.99	0.033	0.835	0.98	124	0.45	129	0.31	130
161 EXPUE	yes	d ln	M	21.63	0.418	0.790	5.60	0.001	0.724	0.98	125	0.44	111	0.31	126
162 EXPRW	yes	d ln	M	13.94	0.304	0.778	8.97	0.030	0.769	0.98	131	0.44	124	0.31	120
163 TERMS	yes	d ln	M	24.23	0.019	0.813	16.36	0.001	0.763	0.98	153	0.47	145	0.35	156
International output and prices, exchange rates															
164 PROUS	yes	d ln	M	9.78	0.635	0.842	4.61	0.134	0.799	0.98	110	0.45	132	0.34	151
165 PROGE	yes	d ln	M	35.91	0.000	0.896	25.45	0.000	0.787	0.98	166	0.53	174	0.40	171
166 PROFR	yes	d ln	M	15.12	0.235	0.784	10.80	0.019	0.775	0.98	146	0.46	135	0.31	134
167 PROUK	yes	d ln	M	17.69	0.125	0.790	8.42	0.007	0.747	0.98	130	0.44	119	0.31	133
168 PREUS	yes	d^2 ln	M	22.88	0.029	0.786	7.01	0.001	0.771	0.98	111	0.44	123	0.28	85
169 PREOC	yes	d^2	M	12.76	0.387	0.752	3.31	0.047	0.747	0.98	106	0.44	99	0.28	75
170 PREGE	yes	d	M	15.66	0.207	0.922	3.84	0.016	0.845	0.98	99	0.47	144	0.41	177
171 PREFR	yes	d^2	M	3.70	0.988	0.781	3.63	0.718	0.776	0.98	137	0.43	83	0.28	95
172 PREUK	yes	d	M	15.09	0.237	1.166	12.84	0.020	1.093	0.97	87	0.47	143	0.38	167
173 PILUS	yes	d ln	Q	10.46	0.033	0.726	7.00	0.005	0.694	0.51	55	0.29	60	0.35	155
174 PILOC	yes	d ln	Q	18.79	0.001	0.410	14.08	0.000	0.410	0.54	63	0.35	66	0.39	168
175 PILEU	yes	d ln	Q	17.37	0.002	0.747	13.63	0.000	0.726	0.53	60	0.31	61	0.22	58
176 PILFR	yes	d ln	Q	10.50	0.033	0.653	6.37	0.005	0.534	0.49	39	0.21	51	0.16	40
177 PILUK	yes	d ln	Q	16.17	0.003	0.929	15.98	0.000	0.885	0.55	65	0.32	63	0.34	147
178 PILSP	yes	d	Q	4.81	0.307	0.802	3.93	0.090	0.788	0.49	40	0.25	55	0.18	49
179 TCERE	no	d	M	8.90	0.712	0.785	1.97	0.180	0.763	0.98	90	0.43	86	0.28	76
180 TCENO	no	d ln	M	11.34	0.500	0.968	4.96	0.079	0.840	0.98	100	0.43	92	0.29	107
181 EXCUS	no	d ln	M	10.23	0.596	0.874	3.05	0.115	0.790	0.98	167	0.52	169	0.35	153
182 EXCGE	no	d ln	M	20.05	0.066	0.868	10.75	0.003	0.878	0.98	179	0.52	168	0.33	144
183 IMPWO	yes	d ln	Q	10.81	0.029	0.786	4.09	0.005	0.878	0.49	41	0.24	54	0.18	43
184 CLEAD	yes	d ln	M	26.40	0.009	0.943	22.57	0.000	0.825	0.98	184	0.66	184	0.57	184

Legend: CLEAD = Composite leading indicator based on the following nine series: CIOIS, PRAIS, ORICO, CLIMA, SCPIS, DEPRE, SPRE2, IMPTB and PROGE.

Table 9

COMOVEMENT PROPERTIES AND PREDICTIVE CONTENT OF TWENTY-SIX SELECTED LEADING VARIABLES

Series	Characteristics			Spectral density			Coherence		Cross-correlation						Predictive content				
							Trasf. series	Filter. (1)	Transformed series			Filtered series (1)			Transformed series				
	Deseas.	Transf.	Freq.	>8 ys	8-2 ys	<2 ys	8-2 ys	8-2 ys	r_0	r_{max}	t_{max} (2)	r_0	r_{max}	t_{max} (2)	p_6	p_{12}	$rank_1$	$rank_6$	$rank_{12}$
CIGIS	yes	d ln	M	0.23	0.21	0.55	0.30	0.54	-0.12	-0.13	-1	-0.68	-0.74	+3	0.816	0.270	112	105	112
CIOIS	yes	d ln	M	0.28	0.27	0.45	0.50	0.58	-0.18	-0.20	+2	-0.71	-0.78	+3	0.519	0.085	138	141	140
PRO05	yes	d ln	M	0.12	0.14	0.74	0.51	0.56	0.15	0.16	-1	0.68	0.78	+3	0.399	0.050	91	114	78
PRO11	yes	ln	M	0.59	0.37	0.05	0.01	0.43	-0.06	-0.12	+8	0.61	0.70	+3	0.001	0.000	147	154	141
PRO14	yes	d ln	M	0.16	0.19	0.66	0.38	0.42	0.12	0.13	+1	0.51	0.72	+5	0.005	0.000	139	133	113
GUIIS	yes	d ln	Q	0.20	0.35	0.45	0.68	0.79	0.54	0.54	0	0.83	0.86	+1	0.764	0.397	33	15	22
CARIS	yes	d	Q	0.28	0.44	0.29	0.63	0.72	-0.39	-0.60	+1	-0.63	-0.87	+2	0.000	0.000	67	67	139
ELETT	yes	d ln	M	0.20	0.20	0.61	0.44	0.64	0.15	0.15	0	0.74	0.84	+3	0.392	0.048	118	147	148
PRAIS	yes	d	M	0.27	0.28	0.45	0.43	0.45	0.07	0.25	+3	0.30	0.79	+8	0.022	0.001	158	166	163
ORITT	yes	d	M	0.37	0.37	0.27	0.56	0.51	0.37	0.40	+1	0.51	0.79	+6	0.033	0.001	159	183	182
ORICO	yes	d	M	0.27	0.29	0.43	0.57	0.60	0.26	0.28	+7	0.55	0.89	+6	0.006	0.000	175	182	180
ORIIN	yes	d	M	0.26	0.27	0.46	0.58	0.60	0.24	0.26	+1	0.63	0.85	+5	0.020	0.001	178	181	176
TORTT	yes	d	M	0.25	0.27	0.48	0.40	0.39	0.07	0.21	+8	0.10	0.75	+9	0.430	0.058	141	164	170
CLIMA	yes	d	M	0.22	0.23	0.55	0.36	0.55	0.21	0.21	0	0.72	0.82	+4	0.654	0.144	83	80	146
ANEIS	yes	d	M	0.24	0.27	0.49	0.19	0.29	0.08	0.15	+6	0.08	0.61	+10	0.481	0.072	103	130	150
SCPIS	yes	d	M	0.32	0.32	0.36	0.42	0.46	-0.19	-0.30	+7	-0.49	-0.75	+5	0.010	0.000	156	180	158
PRENA	yes	d^2	M	0.06	0.06	0.88	0.18	0.27	0.03	0.05	+8	0.29	0.54	+5	0.809	0.262	169	157	123
PRE24	yes	d^2 ln	M	0.10	0.15	0.75	0.31	0.45	0.07	0.11	+2	0.51	0.75	+5	0.766	0.221	173	161	138
PREAT	yes	d	M	0.24	0.29	0.47	0.35	0.45	0.10	0.25	+8	0.49	0.74	+5	0.012	0.000	164	172	152
DEPRE	yes	d	M	0.43	0.36	0.21	0.11	0.12	-0.09	0.32	+11	-0.05	0.62	+13	0.352	0.039	81	160	179
TAIMP	no	level	Q	0.71	0.25	0.04	0.23	0.56	-0.28	-0.29	+1	0.05	-0.86	+4	0.060	0.011	49	64	145
SPRE2	no	d	Q	0.17	0.34	0.49	0.35	0.40	-0.05	-0.34	+3	0.00	-0.64	+4	0.297	0.086	46	58	66
IMPTB	yes	d ln	M	0.12	0.15	0.73	0.49	0.64	0.12	0.15	-1	0.73	0.85	+4	0.284	0.027	97	107	121
IMPSL	yes	d ln	M	0.12	0.15	0.73	0.56	0.66	0.16	0.16	0	0.74	0.86	+3/+4	0.004	0.000	121	94	114
PROGE	yes	d ln	M	0.20	0.20	0.59	0.47	0.53	0.14	0.14	0	0.69	0.76	+3	0.000	0.000	166	174	171
PILUS	yes	d ln	Q	0.33	0.34	0.33	0.31	0.37	0.22	0.40	+2	0.40	0.65	+2	0.033	0.005	55	60	155

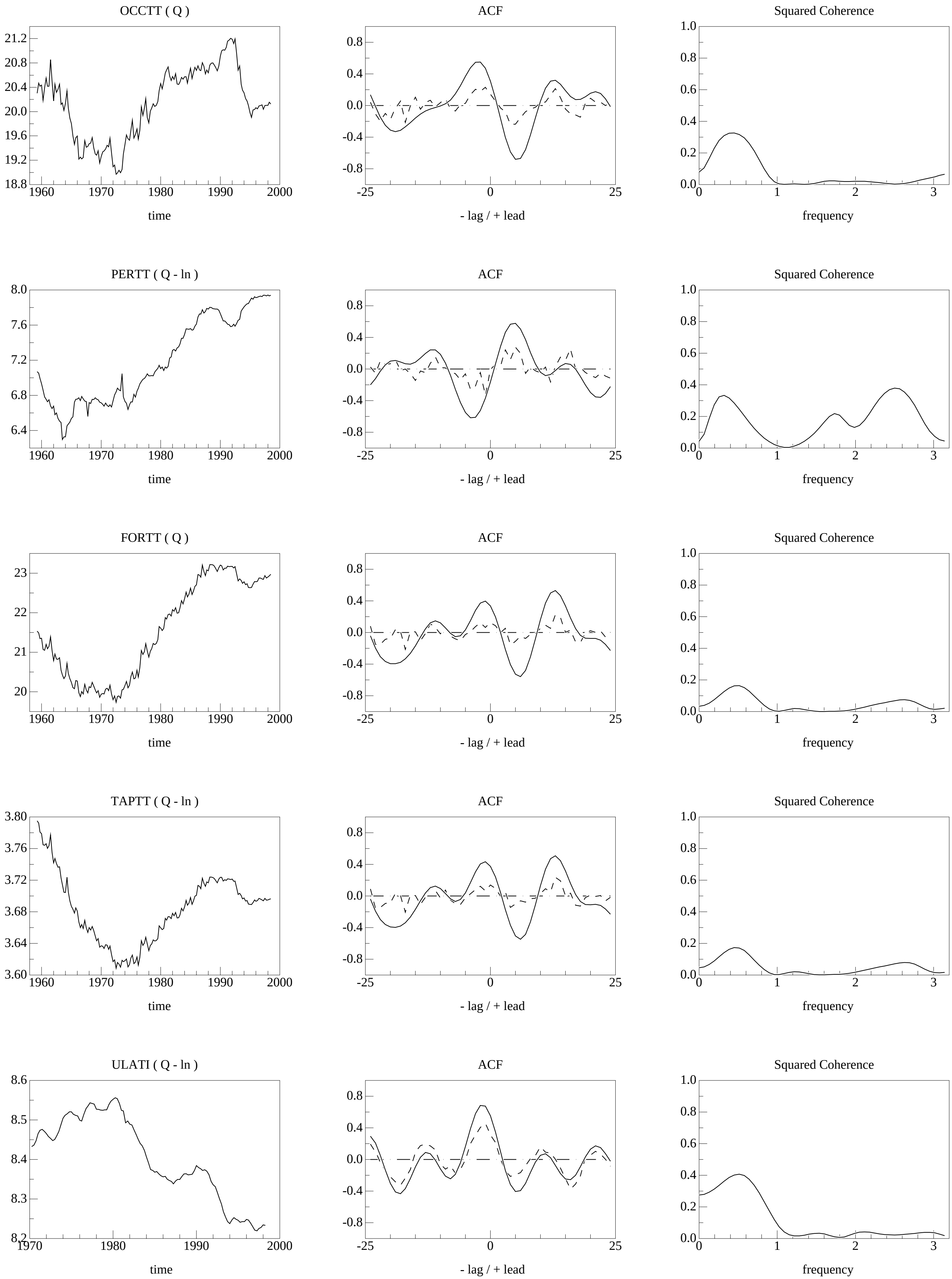
(1) The filter is applied to the level of each series or, if the transformation of the variable (described in the second column) is ln or d ln, to the logarithm. For series whose transformation is d^2 or d^2 ln, the filter is applied, respectively, to the first difference of the variable or to the first logaritmic difference. For the composite coincident indicator, whose transformation is d ln, the filter is applied to the level of the series - (2) The + (-) sign corresponds to a lead (lag) with respect to the composite coincident indicator.

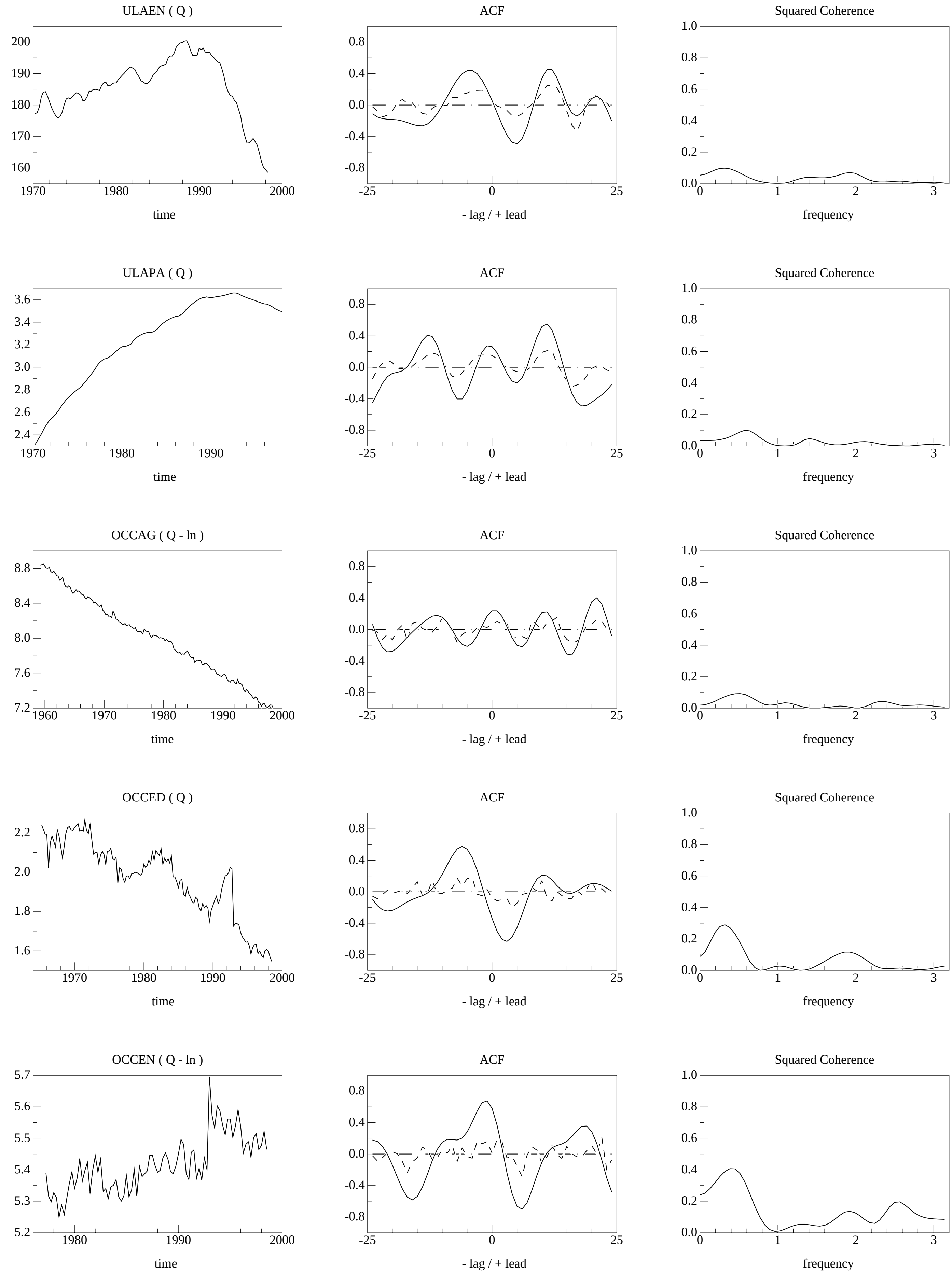
LEADS AND LAGS OF A GROUP OF TWENTY-SIX LEADING VARIABLES AND THE COMPOSITE LEADING INDICATOR WITH RESPECT TO THE COMPOSITE COINCIDENT INDICATOR, 1974-1997

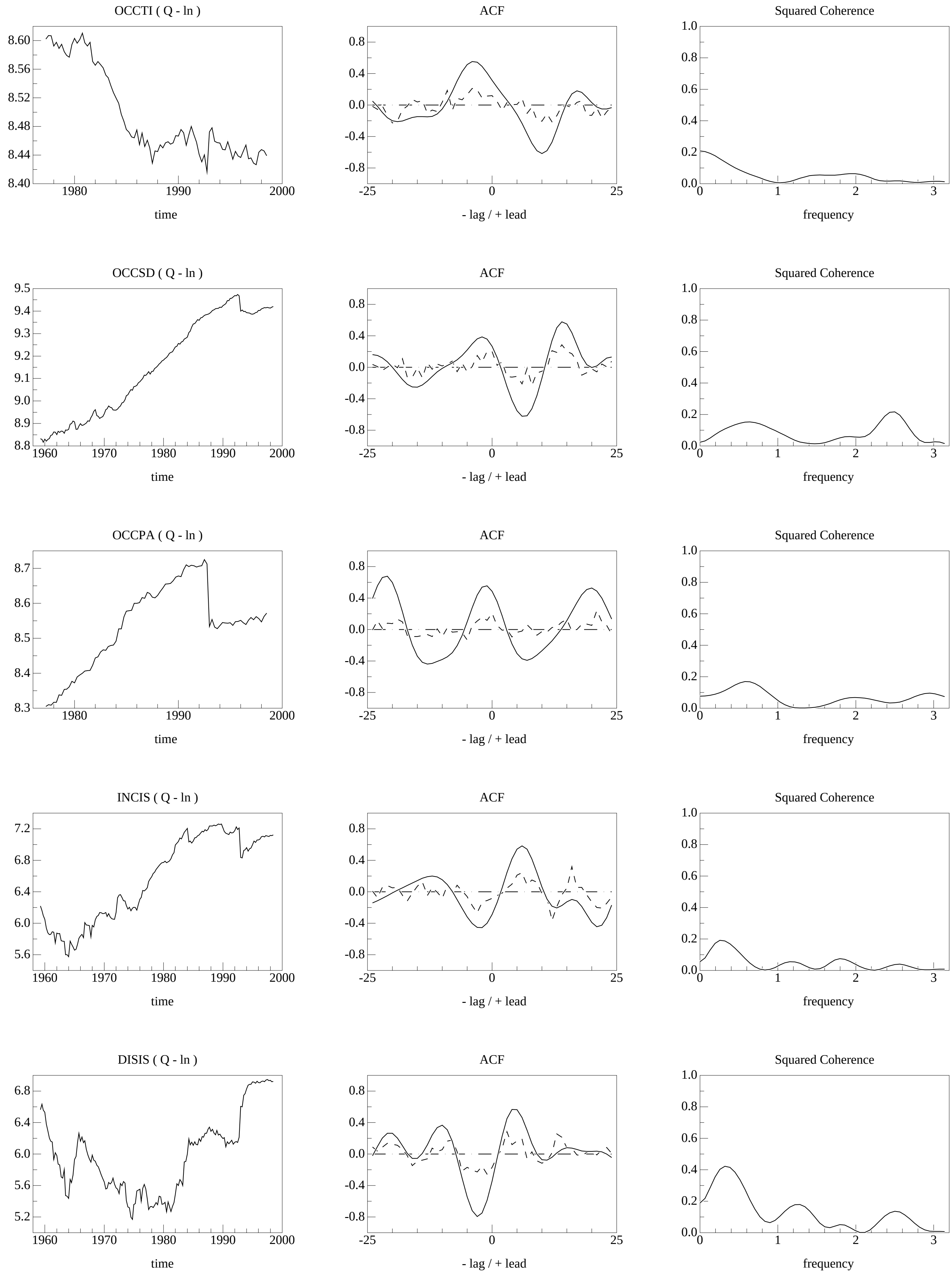
	Peak 74.03	Trough 75.05	Peak 77.02	Trough 77.12	Peak 80.03	Trough 83.03	Peak 92.03	Trough 93.07	Peak 95.11	Trough 96.11	Overall average	Average at peaks	Average at troughs	Number of extra cycles
CIGIS	-6	+2	-2	+2	-6	+20	-24	-5	-	-	-2.4	-9.5	-4.8	0
CIOIS	-3	+2	0	+4	-6	+1	-31	-3	0	+4	-3.2	-8.0	+1.6	1
PRO05	+4	-3	-1	-2	-8	-8	0	+1	-8	-6	-3.1	-2.6	-3.6	1
PRO11	0	-6	-3	-6	-2	+11	12	+5	-6	+4	+0.9	+0.2	+1.6	2
PRO14	-6	-6	-11	-4	-3	-11	-	-	-10	-6	-7.1	-7.5	-6.8	2
GUIIS	-3	+3	-2	-1	-4	+2	-29	+2	-5	+6	-3.1	-8.6	+2.4	0
CARIS	-5	-1	-5	-3	-7	+3	-33	0	-3	0	-5.4	-10.6	-0.2	0
ELETT	+6	-3	-	-	+21	-3	+1	-7	+5	+2	+2.8	+8.3	-2.8	0
PRAIS	-9	-7	-7	-2	-11	-5	-39	-8	-11	0	-9.9	-15.4	-4.4	3
ORITT	-5	-4	-5	-1	-5	-4	-1	-6	-6	+4	-3.3	-4.4	-2.2	2
ORICO	-7	-5	-8	-6	-4	-2	-25	-1	-3	+3	-5.8	-9.4	-2.2	1
ORIIN	-3	-2	-2	+2	-5	-4	+1	-6	-11	+10	-2.0	-4.0	0.0	2
TORTT	-9	-7	-7	-1	-16	-4	-8	-7	-13	0	-7.2	-10.6	-3.8	4
CLIMA	n.a.	n.a.	n.a.	n.a.	n.a.	-3	-5	-4	-12	+5	-3.8	-8.5	-0.7	2
ANEIS	-6	-8	-7	0	-18	-4	-38	-11	-9	+4	-9.7	-15.6	-3.8	3
SCPIS	-7	-4	-9	-2	-12	-6	-4	0	-10	+8	-4.6	-8.4	-0.8	2
PRENA	-6	-5	-10	0	-9	+1	-11	-1	-8	+2	-4.7	-8.8	-0.6	3
PRE24	-2	-5	-12	-1	-13	-11	-39	-41	-5	-3	-13.2	-14.2	-12.2	3
PREAT	-2	-4	-11	-4	-12	-2	-38	+2	-5	+5	-7.1	-13.6	-0.6	2
DEPRE	-	-	-12	-12	-9	-14	-	-	-18	-4	-11.5	-13.0	-10.0	0
TAIMP	-10	-5	-13	-8	-10	-17	-4	-8	-13	-7	-9.5	-10.0	-9.0	1
SPRE2	-11	-4	-13	-15	-9	+1	-25	-17	-8	+6	-9.5	-13.2	-5.8	4
IMPTB	-1	-5	-	-	-5	0	+1	-2	-3	0	-1.9	-2.0	-1.8	0
IMPSL	+2	-5	-11	-3	-4	-6	+3	0	-3	0	-2.7	-2.6	-2.8	1
PROGE	-6	-1	-	-	-1	-4	-14	-1	-10	-7	-5.5	-7.8	-3.3	1
PILUS	-3	-4	-	-	-5	-5	-	-	-	-	-4.3	-4.0	-4.5	2
CLEAD	-6	-5	-3	-6	-7	-7	0	-6	-9	-1	-5.0	-5.0	-5.0	1

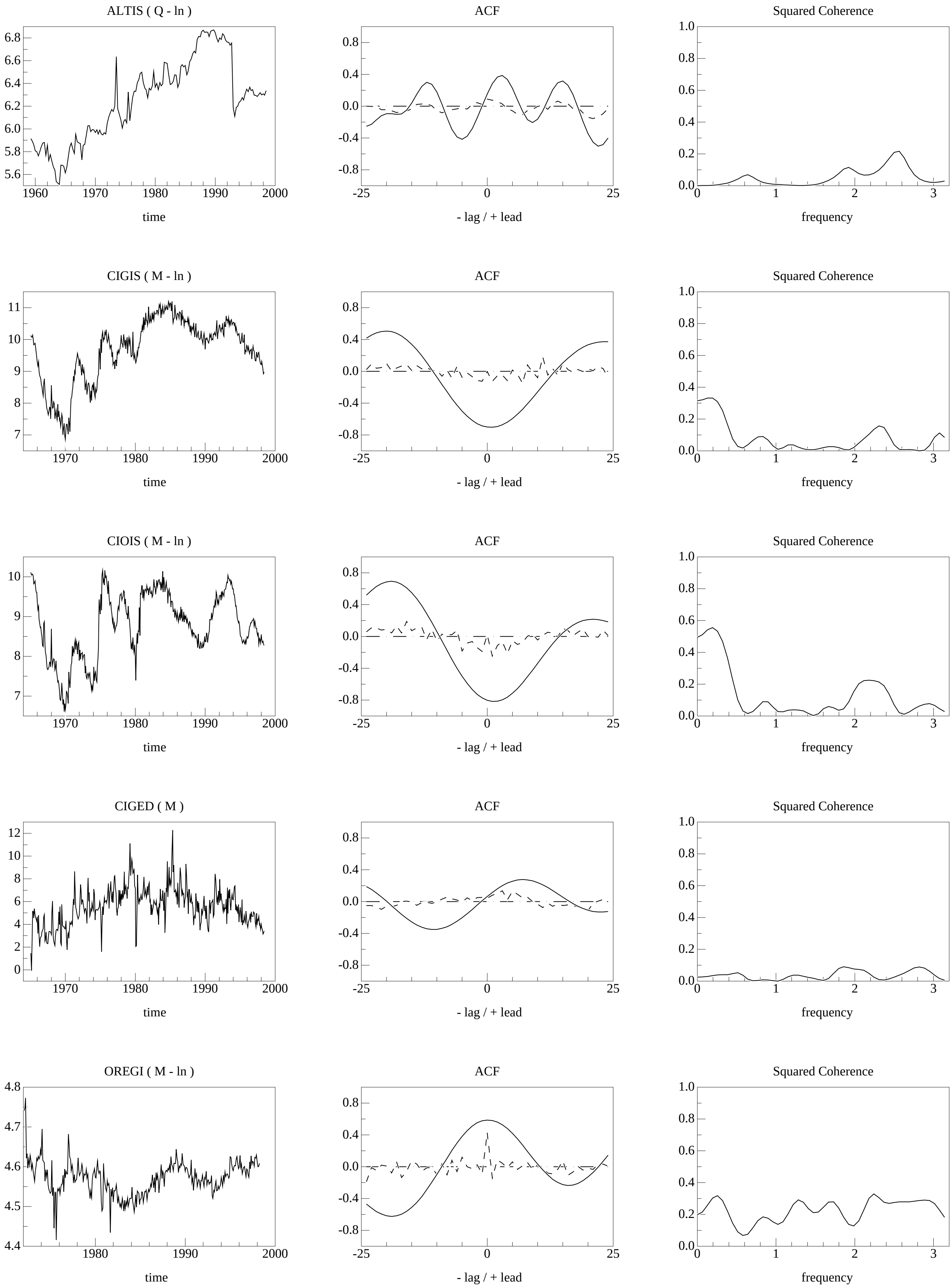
Legend: CLEAD = Composite leading indicator, based on the following nine series: CIOIS, PRAIS, ORICO, CLIMA, SCPIS, DEPRE, SPRE2, IMPTB and PROGE.

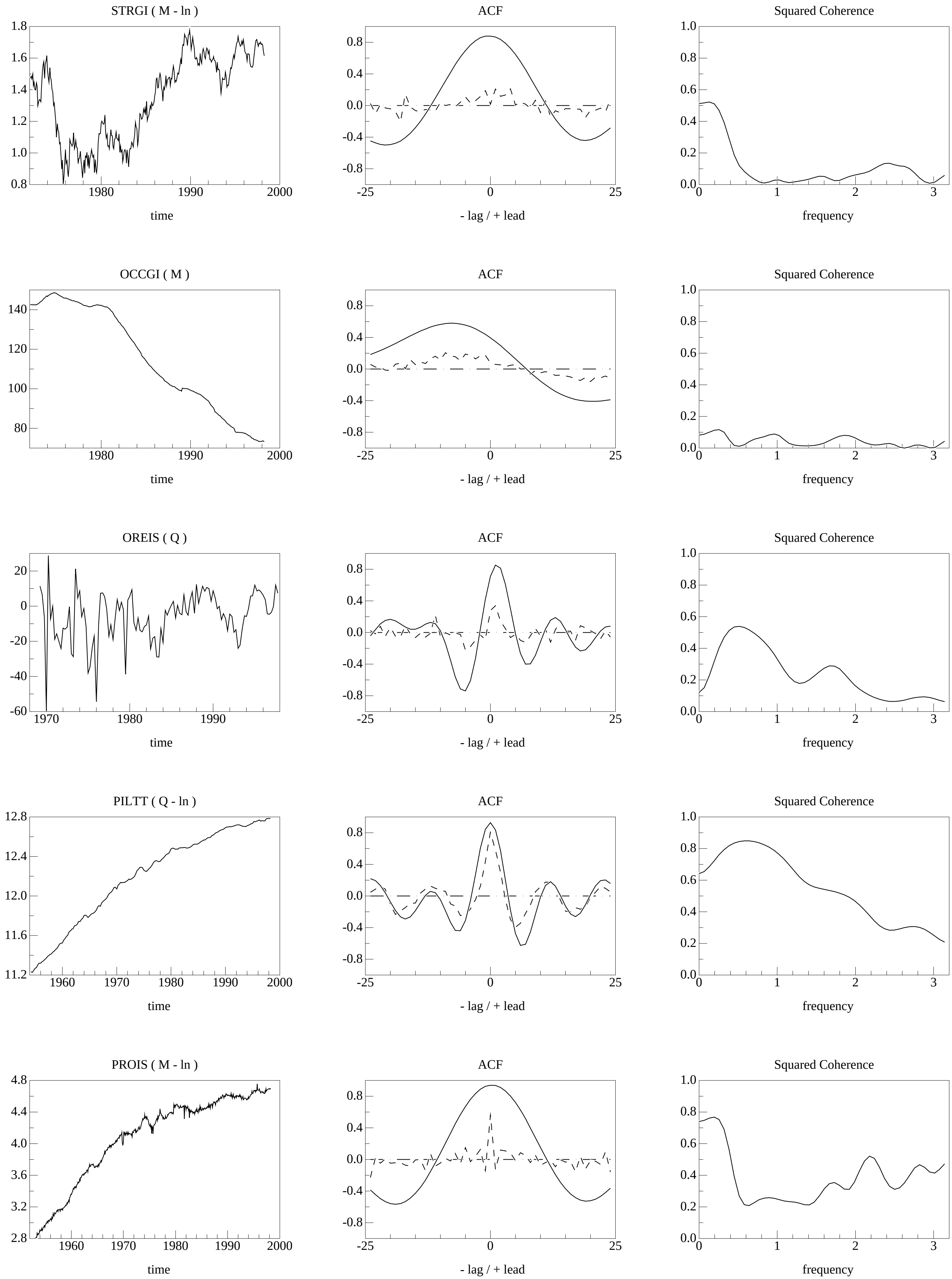
Note: The - (+) sign corresponds to a lead (lag) with respect to the composite coincident indicator.

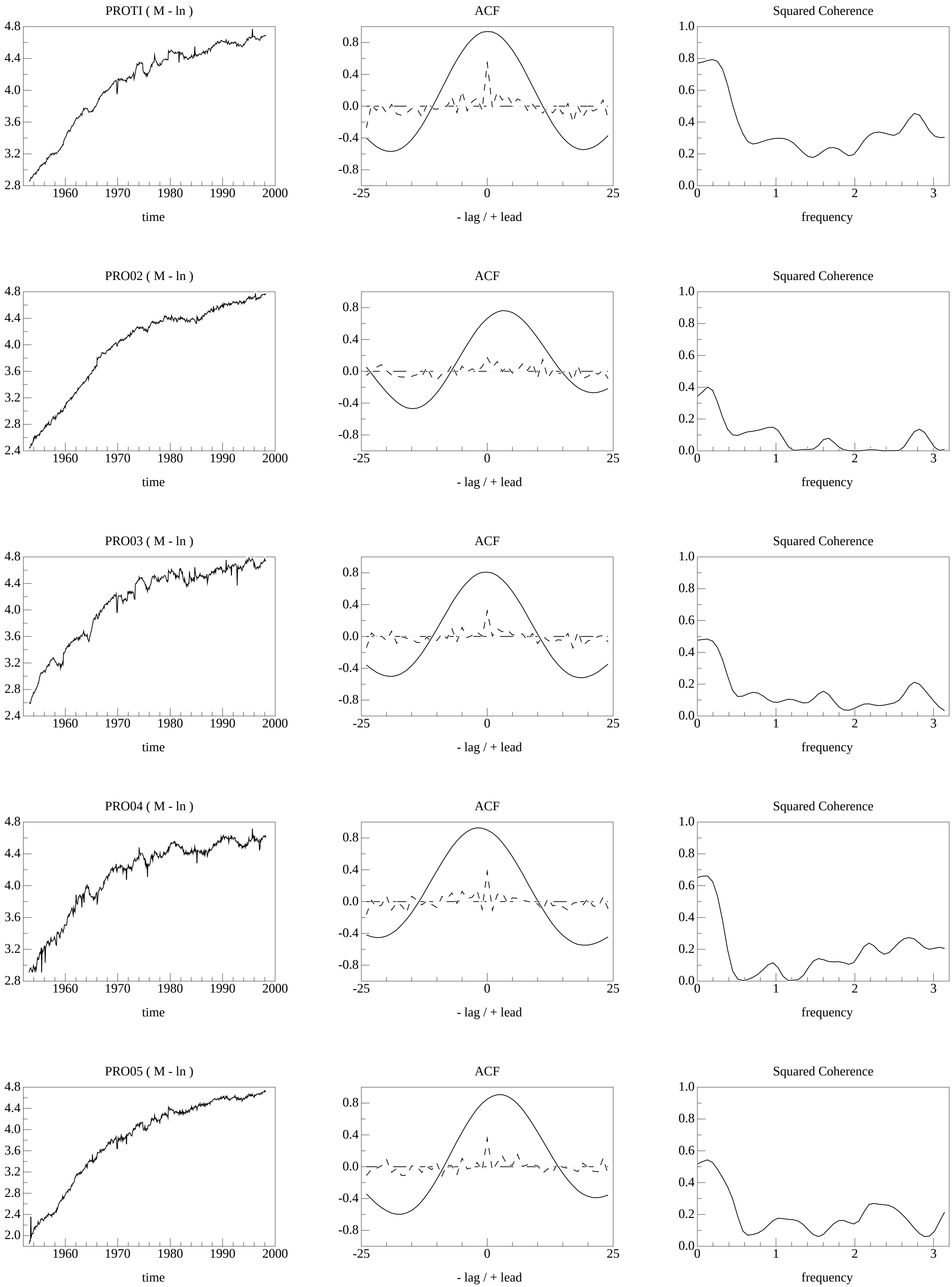

OCCTT (Q)
ACF
Squared Coherence
PERTT (Q - ln)
ACF
Squared Coherence
FORTT (Q)
ACF
Squared Coherence
TAPTT (Q - ln)
ACF
Squared Coherence
ULATI (Q - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency

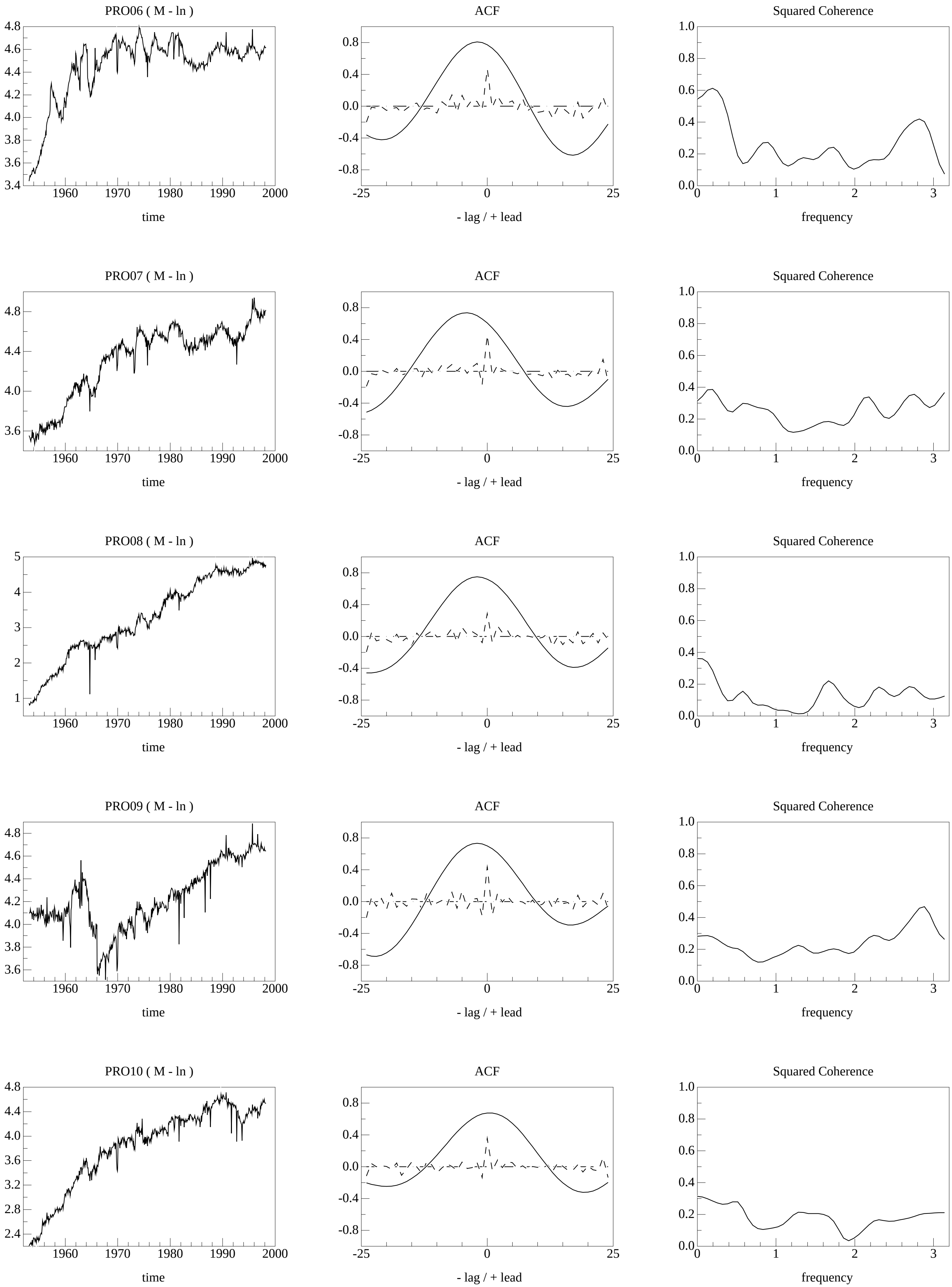

ULAEN (Q)
ACF
Squared Coherence
time
- lag / + lead
frequency
ULAPA (Q)
ACF
Squared Coherence
time
- lag / + lead
frequency
OCCAG (Q - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency
OCCED (Q)
ACF
Squared Coherence
time
- lag / + lead
frequency
OCCEN (Q - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency

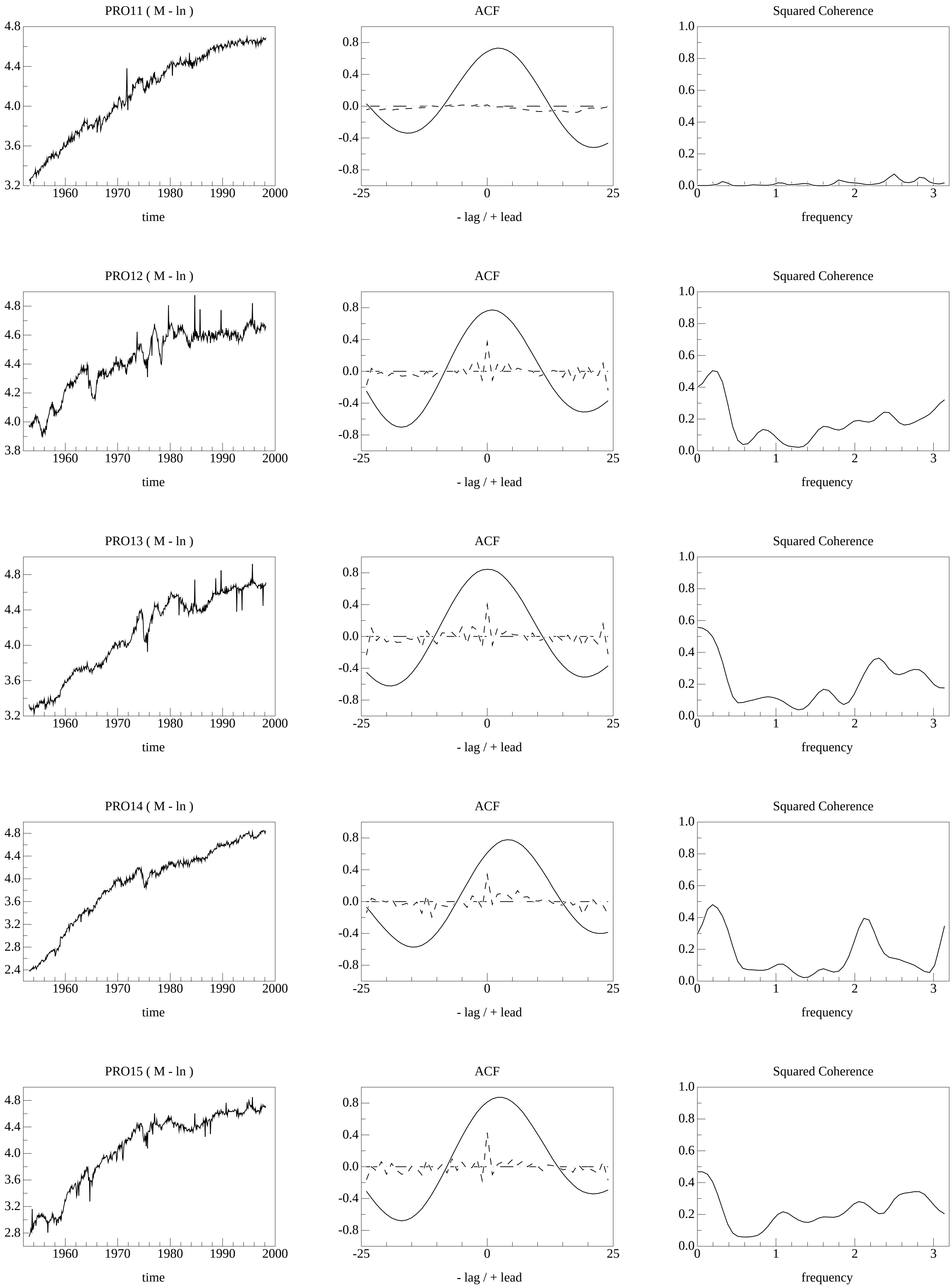

OCCTI (Q - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency
OCCSD (Q - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency
OCCPA (Q - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency
INCIS (Q - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency
DISIS (Q - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency

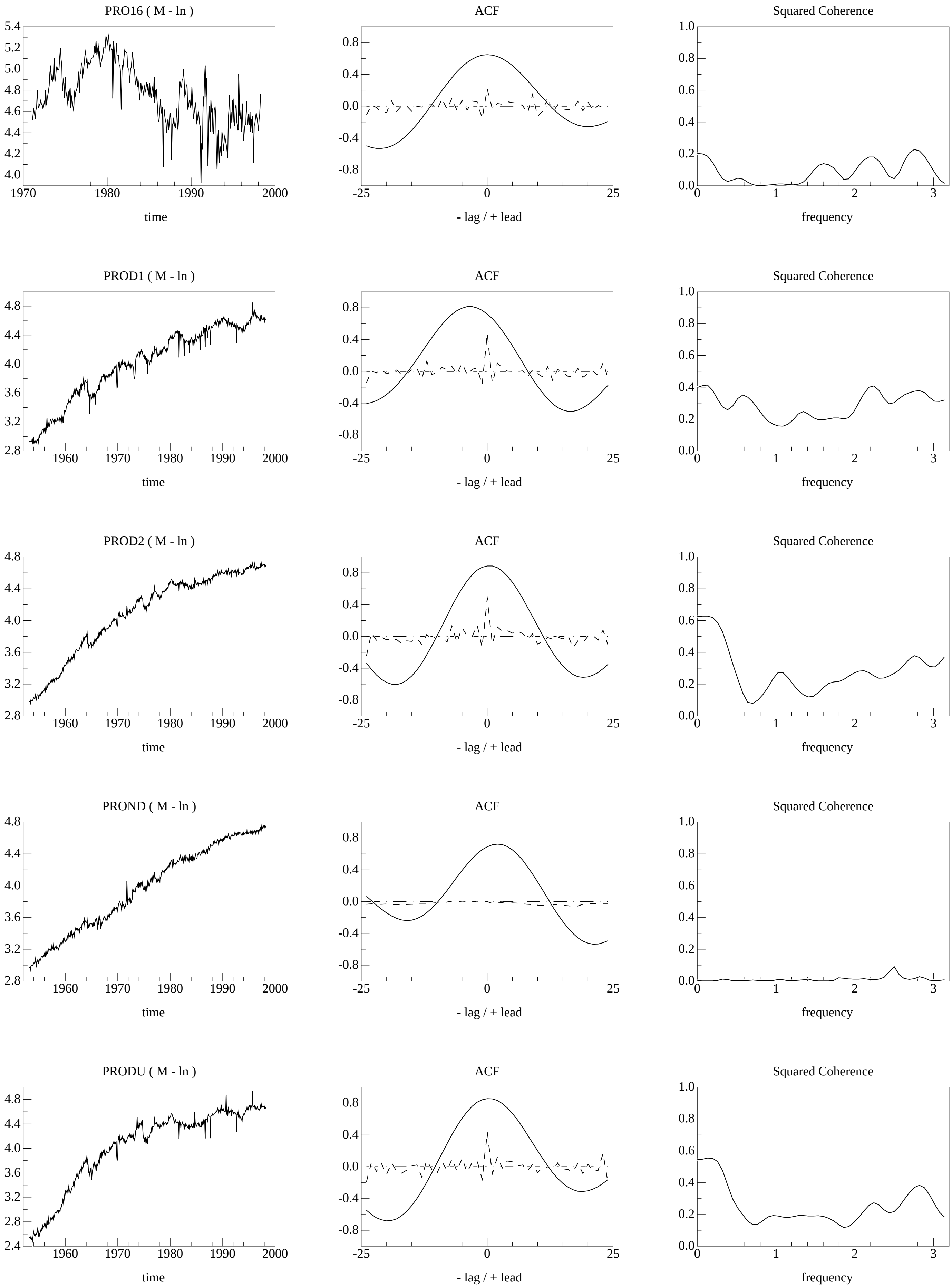

ALTIS (Q - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency
CIGIS (M - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency
CIOIS (M - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency
CIGED (M)
ACF
Squared Coherence
time
- lag / + lead
frequency
OREGI (M - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency

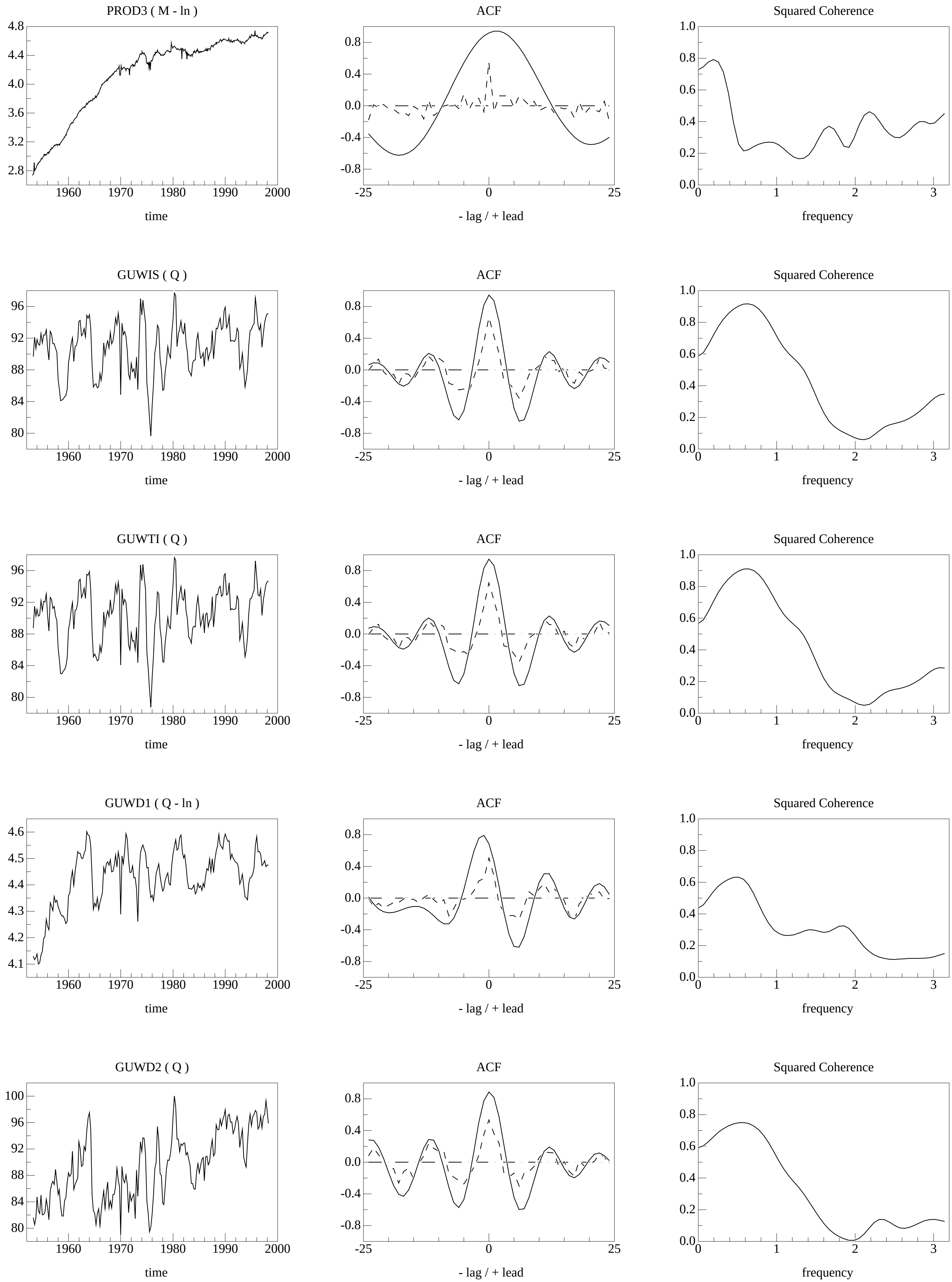

STRGI (M - ln)
time
ACF
- lag / + lead
Squared Coherence
frequency
OCCGI (M)
time
ACF
- lag / + lead
Squared Coherence
frequency
OREIS (Q)
time
ACF
- lag / + lead
Squared Coherence
frequency
PILTT (Q - ln)
time
ACF
- lag / + lead
Squared Coherence
frequency
PROIS (M - ln)
time
ACF
- lag / + lead
Squared Coherence
frequency

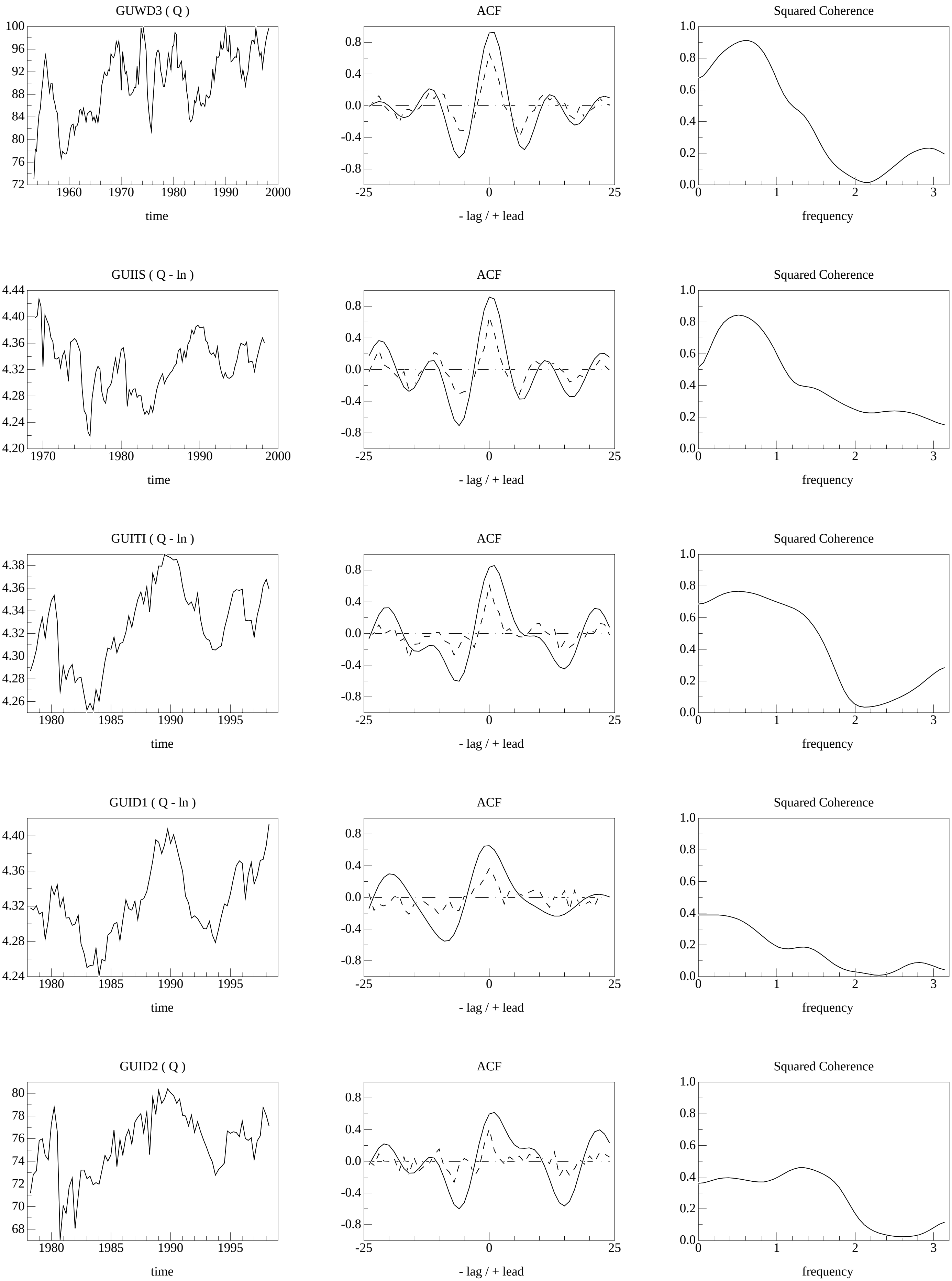

PROTI (M - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency
PRO02 (M - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency
PRO03 (M - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency
PRO04 (M - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency
PRO05 (M - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency

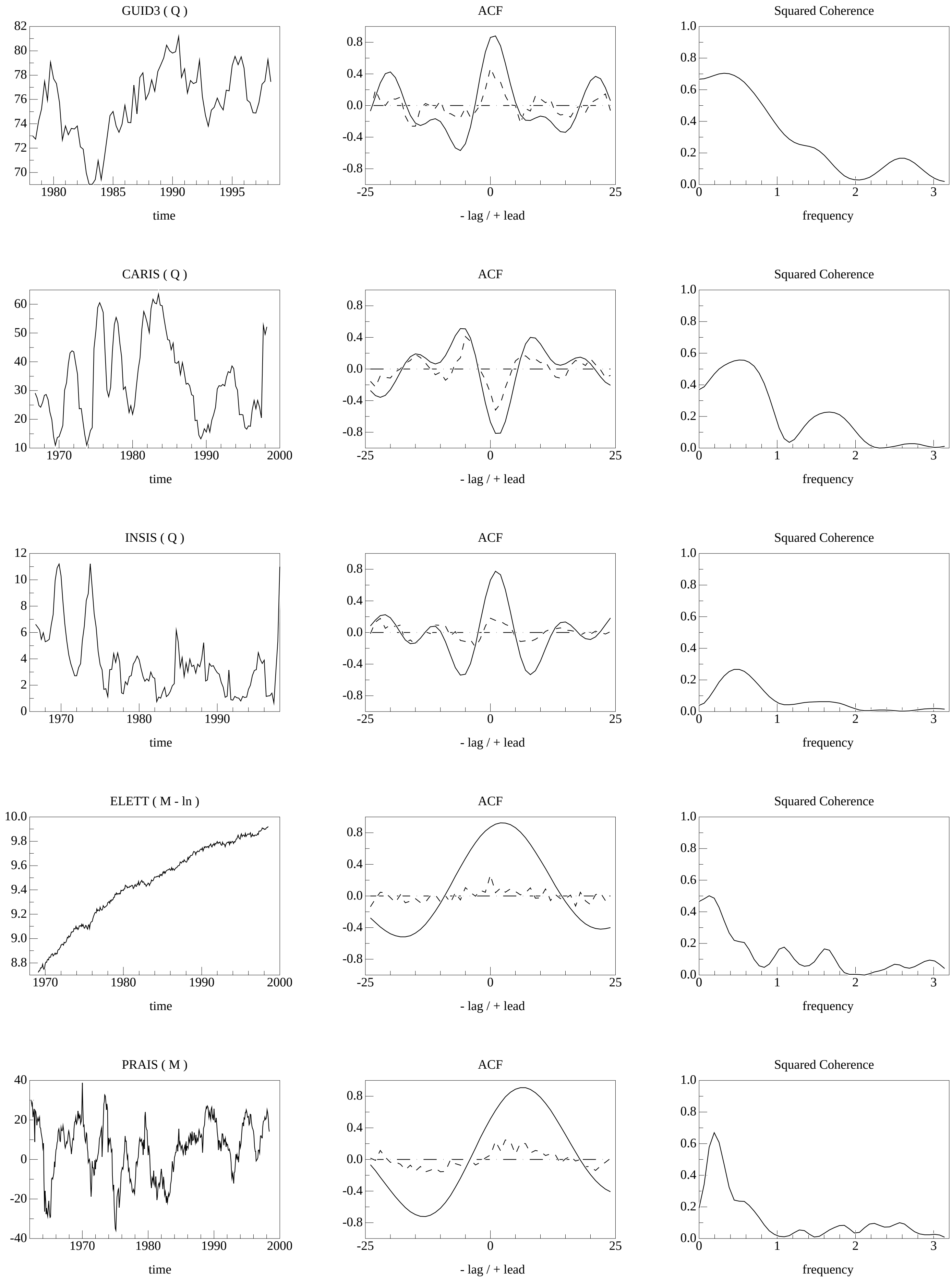

PRO06 (M - ln)
time
ACF
- lag / + lead
Squared Coherence
frequency
PRO07 (M - ln)
time
ACF
- lag / + lead
Squared Coherence
frequency
PRO08 (M - ln)
time
ACF
- lag / + lead
Squared Coherence
frequency
PRO09 (M - ln)
time
ACF
- lag / + lead
Squared Coherence
frequency
PRO10 (M - ln)
time
ACF
- lag / + lead
Squared Coherence
frequency

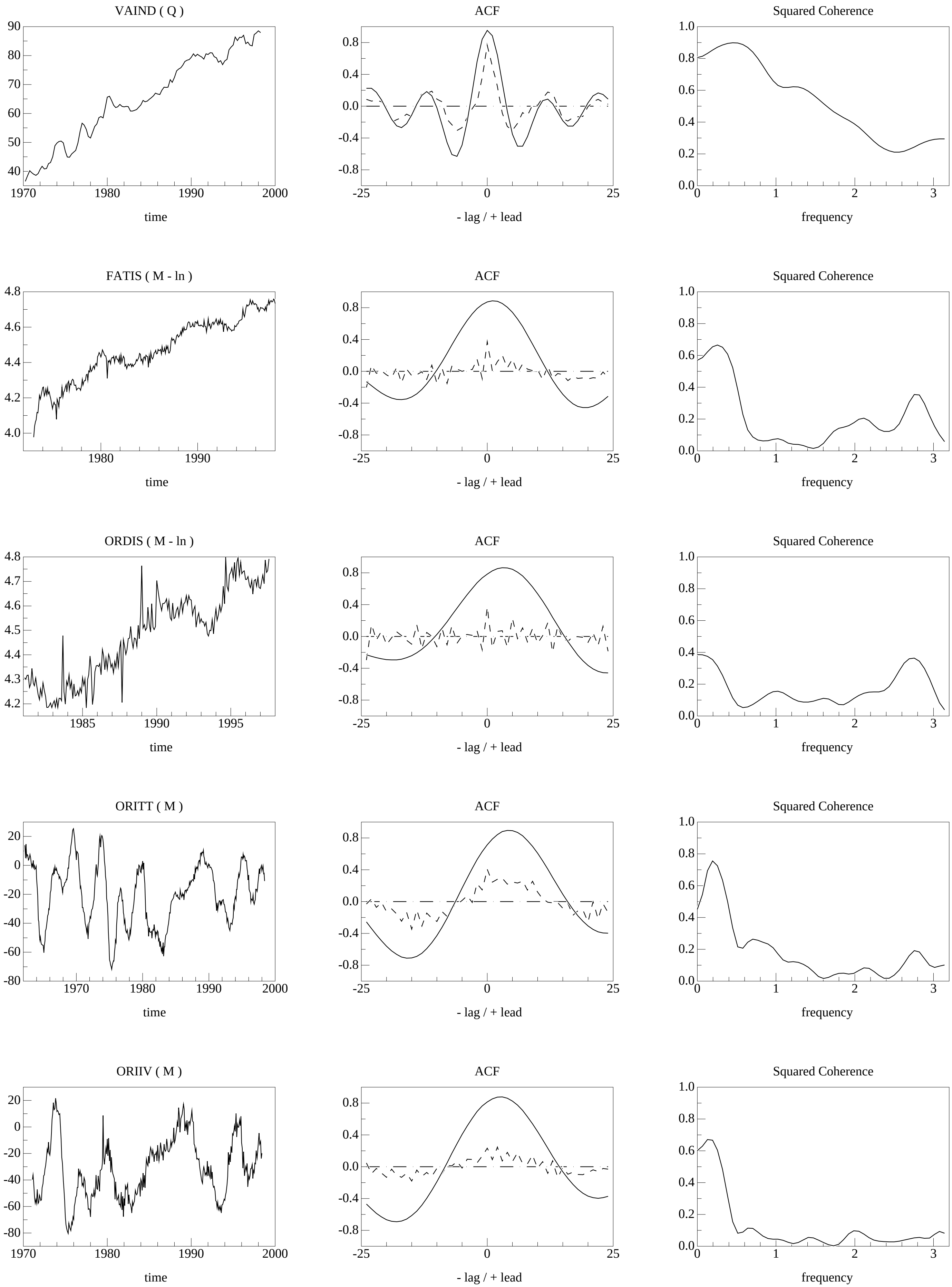

PRO11 (M - ln)
ACF
Squared Coherence
PRO12 (M - ln)
ACF
Squared Coherence
PRO13 (M - ln)
ACF
Squared Coherence
PRO14 (M - ln)
ACF
Squared Coherence
PRO15 (M - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency

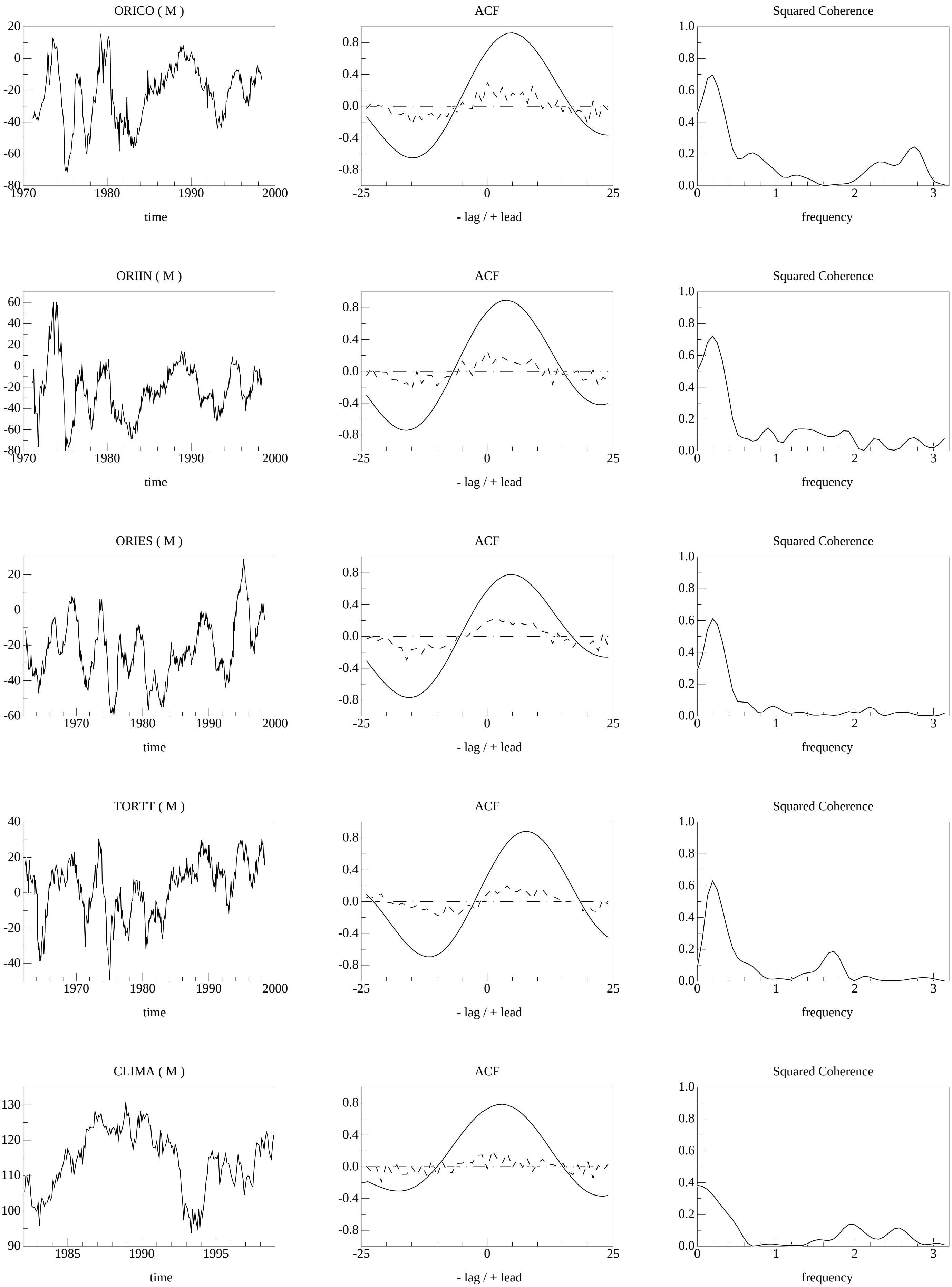

PRO16 (M - ln)
time
ACF
- lag / + lead
Squared Coherence
frequency
PROD1 (M - ln)
time
ACF
- lag / + lead
Squared Coherence
frequency
PROD2 (M - ln)
time
ACF
- lag / + lead
Squared Coherence
frequency
PROND (M - ln)
time
ACF
- lag / + lead
Squared Coherence
frequency
PRODU (M - ln)
time
ACF
- lag / + lead
Squared Coherence
frequency


PROD3 (M - ln)
ACF
Squared Coherence
GUWIS (Q)
ACF
Squared Coherence
GUWTI (Q)
ACF
Squared Coherence
GUWD1 (Q - ln)
ACF
Squared Coherence
GUWD2 (Q)
ACF
Squared Coherence
time
- lag / + lead
frequency

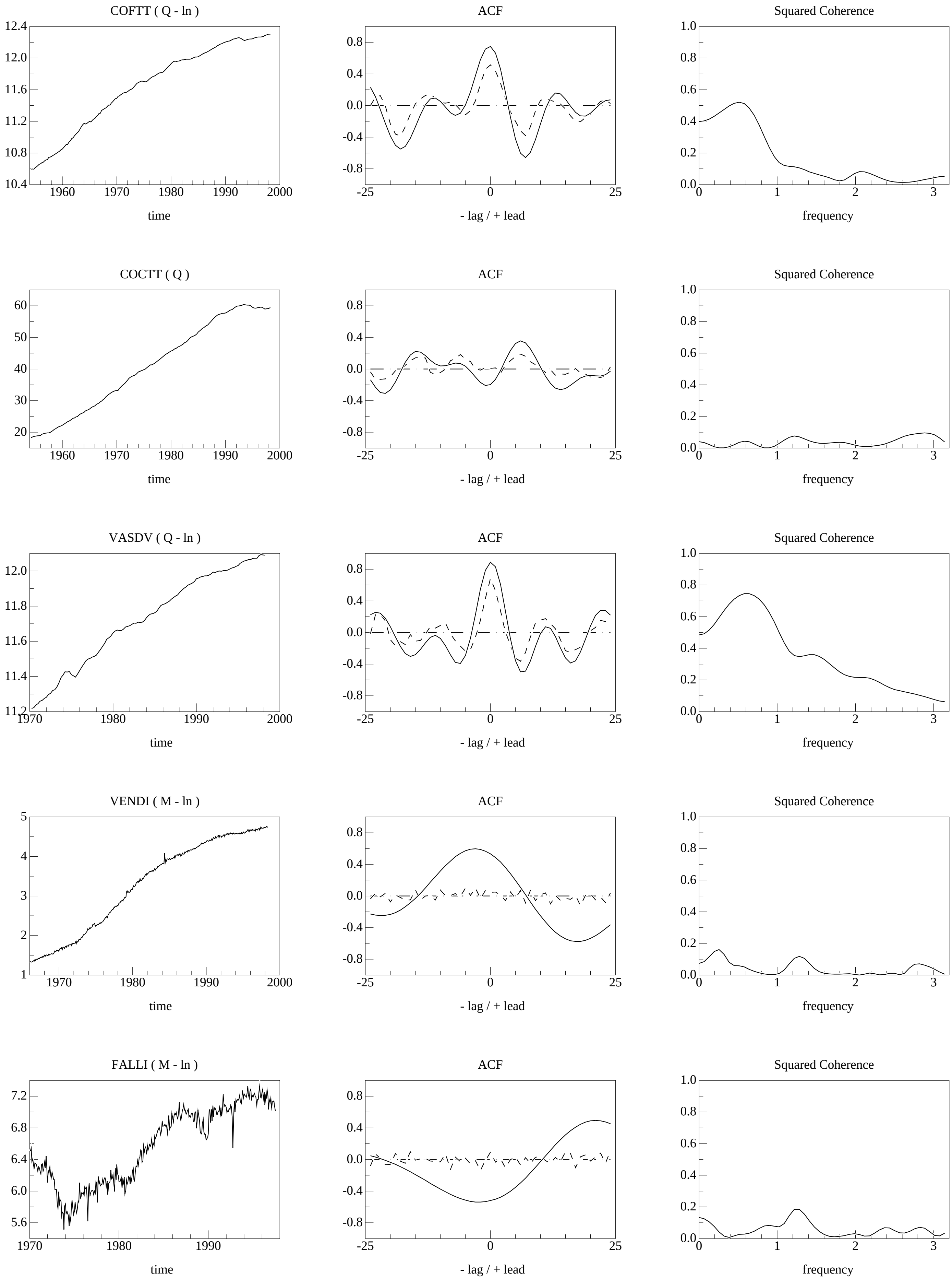

GUWD3 (Q)
time
ACF
- lag / + lead
Squared Coherence
frequency
GUIIS (Q - ln)
time
ACF
- lag / + lead
Squared Coherence
frequency
GUITI (Q - ln)
time
ACF
- lag / + lead
Squared Coherence
frequency
GUID1 (Q - ln)
time
ACF
- lag / + lead
Squared Coherence
frequency
GUID2 (Q)
time
ACF
- lag / + lead
Squared Coherence
frequency


GUID3 (Q)
ACF
Squared Coherence
time
- lag / + lead
frequency
CARIS (Q)
ACF
Squared Coherence
time
- lag / + lead
frequency
INSIS (Q)
ACF
Squared Coherence
time
- lag / + lead
frequency
ELETT (M - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency
PRAIS (M)
ACF
Squared Coherence
time
- lag / + lead
frequency

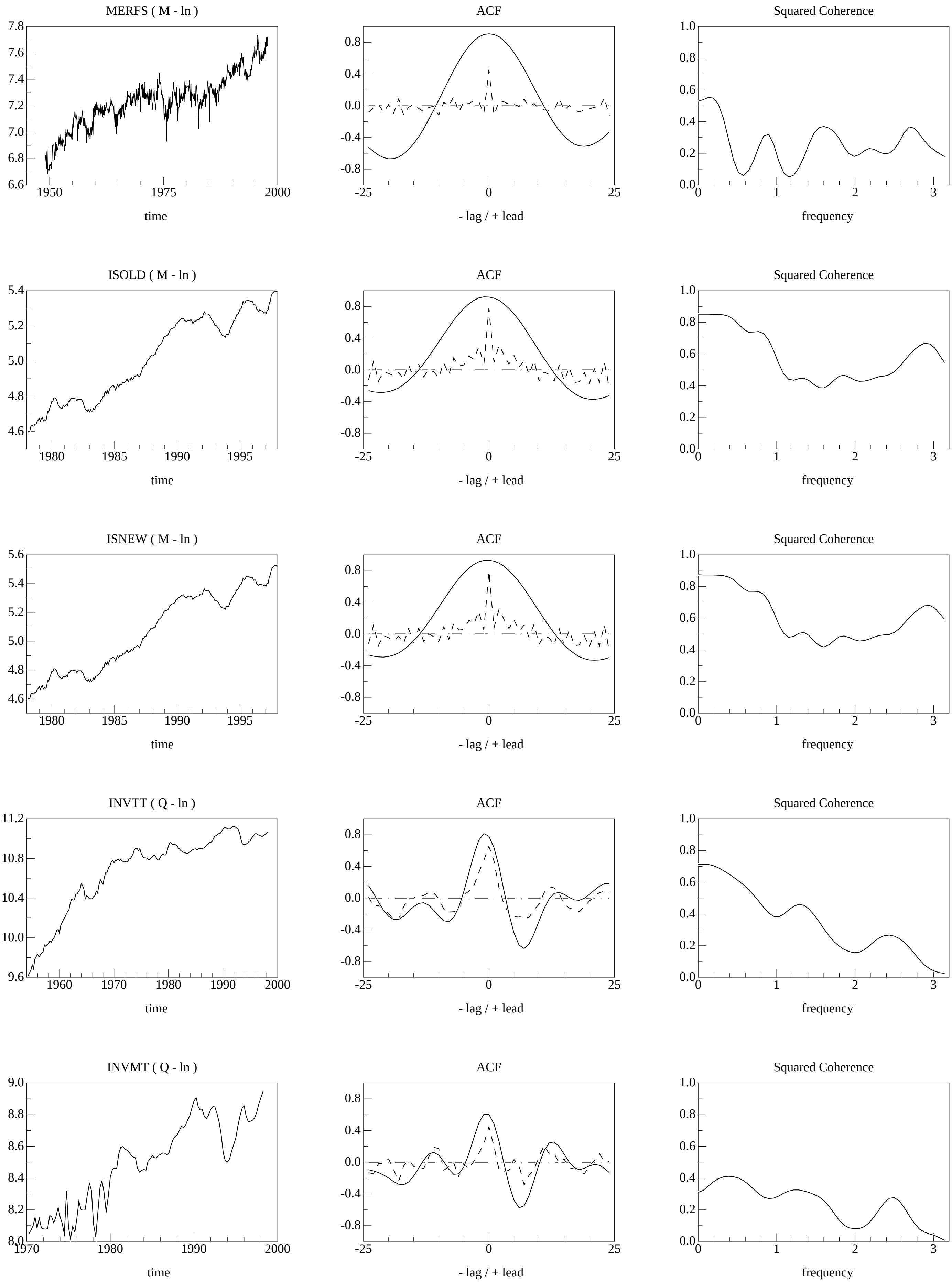

VAIND (Q)
ACF
Squared Coherence
time
- lag / + lead
frequency
FATIS (M - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency
ORDIS (M - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency
ORITT (M)
ACF
Squared Coherence
time
- lag / + lead
frequency
ORIIV (M)
ACF
Squared Coherence
time
- lag / + lead
frequency



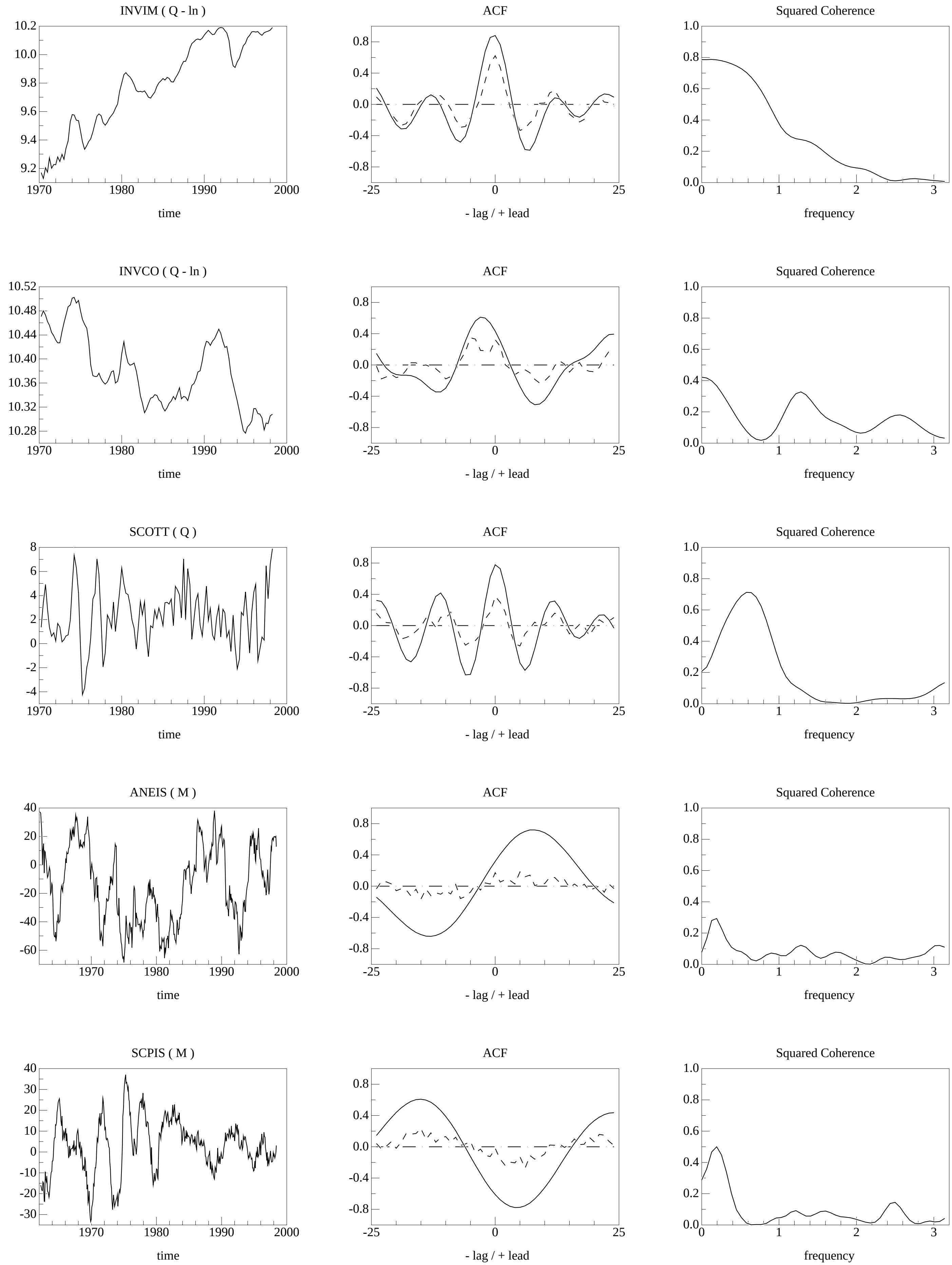
ORICO (M)
time
ACF
- lag / + lead
Squared Coherence
frequency
ORIIN (M)
time
ACF
- lag / + lead
Squared Coherence
frequency
ORIES (M)
time
ACF
- lag / + lead
Squared Coherence
frequency
TORTT (M)
time
ACF
- lag / + lead
Squared Coherence
frequency
CLIMA (M)
time
ACF
- lag / + lead
Squared Coherence
frequency

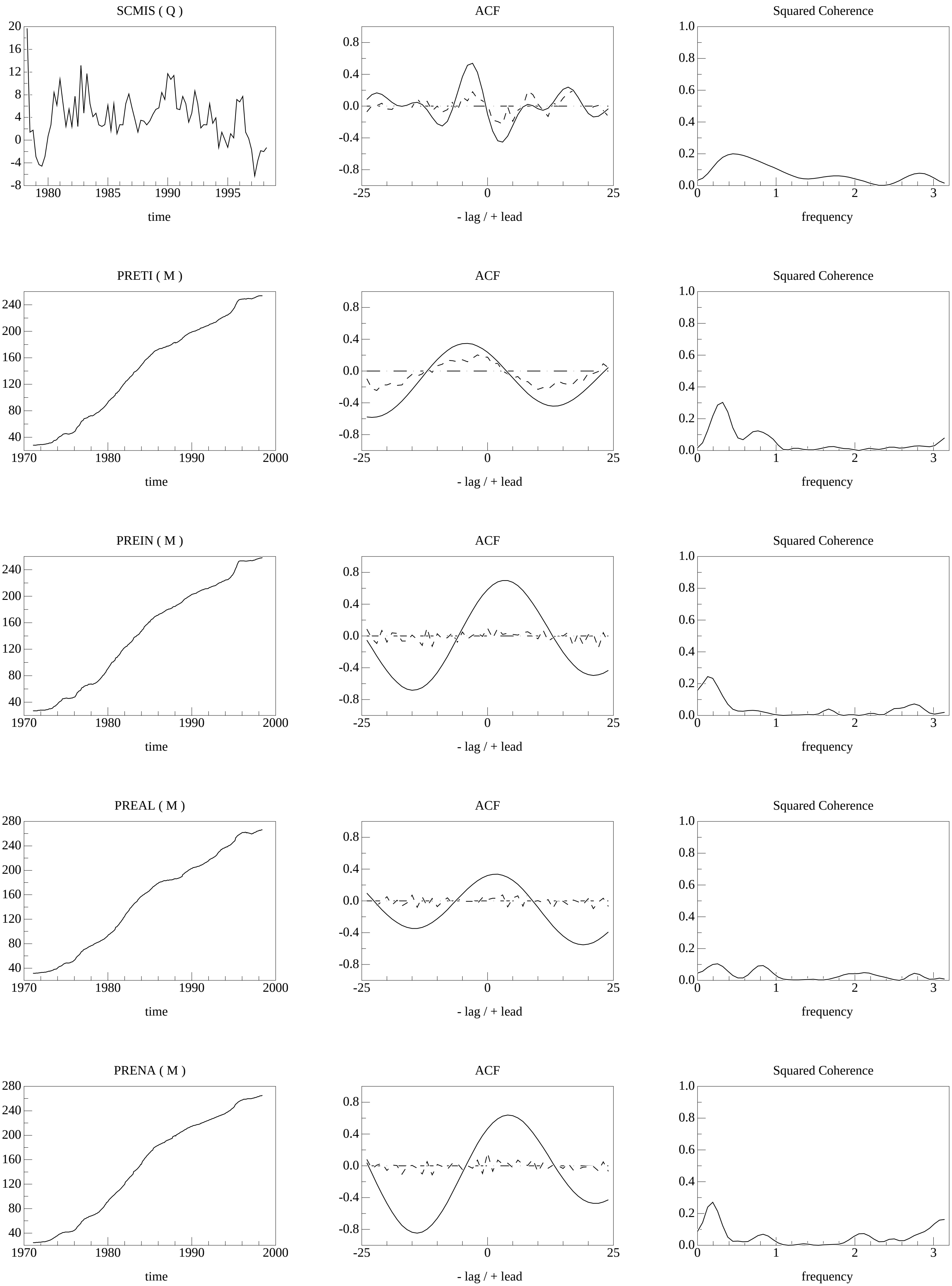


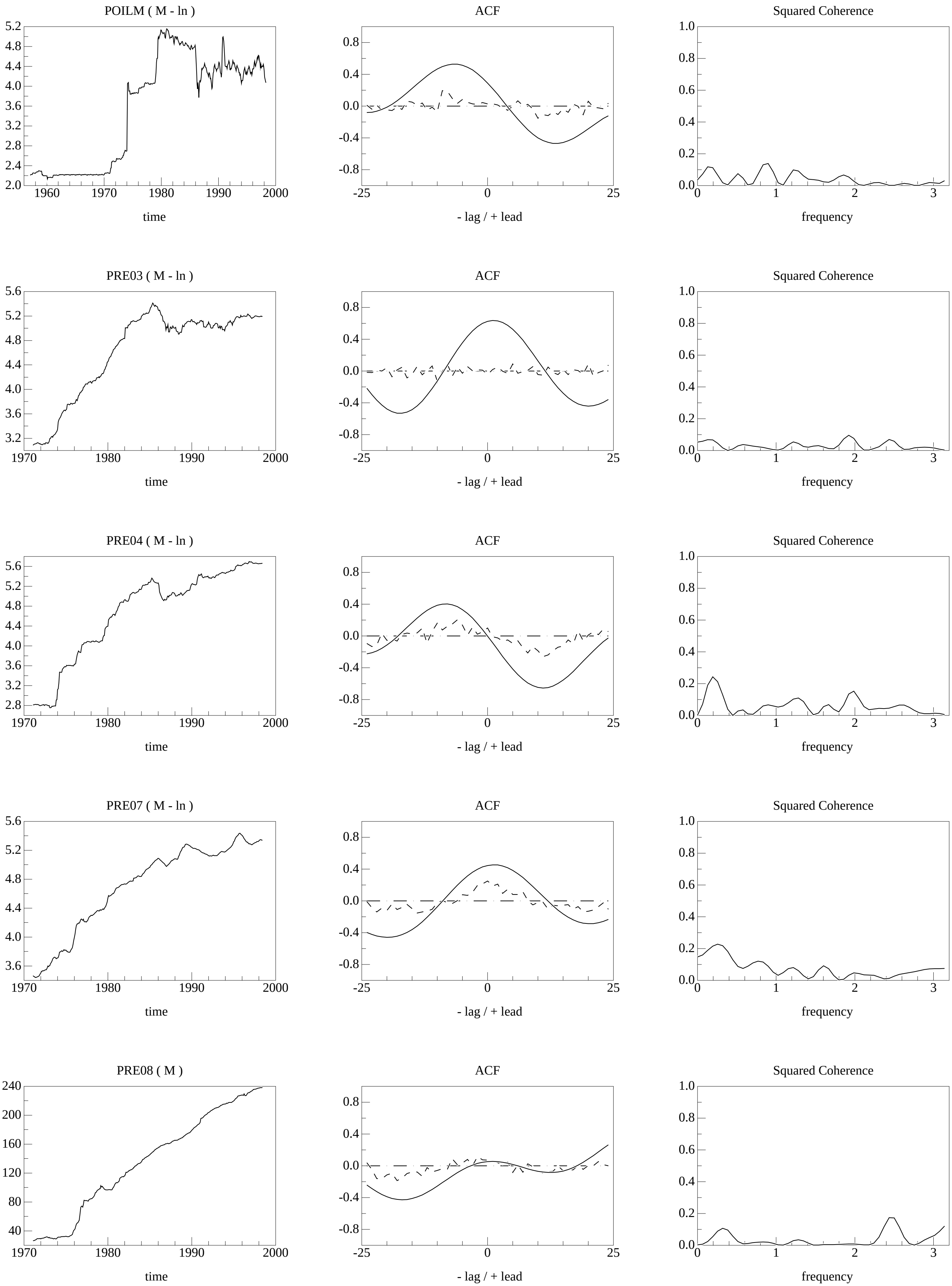
COFTT (Q - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency
COCTT (Q)
ACF
Squared Coherence
time
- lag / + lead
frequency
VASDV (Q - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency
VENDI (M - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency
FALLI (M - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency



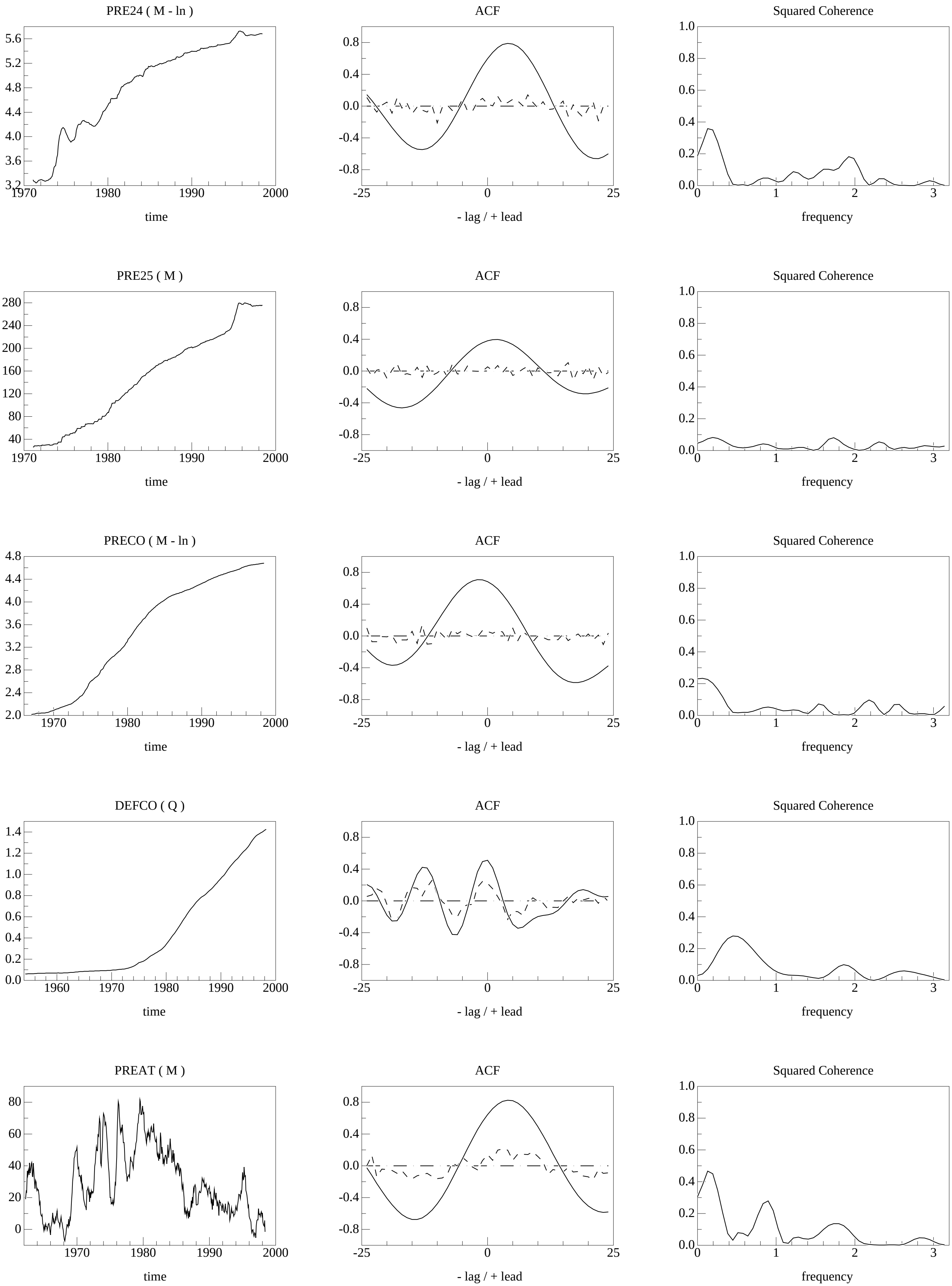
MERFS (M - ln)
time
ACF
- lag / + lead
Squared Coherence
frequency
ISOLD (M - ln)
time
ACF
- lag / + lead
Squared Coherence
frequency
ISNEW (M - ln)
time
ACF
- lag / + lead
Squared Coherence
frequency
INVTT (Q - ln)
time
ACF
- lag / + lead
Squared Coherence
frequency
INVMT (Q - ln)
time
ACF
- lag / + lead
Squared Coherence
frequency

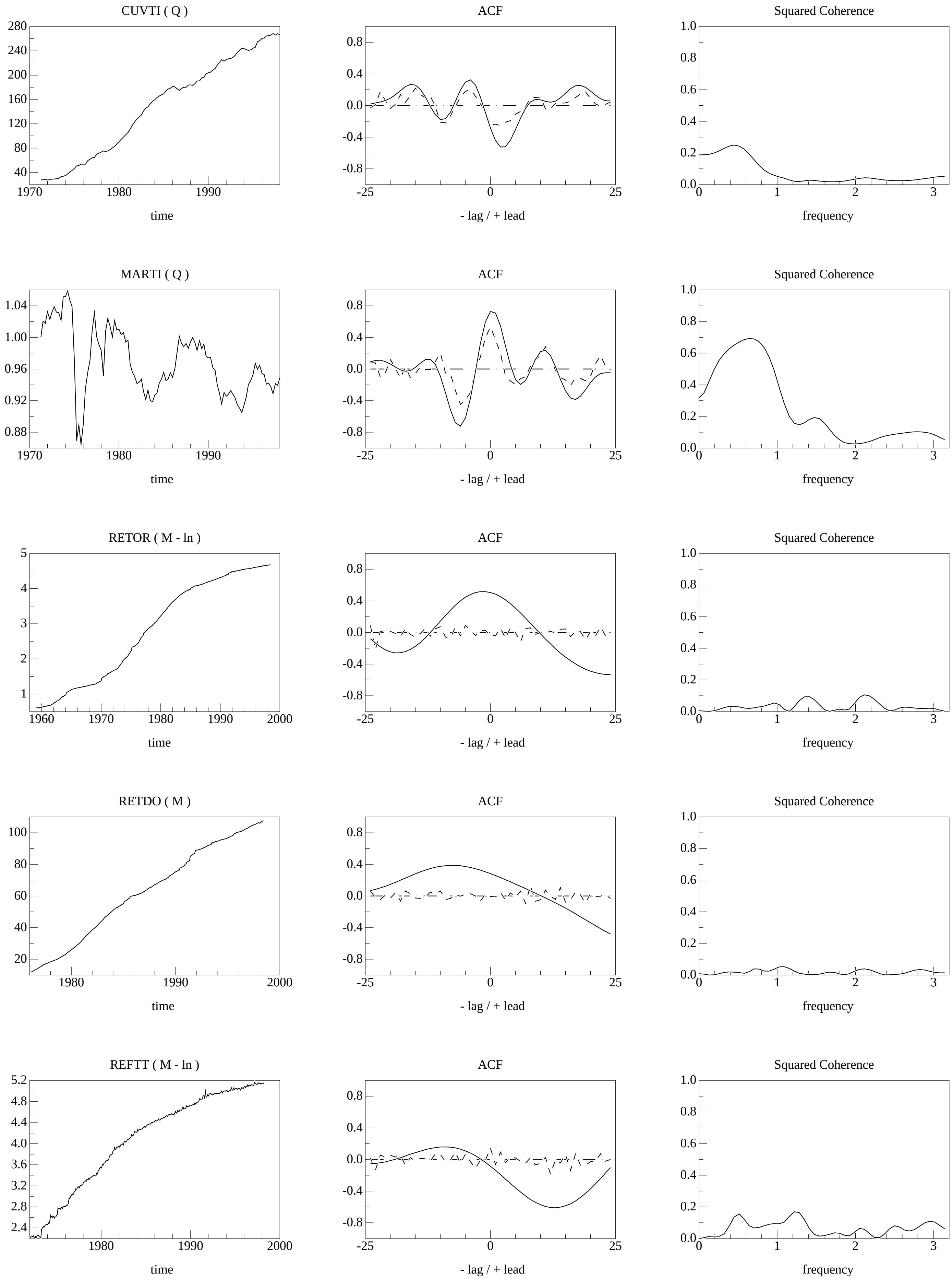

INVIM (Q - ln)
ACF
Squared Coherence
INVCO (Q - ln)
SCOTT (Q)
ANEIS (M)
SCPIS (M)
time
- lag / + lead
frequency

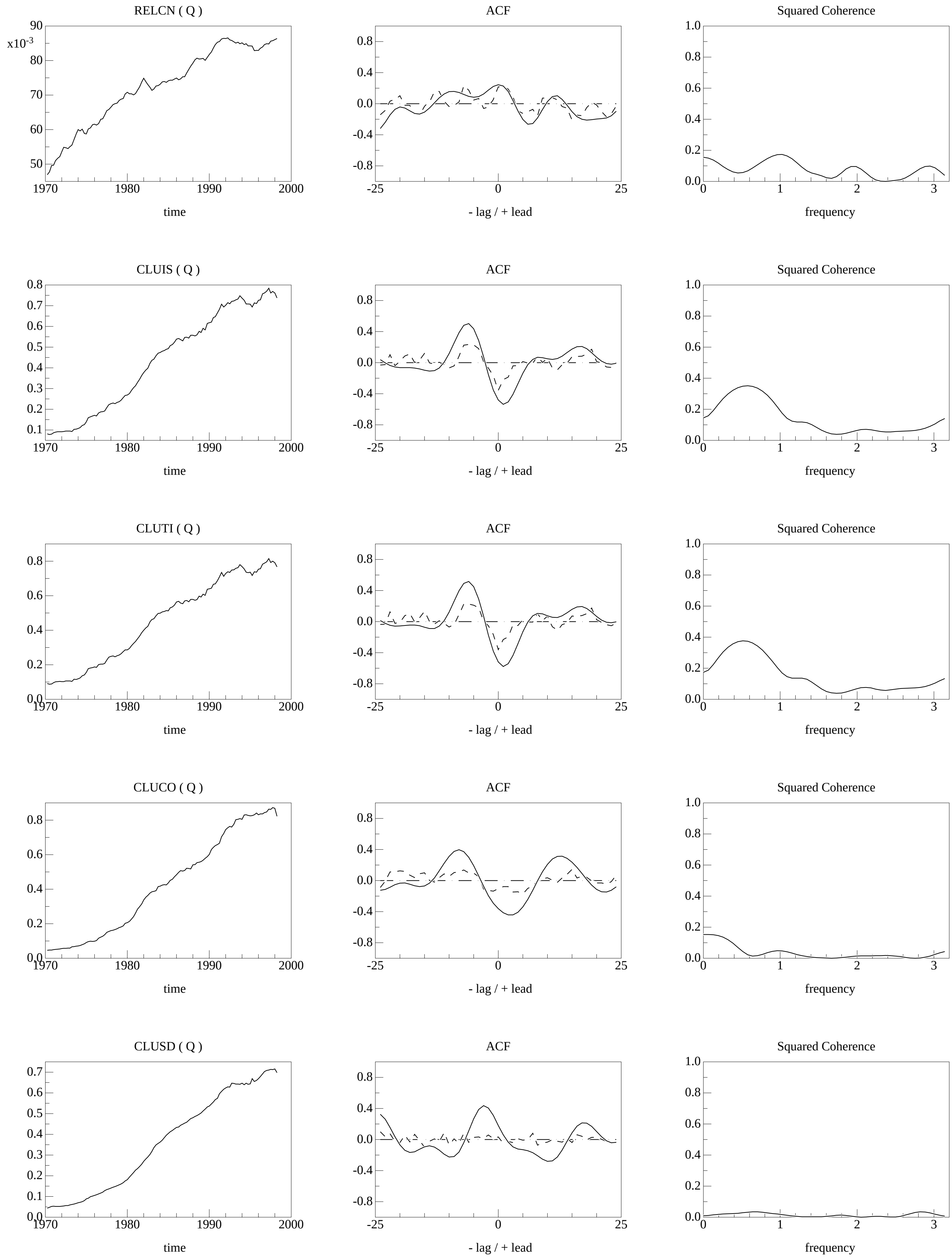

SCMIS (Q)
ACF
Squared Coherence
PRETI (M)
ACF
Squared Coherence
PREIN (M)
ACF
Squared Coherence
PREAL (M)
ACF
Squared Coherence
PRENA (M)
ACF
Squared Coherence
time
- lag / + lead
frequency

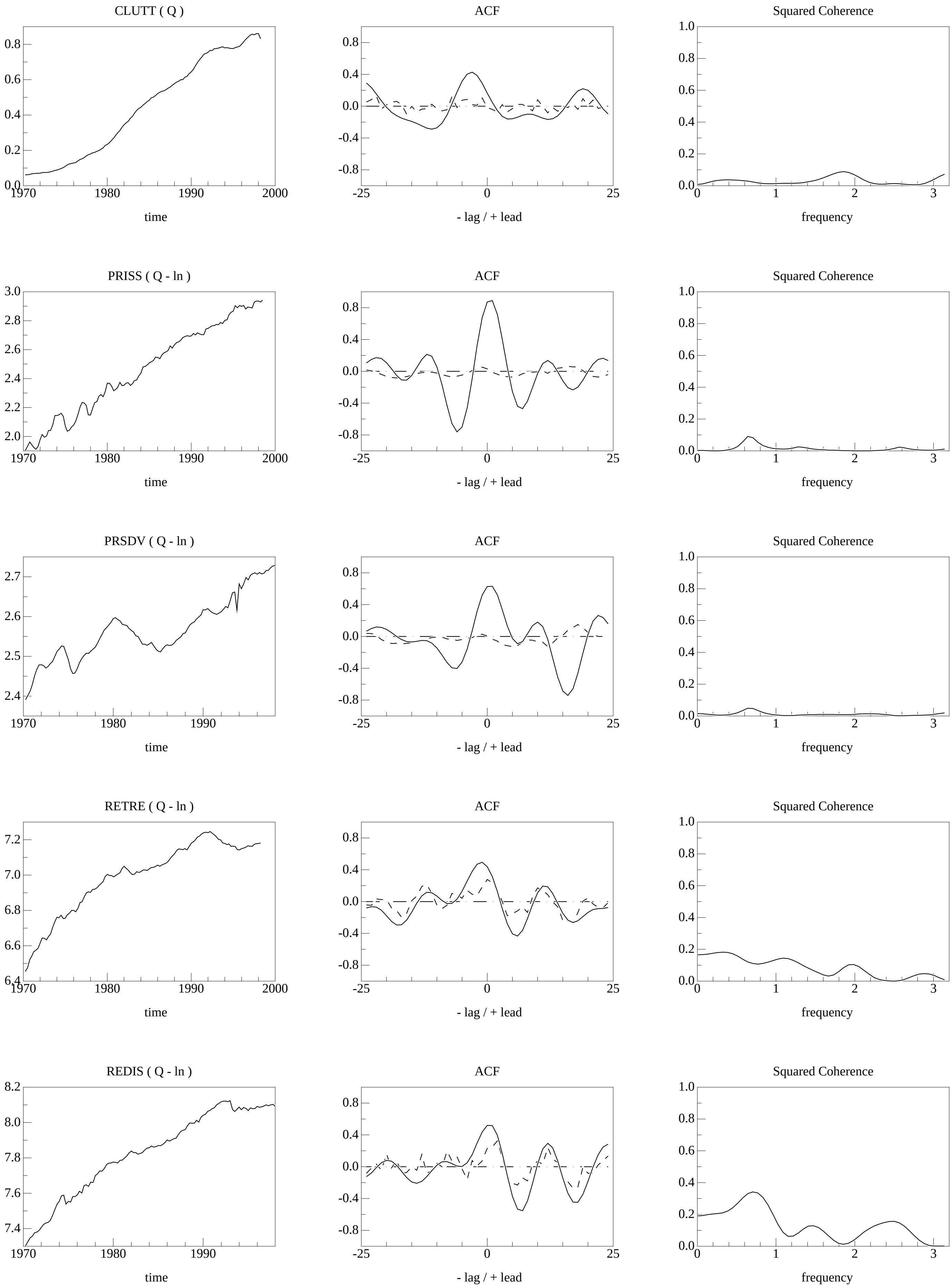


POILM (M - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency
PRE03 (M - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency
PRE04 (M - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency
PRE07 (M - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency
PRE08 (M)
ACF
Squared Coherence
time
- lag / + lead
frequency

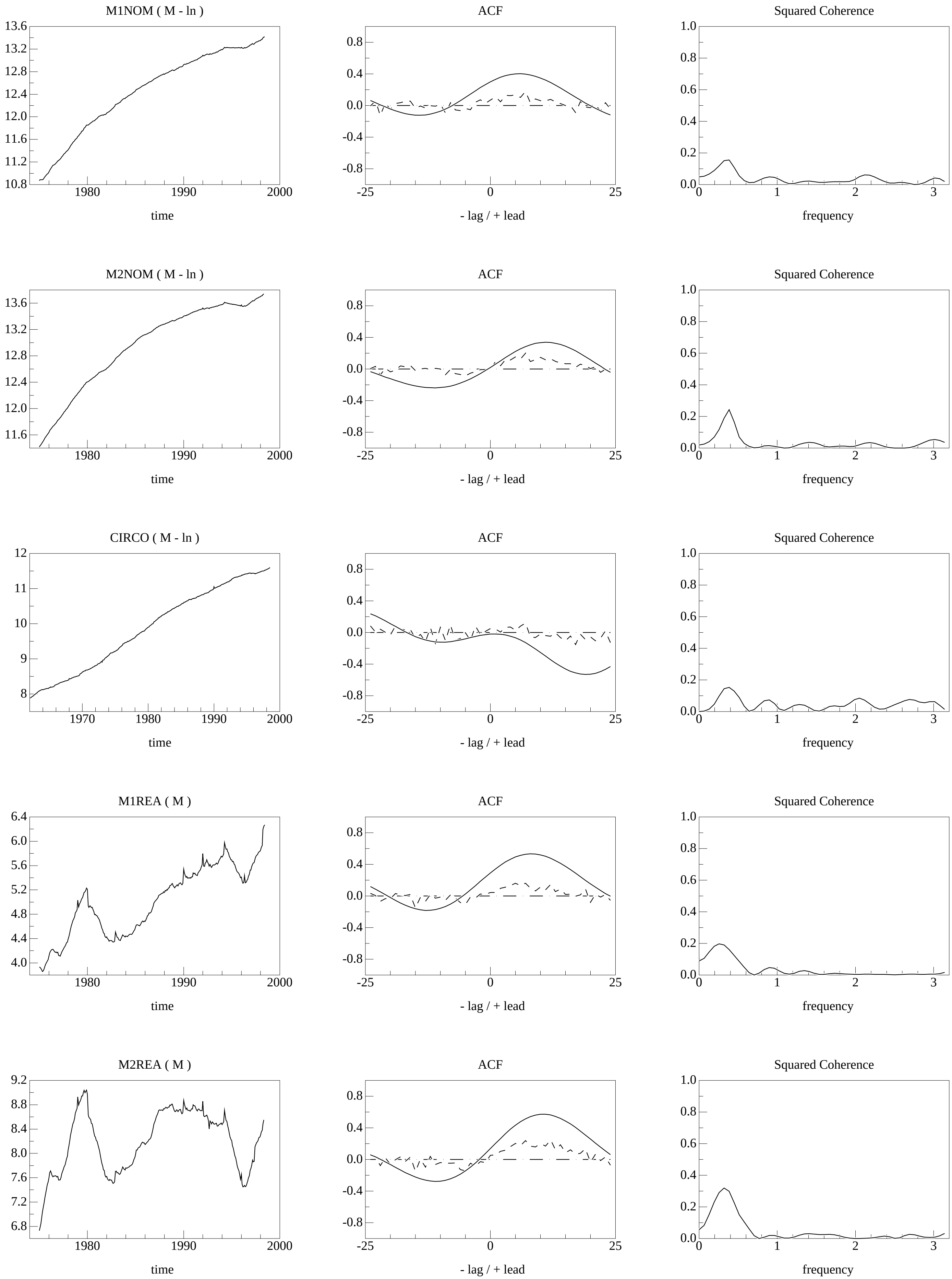

PRE24 (M - ln)
time
ACF
- lag / + lead
Squared Coherence
frequency
PRE25 (M)
time
ACF
- lag / + lead
Squared Coherence
frequency
PRECO (M - ln)
time
ACF
- lag / + lead
Squared Coherence
frequency
DEFCO (Q)
time
ACF
- lag / + lead
Squared Coherence
frequency
PREAT (M)
time
ACF
- lag / + lead
Squared Coherence
frequency


CUVTI (Q)
time
ACF
- lag / + lead
Squared Coherence
frequency
MARTI (Q)
time
ACF
- lag / + lead
Squared Coherence
frequency
RETOR (M - ln)
time
ACF
- lag / + lead
Squared Coherence
frequency
RETDO (M)
time
ACF
- lag / + lead
Squared Coherence
frequency
REFTT (M - ln)
time
ACF
- lag / + lead
Squared Coherence
frequency


RELCN (Q)
x10-3
90
80
70
60
50
1970
1980
1990
2000
time
ACF
0.8
0.4
0.0
-0.4
-0.8
-25
0
25
- lag / + lead
Squared Coherence
1.0
0.8
0.6
0.4
0.2
0.0
0
1
2
3
frequency
CLUIS (Q)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
1970
1980
1990
2000
time
ACF
- lag / + lead
Squared Coherence
frequency
CLUTI (Q)
0.8
0.6
0.4
0.2
0.0
time
ACF
- lag / + lead
Squared Coherence
frequency
CLUCO (Q)
time
ACF
- lag / + lead
Squared Coherence
frequency
CLUSD (Q)
time
ACF
- lag / + lead
Squared Coherence
frequency



CLUTT (Q)
ACF
Squared Coherence
PRISS (Q - ln)
ACF
Squared Coherence
PRSDV (Q - ln)
ACF
Squared Coherence
RETRE (Q - ln)
ACF
Squared Coherence
REDIS (Q - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency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CIRCO (M - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency
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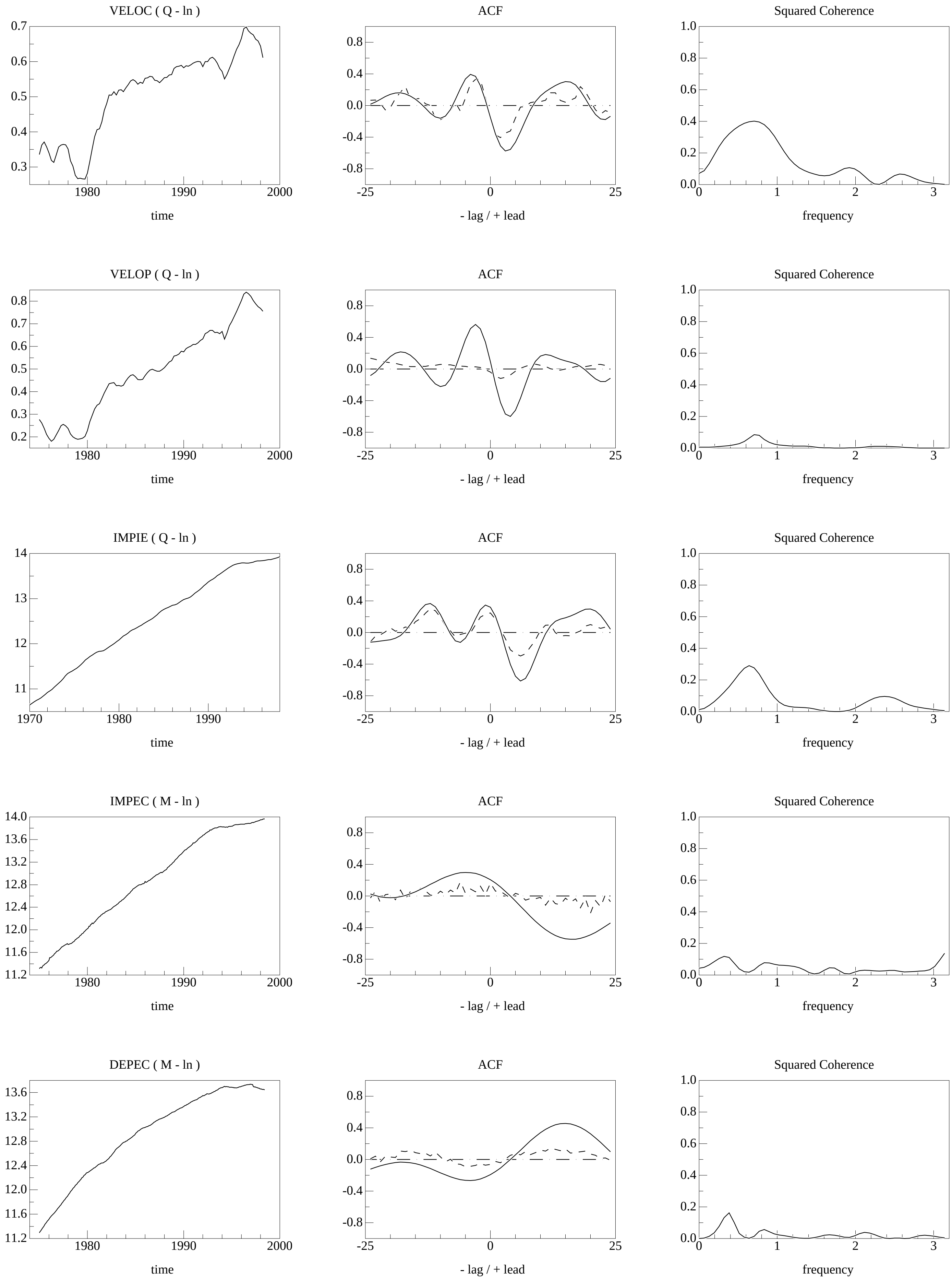
frequency



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frequency
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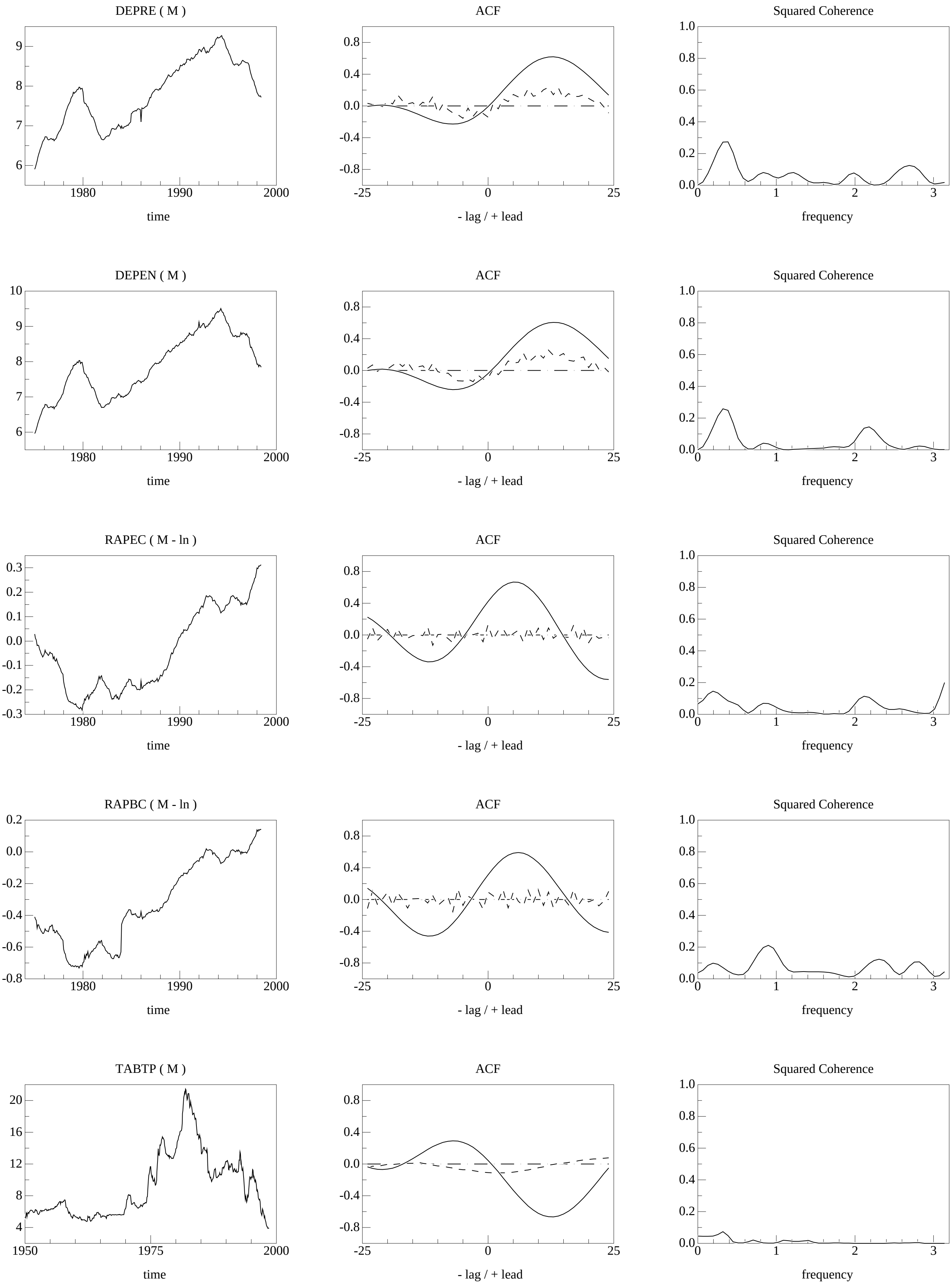
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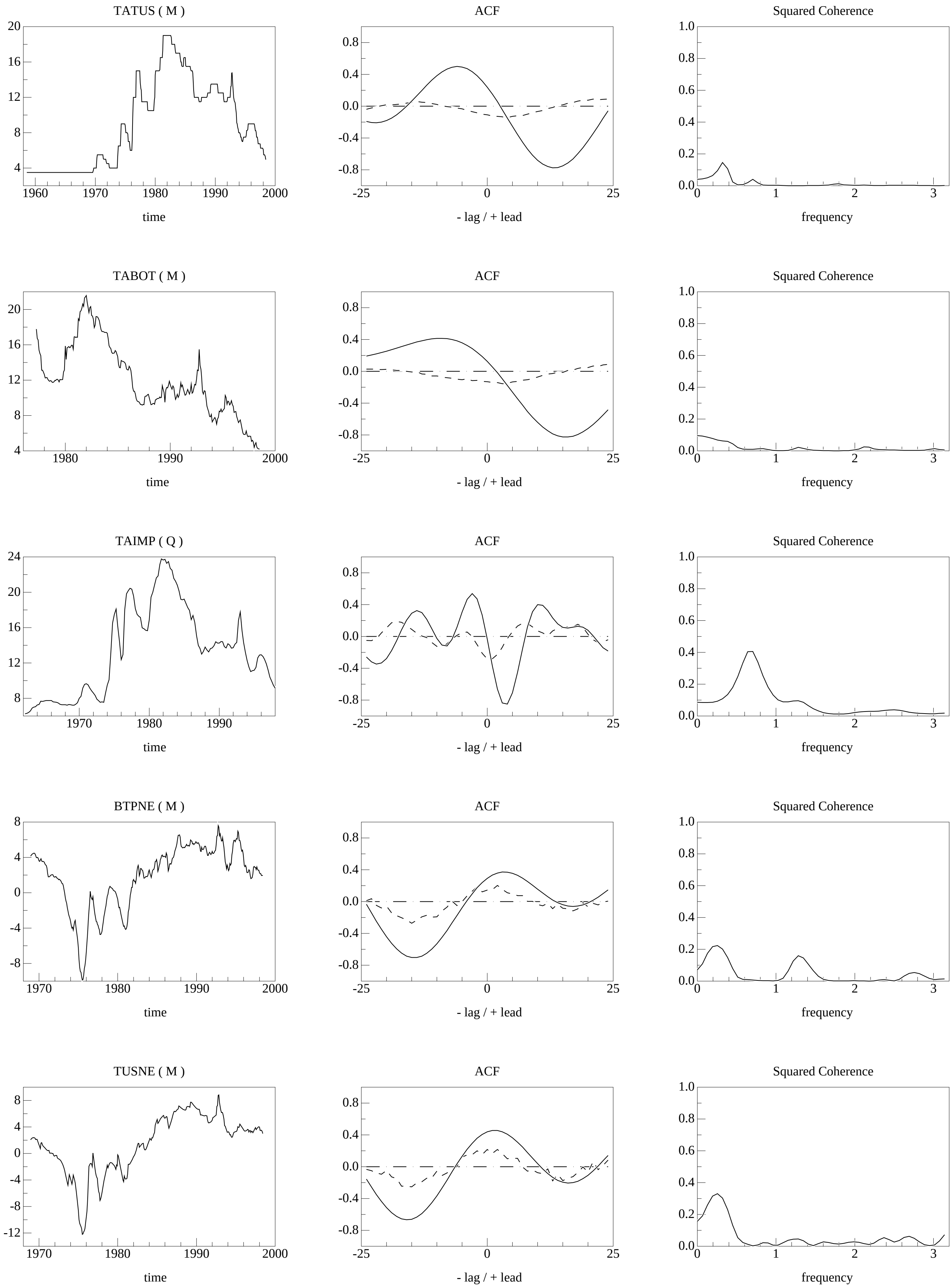
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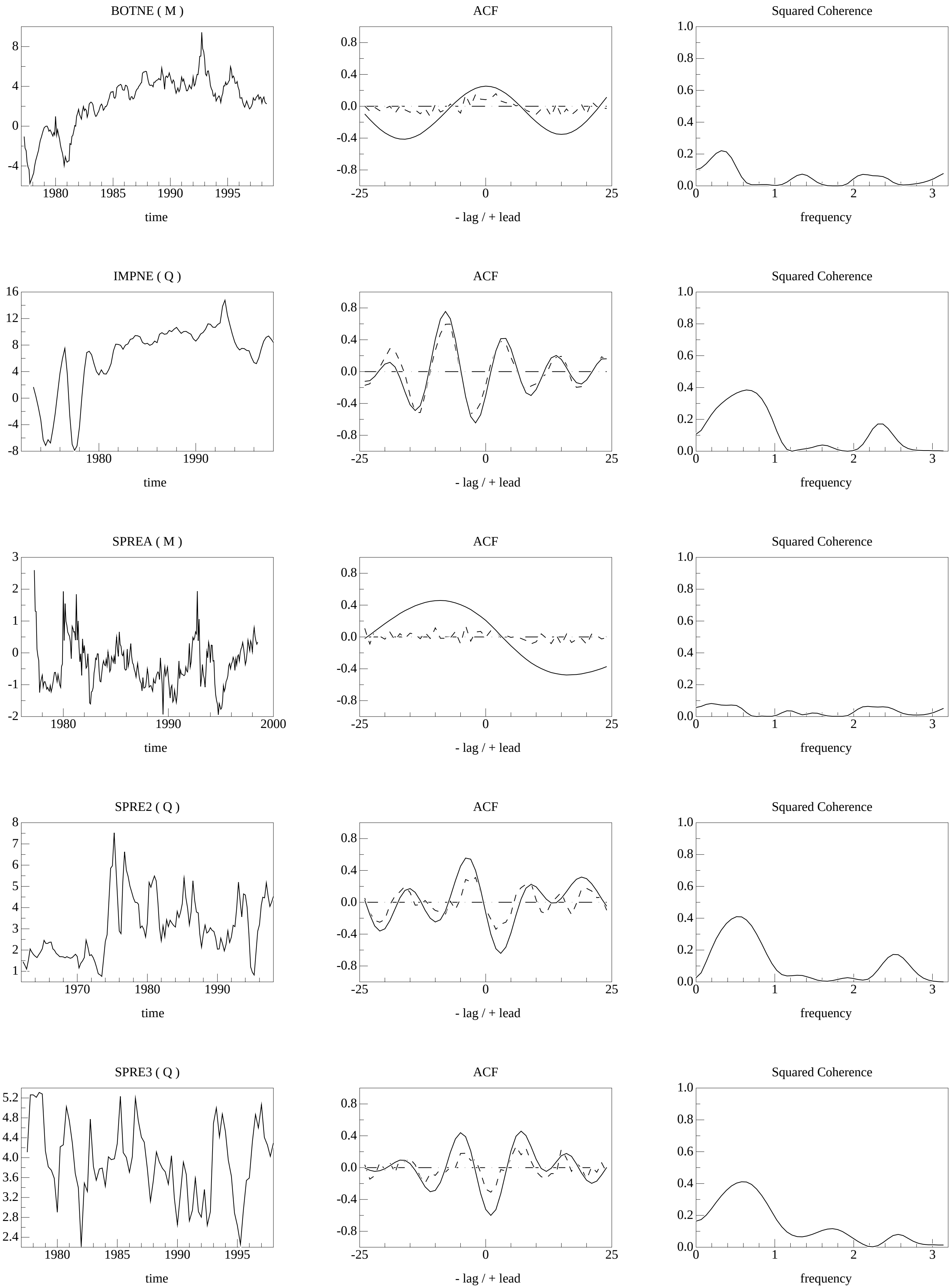
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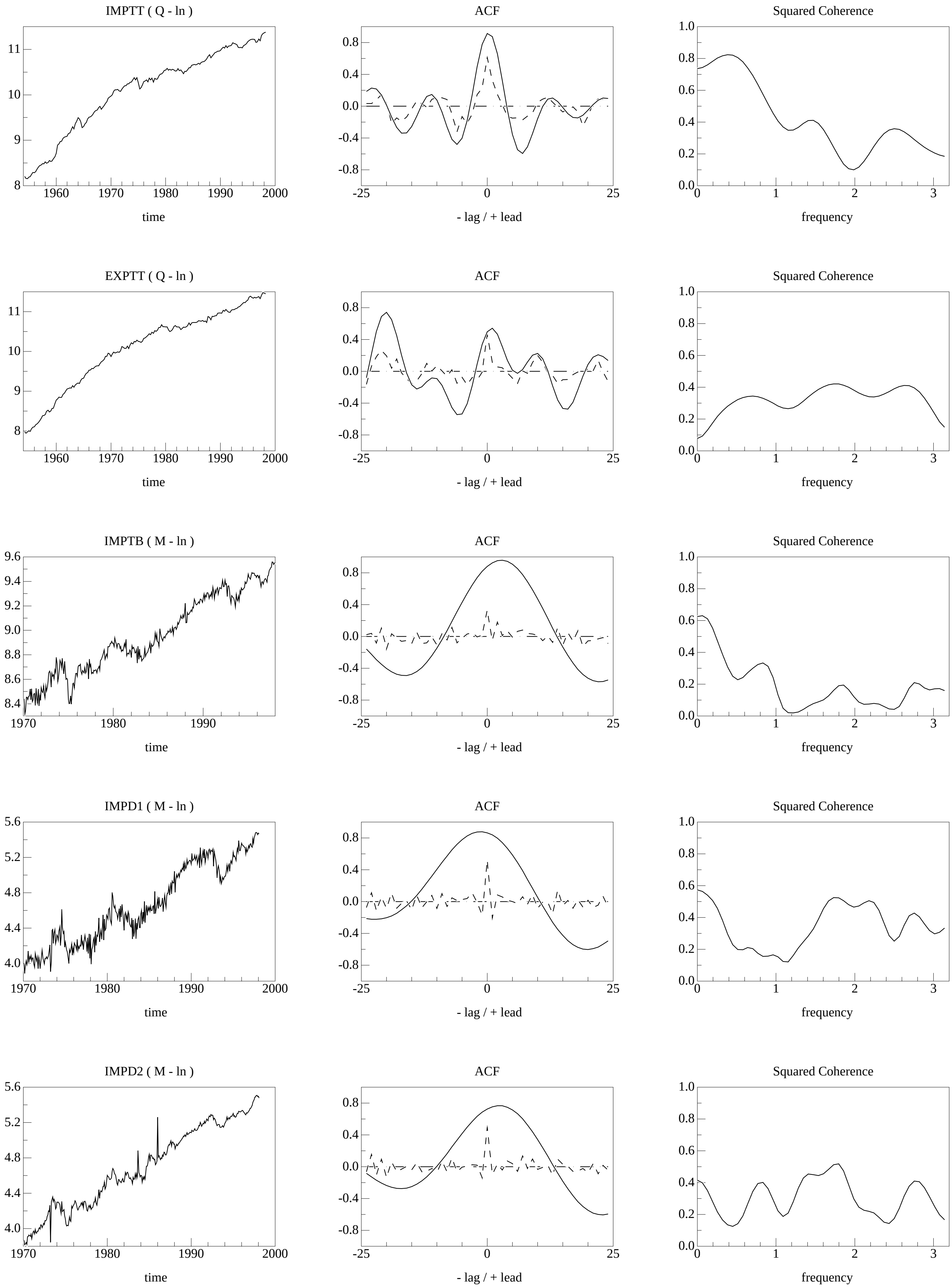
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Squared Coherence
frequency
IMPTB (M - ln)
time
ACF
- lag / + lead
Squared Coherence
frequency
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IMPD2 (M - ln)
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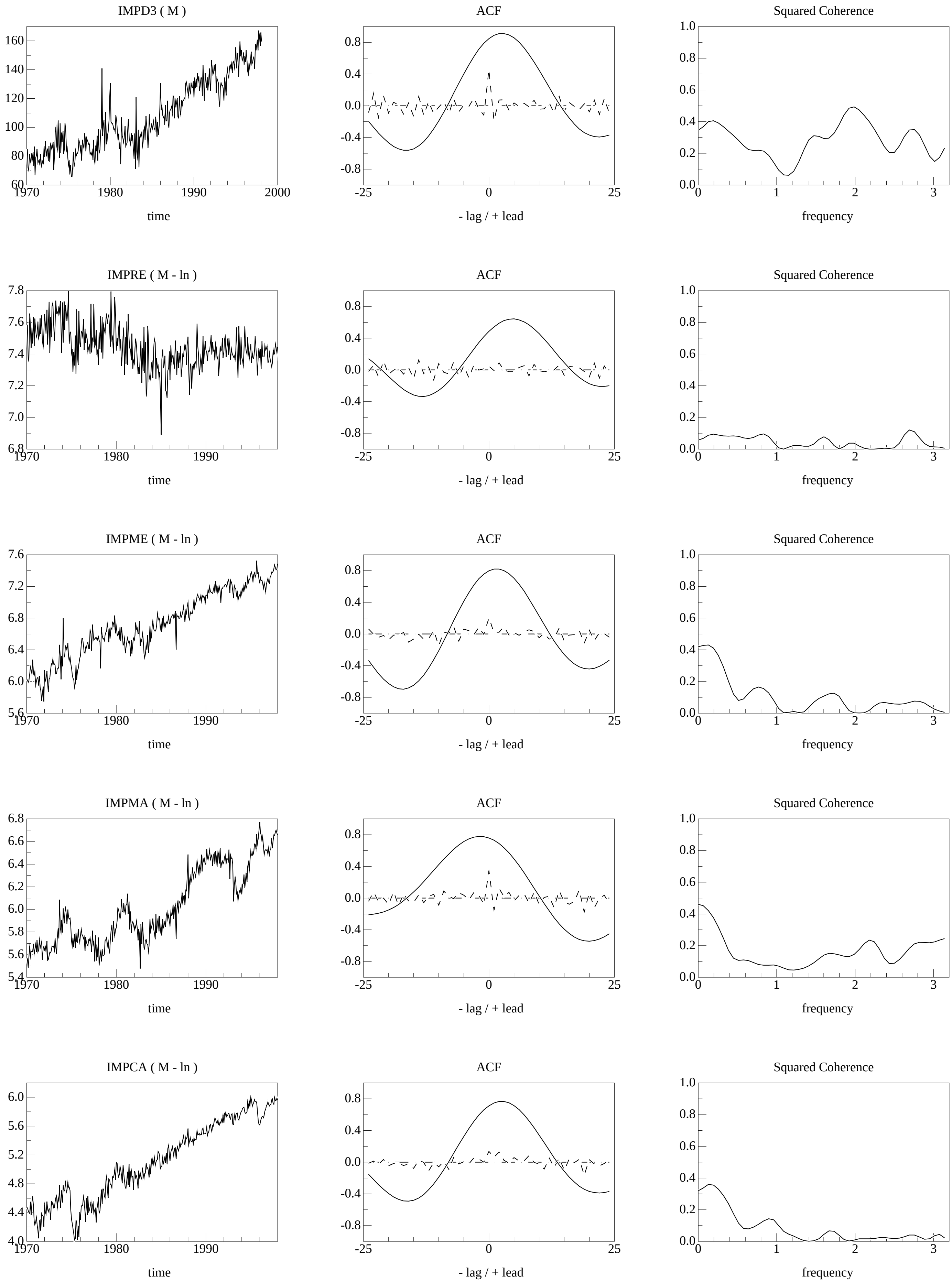
frequency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ACF
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Squared Coherence
frequency
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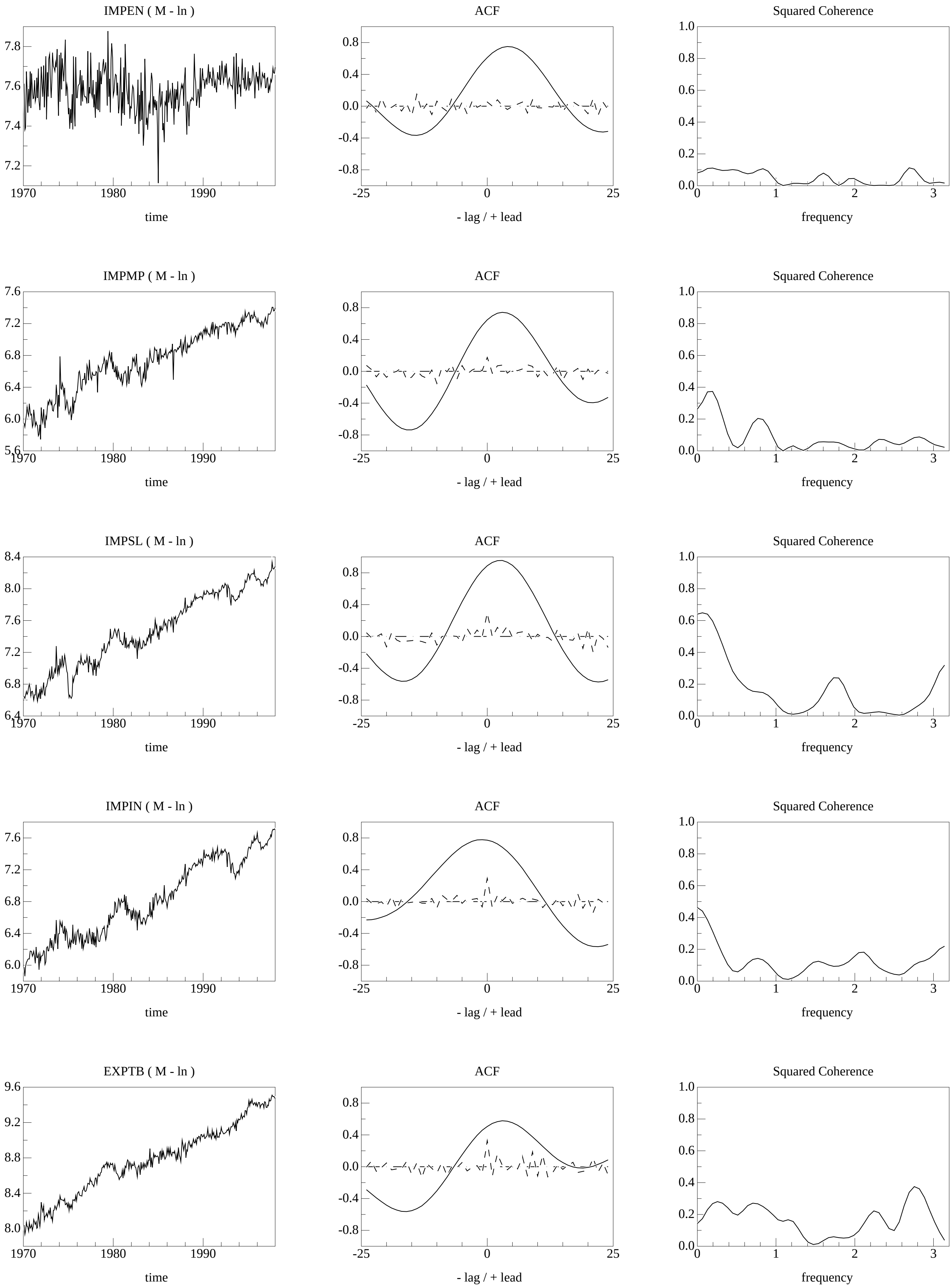
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time
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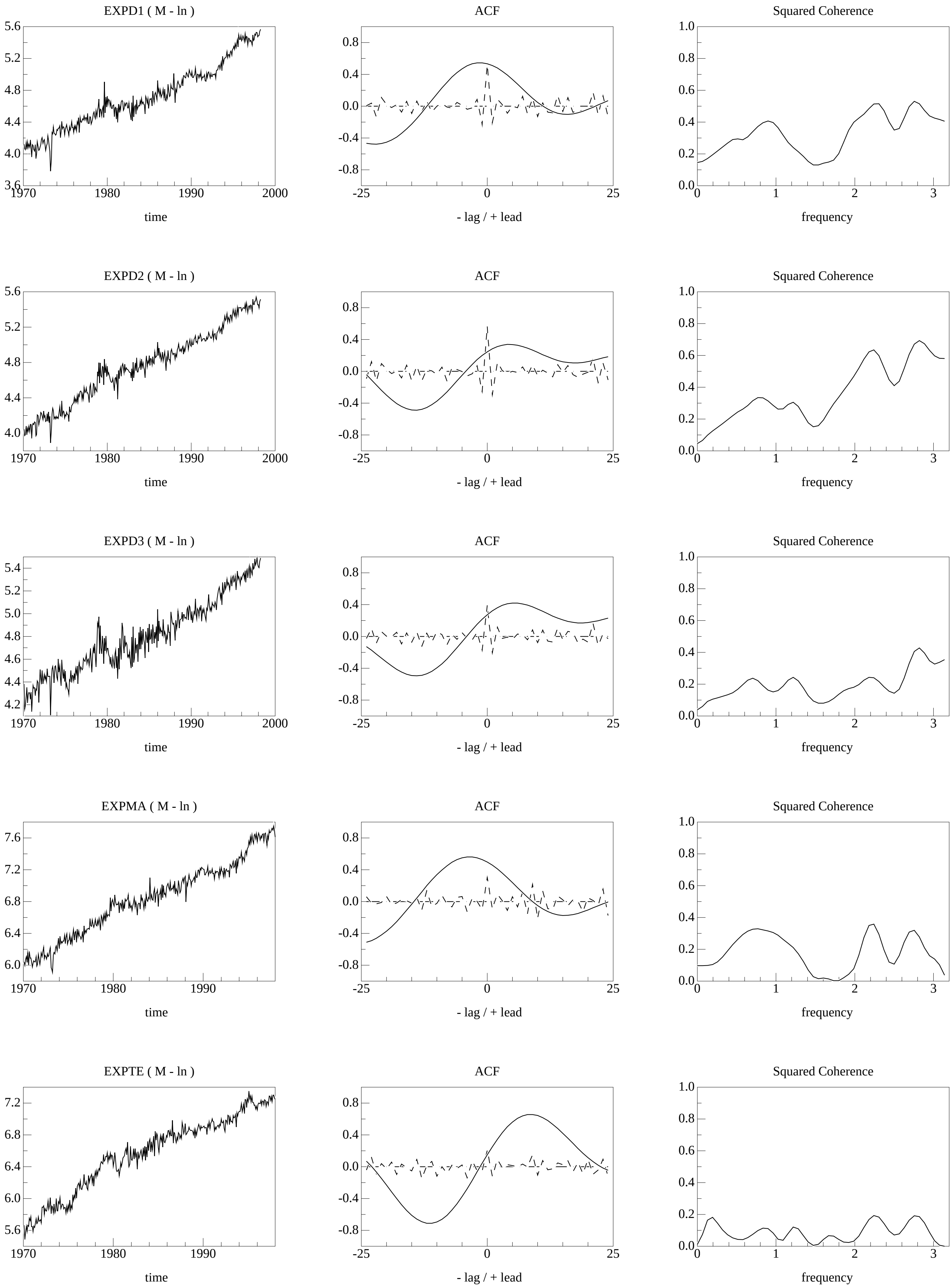

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Squared Coherence
time
- lag / + lead
frequency
EXPD3 (M - ln)
ACF
Squared Coherence
time
- lag / + lead
frequency
EXPMA (M - ln)
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Squared Coherence
time
- lag / + lead
frequency
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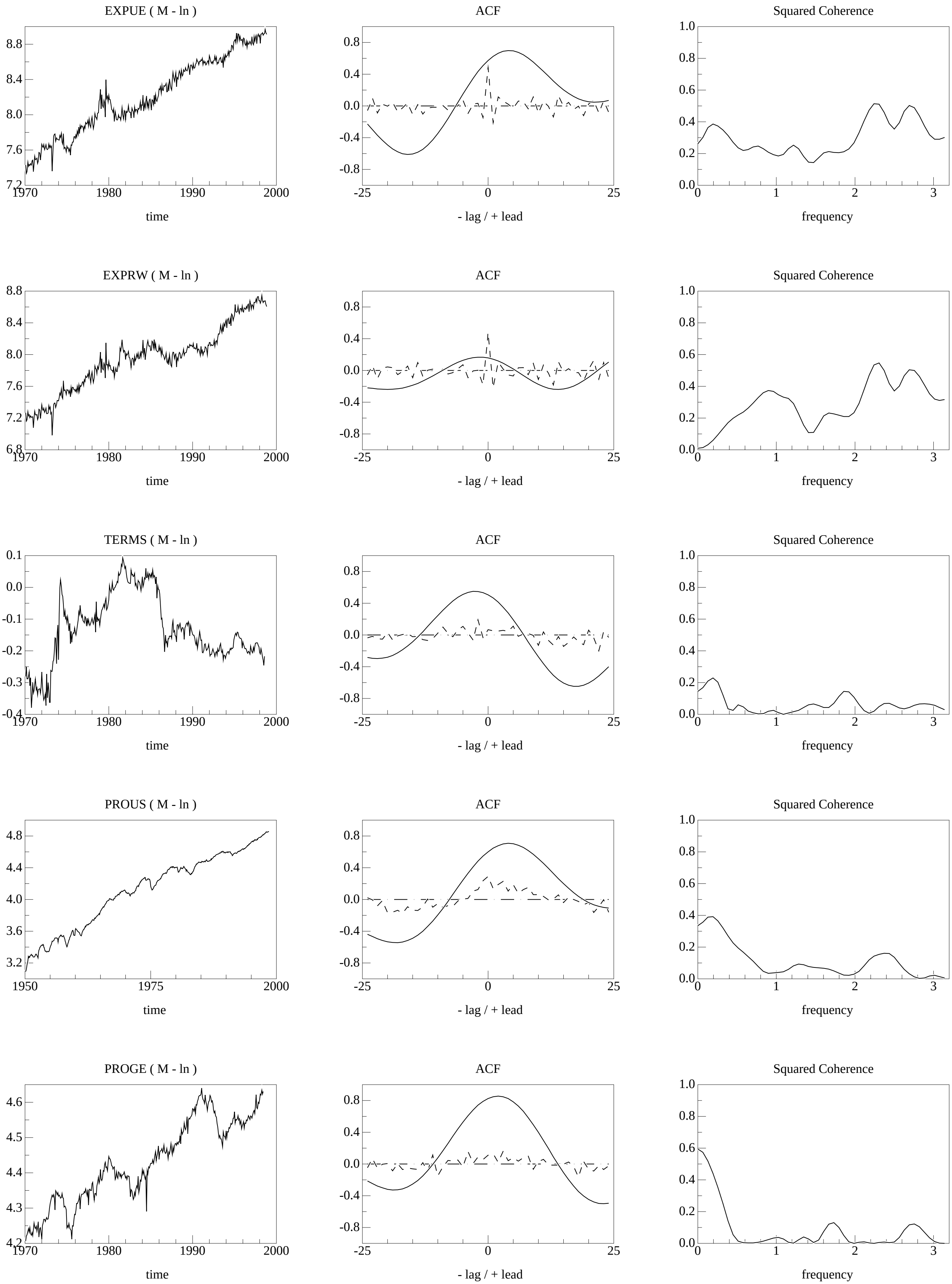
- lag / + lead
frequency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frequency
TERMS (M - ln)
time
ACF
- lag / + lead
Squared Coherence
frequency
PROUS (M - ln)
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ACF
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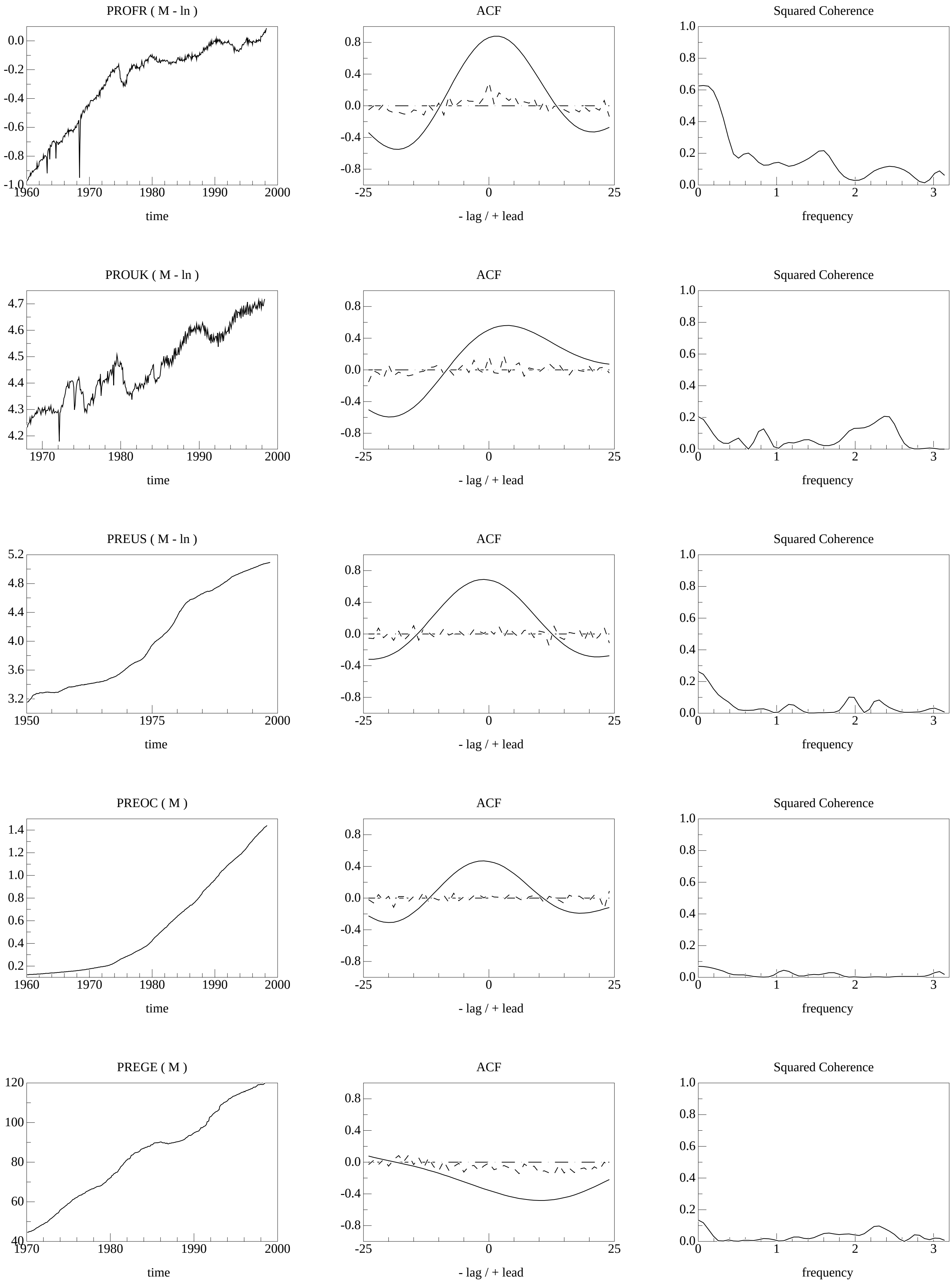
frequency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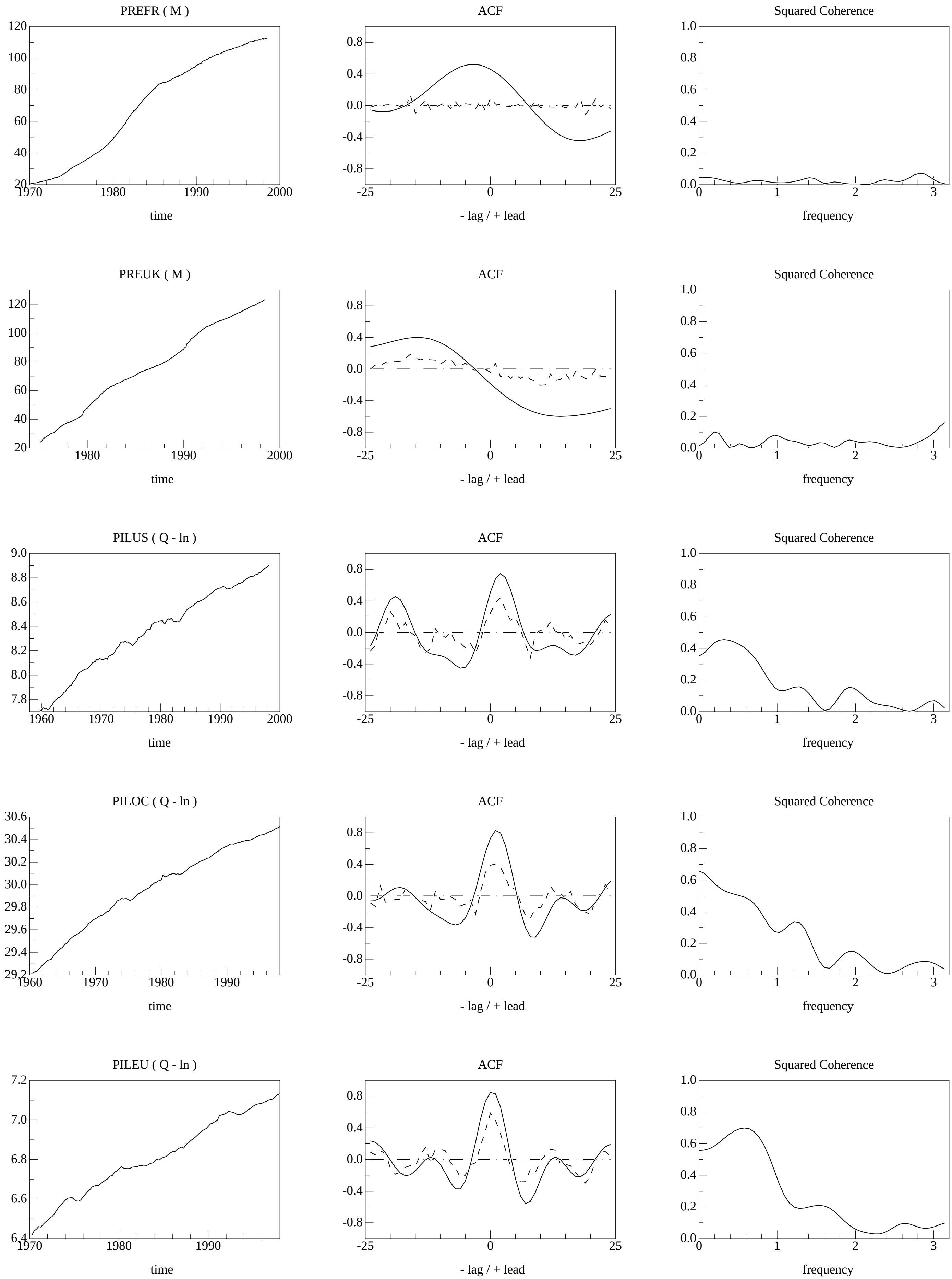
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Squared Coherence
frequency
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time
ACF
- lag / + lead
Squared Coherence
frequency
PILOC (Q - ln)
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- lag / + lead
Squared Coherence
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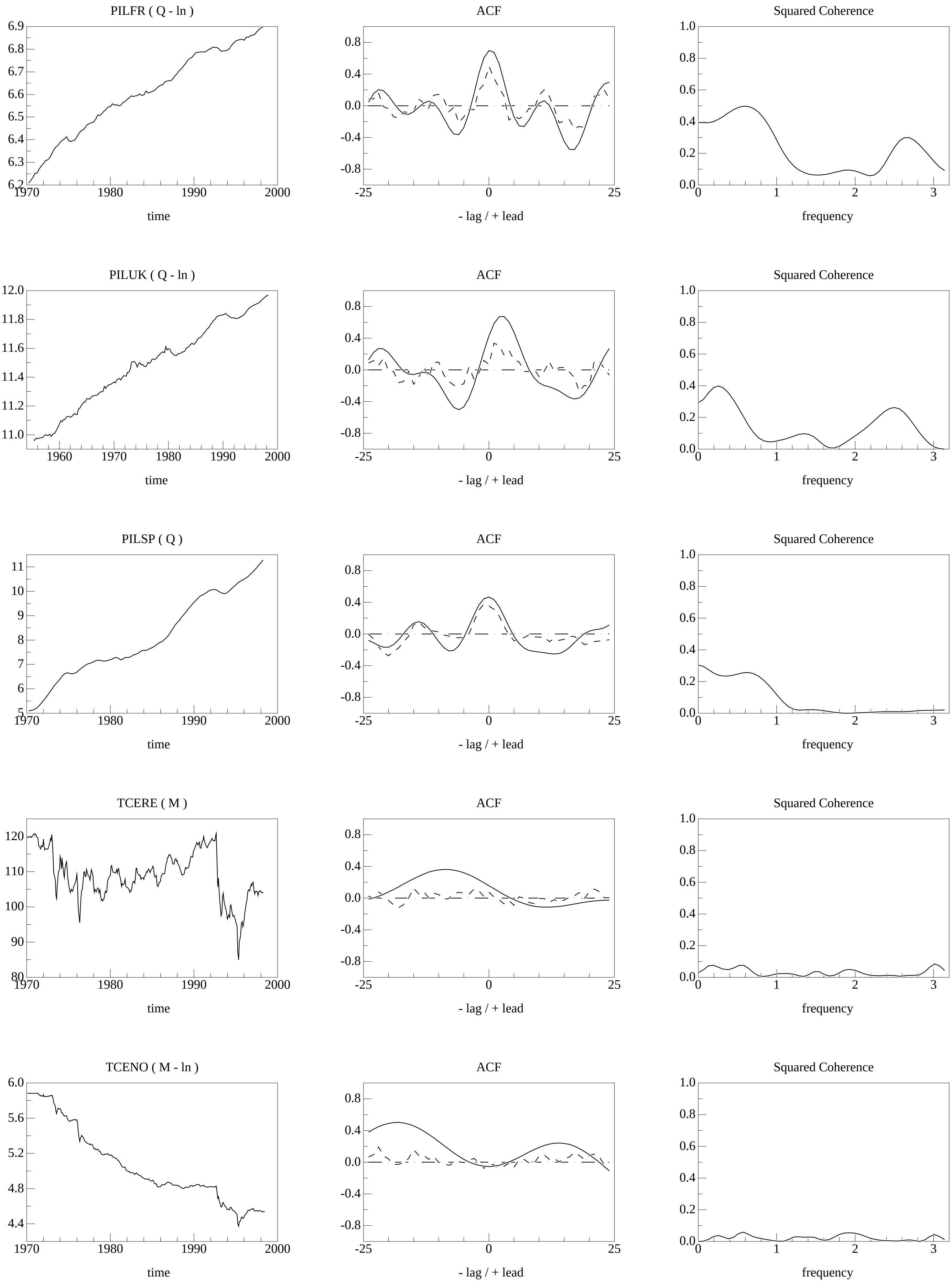
Squared Coherence
frequency



PILFR (Q - ln)
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frequency
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- lag / + lead
frequency
PILSP (Q)
ACF
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time
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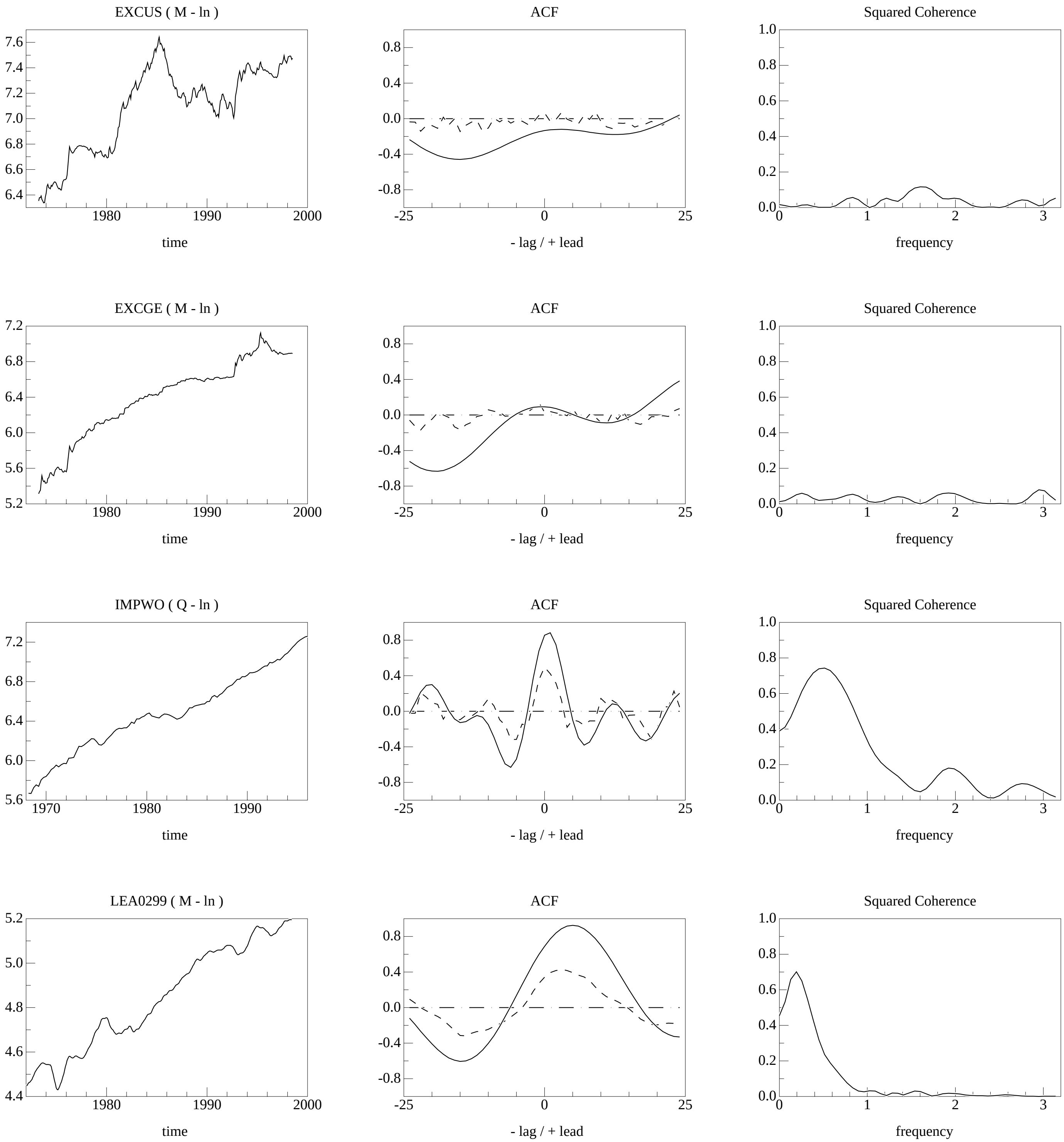
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