MEASURING BUSINESS CYCLES: APPROXIMATE BAND-PASS FILTERS FOR ECONOMIC TIME SERIES

Marianne Baxter and Robert G. King*

Abstract—Band-pass filters are useful in a wide range of economic contexts. This paper develops a set of approximate band-pass filters and illustrates their application to measuring the business-cycle component of macroeconomic activity. Detailed comparisons are made with several alternative filters commonly used for extracting business-cycle components.

I. Introduction

THE STUDY of business cycles necessarily begins with the measurement of business cycles. The seminal contribution of Burns and Mitchell (1946) was influential partly because it provided a comprehensive catalogue of the empirical features of the business cycles of developed countries, notably the United States. However, their work was also important because it developed methods for measuring business cycles that could be used by other researchers working with other countries or other sample periods.

Contemporary students of the business cycle still face the same basic issue as Burns and Mitchell did fifty years ago: How should one isolate the cyclical component of an economic time series? In particular, how should one separate business-cycle elements from slowly evolving secular trends and rapidly varying seasonal or irregular components? The decomposition used by Burns and Mitchell is no longer in common use, due both to its complexity and its central element of judgment.[1] In its place, modern empirical macroeconomists employ a variety of detrending and smoothing techniques to carry out trend-cycle decompositions. These decompositions are frequently ad hoc in the sense that the researcher requires only that the detrending procedure produce a stationary business-cycle component, but does not otherwise explicitly specify the statistical characteristics of business cycles. Examples of techniques in common use are application of two-sided moving averages, first-differencing, removal of linear or quadratic time trends, and application of the Hodrick-Prescott (1980) filter. Many recent studies use a battery of such methods to measure business cycles.

In our view, this proliferation of techniques for measuring business cycles has resulted from a lack of attention to an issue which Burns and Mitchell viewed as central: the definition of a business cycle. In this paper, we develop methods for measuring business cycles that require that the researcher begin by specifying characteristics of these cyclical components. Our procedures isolate business-cycle components in a straightforward way, transforming the macroeconomic data by applying particular moving averages that are implied by these defining characteristics. Technically, we develop approximate band-pass filters that are constrained to produce stationary outcomes when applied to growing time series.[2]

For the empirical applications in this paper, we adopt the definition of *business cycles* suggested by the procedures and findings of NBER researchers like Burns and Mitchell. Burns and Mitchell specified that business cycles were cyclical components of no less than six quarters (eighteen months) in duration, and they found that U.S. business cycles typically last fewer than 32 quarters (eight years). We adopt these limits as our definition of the business cycle. We apply our method to several major quarterly postwar U.S. time series, including output and inflation.

Defining the business cycle as fluctuations with a specified range of periodicities results in a particular two-sided moving average (a linear filter). In the particular case of the NBER definition of the business cycle, the desired filter is a band-pass filter, i.e., a filter that passes through components of the time series with periodic fluctuations between six and 32 quarters, while removing components at higher and lower frequencies. However, the exact band-pass filter is a moving average of infinite order, so an approximation is necessary for practical applications. Thus, a central problem addressed by this paper is how to construct a good approximation to the optimal filter (i.e., the filter that accomplishes the business-cycle decomposition specified by the researcher).

In approaching this problem of filter design, we require that our method meet six objectives.[3] First, as suggested above, the filter should extract a specified range of periodicities and otherwise leave the properties of this extracted component unaffected. Second, we require that the ideal band-pass filter should not introduce phase shift, i.e., that it not alter the timing relationships between series at any frequency. These two objectives define an ideal moving average of the data with symmetric weights on leads and lags. Third, we require that our method be an optimal approximation to the ideal band-pass filter; we specify a particular quadratic loss function for discrepancies between

Received for publication March, 1999. Revision accepted for publication June, 1999.

* University of Virginia

We thank Bennett McCallum, Alexei Onatski, Jim Stock, Mark Watson, and seminar participants at the Federal Reserve Bank of Richmond for helpful comments and suggestions. Filtering programs and other replication materials are available from the authors.

[1] However, it is possible to implement a judgment-free version of the Burns-Mitchell procedure, using the business-cycle dating algorithm of Bry and Boschan (1981). Two recent examples are King and Plosser (1994) and Watson (1994).

[2] Englund et al. (1992) and Hassler et al. (1994) proceed as we do by first defining a business cycle and then developing methods to extract business-cycle components from time series. They employ a two-step procedure in which they first detrend the time series using the Hodrick-Prescott (1980) filter, and then extract business-cycle components by band-pass filtering in the frequency domain. We discuss their method in more detail later in the paper.

[3] These requirements are very similar to those that Prescott (1986) discusses in justifying use of the Hodrick-Prescott (1980) filter.

The Review of Economics and Statistics, November 1999, 81(4): 575–593

the exact and approximate filter. Fourth, we require that the application of an approximate band-pass must result in a stationary time series even when applied to trending data. Given the large body of empirical work that suggests the presence of stochastic trends in economic time series, we design our filters so that they will make the filtered time series stationary if the underlying time series is integrated of order one or two. (Equivalently, we impose the requirement that the approximate filter's frequency response is exactly zero at the zero frequency). This requirement also means that our band-pass filters will eliminate quadratic deterministic trends from a time series. Fifth, we require that the method yield business-cycle components that are unrelated to the length of the sample period. Technically, this means that the moving averages we construct are time invariant, in that the coefficients do not depend on the point in the sample. Sixth, and finally, we require that our method be operational. In the general filter-approximation problem, there is an important tradeoff involved: The ideal band-pass filter can be better approximated with the longer moving averages, but adding more leads and lags also means that observations must be dropped at the beginning and end of the sample, thus leaving fewer for analysis. We therefore experiment extensively with the application of our filter to macroeconomic time series and provide some guidance to readers about the tradeoffs involved. We recommend that researchers use moving averages based on three years of past data and three years of future data, as well as the current observation, when working with both quarterly and annual time series.

The organization of the paper is as follows. Section II describes the construction of approximate band-pass filters. In section III, we define our business-cycle filter and apply it to postwar U.S. data. Further, we investigate the implication of changing the number of leads and lags used to construct the approximate filter for certain summary statistics, using both postwar U.S. data and a specified stochastic data-generating process (for which we can compute the influence of the length of the moving average on population moments). In section IV, we contrast our business-cycle filter to the results of other commonly used procedures. In section V, we provide a detailed comparison of two "HP" filters: the cyclical filter of Hodrick and Prescott (1980) and a high-pass filter constructed using our methods. Particular attention is directed to two practical problems that researchers encounter using the Hodrick-Prescott method: unusual behavior of cyclical components near the end of the sample and the choice of the smoothing parameter for data sampled at other than the quarterly frequency. Section VI concludes the paper with a brief review of the goals and findings of the paper.

II. Filter Design

This section describes the construction of moving averages that isolate the periodic components of an economic time series that lie in a specific band of frequencies. That is, in the jargon of time-series analysis, we are interested in constructing band-pass linear filters. We are particularly interested in designing a business-cycle filter, i.e., a linear filter that eliminates very slow-moving ("trend") components and very high-frequency ("irregular") components while retaining intermediate ("business-cycle") components.

It has long been understood that moving averages alter the relative importance of the periodic components in a time series. (See, for example, Harvey (1981, ch. 3).) If the time series y_t is stationary, then we can use frequency-domain methods to consider these implications of applying moving averages. In this paper, we employ the frequency-domain analysis to consider the design of linear filters, but we ultimately will undertake our filtering entirely in the time domain (i.e., we will simply apply moving averages to macroeconomic data). Thus, for readers who are simply interested in the practical results of our filtering methods, the current section may be skimmed or skipped.

A. *Applying Moving Averages to Time Series*

Applying a moving average to a time series, y_t, produces a new time series y_t^*, with

$$y_t^* = \sum_{k=-K}^{K} a_k y_{t-k}. \tag{1}$$

For convenience in the discussion below, we will write the moving average as a polynomial in the lag operator L, $a(L) = \Sigma_{k=-K}^{K} a_k L^k$, with L defined so that $L^k x_t = x_{t-k}$ for positive and negative values of k. We will further specialize our attention to symmetric moving averages, i.e., those for which the weights are such that $a_k = a_{-k}$ for $k = 1, \ldots K$.

One traditional use of moving averages has been to isolate or to eliminate trends in economic time series. If a symmetric moving average has weights that sum to zero, i.e., $\Sigma_{k=-K}^{K} a_k = 0$, then we show in appendix A that it has trend elimination properties. That is, if the weights sum to zero, we can always factor $a(L)$ as

$$a(L) = (1 - L)(1 - L^{-1})\psi(L) \tag{2}$$

where $\psi(L)$ is a symmetric moving average with $K - 1$ leads and lags. Symmetric moving averages with weights that sum to zero will thus render stationary series that contain quadratic deterministic trends (i.e., components of the form $\tau_t = \gamma_0 + \gamma_1 t + \gamma_2 t^2$). Further, these moving averages can also make stationary the stochastic trends that arise when a time series is a realization of an integrated stochastic process (of the I(1) or I(2) type in the lexicon of Engle and Granger (1987)).

Turning to analyzing the effect of filtering from a frequency-domain perspective, the Cramer representation of a zero-mean stationary time series y_t is

$$y_t = \int_{-\pi}^{\pi} \xi(\omega)\, d\omega. \tag{3}$$

That is, the time series is expressed as the integral of random periodic components, the $\xi(\omega)$, that are mutually orthogonal

$(E\xi(\omega_1)\xi(\omega_2)' = 0$ for $\omega_1 \neq \omega_2)$. In turn, the filtered time series can be expressed as

$$y_t^* = \int_{-\pi}^{\pi} \alpha(\omega)\xi(\omega)\, d\omega, \tag{4}$$

where $\alpha(\omega) = \Sigma_{h=-K}^{K} a_h e^{-i\omega h}$ is the frequency-response function of the linear filter. (The frequency response $\alpha(\omega)$ indicates the extent to which y_t^* responds to y_t at frequency ω, in the sense that $\alpha(\omega)$ is the weight attached to the periodic component $\xi(\omega)$.) Since the periodic components $\xi(\omega)$ are orthogonal, it follows that we can write the variance of the filtered series as

$$\text{var}\,(y_t^*) = \int_{-\pi}^{\pi} |\alpha(\omega)|^2 f_y(\omega)\, d\omega. \tag{5}$$

where $|\alpha(\omega)|^2$ is the squared gain or transfer function of the linear filter at frequency ω and $f_y(\omega) = \text{var}\,(\xi(\omega))$ is the spectral density of the series y at frequency ω. At a given frequency, the squared gain thus indicates the extent to which a moving average raises or lowers the variance of the filtered series relative to that of the original series. The gain $|\alpha(\omega)|$ is similarly the effect on the standard deviation at a particularly frequency: We thus use it in various figures below as a measure of the consequences of filtering.

In terms of our discussion below, it is important to note that the frequency-response function $\alpha(\omega)$ takes on a value of zero at frequency zero if and only if we require that the sum of the filter weights is zero $(\alpha(0) = \Sigma_{h=-K}^{K} a_h e^{-i0h} = 0$ if and only if $\Sigma_{h=-K}^{K} a_h = 0)$.

We turn next to the problem of designing filters to isolate specific frequencies in the data. Our method is to use frequency-domain logic to design a moving average that emphasizes specified frequency bands, but we also require that our business-cycle filter have the trend-elimination properties discussed in this section, so that it can be meaningfully applied to economic time series which are nonstationary. We thus require that our business-cycle filter has a frequency response function with $\alpha(0) = 0$.

B. *The Low-Pass Filter*

A basic building block in filter design is the low-pass filter—a filter that retains only slow-moving components of the data. An ideal symmetric low-pass filter, which passes only frequencies $-\underline{\omega} \leq \omega \leq \underline{\omega}$, has a frequency-response function given by $\beta(\omega) = 1$ for $|\omega| \leq \underline{\omega}$, and $\beta(\omega) = 0$ for $|\omega| > \underline{\omega}$. The frequency-domain implication of symmetry in the weights is that $\beta(\omega) = \beta(-\omega)$.

Let $b(L) = \Sigma_{h=-\infty}^{\infty} b_h L^h$ denote the time-domain representation of this ideal low-pass filter. The filter weights b_h may be found by the inverse Fourier transform of the frequency response function

$$b_h = \frac{1}{2\pi}\int_{-\pi}^{\pi} \beta(\omega) e^{i\omega h}\, d\omega. \tag{6}$$

Evaluating the integral above (see appendix B for the details), the filter weights b_h for the ideal filter are

$$b_0 = \underline{\omega}/\pi \quad \text{and} \quad b_h = \sin(h\underline{\omega})/h\pi \text{ for } h = 1, 2, \ldots \tag{7}$$

While the weights tend to zero as h becomes large, notice that an infinite-order moving average is necessary to construct the ideal filter. Hence, we are led to consider approximation of the ideal filter with a finite moving average $a(L) = \Sigma_{h=-K}^{K} a_h L^h$; this approximating filter has a frequency-response function $\alpha_K(\omega) = \Sigma_{h=-K}^{K} a_h e^{-i\omega h}$.

C. *Approximation of Symmetric Filters*

If one is considering the general problem of choosing an approximate filter, $\alpha_K(\omega)$, to approximate a specific filter $\beta(\omega)$, then a natural approximation strategy is to choose the approximating filter's weights a_h to minimize

$$Q = \frac{1}{2\pi}\int_{-\pi}^{\pi} |\delta(\omega)|^2\, d\omega, \tag{8}$$

where $\delta(\omega) = \beta(\omega) - \alpha_K(\omega)$ is the discrepancy arising from approximation at frequency ω. This loss function attaches equal weight to the squared approximation errors at different frequencies.

There is a remarkable, general result for this class of optimization problems: The optimal approximating filter for given maximum lag length, K, is constructed by simply truncating the ideal filter's weights b_h at lag K. Thus, the optimal approximate low-pass filter sets $a_h = b_h$ for $h = 0, 1, \ldots, K$, and $a_h = 0$ for $h \geq K + 1$, where the weights b_h are those given in equation (7) above.

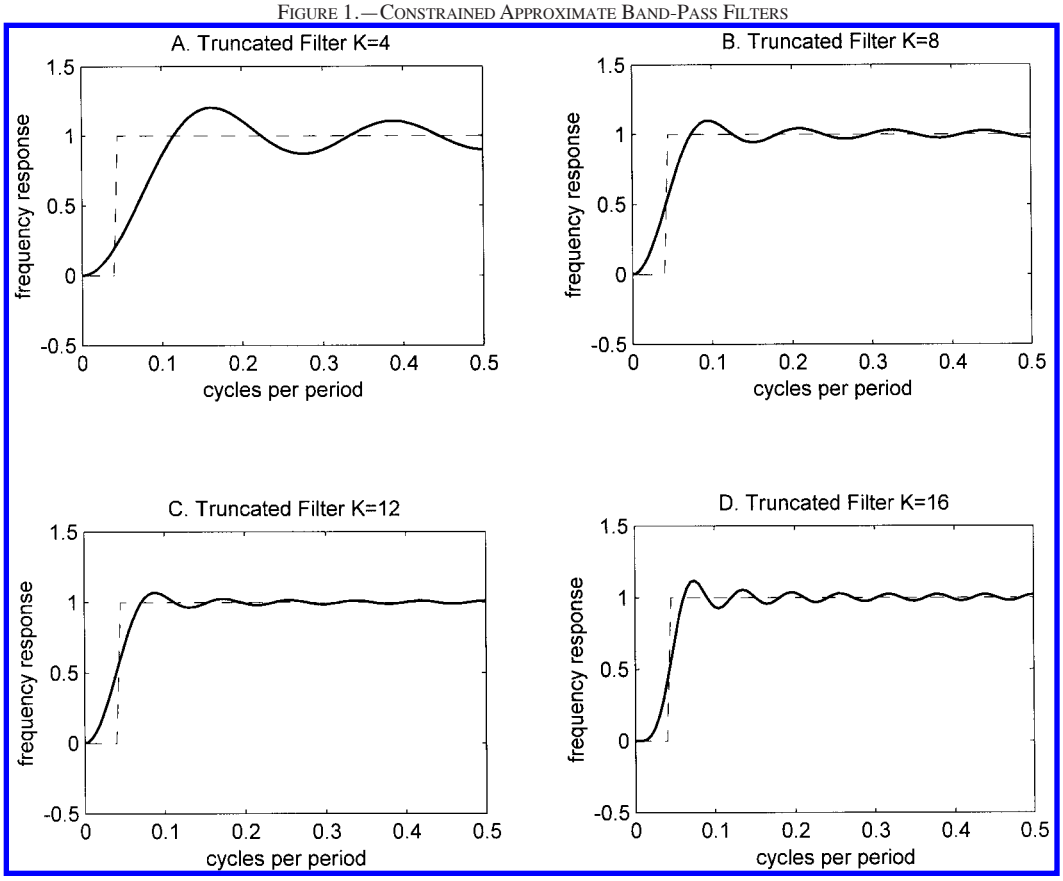
D. *Construction of High-Pass and Band-Pass Filters*

High-pass and band-pass filters are easily constructed from low-pass filters. Before precisely defining these additional filters, we establish some notation that we use throughout the rest of the paper. It is more natural for us to work empirically using terms of periodicity of cycles than frequencies (periodicity is related to frequency via $p = 2\pi/\omega$). Thus, we let $LP_K(p)$ denote the approximate low-pass filter that is truncated at lag K and that passes components of the data with periodicity greater than or equal to p. Since the ideal filter involves $K = \infty$, the ideal low-pass filter is denoted $LP_\infty(p)$.

The ideal high-pass filter $HP_\infty(p)$ passes components of the data with periodicity less than or equal to $p = 32$ (illustrated by the dashed line in figure 1).[4] A low-pass filter removes high-frequency cycles while retaining low ones, the

[4] In this figure, as in others below, the horizontal axis is labeled "cycles per period" and runs from 0 to 1/2. More traditionally, figures like these run from 0 to π, but we use our normalization since it makes it easy to calculate the periodicity by taking the reciprocal of the value on the axis. For example, the "cutoff frequency" for the high-pass filter corresponds to a period of $p = 32$ time units (presumed to be quarters of a year in view of empirical work below), and, hence, $\underline{\omega} = 1/32 \cong 0.03$. However, for the analytical results below, we use the conventional definition that the frequency ω has as its domain the interval $-\pi \leq \omega \leq \pi$.

FIGURE 1.—CONSTRAINED APPROXIMATE BAND-PASS FILTERS



high-pass filter does the reverse task, and the original time series is just the sum of its low-frequency and high-frequency components. Thus, the high-pass filter weights are $1 - b_0$ at $h = 0$ and $-b_h$ at $h = \pm 1, 2, \ldots$. Correspondingly, the optimal approximate high-pass filter, $HP_K(p)$, is simply constructed by truncating the weights of $HP_\infty(p) = 1 - LP_K(p)$.[5]

The ideal band-pass filter passes only frequencies in the ranges $\underline{\omega} \leq |\omega| \leq \overline{\omega}$. It is therefore constructed from two low-pass filters with cutoff frequencies $\underline{\omega}$ and $\overline{\omega}$: We denote the frequency responses of these filters as $\overline{\beta}(\omega)$ and $\underline{\beta}(\omega)$. Then, to get the desired band-pass frequency response, we form the band-pass filter's frequency response as $\overline{\beta}(\omega) - \underline{\beta}(\omega)$ since this will give unit frequency response on the frequency bands $\underline{\omega} \leq |\omega| \leq \overline{\omega}$ and zero elsewhere. It is then easy to derive the filter weights for a band-pass filter. If we let $\underline{b}_h$ and $\overline{b}_h$ be the filter weights for the low-pass filters with cutoffs $\underline{\omega}$ and $\overline{\omega}$, then the band-pass filter has weights $\overline{b}_h - \underline{b}_h$. The dashed line in figure 2 plots an ideal band-pass filter that passes through cycles of length between 6 and 32 quarters, which corresponds to the Burns-Mitchell definition of business-cycle frequencies.

We use a similar notation for the approximate band-pass filters to that developed above for the high- and low-pass filters: $BP_K(p, q)$ denotes our approximate band-pass filter that passes cycles between p and q periods in length, for given truncation point K, where p denotes the shortest cycle length passed by the band-pass filter and q denote the longest cycle length (in figure 2, $p = 6$ and $q = 32$). We construct $BP_K(p, q)$ by truncating the ideal band-pass filter.

E. *Constraints on Specific Points*

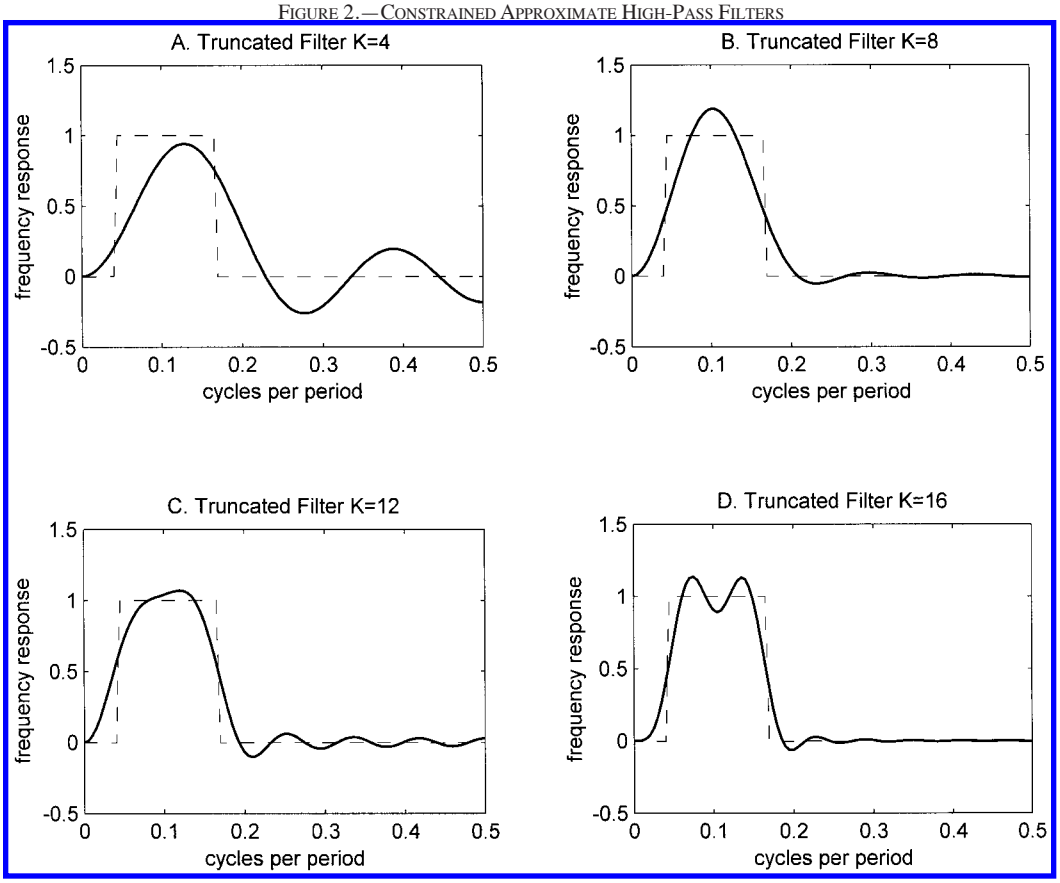
The minimization problem described above may be reformulated to recognize that certain points are of particular concern to the researcher. This approach to filter design has been advanced by Craddock (1957) in the statistics literature and discussed in the context of designing filters to eliminate trend by Granger and Hatanaka (1964, section 8.4), but does not appear to have been much followed up on in applied work in economics.

As an example of our approach, suppose that we want to design a low-pass filter that places unit weight at the zero frequency ($\alpha_K(\omega) = 1$ at $\omega = 0$). This is equivalent to requiring that the filter weights sum to unity (since $1 = \alpha_K(0) = \Sigma_{k=-K}^{K} a_k e^0 = \Sigma_{k=-K}^{K} a_k$). If we construct approximating low-pass filters in this way, then the corresponding high-pass and band-pass filters will place zero weight at the zero frequency, and, as we have seen above, this will mean that they give rise to stationary time series when applied to a range of nonstationary time series.[6]

[5] This is implied by the result discussed in section II, B, that approximation of the ideal low-pass filter simply involves truncation of the ideal filter's weights at lag K.

[6] Equivalently, one can consider the problem of approximating a desired band-pass or high-pass filter subject to the constraint that the weights sum

FIGURE 2.—CONSTRAINED APPROXIMATE HIGH-PASS FILTERS



The constraint that $\alpha_K(0) = 1$ may be incorporated as a side condition to the minimization problem discussed above. Using the results of appendix B, we find the following modification of the optimal approximate filter weights, a_h, as functions of the weights of the ideal low-pass filter, b_h,

$$a_h = b_h + \theta, \tag{9}$$

where θ is a constant that depends on the specified maximum lag length, K. That is, since we require that the filter weights sum to one, ($\Sigma_{h=-K}^{K} a_h = 1$), the normalizing constant is $\theta = (1 - \Sigma_{h=-K}^{K} b_h)/(2K + 1)$. Thus, the constraint that the low-pass filter places unit weight at the zero frequency results in a relatively simple adjustment of the filter weights.

Similar adjustments are necessary when constructing optimal truncated high-pass and band-pass filters subject to constraints on the frequency-zero value of the frequency-response function. As discussed above, the unconstrained band-pass filter has weights that are the difference between two low-pass filters; i.e., the weights are $\bar{b}_h - \underline{b}_h$ where $\bar{b}_h$ is the filter weight at lag/lead h for the upper-cutoff filter and $\underline{b}_h$ is the weight for the lower-cutoff filter. The constrained band-pass filter involves the requirement that the sum of its weights must be zero. Hence, the weights in the constrained optimal band-pass filter are

$$(\bar{b}_h - \underline{b}_h) + (\bar{\theta} - \underline{\theta}), \tag{10}$$

where $\bar{\theta}$ is the adjustment coefficient associated with the upper-cutoff filter and $\underline{\theta}$ is the adjustment coefficient associated with the lower-cutoff filter. (See appendix B for additional discussion of this point.) That is, the constrained optimal Kth-order band-pass filter is simply the difference between two constrained optimal Kth-order low-pass filters. Throughout the remainder of the paper, we consider only band-pass filters with this zero-frequency constraint imposed. We use the notation defined above, $BP_K(p, q)$, to denote our approximation to the ideal band-pass filter that passes cycles between p and q periods.

F. *The Effects of Truncation*

This section explores the effect of changes in the maximum lag length, K, on the shape of the constrained low-pass and high-pass filters. If we choose an approximating moving average with maximum lag length K, implementing the filter means that we lose $2K$ observations (i.e., K leads and K lags). There is no "best" value of K; increasing K leads to a better approximation to the ideal filter, but results in more lost observations. Thus, the researcher will have to balance these opposing factors: The best choice of K in a particular

to zero (that the frequency response is zero at the zero frequency). Accordingly, in appendix B, we study constrained approximation problems with the generic constraint $\phi = \alpha_K(0)$.

instance will depend on the length of the data period and the importance attached to obtaining an accurate approximation to the ideal filter. The next section will explore this trade-off in the context of postwar U.S. macroeconomic time series. In this section, however, we are simply concerned with describing the effect of variations in K on the shape of the approximating filters.

Figure 1 illustrates the effect of truncation on the shape of the high-pass filter that has been constrained to have unit weight at the zero frequency. The ideal filter is illustrated by the dashed line in each panel; it passes frequencies ω that correspond to cycles of length less than or equal to 32 quarters, assuming that the underlying data is measured quarterly. This figure shows that there are important effects on the shape of the approximate high-pass filter of changes in K. When $K = 4$ (so that the moving average covers only the preceding and subsequent four quarters), there is a major departure from the ideal filter. In particular, the approximate filter admits substantial components from the range of frequencies just below the cutoff frequency ($\omega = \pi/16$ or $\omega/s\pi = \frac{1}{32} = 0.03$ cycles per period). This phenomenon is conventionally called *leakage*: This term captures the notion that the filter has passed through frequencies that the filter was designed to suppress, including them with those the filter was designed to retain. The approximating filter has less than unit frequency response on the range just above the cutoff frequency, which we can similarly define as *compression*. Finally, when the index of cycles per period lies roughly between 0.14 and 0.22, then there is a frequency response of more than one-for-one, which we can define as *exacerbation*. As the value of K increases, the truncated filter more closely approximates the true filter. With $K = 8$, the problems of leakage, compression, and exacerbation have been substantially reduced relative to the $K = 4$ case. Further reductions in these departures from the exact filter are obtained with $K = 16$ and $K = 32$. These oscillatory departures of the approximating filter from the exact filter arise even when we do not impose the constraint that $\alpha(0) = 0$ and have been extensively studied in this context. They are typically referred to as the Gibbs phenomenon, after the researcher who initially stressed their importance.[7]

Figure 2 displays the frequency-response function for approximate band-pass filters. As with the approximate high-pass filters, there is substantial leakage, compression, and exacerbation for smallest values of K. The frequency responses oscillate around zero above the higher-cutoff frequency. The fact that there are some small negative weights in the frequency response in these approximate filters means that they do not exactly display the "no phase shift" requirement that we impose on the ideal filter, but we regard these departures as minor.[8] The deviations from the exact filter are attenuated with increases in K, so that these again appear small by $K = 12$. However, it is an empirical question whether improvement in approximating the ideal filter (by use of larger values of K) leads to important changes in a filtered time series or moments computed from it. In section III below, we explore the effects of changes in K on the behavior of filtered macroeconomic time series.

G. *Why Filter in the Time Domain?*

One common approach to band-pass filtering is the frequency-domain method used by Hassler et al. (1994) and Rush et al. (1997). This method works as follows. First, one takes a discrete Fourier transform of the economic data, computing the periodic components associated with a finite number of "harmonic" frequencies. Second, one "zeros out" the frequencies that lie outside of the band of interest. Third, one computes the inverse Fourier transform to get the time-domain filtered series, $\{\tilde{y}_1 \ldots \tilde{y}_T\}$. We see two major drawbacks with this explicitly frequency-domain procedure, relative to our time-domain method. First, since there are likely "stochastic trends" in most economic time series, arising from unit root components, it is necessary to first detrend the series prior to taking the Fourier transform: In order to accomplish band-pass filtering, one must therefore make a choice of detrending method. Working with annual data, Hassler et al. use the Hodrick-Prescott filter with $\lambda = 10$ for this initial detrending step. Working with quarterly data, Rush et al. argue for a much larger value ($\lambda = 10{,}000$) in the initial detrending step so as to avoid distorting business-cycle outcomes. Second, the results of the frequency-domain method at all dates are dependent on the sample length T. Consider, for example, the "business cycle" outcome $\tilde{y}_t$ obtained from a study of quarterly economic data in a study of length T_1, e.g., the observation on cyclical output in 1970:2, obtained using data through 1985. When the sample length is extended to T_2, the discrete Fourier transform of $\{y_1, y_2, \ldots y_T\}$ must be recomputed and each of its elements will change. Consequently, so too will each of the elements of the inverse Fourier transform of the

[7] A formal analysis of the Gibbs phenomenon as it derives from truncation for the unconstrained filter proceeds as follows. (See, for example, Koopmans (1974, ch. 6).) First, the truncation procedure at K leads and lags is viewed as a filter, with Fourier transform $\psi_K(\omega) = \Sigma_{k=-K}^{K} e^{-i\omega k} = \sin((2K+1)\omega/2)/\sin(\omega/2)$. Second, frequency-response function of the truncated filter is $\beta_K(\omega) = \int_{-\pi}^{\pi} \beta(\mu)\psi_K(\omega - \mu)\, d\mu$, using the fact that the Fourier transform of a product is the convolution of the Fourier transforms. Thus, the Gibbs phenomon arises as a consequence of the oscillatory nature of the truncation "window" $\psi_K(\omega)$.

[8] Our reasoning is as follows. The frequency-response function $\alpha(\omega)$ is an imaginary number at each frequency, which can be written in polar form as $g(\omega)e^{-i\phi(\omega)}$, where $g(\omega) = |\alpha(\omega)|$ is the gain and $\phi(\omega)$ is the phase shift. Our approximate filter's frequency-response function is always real-valued since it is symmetric. But, to represent a negative value of the frequency response, since gain is positive, the implied phase shift must be $\pm\pi$, which makes $e^{-i\phi(\omega)} = -1$. (This phase shift is similar to that which arises when one considers the series $-y_t$: In order to represent it in terms of the standard definitions of gain and phase, it must be viewed as having a gain of 1 and a phase shift of $\pm\pi$). We view these departures as small for two reasons. First, the negative values of the frequency response are numerically small. Second, it appears to be an artifact of the mathematical convention that gain is defined positive, rather than actually reflecting a translation of the series through time. If gain had alternatively been defined to admit negative values, then there would be no phase shift implied by a negative frequency response. (If this alternative definition had been employed, then there would also be no phase shift of $-y_t$ relative to y_t.)

filtered series, i.e., the cyclical observations, $\{\tilde{y}_1, \ldots \tilde{y}_T\}$. Thus, the outcome for cyclical output in 1970:2 will necessarily be different when data is added from 1986 to 1994. This time variation violates the fifth requirement that we discussed in section I above—a requirement that we share with Prescott (1986).

III. Measuring Business Cycles

This section explores several empirical issues raised by the foregoing discussion of approximate band-pass filters. As discussed earlier, an ideal business-cycle filter is defined to be the $BP_\infty(6, 32)$ filter, and its optimal approximation is the $BP_K(6, 32)$ filter for $0 < K < \infty$. First, we describe the effect of changes in the truncation point K on moments computed from a specified data-generating process. Second, we explore the effect of variation in K on moments computed from several macroeconomic time series.

A. *Effect of Variation in* K *on an AR(1) Process*

A useful way to explore the approximation error induced by application of the approximate band-pass filter is to compute moments for a known stochastic process using both the ideal and approximate versions of our business-cycle filter, $BP_K(6, 32)$. We examine the effect of variation in K on the autocovariances of the following first-order autoregression:

$$x_t = 0.95x_{t-1} + \epsilon_t$$

with σ_ϵ set so that the variance of x_t is 100 as a convenient normalization (i.e., $\sigma_\epsilon = 100 * (1 - 0.95^2)$). Table 1 gives the autocovariances of x_t for the ideal business-cycle filter and for several approximations to this filter (i.e., several values of K).[9] The first point to be made is that the band-pass filter (exact or approximate) substantially lowers the variance of the series (the autocovariance at lag 0), from a base of 100 to at most about 13.5. Looking next at how the variance of filtered x_t varies with the details of the approximation, we see that, when K is small (so that the moving average covers only a few observations), the approximate filter produces a filtered series whose variance is much smaller than the true or "exact" variance of 13.5. The approximation error for the filtered series' variance becomes quite small once $K \geq 12$. These findings can be understood by recalling that the $K = 4$ approximation to the ideal filter involved both leakage and compression near the cutoff frequency. (See figure 2.) For variables possessing Granger's (1966) typical spectral shape, such as this highly persistent AR(1) process, the effect of the compression is to filter out large components of frequencies for which there is substantial power in the original time series. As K rises and the accuracy of the approximate filter improves, this problem becomes smaller. Interestingly, the variance computed from the approximate filter does not converge monotonically to the true variance as K rises. However, the departures from the true value are small for large values of K. A similar picture emerges for the other autocovariances: Small values of K generally produce autocovariances smaller, in absolute value, than those produced by the ideal filter. Throughout, the approximation error is small for $K \geq 12$.

Table 1.—Effect of K on Moments of an AR(1) Process

K	Autocovariance at Lag: 0	1	2	4	8
2	0.23	0.07	−0.10	0.00	0.00
3	1.43	0.89	−0.05	−0.64	0.00
4	4.07	3.11	1.00	−2.01	0.01
6	8.45	7.23	4.09	−2.66	−1.69
8	9.14	7.91	4.75	−2.30	−2.32
12	13.08	11.78	8.43	0.79	−3.41
16	12.58	11.28	7.91	0.33	−3.59
20	12.10	10.77	7.37	−0.30	−4.42
24	12.19	10.86	7.44	−0.28	−4.60
32	13.01	11.67	8.22	0.42	−4.23
48	13.08	11.72	8.25	0.38	−4.48
60	13.00	11.64	8.15	0.26	−4.68
90	13.10	11.74	8.23	0.31	−4.73
exact	13.51	12.14	8.60	0.59	−4.74
no filter	100.00	95.00	90.25	81.45	66.34

B. *Empirical Effects of Variation in* K

This subsection explores the effect of the length of the moving average on summary statistics for several postwar U.S. time series. To provide some information about how one's view of the macroeconomic "facts" might depend on K, we have computed a set of summary statistics for several U.S. postwar quarterly macroeconomic time series using a range of values for K. Table 2 presents statistics on standard deviations, serial correlation coefficients, and contemporaneous correlations with GNP for $K = \{4, 8, 12, 16, 20\}$. Throughout the table, moments are computed for the time period associated with the shortest filtered time series (i.e., the $K = 20$ filter), so differences in moments are not due to differences in the sample period. Summary statistics are also presented for three other filters: a centered moving average, the first-difference filter, and the Hodrick-Prescott filter—but we defer discussion of these results until section IV.

Table 2-A shows that one commonly used measure of volatility—the standard deviation—is sensitive to the choice of K. Specifically, the measured volatility of every time series studied is about half as large for the lowest value of K ($K = 4$) compared with the value generated by the largest value of K ($K = 32$). This table shows that there is little effect of increases in K on the standard deviations of the filtered time series for $K \geq 12$. These results are consistent with the results obtained above for the AR(1): Small values of K yielded low variances, while a good approximation was obtained for $K \geq 12$.

[9] These autocovariances were not generated from Monte Carlo experiments. They are population moments and were computed by applying the approximate band-pass filter's transfer function, $|\alpha_K(\omega)|^2$, to the spectral density of the first-order autoregression and then numerically integrating the result.

TABLE 2.—EFFECT OF FILTERING ON MOMENTS: QUARTERLY DATA, 1947:1−1997:2

A. STANDARD DEVIATIONS

Variable	K: Truncation Point for Band-Pass Filter					Moving Average	Hodrick-Prescott	First Difference
	4	8	12	16	20			
GNP	0.95	1.49	1.75	1.71	1.71	2.07	1.82	1.08
Cons: durables	2.61	4.09	4.97	4.85	4.83	6.12	5.47	3.81
Cons: nondurables	0.60	0.99	1.15	1.13	1.09	1.37	1.23	0.76
Cons: durables	0.33	0.50	0.65	0.63	0.60	0.81	0.71	0.49
Investment	2.40	4.04	5.14	4.99	5.08	6.18	5.42	2.68
Hours per person	0.24	0.37	0.39	0.39	0.38	0.45	0.41	0.28
Employment	0.67	1.15	1.43	1.40	1.38	1.69	1.47	0.68
Exports	2.42	4.05	4.97	4.90	4.94	6.31	5.54	4.43
Imports	2.50	3.91	4.60	4.48	4.42	5.71	5.22	4.05
Net exports*	6.17	11.11	16.94	16.09	14.60	21.52	18.96	10.03
Gov't purchases	1.00	2.00	3.19	3.04	2.86	4.01	3.27	1.25
GNP deflator	0.29	0.59	0.95	0.90	0.80	1.20	0.91	0.64
Inflation*	0.58	0.82	1.01	0.99	1.01	1.45	1.32	1.50

Notes: Application of these filters involves loss of data points at both ends of the sample. For consistency, the moments reported are for the truncated sample 1952:1−1992:2 (the longest period available for the K = 20 bank-pass filter). The sample period for the hours variable is 1947:1−1996:3. Except for starred variables, natural logs were taken before filtering. See the Data Appendix for a description of data sources.

B. FIRST-ORDER AUTOCORRELATION

VARIABLE	K: TRUNCATION POINT FOR BAND-PASS FILTER					MOVING AVERAGE	HODRICK-PRESCOTT	FIRST DIFFERENCE
	4	8	12	16	20			
GNP	0.80	0.87	0.91	0.90	0.90	0.87	0.84	0.35
CONS: DURABLES	0.79	0.87	0.92	0.91	0.91	0.81	0.77	−0.02
CONS: NONDURABLES	0.82	0.88	0.92	0.91	0.91	0.86	0.83	0.27
CONS: DURABLES	0.78	0.87	0.92	0.91	0.90	0.84	0.81	0.24
INVESTMENT	0.83	0.89	0.93	0.93	0.92	0.91	0.89	0.44
HOURS PER PERSON	0.80	0.86	0.88	0.88	0.88	0.81	0.78	0.26
EMPLOYMENT	0.84	0.89	0.93	0.92	0.92	0.92	0.91	0.70
EXPORTS	0.79	0.89	0.92	0.91	0.91	0.75	0.69	−0.19
IMPORTS	0.78	0.87	0.91	0.90	0.90	0.76	0.72	−0.09
NET EXPORTS*	0.83	0.92	0.96	0.95	0.94	0.91	0.89	0.22
GOV'T PURCHASES	0.84	0.95	0.97	0.97	0.96	0.95	0.94	0.33
GNP DEFLATOR	0.89	0.94	0.96	0.96	0.95	0.95	0.94	0.84
INFLATION*	0.64	0.87	0.89	0.89	0.89	0.49	0.40	−0.37

C. CONTEMPORANEOUS CORRELATION WITH GNP

VARIABLE	K: TRUNCATION POINT FOR BAND-PASS FILTER					MOVING AVERAGE	HODRICK-PRESCOTT	FIRST DIFFERENCE
	4	8	12	16	20			
GNP	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CONS: DURABLES	0.85	0.83	0.78	0.79	0.78	0.74	0.75	0.65
CONS: NONDURABLES	0.73	0.81	0.82	0.82	0.83	0.79	0.78	0.50
CONS: DURABLES	0.53	0.70	0.76	0.76	0.77	0.75	0.72	0.37
INVESTMENT	0.90	0.90	0.87	0.87	0.89	0.85	0.85	0.74
HOURS PER PERSON	0.85	0.85	0.83	0.83	0.84	0.80	0.80	0.69
EMPLOYMENT	0.81	0.81	0.83	0.83	0.82	0.83	0.82	0.72
EXPORTS	0.26	0.24	0.28	0.29	0.32	0.29	0.27	0.20
IMPORTS	0.74	0.80	0.77	0.77	0.79	0.72	0.71	0.35
NET EXPORTS*	−0.44	−0.45	−0.41	−0.41	−0.45	−0.38	−0.39	−0.18
GOV'T PURCHASES	0.20	0.12	0.18	0.17	0.11	0.19	0.17	0.24
GNP DEFLATOR	−0.39	−0.46	−0.49	−0.49	−0.51	−0.49	−0.55	−0.26
INFLATION*	−0.06	0.05	0.14	0.12	0.18	0.09	0.05	−0.17

Table 2-B presents serial correlation coefficients. As with the standard deviations, the serial correlations of the filtered time series depend on K. In particular, this measure of persistence is uniformly lower for the smallest value of K, compared with the largest. The reason, once again, can be traced to the effects of leakage and compression for small K on the filtered time series. Since the most-persistent components of economic time series occur at the lower frequencies, the effect of compression in particular is to reduce the measured persistence of the filtered time series. As with standard deviations, the problem is most severe for $K = 4$, and there is little change for $K \geq 12$.

Table 2-C presents results for the contemporaneous correlation of various aggregates with GNP, which is one commonly used measure of the comovement of a variable with the business cycle. This table shows that there is a tendency for a variable's correlation with GNP to increase as K increases, although this is not uniformly true. As before, there is a tendency for the estimated moments not to change much for $K \geq 12$. Overall, our results suggest that summary statistics computed from the key macroeconomic time series are largely invariant to further improvements in the approximate business-cycle filter beyond $K = 12$.

C. *Inspecting the Results for GNP*

Figure 3 displays the results of applying five filters to the natural logarithm of gross national product.[10] Throughout the four graphs, we use the band-pass business-cycle filter with $K = 12$ as our reference point: It is the dark line which is present in all of the graphs. The common sample period for these graphs is 1947.1–1997.1, but, since we use $K = 12$, we lose three years of data at each end of the plots for the band-pass and high-pass filters.

The First-Difference Filter: Panel A of figure 3 shows the quarterly growth rate of real GNP versus the band-pass filter. The first-difference filter's heavy weight on high-frequency components of the data lead to the very jagged appearance of the filtered time series. There is little correspondence between the time series produced by the first-difference and the band-pass filters.

The Hodrick-Prescott Filter: Panel B of figure 3 plots Hodrick-Prescott filtered real GNP. There is a very close correspondence between the cycles isolated by this filter and those generated by the band-pass filter, although the Hodrick-Prescott filtered series is somewhat less smooth.

The High-Pass Filter ($HP_K(32)$): Panel C of figure 3 displays a high-pass filter constructed using our procedures that isolates periodic components of 32 quarters (eight years). We have chosen the same K value for this filter as for the reference band-pass filter, so that the panel simply illustrates the effect of the smoothing of high-frequency components introduced by our band-pass filter. For GNP, the panel makes clear that this smoothing of irregular components has little effect on the overall volatility.

The Deviation from Five-Year Moving Average Filter: Finally, Panel D of figure 3 displays deviations from a centered equally weighted moving average, which is a detrending method long used by business-cycle researchers. As with the Hodrick-Prescott filter and the high-pass filter, the correspondence with the band-pass filter is quite close, with the moving average filter being somewhat more volatile.

D. *Inspecting the Results for Inflation*

In figure 4, we present the results of applying the same five filters to the inflation rate. As before, the dark line in each panel is the $BP_K(6, 32)$ business-cycle filter.

The First-Difference Filter: Panel A of figure 4 shows the quarterly growth rate of inflation versus the band-pass filter. As before, the first-difference filter produces a highly volatile time series that bears little resemblance to the band-pass filter.

The Hodrick-Prescott Filter: Panel B of figure 4 plots Hodrick-Prescott filtered real GNP. In contrast to the results for GNP, there is a notable difference between the Hodrick-Prescott filter and the band-pass filter. The reason is that inflation contains important high-frequency components that are passed by the Hodrick-Prescott filter, but that are removed by the band-pass filter. GNP, by contrast, does not have important variation at high frequencies.

The High-Pass Filter ($HP_K(32)$): Panel C of figure 4 displays results for the $HP_{12}(32)$ filter. Like the Hodrick-Prescott filter, this filter passes the high-frequency components of inflation, leading to a more volatile filtered time series compared with that produced by the band-pass filter.

The Deviation from Five-Year Moving Average Filter: Finally, Panel D of figure 4 displays deviations from a moving average. As with the Hodrick-Prescott filter and the high-pass filter, the correspondence with the band-pass filter is weaker when we consider inflation compared with GNP. Once again, the reason is that high-frequency variation is much more important as a source of overall variation in inflation, compared with GNP.

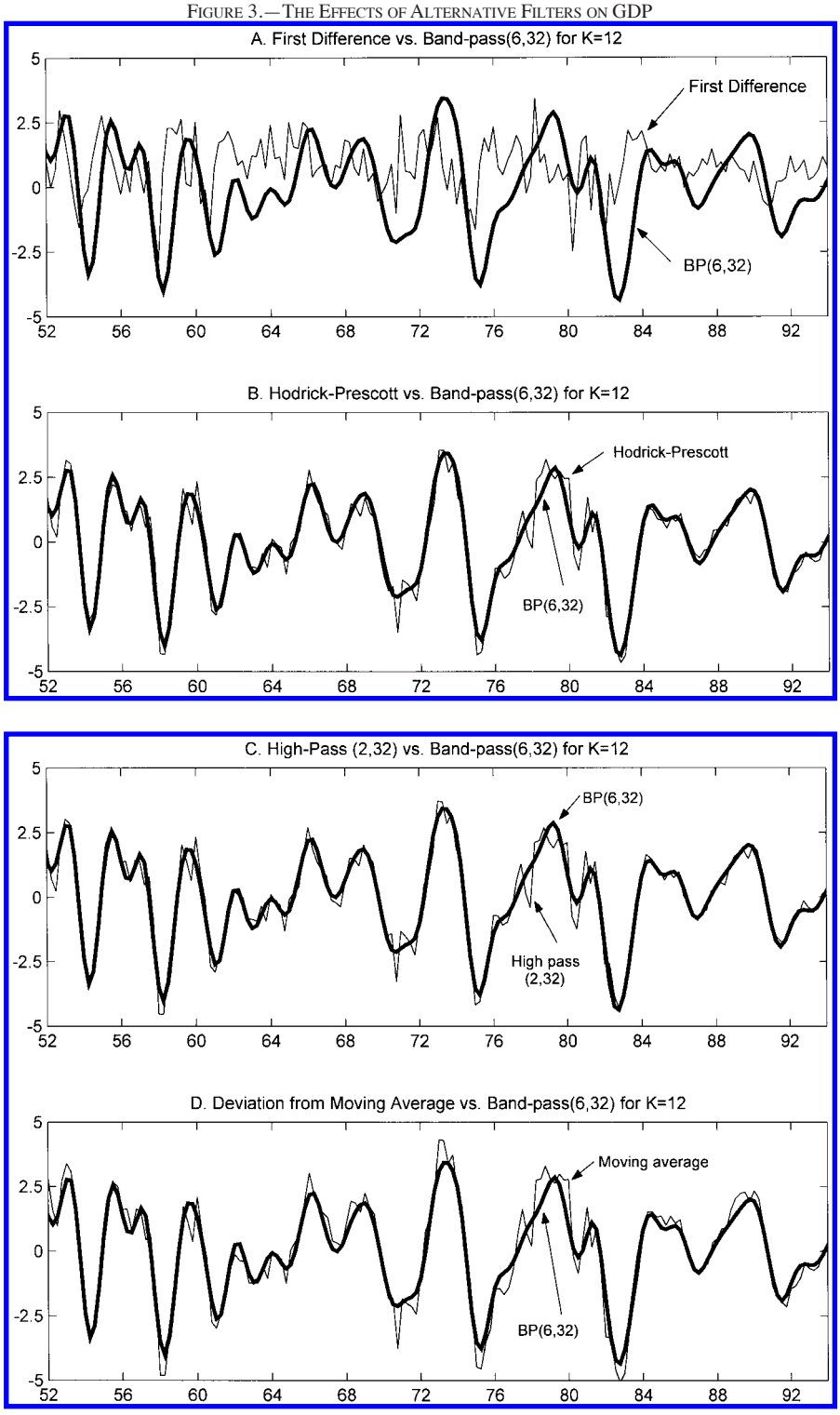
IV. Comparison with Other Filters

This section compares the properties of our proposed business-cycle filter with other commonly used filters.[11] We evaluate each filter in terms of its ability to achieve the following characteristics that we have argued are necessary for a "good" business-cycle filter: ability to remove unit roots, absence of phase shift, and ability to isolate business-cycle frequencies without reweighting the passed frequencies. Further, since model evaluation involves comparison of model moments with moments computed from the data, it is desirable that a business-cycle filter be easily (and consistently) applied both to the data and to economic models.

[10] We used excerpts from the database provided with Stock and Watson's (1999) extensive cataloging of U.S. business-cycle facts. Exact definitions of variables are contained in replication materials available from the authors.

[11] Our comparison is motivated, in part, by the fact that previous studies have shown that business-cycle statistics are quite sensitive to the detrending procedure. (See, for example, Baxter (1991) and Kydland and Prescott (1990).)

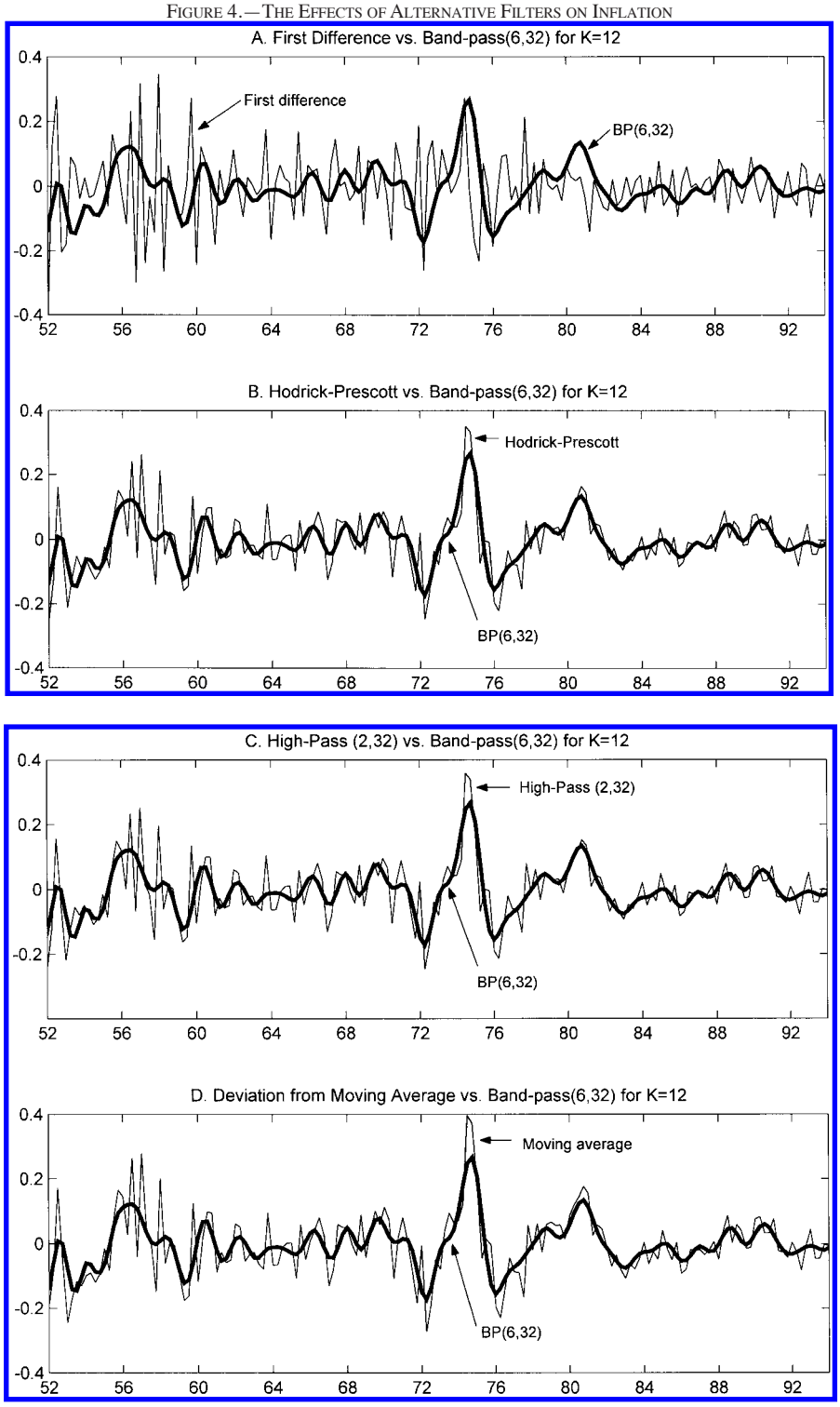
FIGURE 3.—THE EFFECTS OF ALTERNATIVE FILTERS ON GDP



A. *Removal of Linear Trends*

Although the removal of linear (or log-linear) trends historically was a standard method for separating trends from cycles, a large and growing body of evidence suggests that many macroeconomic time series contain unit root (stochastic trend) components that would not be removed by this procedure. Primarily for this reason, this approach to detrending has fallen out of favor in empirical macroeconomic investigations. Although this procedure does not induce phase shift (nor does it reweight frequencies), the failure to remove unit root components from the data means that linear detrending is undesirable for most macroeconomic time series.

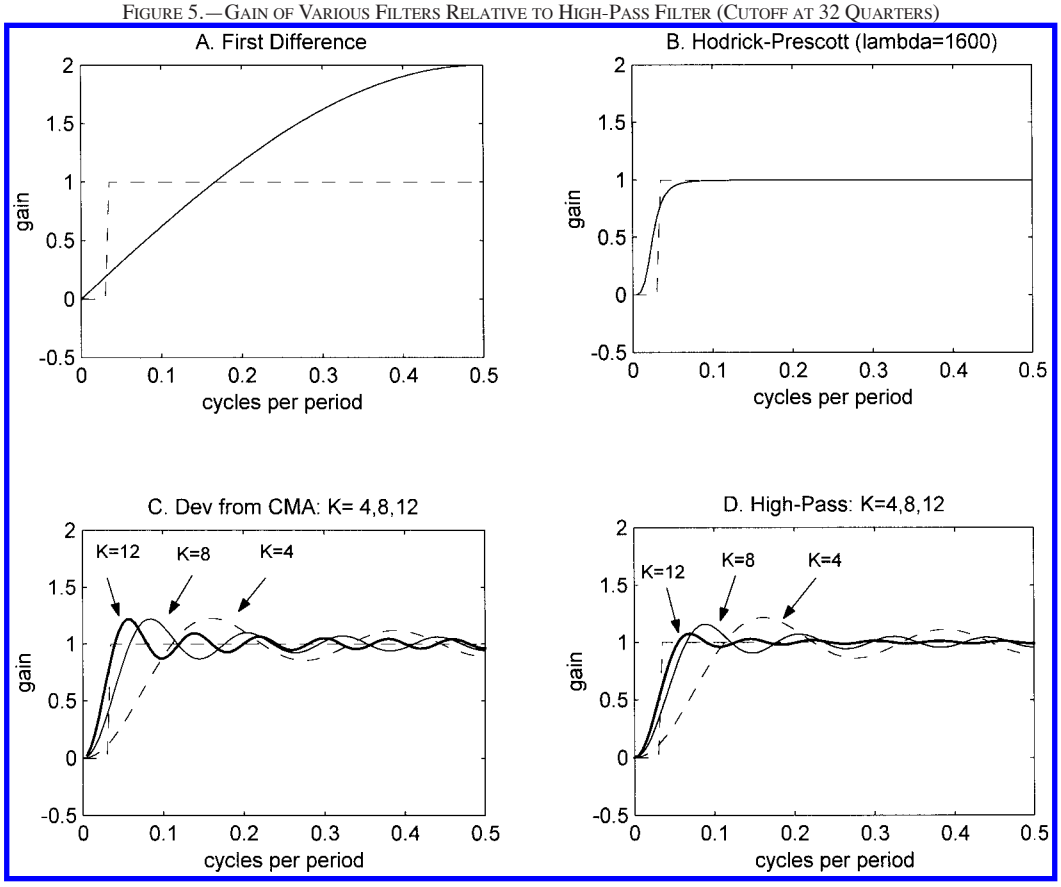
FIGURE 4.—THE EFFECTS OF ALTERNATIVE FILTERS ON INFLATION



B. The First-Difference Filter

The first-difference filter extracts the cyclic component y_t^c from a time series y_t as follows: $y_t^c = (1 - L)y_t$. It is evident that this filter removes unit root components from the data; for this reason, use of the first-difference filter has been popular in recent years. However, there are several problems with this filter with respect to the criteria listed above. First, because this filter is not symmetric, it alters timing relationships between variables (i.e., there is substantial phase shift for this filter). Second, this filter involves a dramatic reweighting of frequencies. Figure 5 panel A plots the gain function for this filter; the first-difference filter reweights strongly toward the higher frequencies, while downweighting lower frequencies. If the goal of a business-cycle

FIGURE 5.—GAIN OF VARIOUS FILTERS RELATIVE TO HIGH-PASS FILTER (CUTOFF AT 32 QUARTERS)



filter is to isolate fluctuations in the data that occur between specific periodicities, without special emphasis on any particular frequency, the first-difference filter is a poor choice.

C. *The Hodrick-Prescott Filter*

Use of the business-cycle filter proposed by Hodrick and Prescott (1980) has grown dramatically in recent years, especially in investigations involving the quantitative-equilibrium approach to constructing aggregative models. The properties of this filter were previously studied by King and Rebelo (1993), and the following discussion borrows heavily from their analysis.

The infinite-sample version of the Hodrick-Prescott filter defines the cyclic component of a time series y_t as follows:

$$y_t^c = \left(\frac{\lambda(1-L)^2(1-L^{-1})^2}{1+\lambda(1-L)^2(1-L^{-1})^2} \right) y_t \tag{11}$$

where λ is a parameter that penalizes variation in the growth component. (For quarterly data, Hodrick and Prescott recommend a value of $\lambda = 1600$.) From this equation, we see that the Hodrick-Prescott filter removes unit root components from the data. (In fact, it will remove nonstationary components that are integrated of order four or less.) Further, the filter is symmetric so there is no phase shift. Expanding equation (11) gives the following time-domain representation of the growth component extracted by the Hodrick-Prescott filter. (See appendix A to King and Rebelo (1989) for the derivation.):

$$y_t^g = \frac{\theta_1\theta_2}{\lambda}\left(\sum_{j=0}^{\infty} (A_1\theta_1^j + A_2\theta_2^j) y_{t-j} + \sum_{j=0}^{\infty} (A_1\theta_1^j + A_2\theta_2^j) y_{t+j} \right) \tag{12}$$

where A_1 and A_2 depend on θ_1 and θ_2; the coefficient $A_1\theta_1^j + A_2\theta_2^j$ is a real number for each j; and A_1 and A_2 are complex conjugates.[12]

As noted by King and Rebelo, the Fourier transform of the cyclical component of the Hodrick-Prescott filter has a

[12] Equation (12) makes it clear that the Hodrick-Prescott filter is a two-sided moving average, as are several of the filters we consider. This equation also shows that the moving average is of infinite order, so that in empirical applications some approximation to this filter is required. We discuss the issue of approximation of the Hodrick-Prescott filter in section V below; the discussion here focuses on the exact Hodrick-Prescott filter.

particularly simple form:

$$\tilde{C}(\omega) = \frac{4\lambda(1 - \cos(\omega))^2}{1 + 4\lambda(1 - \cos(\omega))^2}. \quad (13)$$

Thus, the cyclical component of the Hodrick-Prescott filter places zero weight on the zero frequency ($\tilde{C}(0) = 0$), and close to unit weight on high frequencies ($\tilde{C}(\pi) = 16\lambda/(1 + 16\lambda)$). Figure 5-B plots the frequency-response function of the Hodrick-Prescott filter for $\lambda = 1600$. Visually, this filter looks remarkably like an approximate high-pass filter with cutoff frequency $\underline{\omega} = \pi/16$ or 32 cycles per period.

In terms of the objectives that we specified for our filter design problem, the Hodrick-Prescott cyclical filter has several desirable features. First, no phase shift is introduced. Second, it has trend-elimination properties: It places zero weight at the zero frequency or, equivalently, contains multiple differencing operations. Third, with $\lambda = 1600$, it approximates the high-pass filter $HP_\infty(32)$ reasonably well since its gain rises sharply from near zero to near unit in the vicinity of the cutoff frequency $\omega = \pi/16$. However, since the Hodrick-Prescott filter of equation (4.2) is an infinite order moving average, some modification is necessary in order to apply it to data. We return to discussion of this topic in section V below.

D. Moving Averages

Another widely used method of detrending economic time series is to define the growth or trend component as a two-sided or centered moving average, with the cyclic component defined in the usual way as the deviation of a particular observation from the trend line. That is, the growth or trend component is formed as

$$y_t^g = \frac{1}{2K + 1} \sum_{j=-K}^{K} y_{t-j}. \quad (14)$$

Thus, the cyclic component of y_t is generated as $y_t^c = a(L)\, y_t$ with $a_0 = 1 - 1/2K + 1$, and $a_j = a_{-j} = 1/2K + 1$ for $j = 1, 2, \ldots, K$. This filter places zero weight at the zero frequency since $\Sigma a_k = 0$, and is symmetric. Figure 5-C plots the gain for the centered moving-average filter for several values of K.[13]

E. A High-Pass Filter

We have defined a high-pass business-cycle filter, $HP_K(32)$, as a filter that passes components of the data with periodicity less than or equal to 32 quarters. Figure 5-D plots the gain for this filter for several values of K. As with the moving-average filter, this filter yields a good approximation to an ideal high-pass filter for sufficiently large values of K (i.e., $K \geq 12$).

F. Moment Implications

Table 2 shows how application of these alternative filters affects moments computed from several postwar U.S. time series. We focus on three sets of moments of particular interest to business-cycle analysis: volatility, persistence, and correlation with output.

Volatility. Table 2-A presents volatility statistics. As discussed earlier, the band-pass filter with $K \geq 12$ yields a very good approximation to the ideal band-pass filter. For this reason, we regard the statistics computed with the $K = 20$ band-pass filter as the best measure of business-cycle volatility, and then compare the other filters to this benchmark. Except for inflation (which we discuss separately below), a clear pattern emerges. The Hodrick-Prescott filter produces volatility statistics that exceed those of the ideal band-pass filter, although in many cases not by a large amount. The moving-average filter produces volatility statistics that are larger still, although again the changes are not dramatic. The first-difference filter, by contrast, produces volatility statistics that are smaller (in many cases, much smaller) than those produced by the band-pass filter. Having studied the gain functions of these filters, these results are easy to understand. The Hodrick-Prescott and moving-average filters are rough approximations to a high-pass filter, which means that they retain some high-frequency volatility that is removed by the band-pass filter. These macroeconomic time series do not have a great deal of power at high frequencies, so including these components leads to only small increases in the volatility of the filtered time series. The first-difference filter produces smaller measures of volatility because it removes more of the low-frequency components of the time series than the band-pass filter, while reweighting the frequencies to emphasize the higher frequencies. For all the variables studied except inflation, most of the power is at the lower frequencies.

The pattern described above is reversed for inflation: Here, the first-difference filter produces the highest measure of cyclic volatility. As discussed in section III.D. above, inflation contains sizable high-frequency components—components that are emphasized by the first-difference filter. This also explains why the moving-average and Hodrick-Prescott filters produce significantly higher volatility measures compared with the band-pass filter: The band-pass filter removes the high-frequency components, while these alternative filters do not.

Persistence. Table 2-B presents statistics on the first-order autocorrelation of filtered macroeconomic time series.

[13] The general shape of this filter is very similar to that of the approximate high-pass filter, plotted in figure 5-D, although the "side lobes" are more exaggerated for the moving-average filter.

As before, we take the band-pass filter (for $K \geq 12$) as our benchmark. Compared with this benchmark, each of the other filters produces a lower measure of persistence. Excepting, once again, the inflation series, the differences are relatively small for the moving-average and Hodrick-Prescott filters. However, the first-difference filter produces dramatically smaller measures of persistence compared with the other filters. Once again, this is due to the fact that the first-difference filter removes more of the highly persistent, low-frequency components, and emphasizes the much-less-persistent, high-frequency components. As before, the inflation series behaves differently than the other time series, because of its important high-frequency components. (With the emphasis on these components provided by the first-difference filter, the measured persistence of inflation is actually negative.)

Correlation with GNP. Finally, Table 2-C provides statistics on the correlation between various macro variables and GNP. Once again, we find that the moving-average and Hodrick-Prescott filters produce statistics that are roughly similar to those computed using the band-pass filter. The first-difference filter produces correlations that are, in many cases, significantly smaller (in absolute value). Overall, researchers using the band-pass filter, the moving-average filter, or the Hodrick-Prescott filter on quarterly postwar U.S. time series are likely to obtain a similar impression of the nature of business cycles. However, use of the first-difference filter will yield a markedly different view of the central business cycle "facts."

In general, the first-difference procedure produces filtered time series with lower volatility than those generated by the band-pass filters or the Hodrick-Prescott filter. This is a direct consequence of the fact that the first-difference filter downweights the lower frequencies relative to the alternative filters. For the same reason, the first-difference filter produces time series that exhibit much lower persistence than those produced by other filters (see table 2-B) and whose correlation with GNP is also much lower (table 2-C).

V. Comparing HPs

In this section, we undertake a detailed comparison of the Hodrick-Prescott filter with high-pass filters constructed using our approach. For the purposes of many users of the Hodrick-Prescott filter, we shall conclude that our high-pass filter is better in one important dimension: its ease of application to data sampled at other-than-quarterly frequencies.

A. The Quarterly HP Filters Can Be Very Close

The first observation is that our $HP_{12}(32)$ filter and the conventional Hodrick-Prescott filter give essentially similar results for quarterly GNP, thus reinforcing the idea—discussed in the previous section—that the Hodrick-Prescott filter is a reasonable approximation to the band-pass filter. This result is suggested by comparison of panels *C* and *D* of figure 5, discussed in section III.B, above: The two series look very much like each other. In fact, the correlation of the Hodrick-Prescott cyclical component and the $HP_{12}(32)$ cyclical component is 0.994 over the common sample period.

B. The Hodrick-Prescott Filter in Finite Samples

Many individuals currently use the Hodrick-Prescott filter with $\lambda = 1600$ for defining cyclical components of quarterly economic time series. One main rationale for this, given by Prescott (1986), is that the filter is approximately a band-pass filter that passes cyclical components of periodicity greater than eight years (32 quarters).

To apply the Hodrick-Prescott cyclical filter to data, one strategy would be to truncate its weights at some fixed lag K, which would be analogous to our approximation of the ideal band-pass filter. However, in actual practice, an alternative procedure is typically used. This procedure has the apparently attractive feature that there is no loss of data from filtering. That is, for a time series y_t for $t = 1, \ldots T$, the Hodrick-Prescott procedure produces estimates of the cyclical component, y_t^c for $t = 1, \ldots T$.[14]

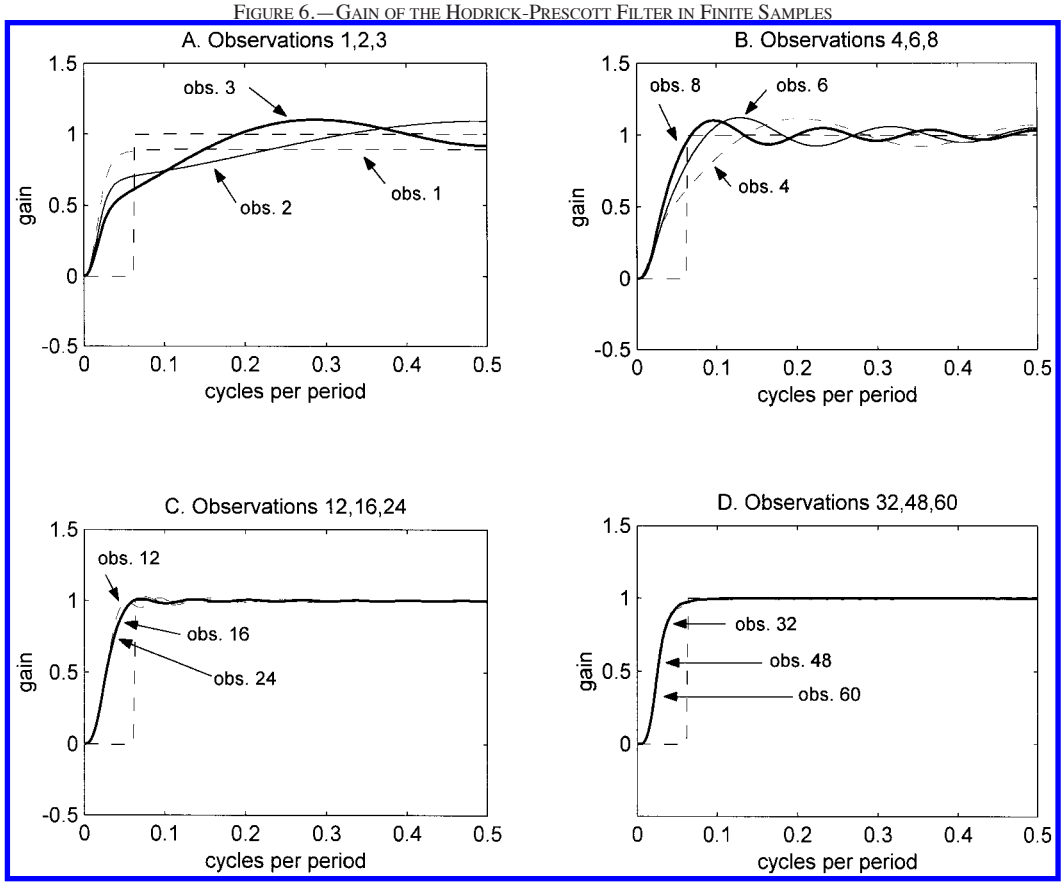
To understand this outcome, it is useful to return to the original derivation of the Hodrick-Prescott filter as the solution to a specific econometric problem, which is essentially to find the optimal estimates of trend and cycle corresponding to a particular known probability model. If we let y_t^τ denote the trend component and continue to let y_t^c denote the cyclical component, this probability model is that trend and cycle are driven by independent white noises (η_t and ϵ_t respectively) and that their dynamics are $\Delta^2\tau_t = \eta_t$ and $c_t = \epsilon_t$. If one knows the relative magnitude of σ_η^2 and σ_ϵ^2, then it is possible to extract estimates of y_t^τ and y_t^c at each date of a finite sample $t = 1, \ldots T$. Further, these estimates are simply weighted averages of the original data, so that the cyclical component at date t is

$$y_t^c = \sum_{h=1}^{T} d_{ht} y_h.$$

While this derivation makes the date t cyclical component a moving average of the data, the linear filter is not time invariant: The weights depend on the date t as well as the lead/lag index h. However, the algorithm that we use for

[14] We implement the finite-sample Hodrick-Prescott filter as follows. First, we stack the data into a column vector Y. Second, we define a matrix Γ that links the corresponding column vector of "growth components," Y^G, to the data: $Y = \Gamma Y^G$. Third, we compute the vector of "cyclical components" as $Y^C = Y - Y^G = (I - \Gamma^{-1})Y$. The matrix Γ is implied by the equations that link the growth components to the data. The general equation is $y_t = \lambda y_{t+2}^g - 4\lambda y_{t+1}^g + (1 + 6\lambda)y_t^g - 4\lambda y_{t-1}^g + \lambda y_{t-2}^g$, but this expression must be modified near the endpoints. For example, at the beginning of the sample, we use $y_1 = (1 + \lambda)y_1^g + (-2\lambda)g_2^g + (1 + \lambda)y_3^g$ and $y_2 = (-2\lambda)y_1^g + (1 + 5\lambda)y_2^g + (-4\lambda)y_3^g + \lambda y_4^g$, and comparable modifications must be made near the end of the sample.

FIGURE 6.—GAIN OF THE HODRICK-PRESCOTT FILTER IN FINITE SAMPLES



computing the Hodrick-Prescott filter makes it easy to recover the coefficient d_{ht} so that we can study their properties. One feature that emerges is that, for each date t, $\Sigma_{h=1}^{T} d_{ht} = 0$ so that, in this fashion, the time-varying linear filter displays trend-elimination properties at every date.

To begin our more detailed look at the time-varying filter, we compute the gain of the linear filter $d_t(L) = \Sigma_{h=1}^{T} d_{ht} L^{(h-t)}$ in figure 6 for a range of dates $t = (1, 2, 3), (4, 6, 8), (12, 16, 24), (32, 48, 60)$. These choices are motivated by the idea that we are studying a quarterly sample period of postwar size, so that there are about 180 observations, and we want to explore the effects of time variation near the endpoints and in the middle of the sample. (It is sufficient to look at the initial values because there is a symmetry property to the weights: $d_{1T} = d_{T1}$, etc.) These figures show that the d_{ht} coefficients at the beginning of the sample period are such that the $d_t(L)$ has very different properties than an exact high-pass filter: The gain functions differ sharply from each other for $t = 1, 2, 3$ and from the gain of the exact high-pass filter. (There is also phase shift near the endpoints, since $d_t(L)$ is not close to being a symmetric linear filter for t close to 1 or T.) But, as we move toward the middle of the sample period, the gain of the filter differs less sharply from one observation to the next, and the overall filter looks closer to the ideal band-pass filter.

Another perspective on the extent of time variation in the filter weights is afforded by considering the effect of $d(L)$ if it is applied to a specific data-generating process. While it is feasible to undertake this for standard macroeconomic models, we opted for the simpler procedure of evaluating the effects of the filter on population variance of a first-order autoregression, $y_t = \rho\, y_{t-1} + e_t$ with $\sigma_e^2 = 1$ and $\rho = 0.95$. Table 3 gives the variance by observation with the time-varying weight version of the Hodrick-Prescott filter. (This variance should be viewed as calculated across many realizations of the time series generated by this first-order autoregressive process.) Although each observation has the same variance before filtering, time-variation in the filter applied to the process leads to different variances across observations. In fact, the change in the variance is not even monotonic, as suggested by the gain patterns in Figure 6.

This investigation thus suggests that the Hodrick-Prescott filter does not really generate as many useful estimates of the cyclical component as there are data points. Since the filter weights settle down after about the twelveth observation, it would seem natural to drop twelve observations from the beginning and end of the sample period. But, then, there would be little reason to prefer the Hodrick-Prescott filter to our high-pass filter for quarterly data.

C. *HP Filters at Other Data Frequencies*

Is the Hodrick-Prescott filter an adequate approximation to a high-pass filter when used with data sampled at other

TABLE 3.—EFFECT OF HODRICK-PRESCOTT FILTER WITH TIME-VARYING WEIGHTS

Observation	Variance
1	17.50
2	12.01
3	9.97
4	9.72
6	11.54
8	13.70
12	15.64
16	15.76
24	15.89
32	16.54
48	16.56
60	16.56
90	16.56

frequencies? The answer to this question is important to researchers concerned with international and public finance questions: Very often, the data used by these researchers are available only at the annual frequency. For our procedures, it is clear how to move between different data frequencies. For example, if we are considering results from the high-pass filter $HP_{12}(32)$ with data at the quarterly frequency, then the natural first filter to consider for annual data is $HP_3(8)$: We isolate the same frequencies (periodicities of eight years and higher), and we lose the same number of years of data at the ends of the sample.

However, it is much less clear how to proceed with the Hodrick-Prescott method. The difficulty is that the Hodrick-Prescott filter requires the researcher to specify the "smoothing parameter," λ. For quarterly data, we found that $\lambda = 1600$ produces a reasonable approximation to a high-pass filter. For annual data, current empirical practice is to use $\lambda = 400$ or $\lambda = 100$. (For example, Backus and Kehoe (1992) use $\lambda = 100$ in their study of international business cycles.) To investigate whether these values of λ yield a good approximation to a band-pass filter for annual data, we applied our $BP_3(2, 8)$ filter and the HP filter for several values of λ to U.S. annual GNP.[15] The commonly used values of $\lambda = 400$ and $\lambda = 100$ did not produce a filtered time series for GNP that closely resembled that produced by the band-pass filter.[16] However, setting $\lambda = 10$ produced a much better correspondence between the Hodrick-Prescott and band-pass filters. Figure 7 plots the gain for the Hodrick-Prescott filter for the three values of λ against the ideal filter. This figure reveals why $\lambda = 100$ and $\lambda = 400$ produce such different pictures for filtered GNP compared with the optimal approximate band-pass filter: For these values of λ, the Hodrick-Prescott filter is a poor approximation to the ideal filter. In particular, these filters contain a great deal of leakage from low frequencies. (That is, the $\lambda = 100$ and $\lambda = 400$ filters pass through nearly all of the components of the data with cycles between nine and sixteen years—components that most researchers would not identify as business-cycle components.) The approximation to the ideal band-pass filter is significantly better for $\lambda = 10$. However, even the $\lambda = 10$ filter contains significant leakage as well as significant compression.[17]

The foregoing discussion concerned the properties of the exact Hodrick-Prescott filter. In practice, however, a finite-moving-average approximation to this exact filter must be used. Looking at a figure similar to figure 6 but designed for annual data, we found that the finite-sample version of the filter produces serious departures from the ideal filter for the first three observations, but improves dramatically after the fourth observation. We thus recommend dropping at least three data points from each end of the sample when using the Hodrick-Prescott filter on annual data, even if one chooses $\lambda = 10$, which is the same number of data points dropped by our business-cycle filter.

VI. Summary and Conclusions

This paper develops a set of approximate band-pass filters designed for use in a wide range of economic applications. The empirical focus of the paper is on isolating cyclic fluctuations in economic time series, defined as cycles in the data between specified frequency bands. We make detailed comparisons of our band-pass business-cycle filter with other commonly used filters, and evaluate these alternative filters in terms of their ability to isolate business-cycle fluctuations in the data. We found that linear detrending and first-differencing the data are not desirable business-cycle filters. On the other hand, moving-average analysis and Hodrick-Prescott filtering can, in some cases, produce reasonable approximations to an ideal business-cycle filter. However, the optimal approximate band-pass filter that we develop in this paper is more flexible and easier to implement than these filters and produces a better approximation to the ideal filter. While the main motivation for and focus of our investigation is on construction of a business-cycle filter, the results should be of more-general interest since the defining periodicities may be readily specified by a researcher and applied to data at any observation frequency. Based on the results of this paper, we recommend three filters for use with quarterly and annual macroeconomic data.

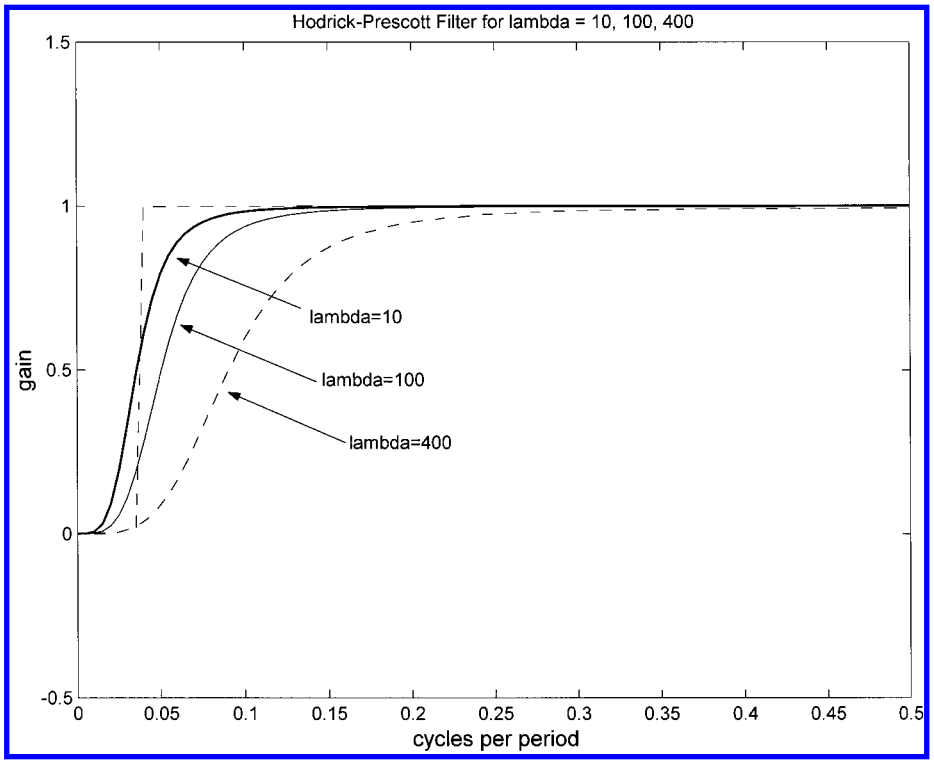
For quarterly macroeconomic data, we recommend the Burns-Mitchell band-pass filter, which admits frequency components between 6 and 32 quarters, with $K = 12$. This filter removes low-frequency trend variation and smooths high-frequency irregular variation, while retaining the major features of business cycles. Some macroeconomists, particularly those who have extensively used the Hodrick-Prescott filter, may prefer to employ the high-pass filter, which

[15] Since the shortest detectable cycle in a time series is one that lasts two periods, the annual business-cycle filter passes components with cycle length between two and eight years. Note that, in this case, the band-pass filter is equivalent to a high-pass filter.

[16] This finding was not altered by increasing the K parameter from 3 to 6.

[17] Hassler et al. (1994) also argue that $\lambda = 10$ is the appropriate value for the smoothing parameter when applying the Hodrick-Prescott filter to annual data.

FIGURE 7.—ALTERNATIVE ANNUAL HODRICK-PRESCOTT FILTERS



admits frequency components between 2 and 32 quarters with $K = 12$. Essentially, this filter removes the trend variation without removing the higher-frequency irregular variation in the series. Relative to the Hodrick-Prescott method, this filter does involve dropping three years of data at the beginning and end of the sample; we have seen, however, that this loss is more apparent than real because the weights in the Hodrick-Prescott filter are rapidly changing near the ends of the sample, resulting in substantial distortions of these cyclical observations. The filter weights are provided in the first two columns of table 4.

For annual macroeconomic data, band-pass and high-pass business-cycle filters are equivalent. We accordingly recommend a single filter that admits periodic components between two and eight years, with $K = 3$. The filter weights are given in the last column of table 4.

TABLE 4.—MOVING AVERAGE WEIGHTS FOR BUSINESS-CYCLE FILTERS

Lag	BP(6,32)	BP(2,32)	BP(2,8)
0	0.2777	0.9425	0.7741
1	0.2204	−0.0571	−0.2010
2	0.0838	−0.0559	−0.1351
3	−0.0521	−0.0539	−0.0510
4	−0.1184	−0.0513	
5	−0.1012	−0.0479	
6	−0.0422	−0.0440	
7	0.0016	−0.0396	
8	0.0015	−0.0348	
9	−0.0279	−0.0297	
10	−0.0501	−0.0244	
11	−0.0423	−0.0190	
12	−0.0119	−0.0137	

We have applied the filters constructed in this paper in various research contexts, which provides an additional demonstration of their flexibility and usefulness. For example, Baxter (1994) uses the methods of this paper to study the relationship between real exchange-rate differentials and real interest rates at low frequencies (trend components), medium frequencies (business-cycle components) and high frequencies (irregular components). She concludes that prior studies have missed interesting relationships between these variables because a concern for producing stationary data led researchers to use the first-difference filter. This procedure emphasized irregular (high-frequency) components where little relationship exists at the expense of the business-cycle components where a striking, positive relationship emerges. In another application, King and Watson (1994) show that the "Phillips correlations" (defined as a negative correlation of inflation and unemployment) appear strong at the business-cycle frequencies even though they are hard to see in the original inflation and unemployment time series. This latter investigation uses monthly data and thus defines the business-cycle periodicities as 18 months to 96 months. It thus highlights one important strength of our approach: It is easy to alter the filter construction when the sampling frequency changes.

In conclusion, the primary goal of this paper was to "build a better mousetrap"—that is, to develop an approach to filtering economic time series that is fast, flexible, and easy

to implement. Our goal in this undertaking is to encourage empirical researchers to adopt a common approach to filtering, which will greatly aid in replication and comparison of results across researchers.

REFERENCES

Backus, D., and P. Kehoe, "International Evidence on the Historical Properties of Business Cycles," *American Economic Review* 82 (Sep., 1992), 864–888.

Baxter, M., "Business Cycles, Stylized Facts, and the Exchange Rate Regime: Evidence from the United States," *Journal of International Money and Finance* 10 (Jan., 1991), 71–88.

——— "Real Exchange Rates and Real Interest Differentials: Have We Missed the Business-Cycle Relationship?" *Journal of Monetary Economics* 33 (Feb., 1994), 5–37.

Bry, G., and C. Boschan, *Cyclical Analysis of Time Series: Selected Procedures and Computer Programs* (New York: National Bureau of Economic Research, 1981).

Burns, A. M., and W. C. Mitchell, *Measuring Business Cycles* (New York: National Bureau of Economic Research, 1946).

Craddock, J. M., "An Analysis of the Slower Temper Variations at Kew Observatory by Means of Mutually Exclusive Bandpass Filters," *Journal of the Royal Statistical Society,* 120 (1957), 387–397.

Engle, R., and C. Granger, "Co-Integration and Error Correction: Representation, Estimation, and Testing," *Econometrica* 55 (March, 1987), 251–276.

Englund, P., T. Persson, and L. E. O. Svensson, "Swedish Business Cycles: 1861–1988," *Journal of Monetary Economics* 30 (Dec., 1992), 343–371.

Granger, C., "The Typical Spectral Shape of An Economic Variable," *Econometrica* 34 (Jan., 1966), 150–161.

Granger, C. W. J., and M., *Spectral Analysis of Economic Time Series* (Princeton, N.J.: Princeton University Press, 1964).

Harvey, A. C., *Time Series Models* (New York: John Wiley and Sons, 1981).

Hassler, J., P. Lundvik, T. Persson, and P. Soderlind, "The Swedish Business Cycle: Stylized Facts over 130 Years," in V. Bergstrom, A. Vredin (eds.), *Measuring and interpreting business cycles*. (Oxford and New York: Oxford University Press, Clarendon Press, 1994), 9–108.

Hodrick, R. J., and E. C. Prescott, "Post-war U.S. Business Cycles: An Empirical Investigation," working paper, Carnegie-Mellon University (1980).

King, R. G., and S. T. Rebelo, "Low Frequency Filtering and Real Business Cycles," Rochester Center for Economic Research working paper No. 205, University of Rochester (Oct., 1989).

——— "Low Frequency Filtering and Real Business Cycles," *Journal of Economic Dynamics and Control* 17 (Jan., 1993), 207–231.

King, R. G., and C. I. Plosser, "Real Business Cycles and the Test of the Adelmans," *Journal of Monetary Economics* 33 (April, 1994), 405–438.

King, R. G., and M. W. Watson, "The Post-War U.S. Phillips Curve: A Revisionist Econometric History," Carnegie Rochester Conference Series on Public Policy 41 (Fall, 1994), 157–219.

Koopmans, L., *The Spectral Analysis of Time Series* (New York: Academic Press, 1974).

Kydland, F., and E. C. Prescott, "Real Facts and A Monetary Myth," Federal Reserve Bank of Minneapolis, *Quarterly Review 14* (Spring, 1990), 3–18.

Prescott, E. C., "Theory Ahead of Business Cycle Measurement," *Carnegie-Rochester Conference Series on Public Policy* 25 (Fall, 1986), 11–66.

Stock, J. H., and M. W. Watson, "Business Cycle Fluctuations in U.S. Macroeconomic Time Series, in J. Taylor and M. Woodford (eds.), *Handbook of Macroeconomics,* Amsterdam: Elsevier Science Publishers, 1999).

Rush, M., Y. Li, and L. Zhu, "Filtering Methodology and Fit in Dynamic Business Cycle Models," University of Florida working paper (1997).

Watson, M. W., "Business Cycle Duration and Postwar Stabilization of the U.S. Economy," *American Economic Review* 84 (March, 1994), 24–46.

APPENDIX

A. Trend-Elimination Properties

In this appendix, we demonstrate that symmetric moving-average filters can render stationary economic time series with deterministic and stochastic trends. In particular, we consider the filter $a(L) = \Sigma_{k=-K}^{K} a_k L^k$ on which we impose two conditions: that the coefficients sum to zero, $a(1) = \Sigma_{k=-K}^{K} a_k = 0$; and that the filter is symmetric, $a_k = a_{-k}$. Using these conditions, we rewrite the moving average as

$$a(L) = \sum_{k=-K}^{K} a_k L^k = \sum_{k=-K}^{K} a_k L^k - a_k = \sum_{k=1}^{K} a_k (L^k + L^{-k} - 2),$$

where the first equality follows from the sum of coefficients requirement and the second follows from the symmetry assumption. The individual terms $(L^k + L^{-k} - 2)$ can be rewritten as $-(1 - L^k)(1 - L^{-k})$. Using the additional fact that $(1 - L^k) = (1 - L)[1 + L + L_2 + \ldots L^{k-1}]$, a little bit of algebra demonstrates that $[1 + L^1 + \cdots + L^{k-1}]$ $[1 + L^{-1} + \cdots + L^{-(k-1)}]$ is equal to $\Sigma_{h=-(k-1)}^{(k-1)}(k - |h|)L^h$. Hence, we conclude that

$$\begin{aligned} a(L) &= -\sum_{k=1}^{K} a_k[(1 - L^{-k})(1 - L^{-k})] \\ &= -(1 - L)(1 - L^{-1})\psi_K(L), \end{aligned}$$

with $\psi_K(L)$ being a symmetric moving average with $K - 1$ leads and lags, which is defined by $\psi_K(L) = [\Sigma_{k=1}^{K} a_k \Sigma_{h=-(k-1)}^{(k-1)}(k - |h|)L^h]$. Since $\psi_K(L)$ is a finite-term moving average, it does not alter the stationarity properties of any series to which it is applied.

We have shown that any symmetric moving filter $a(L)$ whose weights sum to zero contains a backward difference $(1 - L)$ and a forward difference $(1 - L^{-1})$. Consequently, $a(L)$ has the ability to render stationary I(2) stochastic processes and quadratic deterministic trends.

APPENDIX

B. Optimal Approximation

In this appendix, we consider the optimal approximation of an ideal symmetric linear filter by a *K*th-order symmetric moving average. We pose the filter design problem in the frequency domain.

Preliminaries

Consider a filter $g(L) = \Sigma_{h=-\infty}^{\infty} g_h L^h$ with square-summable weights. The filter and its frequency-response function $\gamma(\omega)$ are a Fourier transform pair. Operationally, this means that the frequency-response function can be obtained from the filter weights by the Fourier sum,

$$\gamma(\omega) = \sum_{h=-\infty}^{\infty} g_h e^{-i\omega h}.$$

The filter weights can be obtained from the frequency-response function by the Fourier integral,

$$g_h = \frac{1}{2\pi} \int_{-\pi}^{\pi} \gamma(\omega) e^{i\omega h}\, d\omega.$$

To accomplish this integration in particular contexts, we employ the facts that

$$\frac{1}{2\pi}\int_{-\pi}^{\pi} e^{-i\omega(j-k)}\,d\omega = 1 \quad \text{for } j = k$$

$$\frac{1}{2\pi}\int_{-\pi}^{\pi} e^{-i\omega(j-k)}\,d\omega = 0 \quad \text{for } j \neq k.$$

(For example, these facts imply that $g_h = (1/2\pi)\int_{-\pi}^{\pi} \times \gamma(\omega)e^{i\omega h}\,d\omega = (1/2\pi)\int_{-\pi}^{\pi}[\Sigma_{h=-\infty}^{\infty} g_h e^{-i\omega h}]e^{i\omega h}d\omega = g_h$, which is a "reality check" of sorts.) We use these facts and the Fourier integral repeatedly in our analysis below, given that we design the optimal filter in the frequency domain and must derive the filter weights.

Application to Deriving Weights for the Ideal Low-Pass Filter

The Fourier integral of the ideal low-pass filter $\beta(\omega)$ implies that the filter coefficients satisfy

$$b_h = \frac{1}{2\pi}\int_{-\pi}^{\pi} \beta(\omega)e^{i\omega h}\,d\omega = \frac{1}{2\pi}\int_{-\overline{\omega}}^{\overline{\omega}} e^{i\omega h}\,d\omega,$$

where the second line derives from the fact that $\beta(\omega) = 1$ for $|\omega| \leq \overline{\omega}$ and $\beta(\omega) = 0$ for $|\omega| > \overline{\omega}$. Hence, it follows that

$$b_0 = \frac{1}{2\pi}\int_{-\overline{\omega}}^{\overline{\omega}} d\omega = \frac{\overline{\omega}}{\pi}$$

$$b_h = \frac{1}{2\pi}\int_{-\pi}^{\pi} \beta(\omega)e^{i\omega h} = \frac{1}{2\pi}\left[\frac{1}{ih}e^{i\omega h}\right]_{-\overline{\omega}}^{\omega} = \frac{1}{\pi h}\sin(\overline{\omega}h)$$

where the last equality follows from $2i\sin(x) = e^{ix} - e^{-ix}$.

The Filter Design Problem in the Frequency Domain

The problem is to minimize $Q = 1/2\pi\int_{-\pi}^{\pi}|\delta(\omega)|^2\,d\omega$, with $\delta(\omega)$ being the discrepancy between the exact and approximating filters at frequency ω, $\delta(\omega) = \beta(\omega) - \alpha(\omega)$. Some versions of the problem discussed in the text require that the approximating filter take on a specified value at the zero frequency, which we represent as $\alpha(0) = \phi$. (Equivalently, since $e^0 = 1$, this restriction is $\Sigma_{k=-K}^{K} a_k = \phi$.) To solve this as a constrained-maximization problem, we form the Lagrangian, $L = -Q + \lambda[\alpha(0) - \phi]$, which may be expressed alternatively as

$$L = -\frac{1}{2\pi}\int_{-\pi}^{\pi}\left[\beta(\omega) - \sum_{k=-K}^{K} a_k e^{-i\omega k}\right]\left[\beta(\omega) - \sum_{k=-K}^{K} a_k e^{-i\omega k}\right]' d\omega + \lambda\left[\sum_{k=-K}^{K} a_k - \phi\right].$$

The first-order conditions are

$$a_j: 0 = \frac{1}{2\pi}\int_{-\pi}^{\pi} e^{-i\omega j}\left[\beta(\omega) - \sum_{k=-K}^{k} a_k e^{-i\omega k}\right]' d\omega + \frac{1}{2\pi}\int_{-\pi}^{\pi}\left[\beta(\omega) - \sum_{k=-K}^{K} a_k e^{-i\omega k}\right] e^{i\omega j}\,d\omega + \lambda$$

$$\lambda: 0 = \sum_{k=-K}^{K} a_k - \phi$$

where $-K \leq j \leq K$.

Restrictions on the Filter Weights From the First-Order Conditions

Repeatedly using the facts that $(1/2\pi)\int_{-\pi}^{\pi} e-i\omega(j-k)\,d\omega = 1$ for $j = k$ and $(1/2\pi)\times\int_{-\pi}^{\pi} e^{-i\omega(j-k)}\,d\omega = 0$ for $j \neq k$, the $2K + 1$ first-order conditions with respect to a_j can be expressed as

$$0 = 2(b_j - a_j) + \lambda.$$

(For an example of this process, the term $(1/2\pi)\int_{-\pi}^{\pi}[\Sigma_{k=-K}^{K} a_k e^{-i\omega k}]e^{i\omega j}\,d\omega$ is equal to $(1/2\pi)\int_{-\pi}^{\pi} a_j\,d\omega = a_j$.)

Thus, if there is no constraint on $\alpha(0)$ so that $\lambda = 0$, then it follows that the optimal approximate filter simply involves truncation of the ideal filter's weights.

If there is a constraint on $\alpha(0)$, then λ must be chosen so that the constraint is satisfied. For this purpose, it is useful to write the FOCs as $a_h = b_h + \theta$, where $\theta = \lambda/2$. Then, requiring that $\alpha(0) = \Sigma_{h=-K}^{K} a_h = \phi$, we find that the required adjustment is

$$\theta = \frac{\phi - \sum_{h=-K}^{K} b_h}{2K + 1}.$$

Conclusions and Extensions

We have derived the general result discussed in the text. Construction of the optimal approximating filter contains two steps: truncation of the ideal filter's weights and addition of the correction term θ. Further, the form of this correction process makes clear the origins of some of the observations made in the main text which are not explicitly derived here. For example, the same logic implies that the constrained Kth-order approximate band-pass filter is the difference between two constrained Kth-order approximate low-pass filters. Since the ideal band-pass filter weights are simply differences between the weights of two low-pass filters, $\overline{b}_h - \underline{b}_h$ it follows that the weights for an optimal truncated band-pass filter are $(\overline{b}_h - \underline{b}_h) - [\Sigma_{h=-K}^{K}(\overline{b}_h - \underline{b}_h)]/[2K + 1]$. As this may be rearranged as $[\overline{b}_h + [1 - \Sigma_{h=-K}^{K}\overline{b}_h]/[2K + 1]] - [\underline{b}_h + [1 - \Sigma_{h=-K}^{K}\underline{b}_h/[2K + 1]]$, it follows that the weights of the optimal, constrained approximate band-pass filter are simply the difference in the weights of the two constrained Kth-order low-pass filters.

This article has been cited by:

1. Arman Kheirati Roonizi, Christian Jutten. 2020. Improved smoothness priors using bilinear transform. *Signal Processing* **169**, 107381. [Crossref]
2. Somayeh Azami, Fatemeh Angazbani. 2020. CO2 response to business cycles: New evidence of the largest CO2-Emitting countries in Asia and the Middle East. *Journal of Cleaner Production* **252**, 119743. [Crossref]
3. Fabio Verona. 2020. Investment, Tobin's Q, and Cash Flow Across Time and Frequencies. *Oxford Bulletin of Economics and Statistics* **82**:2, 331-346. [Crossref]
4. Martin Boďa, Mariana Považanová. 2020. Formal and statistical aspects of estimating Okun's law at a regional level. *Papers in Regional Science* **40**. . [Crossref]
5. Charles Olivier MAO TAKONGMO. 2020. DSGE models, detrending, and the method of moments. *Bulletin of Economic Research* **39**. . [Crossref]
6. Aitor Ciarreta, Peru Muniain, Ainhoa Zarraga. 2020. Realized volatility and jump testing in the Japanese electricity spot market. *Empirical Economics* **58**:3, 1143-1166. [Crossref]
7. Hasan Engin Duran, Ugo Fratesi. 2020. Employment volatility in lagging and advanced regions: The Italian case. *Growth and Change* **51**:1, 207-233. [Crossref]
8. Arturo L. Vásquez Cordano, Abdel M. Zellou. 2020. Super cycles in natural gas prices and their impact on Latin American energy and environmental policies. *Resources Policy* **65**, 101513. [Crossref]
9. Rakesh Padhan, K.P. Prabheesh. 2020. Business cycle synchronization: Disentangling direct and indirect effect of financial integration in the Indian context. *Economic Modelling* **85**, 272-287. [Crossref]
10. Giovanni Carnazza, Paolo Liberati, Agnese Sacchi. 2020. The cyclically-adjusted primary balance: A novel approach for the euro area. *Journal of Policy Modeling* . [Crossref]
11. Yoshito Funashima. 2020. Money stock versus monetary base in time–frequency exchange rate determination. *Journal of International Money and Finance* 102150. [Crossref]
12. K.P. Prabheesh, Reza Anglingkusumo, Solikin M. Juhro. 2020. The dynamics of global financial cycle and domestic economic cycles: Evidence from India and Indonesia. *Economic Modelling* . [Crossref]
13. Kristian Jönsson. 2020. Cyclical Dynamics and Trend/Cycle Definitions: Comparing the HP and Hamilton Filters. *Journal of Business Cycle Research* **81**. . [Crossref]
14. Vidhi Chhaochharia, George M. Korniotis, Alok Kumar. 2020. Prozac for depressed states? Effect of mood on local economic recessions. *Review of Financial Economics* **92**. . [Crossref]
15. Priyank Gandhi, Hanno Lustig, Alberto Plazzi. 2020. Equity Is Cheap for Large Financial Institutions. *The Review of Financial Studies* **16**. . [Crossref]
16. Karol Szomolányi, Martin Lukáčik, Adriana Lukáčiková. 2020. Estimate of Elasticity of Substitution of Inputs in Slovak Economy. *Politická ekonomie* **67**:6, 611-630. [Crossref]
17. Michel Cyrille Samba, Christophe Mbassi. 2020. Business Cycle Synchronization: A Reassessment of the Optimum Currency Area Theory within the CFA Franc Zone. *Journal of African Business* **21**:1, 126-144. [Crossref]
18. Pedro Portugal, António Rua. 2020. How the ins and outs shape differently the U.S. unemployment over time and across frequencies. *European Economic Review* **121**, 103348. [Crossref]
19. Paul Beaudry, Dana Galizia, Franck Portier. 2020. Putting the Cycle Back into Business Cycle Analysis. *American Economic Review* **110**:1, 1-47. [Crossref]
20. Joshua Brault, Hashmat Khan. 2020. THE SHIFTS IN LEAD-LAG PROPERTIES OF THE U.S. BUSINESS CYCLE. *Economic Inquiry* **58**:1, 319-334. [Crossref]
21. Thai Vu Hong Nguyen, Tra Thi Thu Pham, Canh Phuc Nguyen, Thanh Cong Nguyen, Binh Thanh Nguyen. 2020. Excess liquidity and net interest margins: Evidence from Vietnamese banks. *Journal of Economics and Business* 105893. [Crossref]
22. Tucker S. McElroy, Marc Wildi. 2020. The Multivariate Linear Prediction Problem: Model-Based and Direct Filtering Solutions. *Econometrics and Statistics* . [Crossref]
23. Abdykappar A. Ashimov, Yuriy V. Borovskiy, Dmitry A. Novikov, Bakyt T. Sultanov, Mukhit A. Onalbekov. Macroeconomic Analysis and Parametric Control Based on Global Multi-country Dynamic Computable General Equilibrium Model (Model 1) 73-201. [Crossref]

24. Abdykappar A. Ashimov, Yuriy V. Borovskiy, Dmitry A. Novikov, Bakyt T. Sultanov, Mukhit A. Onalbekov. Parametric Control of Macroeconomic Systems: Basic Components of Theory 1-72. [Crossref]
25. Abdykappar A. Ashimov, Yuriy V. Borovskiy, Dmitry A. Novikov, Bakyt T. Sultanov, Mukhit A. Onalbekov. Macroeconomic Analysis and Parametric Control Based on Global Multi-country Hybrid Econometric Model (Model 3) 309-346. [Crossref]
26. Abdykappar A. Ashimov, Yuriy V. Borovskiy, Dmitry A. Novikov, Bakyt T. Sultanov, Mukhit A. Onalbekov. Macroeconomic Analysis and Parametric Control Based on Global Dynamic Stochastic General Equilibrium Model (Model 2) 203-307. [Crossref]
27. Torben Klarl. 2020. The response of CO 2 emissions to the business cycle: New evidence for the U.S. *Energy Economics* **85**, 104560. [Crossref]
28. Serhan Cevik, Tianle Zhu. 2019. Trinity Strikes Back: Monetary Independence And Inflation In The Caribbean. *Journal of International Development* **0**. . [Crossref]
29. Elton Beqiraj, Lucrezia Fanti, Luca Zamparelli. 2019. Sectoral composition of output and the wage share: The role of the service sector. *Structural Change and Economic Dynamics* **51**, 1-10. [Crossref]
30. Joaquín Serrano, Leonardo Gasparini, Mariana Marchionni, Pablo Glüzmann. 2019. Economic cycle and deceleration of female labor force participation in Latin America. *Journal for Labour Market Research* **53**:1. . [Crossref]
31. Hasan Engin Duran. 2019. Structural change and output volatility reduction in OECD countries: evidence of the Second Great Moderation. *Journal of Economic Structures* **8**:1. . [Crossref]
32. Luisa Corrado, Isolina Rossi. 2019. Anatomy of credit-less recoveries. *Journal of Macroeconomics* **62**, 103152. [Crossref]
33. Marlon Fritz. 2019. Steady state adjusting trends using a data-driven local polynomial regression. *Economic Modelling* **83**, 312-325. [Crossref]
34. Shesadri Banerjee, Parantap Basu, Chetan Ghate. 2019. A MONETARY BUSINESS CYCLE MODEL FOR INDIA. *Economic Inquiry* **21**. . [Crossref]
35. Debdulal Mallick. 2019. Policy regimes and the shape of the Phillips curve in Australia. *Journal of Policy Modeling* **41**:6, 1077-1094. [Crossref]
36. Christopher Heiberger, Halvor Ruf. 2019. Epstein–Zin Utility, Asset Prices, and the Business Cycle Revisited. *German Economic Review* **20**:4. . [Crossref]
37. Maria Grazia Zoia, Laura Barbieri, Luca Bagnato. 2019. An insight into the Italian economy from an analysis based on the industrial production index in both frequency and time domains. *Metroeconomica* **70**:4, 688-710. [Crossref]
38. Youngkyung Ok, Jungmu Kim, Yuen Jung Park. 2019. The Effect of Housing Prices on Bank Performance in Korea. *Sustainability* **11**:22, 6242. [Crossref]
39. Baran Doda, Simon Quemin, Luca Taschini. 2019. Linking permit markets multilaterally. *Journal of Environmental Economics and Management* **98**, 102259. [Crossref]
40. Francis Leni Anguyo, Rangan Gupta, Kevin Kotzé. 2019. Inflation dynamics in Uganda: a quantile regression approach. *Macroeconomics and Finance in Emerging Market Economies* **3**, 1-27. [Crossref]
41. Giorgio Canarella, Luis Gil-Alana, Rangan Gupta, Stephen M Miller. 2019. Persistence and cyclical dynamics of US and UK house prices: Evidence from over 150 years of data. *Urban Studies* **24**, 004209801987269. [Crossref]
42. Jang Hyung Cho, Robert Daigler, YoungHa Ki, Janis Zaima. 2019. Destabilizing momentum trading and counterbalancing contrarian strategy by large trader groups. *Review of Accounting and Finance* **19**:1, 83-106. [Crossref]
43. Sebastian Breuer, Steffen Elstner. 2019. Germany's Growth Prospects against the Backdrop of Demographic Change. *Jahrbücher für Nationalökonomie und Statistik*, ahead of print. [Crossref]
44. Philipp Harting. 2019. MACROECONOMIC STABILIZATION AND LONG-TERM GROWTH: THE ROLE OF POLICY DESIGN. *Macroeconomic Dynamics* **85**, 1-46. [Crossref]
45. Thai V. H. Nguyen, Agyenim Boateng, Tra Thi Thu Pham. 2019. Involuntary excess reserve and heterogeneous transmission of policy rates to bank lending rates in China. *Empirical Economics* **57**:3, 1023-1044. [Crossref]
46. Connor Bryant, Bernd Süssmuth. 2019. Is the Relationship of Wealth Inequality with the Real, Financial and Housing Cycle Country-Specific?. *Atlantic Economic Journal* **47**:3, 323-341. [Crossref]
47. Jair N. Ojeda-Joya, Oscar Jaulin-Mendez, Juan C. Bustos-Peláez. 2019. The Interdependence Between Commodity-Price and GDP Cycles: A Frequency-Domain Approach. *Atlantic Economic Journal* **47**:3, 275-292. [Crossref]
48. Jaime Cuéllar-Martín, Ángel L. Martín-Román, Alfonso Moral. 2019. An Empirical Analysis of Natural and Cyclical Unemployment at the Provincial Level in Spain. *Applied Spatial Analysis and Policy* **12**:3, 647-696. [Crossref]

49. Gonçalo Faria, Fabio Verona. 2019. The yield curve and the stock market: Mind the long run. *Journal of Financial Markets* 100508. [Crossref]
50. Till Strohsal, Christian R. Proaño, Jürgen Wolters. 2019. Characterizing the financial cycle: Evidence from a frequency domain analysis. *Journal of Banking & Finance* **106**, 568-591. [Crossref]
51. Shomesh E. Chaudhuri, Andrew W. Lo. 2019. Dynamic Alpha: A Spectral Decomposition of Investment Performance Across Time Horizons. *Management Science* **65**:9, 4440-4450. [Crossref]
52. Yanfang Sun, Haiyan Xie, Xirong Niu. 2019. Characteristics of Cyclical Fluctuations in the Development of the Chinese Construction Industry. *Sustainability* **11**:17, 4523. [Crossref]
53. Guido Bulligan, Lorenzo Burlon, Davide Delle Monache, Andrea Silvestrini. 2019. Real and financial cycles: estimates using unobserved component models for the Italian economy. *Statistical Methods & Applications* **28**:3, 541-569. [Crossref]
54. Matias Marañon, Mustafa Kumral. 2019. Dynamics Behind Cycles and Co-movements in Metal Prices: An Empirical Study Using Band-Pass Filters. *Natural Resources Research* **61**. . [Crossref]
55. Manuel González-Astudillo. 2019. Estimating the U.S. output gap with state-level data. *Journal of Applied Econometrics* **34**:5, 795-810. [Crossref]
56. SAMI ALPANDA, SARAH ZUBAIRY. 2019. Household Debt Overhang and Transmission of Monetary Policy. *Journal of Money, Credit and Banking* **51**:5, 1265-1307. [Crossref]
57. Vadim Kufenko. 2019. Hide-and-Seek with time-series filters: a model-based Monte Carlo study. *Empirical Economics* **81**. . [Crossref]
58. Qing Han. 2019. International Real Business Cycles of the Chinese Economy: Asymmetric Preference, Incomplete Financial Markets, and Terms of Trade Shocks. *Emerging Markets Finance and Trade* **55**:9, 1926-1953. [Crossref]
59. Krzysztof Beck. 2019. What drives business cycle synchronization? BMA results from the European Union. *Baltic Journal of Economics* **19**:2, 248-275. [Crossref]
60. Marco Gallegati. 2019. A system for dating long wave phases in economic development. *Journal of Evolutionary Economics* **29**:3, 803-822. [Crossref]
61. Yang Han, Zehao Liu, Jun Ma. 2019. Growth cycles and business cycles of the Chinese economy through the lens of the unobserved components model. *China Economic Review* 101317. [Crossref]
62. Doobae Jun, Changmo Ahn, Jinsu Kim, Gwangil Kim. 2019. Signal analysis of global financial crises using Fourier series. *Physica A: Statistical Mechanics and its Applications* **526**, 121015. [Crossref]
63. Ganna Kharlamova, Andriy Stavytskyy, Oleksandr Chernyak, Vincentas Giedraitis, Olena Komendant. 2019. Economic modeling of the GDP gap in Ukraine and worldwide. *Problems and Perspectives in Management* **17**:2, 493-509. [Crossref]
64. Xiaojin Sun, Kwok Ping Tsang. 2019. What cycles? Data detrending in DSGE models. *Studies in Nonlinear Dynamics & Econometrics* **23**:3. . [Crossref]
65. Vo Phuong Mai Le, David Meenagh, Patrick Minford. 2019. A long-commodity-cycle model of the world economy over a century and a half — Making bricks with little straw. *Energy Economics* **81**, 503-518. [Crossref]
66. Leonida Correia, Sofia Gouveia, Patrícia Martins. 2019. The European wine export cycle. *Wine Economics and Policy* **8**:1, 91-101. [Crossref]
67. Leonida Correia, Patrícia Martins. 2019. Has the sovereign debt crisis changed the cyclicality of Portuguese remittances?. *International Review of Applied Economics* **33**:3, 453-472. [Crossref]
68. Serhan Cevik. 2019. Anchor me: the benefits and challenges of fiscal responsibility. *Asian-Pacific Economic Literature* **33**:1, 33-47. [Crossref]
69. Egon Smeral. 2019. Seasonal forecasting performance considering varying income elasticities in tourism demand. *Tourism Economics* **25**:3, 355-374. [Crossref]
70. Xiaoyu Zhang, Fanghui Pan. 2019. The Dependence of China's Monetary Policy Rules on Interest Rate Regimes: Empirical Analysis Based on a Pseudo Output Gap. *Sustainability* **11**:9, 2557. [Crossref]
71. Nataliya V. Orlova, Natalya A. Lavrova. 2019. Potential output as a reflection of Russian economy perspectives. *Voprosy Ekonomiki* :4, 5-20. [Crossref]
72. G. Bruno, L. Crosilla, P. Margani. 2019. Inspecting the Relationship Between Business Confidence and Industrial Production: Evidence on Italian Survey Data. *Journal of Business Cycle Research* **15**:1, 1-24. [Crossref]
73. Giovanni Dosi, Andrea Roventini, Emanuele Russo. 2019. Endogenous growth and global divergence in a multi-country agent-based model. *Journal of Economic Dynamics and Control* **101**, 101-129. [Crossref]

74. Amine Lahiani. 2019. Exploring the inflationary effect of oil price in the US. *International Journal of Energy Sector Management* **13**:1, 60-76. [Crossref]
75. Matthieu Charpe, Slim Bridji, Peter Mcadam. 2019. LABOR SHARE AND GROWTH IN THE LONG RUN. *Macroeconomic Dynamics* **2049**, 1-38. [Crossref]
76. Mustafa İsmihan. 2019. The dual adjustment approach with an application to the consumption function. *Central Bank Review* **19**:1, 1-8. [Crossref]
77. Marco Gallegati, Federico Giri, Antonio Palestrini. 2019. DSGE model with financial frictions over subsets of business cycle frequencies. *Journal of Economic Dynamics and Control* **100**, 152-163. [Crossref]
78. Yuliya Lovcha, Alejandro Perez-Laborda. 2019. Trimmed Whittle estimation of the SVAR vs. filtering low-frequency fluctuations: applications to technology shocks. *Studies in Nonlinear Dynamics & Econometrics*, ahead of print. [Crossref]
79. Bangzhu Zhu, Shunxin Ye, Dong Han, Ping Wang, Kaijian He, Yi-Ming Wei, Rui Xie. 2019. A multiscale analysis for carbon price drivers. *Energy Economics* **78**, 202-216. [Crossref]
80. Brendan Epstein, Alan Finkelstein Shapiro. 2019. Financial development, unemployment volatility, and sectoral dynamics. *Journal of Economic Dynamics and Control* **99**, 82-102. [Crossref]
81. Tomáš Šestořád. 2019. Government Expenditure Multiplier at Zero Nominal Interest Rate. *Politická ekonomie* **67**:1, 20-47. [Crossref]
82. Karel Janda, Oleg Kravtsov. 2019. Basel III Leverage and Capital Ratio over the Economic Cycle in the Czech Republic and its Comparison with the CEE Region. *European Financial and Accounting Journal* **13**:4, 5-23. [Crossref]
83. Terence C. Mills. Trends, Cycles, and Structural Breaks in Cliometrics 1557-1582. [Crossref]
84. Burkhard Heer. Ramsey Model 9-61. [Crossref]
85. Radhika Pandey, Ila Patnaik, Ajay Shah. Business Cycle Measurement in India 121-152. [Crossref]
86. Rainer Metz, Helmut Thome. Zeitreihenanalyse 1451-1465. [Crossref]
87. Uwe Vollmer. Instabilitäten: Konjunktur, Inflation, Finanzkrisen 151-278. [Crossref]
88. . References 315-327. [Crossref]
89. F.M. Bandi, B. Perron, A. Tamoni, C. Tebaldi. 2019. The scale of predictability. *Journal of Econometrics* **208**:1, 120-140. [Crossref]
90. Roweno Heijmans, Reyer Gerlagh. 2019. Regulating Global Externalities. *SSRN Electronic Journal* . [Crossref]
91. Matteo Barigozzi, Marc Hallin, Stefano Soccorsi. 2019. Time-Varying General Dynamic Factor Models and the Measurement of Financial Connectedness. *SSRN Electronic Journal* . [Crossref]
92. Dulani Jayasuriya Daluwathumullagamge. 2019. A Tale of Two Returns: Stock and Investment Returns with Investment Specific Technology Shocks. *SSRN Electronic Journal* . [Crossref]
93. Yves Stephan Schüler. 2019. On the Cyclical Properties of Hamilton's Regression Filter and Refinements. *SSRN Electronic Journal* . [Crossref]
94. Jorge Galán. 2019. Measuring Credit-To-GDP Gaps. The Hodrick-Prescott Filter Revisited. *SSRN Electronic Journal* . [Crossref]
95. Luis J. Álvarez, Ana Gómez-Loscos, Maria Dolores Gadea Rivas. 2019. Inflation Interdependence in Advanced Economies. *SSRN Electronic Journal* . [Crossref]
96. Huthaifa Alqaralleh. 2019. Measuring business cycles: Empirical evidence based on an unobserved component approach. *Cogent Economics & Finance* **7**:1. . [Crossref]
97. Charles Olivier Mao Takongmo. 2019. Keynesian Models, Detrending, and the Method of Moments. *SSRN Electronic Journal* . [Crossref]
98. Johannes Fisel, Neil Duffie, Emanuel Moser, Gisela Lanza. 2019. Changeability - a frequency perspective. *Procedia CIRP* **79**, 186-191. [Crossref]
99. Alexandre Assemien, Loesse J. Esso, Kouamé D. Kanga. 2019. Can Monetary Policy Influence Employment? The case of West African States. *Revue d'économie politique* **129**:5, 777. [Crossref]
100. Mihnea Constantinescu, Anh D.M. Nguyen. 2018. Unemployment or credit: Which one holds the potential? Results for a small open economy with a low degree of financialization. *Economic Systems* **42**:4, 649-664. [Crossref]
101. Thomas Conlon, John Cotter, Ramazan Gençay. 2018. Long-run wavelet-based correlation for financial time series. *European Journal of Operational Research* **271**:2, 676-696. [Crossref]
102. Yuan Yao, Yi Cao, Xuemei Ding, Jia Zhai, Junxiu Liu, Yuling Luo, Shuai Ma, Kailin Zou. 2018. A paired neural network model for tourist arrival forecasting. *Expert Systems with Applications* **114**, 588-614. [Crossref]

103. Luboš Hanus, Lukáš Vácha. 2018. Growth cycle synchronization of the Visegrad Four and the European Union. *Empirical Economics* **33**. . [Crossref]
104. Minh Kieu Nguyen, Dinh Nghi Le. 2018. Return Spillover from the US and Japanese Stock Markets to the Vietnamese Stock Market: A Frequency-Domain Approach. *Emerging Markets Finance and Trade* **12**, 1-12. [Crossref]
105. Satoshi Urasawa. 2018. Structural Change and Business Cycles in Japan: Revisiting the Stylized Facts. *Journal of Business Cycle Research* **14**:2, 243-281. [Crossref]
106. Karim Barhoumi, Reda Cherif, Nooman Rebei. 2018. Stochastic trends and fiscal policy. *Economic Modelling* **75**, 256-267. [Crossref]
107. Alexander Konon, Michael Fritsch, Alexander S. Kritikos. 2018. Business cycles and start-ups across industries: An empirical analysis of German regions. *Journal of Business Venturing* **33**:6, 742-761. [Crossref]
108. Michael Ellington. 2018. The case for Divisia monetary statistics: A Bayesian time-varying approach. *Journal of Economic Dynamics and Control* **96**, 26-41. [Crossref]
109. Qi Dong, Xiangbo Liu. 2018. Multivariate filter estimation and ARDL model analysis of China's potential output. *Applied Economics Letters* **25**:18, 1327-1332. [Crossref]
110. Chih-Pin Lin, Chi-Jui Huang, Cheng-Min Chuang. 2018. Corruption and business cycle volatility: a corporate governance perspective. *Asia-Pacific Journal of Accounting & Economics* **25**:5, 586-606. [Crossref]
111. Julia Cagé, Lucie Gadenne. 2018. Tax revenues and the fiscal cost of trade liberalization, 1792–2006. *Explorations in Economic History* **70**, 1-24. [Crossref]
112. R. Barrell, D. Karim, C. Macchiarelli. 2018. Towards an understanding of credit cycles: do all credit booms cause crises?. *The European Journal of Finance* **65**, 1-16. [Crossref]
113. Pu Chen, Willi Semmler. 2018. Short and Long Effects of Productivity on Unemployment. *Open Economies Review* **29**:4, 853-878. [Crossref]
114. JULIEN CHAMPAGNE, GUILLAUME POULIN-BELLISLE, RODRIGO SEKKEL. 2018. The Real-Time Properties of the Bank of Canada's Staff Output Gap Estimates. *Journal of Money, Credit and Banking* **50**:6, 1167-1188. [Crossref]
115. Yilmaz Akdi, Serdar Varlik, Hakan Berument. 2018. Cycle Duration in Production with Periodicity – Evidence from Turkey. *International Econometric Review* **10**:2, 24-32. [Crossref]
116. D. Pollock. 2018. Filters, Waves and Spectra. *Econometrics* **6**:3, 35. [Crossref]
117. Norazza M. Haniff, Abul Mansur M. Masih. 2018. Do Islamic Stock Returns Hedge Against Inflation? A Wavelet Approach. *Emerging Markets Finance and Trade* **54**:10, 2348-2366. [Crossref]
118. F. Lamperti, G. Dosi, M. Napoletano, A. Roventini, A. Sapio. 2018. Faraway, So Close: Coupled Climate and Economic Dynamics in an Agent-based Integrated Assessment Model. *Ecological Economics* **150**, 315-339. [Crossref]
119. Ching-wai (Jeremy) Chiu, Richard D.F. Harris, Evarist Stoja, Michael Chin. 2018. Financial market Volatility, macroeconomic fundamentals and investor Sentiment. *Journal of Banking & Finance* **92**, 130-145. [Crossref]
120. Luis J. Álvarez, Ana Gómez-Loscos. 2018. A menu on output gap estimation methods. *Journal of Policy Modeling* **40**:4, 827-850. [Crossref]
121. Yoshito Funashima. 2018. Macroeconomic policy coordination between Japanese central and local governments. *Empirical Economics* **54**:4, 1631-1651. [Crossref]
122. Jameel Ahmed, Sajid M. Chaudhry, Stefan Straetmans. 2018. Business and Financial Cycles in the Eurozone: Synchronization or Decoupling. *The Manchester School* **86**:3, 358-389. [Crossref]
123. Marco Gallegati, Domenico Delli Gatti. 2018. Macrofinancial imbalances in historical perspective: A global crisis index. *Journal of Economic Dynamics and Control* **91**, 190-205. [Crossref]
124. Junsheng Ha, Pei-Pei Tan, Kim-Leng Goh. 2018. Linear and nonlinear causal relationship between energy consumption and economic growth in China: New evidence based on wavelet analysis. *PLOS ONE* **13**:5, e0197785. [Crossref]
125. Yue Wu, Pengjian Shang, Yilong Li. 2018. Modified generalized multiscale sample entropy and surrogate data analysis for financial time series. *Nonlinear Dynamics* **92**:3, 1335-1350. [Crossref]
126. Nick Vink, Willem H. Boshoff, Johan Fourie, Rossouw van Jaarsveld. 2018. Wine Cycles in South Africa. *Journal of Wine Economics* **13**:2, 182-198. [Crossref]
127. Didier Nibbering, Richard Paap, Michel van der Wel. 2018. What do professional forecasters actually predict?. *International Journal of Forecasting* **34**:2, 288-311. [Crossref]

128. Marianna Siničáková, Veronika Šuliková, Ľubica Štiblárová. 2018. Traditional and Alternative Look at the Business Cycle Synchronisation in the European Union. *Politická ekonomie* **66**:2, 260-277. [Crossref]
129. Gerhard Rünstler, Marente Vlekke. 2018. Business, housing, and credit cycles. *Journal of Applied Econometrics* **33**:2, 212-226. [Crossref]
130. Panayotis G. Michaelides, Efthymios G. Tsionas, Angelos T. Vouldis, Konstantinos N. Konstantakis, Panagiotis Patrinos. 2018. A Semi-Parametric Non-linear Neural Network Filter: Theory and Empirical Evidence. *Computational Economics* **51**:3, 637-675. [Crossref]
131. Trevor S. Gallen. 2018. Is the labor wedge due to rigid wages? Evidence from the self-employed. *Journal of Macroeconomics* **55**, 184-198. [Crossref]
132. Ayako Saiki. 2018. Business Cycle Synchronization and Vertical Trade Integration: A Case Study of the Eurozone and East Asia. *Global Economy Journal* **18**:1, 20170101. [Crossref]
133. João Valle e Azevedo, Ana Pereira. 2018. Macroeconomic Forecasting using Low-frequency Filters. *Oxford Bulletin of Economics and Statistics* **80**:1, 39-64. [Crossref]
134. . Building Solid Foundations: How to Promote Potential Growth 157-216. [Crossref]
135. Dirk Visser, Gary Van Vuuren. 2018. Filter selection for countercyclical capital buffers. *South African Journal of Economic and Management Sciences* **21**:1. . [Crossref]
136. Zura Kakushadze, Juan Andrés Serur. Foreign Exchange (FX) 143-153. [Crossref]
137. Marnik G. Dekimpe, Barbara Deleersnyder. 2018. Business cycle research in marketing: a review and research agenda. *Journal of the Academy of Marketing Science* **46**:1, 31-58. [Crossref]
138. Eirini Ozouni, Constantinos Katrakylidis, Grigoris Zarotiadis. 2018. Technology evolution and long waves: investigating their relation with spectral and cross-spectral analysis. *Journal of Applied Economics* **21**:1, 160-174. [Crossref]
139. Rahul Gupta, Kartik Audhkhasi, Zach Jacokes, Agata Rozga, Shrikanth Narayanan. 2018. Modeling Multiple Time Series Annotations as Noisy Distortions of the Ground Truth: An Expectation-Maximization Approach. *IEEE Transactions on Affective Computing* **9**:1, 76-89. [Crossref]
140. Agustín Molina-Parra, Diego Martínez-López. 2018. DO FEDERAL DEFICITS MOTIVATE REGIONAL FISCAL (IM)BALANCES? EVIDENCE FOR THE SPANISH CASE. *Journal of Regional Science* **58**:1, 224-258. [Crossref]
141. Václav Adamec. 2018. Synchronization of Economic Cycles in Countries of the Visegrad Group, Germany and Eurozone. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis* **66**:3, 719-728. [Crossref]
142. Yves Stephan Schhler. 2018. Detrending and Financial Cycle Facts Across G7 Countries: Mind a Spurious Medium Term!. *SSRN Electronic Journal* . [Crossref]
143. Charles Ka Yui Leung, Cho Yiu Joe Ng. 2018. Macro Aspects of Housing. *SSRN Electronic Journal* . [Crossref]
144. Shomesh Chaudhuri, Andrew W. Lo. 2018. Dynamic Alpha: A Spectral Decomposition of Investment Performance Across Time Horizons. *SSRN Electronic Journal* . [Crossref]
145. Giorgio Canarella, Luis A. Gil-Alana, Rangan Gupta, Stephen M. Miller. 2018. Persistence and Cyclical Dynamics of U.S. and U.K. House Prices: Evidence from Over 150 Years of Data. *SSRN Electronic Journal* . [Crossref]
146. Aris Zoleta, Paul Argamoso. 2018. Real Business Cycles in the Philippines. *SSRN Electronic Journal* . [Crossref]
147. Seong K. Byun, Valery Polkovnichenko, Michael J. Rebello. 2018. Composition of Cash Flow Shocks and Debt Financing. *SSRN Electronic Journal* . [Crossref]
148. Jorge E. Galán, Javier Mencia. 2018. Empirical Assessment of Alternative Structural Methods for Identifying Cyclical Systemic Risk in Europe. *SSRN Electronic Journal* . [Crossref]
149. Karol Szomolányi, Martin Lukacik, Adriana Lukacikova. 2018. Elasticity of Substitution in Post-Communist Economies. *SSRN Electronic Journal* . [Crossref]
150. Ryan A. Chahrour, Robert Ulbricht. 2018. Robust Predictions for DSGE Models with Incomplete Information. *SSRN Electronic Journal* . [Crossref]
151. Priyanka Sahu, Naresh Kumar Sharma. Core Inflation Dynamics and Impact of Demand and Supply Shocks: Evidence from India 3-25. [Crossref]
152. Hélène Raymond, Dramane Coulibaly, Luc Désiré Omgba. 2017. Exchange rate misalignments in energy-exporting countries: Do sovereign wealth funds matter?. *International Economics* **152**, 124-144. [Crossref]
153. Britta Gehrke, Fang Yao. 2017. Are supply shocks important for real exchange rates? A fresh view from the frequency-domain. *Journal of International Money and Finance* **79**, 99-114. [Crossref]

154. Rasmus Fatum, Yohei Yamamoto, Guozhong Zhu. 2017. Is the Renminbi a safe haven?. *Journal of International Money and Finance* **79**, 189-202. [Crossref]

155. Michael T. Belongia, Peter N. Ireland. 2017. Circumventing the zero lower bound with monetary policy rules based on money. *Journal of Macroeconomics* **54**, 42-58. [Crossref]

156. Andreas Groth, Michael Ghil. 2017. Synchronization of world economic activity. *Chaos: An Interdisciplinary Journal of Nonlinear Science* **27**:12, 127002. [Crossref]

157. Stéphane Verguet, Edward O. Jones, Mira Johri, Shaun K. Morris, Wilson Suraweera, Cindy L. Gauvreau, Prabhat Jha, Mark Jit. 2017. Characterizing measles transmission in India: a dynamic modeling study using verbal autopsy data. *BMC Medicine* **15**:1. . [Crossref]

158. Meryem Ouahilal, Mohammed El Mohajir, Mohamed Chahhou, Badr Eddine El Mohajir. 2017. A novel hybrid model based on Hodrick–Prescott filter and support vector regression algorithm for optimizing stock market price prediction. *Journal of Big Data* **4**:1. . [Crossref]

159. Branimir Jovanovic, Egzona Hani, Ljupka Georgievska. 2017. Post-crisis credit slowdown in South-East Europe: return to normality?. *Empirica* **44**:4, 733-780. [Crossref]

160. Vadim Kufenko, Niels Geiger. 2017. Stylized Facts of the Business Cycle: Universal Phenomenon, or Institutionally Determined?. *Journal of Business Cycle Research* **13**:2, 165-187. [Crossref]

161. Martin Gächter, Alexander Gruber, Aleksandra Riedl. 2017. Wage Divergence, Business Cycle Co-Movement and the Currency Union Effect. *JCMS: Journal of Common Market Studies* **55**:6, 1322-1342. [Crossref]

162. Adam McCloskey, Jonathan B. Hill. 2017. Parameter Estimation Robust to Low-Frequency Contamination. *Journal of Business & Economic Statistics* **35**:4, 598-610. [Crossref]

163. Yuan Yao, Jia Zhai, Yi Cao, Xuemei Ding, Junxiu Liu, Yuling Luo. 2017. Data analytics enhanced component volatility model. *Expert Systems with Applications* **84**, 232-241. [Crossref]

164. Arnold Polanski, Evarist Stoja. 2017. Forecasting multidimensional tail risk at short and long horizons. *International Journal of Forecasting* **33**:4, 958-969. [Crossref]

165. Muazu Ibrahim, Paul Alagidede. 2017. Financial sector development, economic volatility and shocks in sub-Saharan Africa. *Physica A: Statistical Mechanics and its Applications* **484**, 66-81. [Crossref]

166. Mahmoud Botshekan, André Lucas. 2017. Long-Term versus Short-Term Contingencies in Asset Allocation. *Journal of Financial and Quantitative Analysis* **52**:5, 2277-2303. [Crossref]

167. Luis Emilio Morales, Nam Hoang, Eric Stuen. 2017. Spatial price premium transmission for Meat Standards Australia-graded cattle: the vulnerability of price premiums to outside shocks. *Australian Journal of Agricultural and Resource Economics* **61**:4, 590-609. [Crossref]

168. Robert S. Chirinko, Debdulal Mallick. 2017. The Substitution Elasticity, Factor Shares, and the Low-Frequency Panel Model. *American Economic Journal: Macroeconomics* **9**:4, 225-253. [Crossref]

169. Konrad Żelazowski. 2017. HOUSING MARKET CYCLES IN THE CONTEXT OF BUSINESS CYCLES. *Real Estate Management and Valuation* **25**:3, 5-14. [Crossref]

170. Viv B. Hall, Peter Thomson, Stuart McKelvie. 2017. On the robustness of stylised business cycle facts for contemporary New Zealand. *New Zealand Economic Papers* **51**:3, 193-216. [Crossref]

171. Victor Pontines. 2017. The financial cycles in four East Asian economies. *Economic Modelling* **65**, 51-66. [Crossref]

172. Jean-Louis Combes, Alexandru Minea, Moussé Sow. 2017. Is fiscal policy always counter- (pro-) cyclical? The role of public debt and fiscal rules. *Economic Modelling* **65**, 138-146. [Crossref]

173. Ruggero Caldana, Gianluca Fusai, Andrea Roncoroni. 2017. Electricity forward curves with thin granularity: Theory and empirical evidence in the hourly EPEXspot market. *European Journal of Operational Research* **261**:2, 715-734. [Crossref]

174. Barbara Meller, Norbert Metiu. 2017. The synchronization of credit cycles. *Journal of Banking & Finance* **82**, 98-111. [Crossref]

175. Federico Etro. 2017. Research in economics and macroeconomics. *Research in Economics* **71**:3, 373-383. [Crossref]

176. Federico Poloni, Giacomo Sbrana. 2017. MULTIVARIATE TREND–CYCLE EXTRACTION WITH THE HODRICK–PRESCOTT FILTER. *Macroeconomic Dynamics* **21**:6, 1336-1360. [Crossref]

177. Baran Doda, Luca Taschini. 2017. Carbon Dating: When Is It Beneficial to Link ETSs?. *Journal of the Association of Environmental and Resource Economists* **4**:3, 701-730. [Crossref]

178. Shurong Han, Yeqing Huang. 2017. Medical imaging technology shock and volatility of macro economics: Analysis using a three-sector dynamical stochastic general equilibrium REC model. *Journal of X-Ray Science and Technology* **25**:4, 689-700. [Crossref]

179. Daniel Buncic, Oliver Müller. 2017. Measuring the output gap in Switzerland with linear opinion pools. *Economic Modelling* **64**, 153-171. [Crossref]

180. Gabriel J. Power, James Eaves, Calum Turvey, Dmitry Vedenov. 2017. Catching the curl: Wavelet thresholding improves forward curve modelling. *Economic Modelling* **64**, 312-321. [Crossref]

181. G. Dosi, M.C. Pereira, A. Roventini, M.E. Virgillito. 2017. When more flexibility yields more fragility: The microfoundations of Keynesian aggregate unemployment. *Journal of Economic Dynamics and Control* **81**, 162-186. [Crossref]

182. Benoît Desmarchelier, Faridah Djellal, Faïz Gallouj. 2017. Economic growth, business cycles and products variety: exploring the role of demand satiety. *Journal of Evolutionary Economics* **27**:3, 503-529. [Crossref]

183. James O'Brien, Paweł J. Szerszeń. 2017. An evaluation of bank measures for market risk before, during and after the financial crisis. *Journal of Banking & Finance* **80**, 215-234. [Crossref]

184. F F Yan, W E Qi, X Ouyang. 2017. Fluctuation traits of Litchi wholesale price in China. *IOP Conference Series: Earth and Environmental Science* **77**, 012016. [Crossref]

185. Martyna Marczak, Víctor Gómez. 2017. Monthly US business cycle indicators: a new multivariate approach based on a band-pass filter. *Empirical Economics* **52**:4, 1379-1408. [Crossref]

186. Lu Han, Ruihuan Ge. 2017. Wavelets Analysis on Structural Model for Default Prediction. *Computational Economics* **50**:1, 111-140. [Crossref]

187. Byoung Uk Kang, Francis In, Tong Suk Kim. 2017. Timescale betas and the cross section of equity returns: Framework, application, and implications for interpreting the Fama–French factors. *Journal of Empirical Finance* **42**, 15-39. [Crossref]

188. Jason Angelopoulos. 2017. Time–frequency analysis of the Baltic Dry Index. *Maritime Economics & Logistics* **19**:2, 211-233. [Crossref]

189. Johannes W. Fedderke, Daniel K. Mengisteab. 2017. Estimating South Africa's Output Gap and Potential Growth Rate. *South African Journal of Economics* **85**:2, 161-177. [Crossref]

190. Marinko SKARE. 2017. MACROECONOMIC NOISE REMOVAL ALGORITHM (MARINER). *Technological and Economic Development of Economy* **23**:3, 549-565. [Crossref]

191. Nicholas Sly, Caroline Weber. 2017. Bilateral Tax Treaties and GDP Comovement. *Review of International Economics* **25**:2, 292-319. [Crossref]

192. Margherita Gerolimetto, Stefano Magrini. 2017. A Novel Look at Long-run Convergence Dynamics in the United States. *International Regional Science Review* **40**:3, 241-269. [Crossref]

193. Radhika Pandey, Ila Patnaik, Ajay Shah. 2017. Dating business cycles in India. *Indian Growth and Development Review* **10**:1, 32-61. [Crossref]

194. Colin Jones, Neil Dunse, Nicola Livingstone, Kevin Cutsforth. 2017. The restructuring of the institutional real estate portfolio in the UK. *Journal of Property Research* **34**:2, 129-146. [Crossref]

195. Philip Arestis, Ana Rosa Gonzalez-Martinez, Lu-kui Jia. 2017. House price overvaluation in Hong Kong. *International Journal of Housing Markets and Analysis* **10**:2, 282-304. [Crossref]

196. Brigitte Granville, Sana Hussain. 2017. Eurozone cycles: An analysis of phase synchronization. *International Journal of Finance & Economics* **22**:2, 83-114. [Crossref]

197. Enrique Alberola, Rocio Gondo, Marco Lombardi, Diego Urbina. 2017. Output gaps and stabilisation policies in Latin America: The effect of commodity and capital flow cycles. *Ensayos sobre Política Económica* **35**:82, 40-52. [Crossref]

198. Xinxin Xu, Ziqiang Zeng, Jiuping Xu, Mengxiang Zhang. 2017. Fuzzy Dynamical System Scenario Simulation-Based Cross-Border Financial Contagion Analysis: A Perspective From International Capital Flows. *IEEE Transactions on Fuzzy Systems* **25**:2, 439-459. [Crossref]

199. Hasan Engin Duran, Alexandra Ferreira-Lopes. 2017. Determinants of co-movement and of lead and lag behavior of business cycles in the Eurozone. *International Review of Applied Economics* **31**:2, 255-282. [Crossref]

200. Peter Hingley, Walter G. Park. 2017. Do business cycles affect patenting? Evidence from European Patent Office filings. *Technological Forecasting and Social Change* **116**, 76-86. [Crossref]

201. Gabriel Mathy, Nicolas L. Ziebarth. 2017. How Much Does Political Uncertainty Matter? The Case of Louisiana under Huey Long. *The Journal of Economic History* **77**:1, 90-126. [Crossref]

202. A. V. Zubarev, P. V. Trunin. 2017. The analysis of the dynamics of the Russian economy using the output gap indicator. *Studies on Russian Economic Development* **28**:2, 126-132. [Crossref]

203. Luis Álvarez. 2017. Business Cycle Estimation with High-Pass and Band-Pass Local Polynomial Regression. *Econometrics* **5**:1, 1. [Crossref]
204. Hema Yoganarasimhan. 2017. Identifying the Presence and Cause of Fashion Cycles in Data. *Journal of Marketing Research* **54**:1, 5-26. [Crossref]
205. Shaista Arshad. Background on Business Cycles 7-13. [Crossref]
206. Karel Janda, Oleg Kravtsov. Examining the Interdependencies Between Leverage and Capital Ratios in the Banking Sector of the Czech Republic 161-172. [Crossref]
207. William G. Brafu-Insaidoo, Nicholas Biekpe. Foreign Capital Flows and Output Growth Volatility in Selected Sub-Saharan African Countries 225-249. [Crossref]
208. Barbara Deleersnyder, Marnik G. Dekimpe. Business-Cycle Research in Marketing 361-384. [Crossref]
209. Marco Gallegati, Mauro Gallegati, James B. Ramsey, Willi Semmler. 2017. Long waves in prices: new evidence from wavelet analysis. *Cliometrica* **11**:1, 127-151. [Crossref]
210. Siem Jan Koopman, Rutger Lit, André Lucas. Model-based Business Cycle and Financial Cycle Decomposition for Europe and the United States 151-168. [Crossref]
211. Yoshito Funashima. 2017. Time-varying leads and lags across frequencies using a continuous wavelet transform approach. *Economic Modelling* **60**, 24-28. [Crossref]
212. Miguel de Carvalho, António Rua. 2017. Real-time nowcasting the US output gap: Singular spectrum analysis at work. *International Journal of Forecasting* **33**:1, 185-198. [Crossref]
213. Stephan M. Wagner, Kamil J. Mizgier, Stylianos Papageorgiou. 2017. Operational disruptions and business cycles. *International Journal of Production Economics* **183**, 66-78. [Crossref]
214. Chuanglian Chen, Shujie Yao, Jinghua Ou. 2017. Exchange rate dynamics in a Taylor rule framework. *Journal of International Financial Markets, Institutions and Money* **46**, 158-173. [Crossref]
215. Mark Baimbridge, Ioannis Litsios, Karen Jackson, Uih Ran Lee. The Relationship Between the Real Exchange Rate and Current Account Imbalances in the Eurozone 165-194. [Crossref]
216. Muhammad Fajar, Sutawanir Darwis, Gumgum Darmawan. Spectral analysis and markov switching model of Indonesia business cycle 020031. [Crossref]
217. Gunes Kamber, James Morley, Benjamin Wong. 2017. Intuitive and Reliable Estimates of the Output Gap from a Beveridge-Nelson Filter. *SSRN Electronic Journal* . [Crossref]
218. Yannick Lucotte, Aurrlien Leroy. 2017. Competition and Credit Procyclicality in European Banking. *SSRN Electronic Journal* . [Crossref]
219. Francesco Lamperti, Mauro Napoletano. 2017. Faraway, So Close: Coupled Climate and Economic Dynamics in an Agent-Based Integrated Assessment Model. *SSRN Electronic Journal* . [Crossref]
220. Thomas Raffinot. 2017. Time-Varying Risk Premiums and Economic Cycles. *SSRN Electronic Journal* . [Crossref]
221. Luis J. lvarez, Ana GGmez-Loscos. 2017. A Menu on Output Gap Estimation Methods. *SSRN Electronic Journal* . [Crossref]
222. Alexandr Kopytov, Haotian Xiang. 2017. Make America Great: Long-Run Impacts of Short-Run Public Investment. *SSRN Electronic Journal* . [Crossref]
223. Xiaojin Sun, Kwok Ping Tsang. 2017. What Cycles? Data Detrending in DSGE Models. *SSRN Electronic Journal* . [Crossref]
224. Kathrin Ellieroth. 2017. Cyclicality of Hours Worked by Married Women and Spousal Insurance. *SSRN Electronic Journal* . [Crossref]
225. Etoundi Atenga Eric Martial. 2017. On the Determinants of Output Co-Movements in the CEMAC Zone: Examining the Role of Trade, Policy Channel, Economic Structure and Common Factors. *SSRN Electronic Journal* . [Crossref]
226. Jasper <!>de Winter, Siem Jan Koopman, Irma Hindrayanto, Anjali Chouhan. 2017. Modeling the Business and Financial Cycle in a Multivariate Structural Time Series Model. *SSRN Electronic Journal* . [Crossref]
227. Ding Luo. 2017. Capital Heterogeneity, Time-to-Build, and Return Predictability. *SSRN Electronic Journal* . [Crossref]
228. Jinho Choi, Juan Carlos Escanciano, Junjie Guo. 2017. Identification and Generalized Band Spectrum Estimation of the New Keynesian Phillips Curve. *SSRN Electronic Journal* . [Crossref]
229. Giovanni Dosi, Andrea Roventini, Emanuele Russo. 2017. Endogenous Growth and Global Divergence in a Multi-Country Agent-Based Model. *SSRN Electronic Journal* . [Crossref]

230. Ryan Chahrour, Robert Ulbricht. 2017. Information-Driven Business Cycles: A Primal Approach. *SSRN Electronic Journal* . [Crossref]
231. Karol Szomolányi, Martin Lukacik, Adriana Lukacikova. 2017. Long-Run Elasticity of the Substitution in the Slovak Economy. *SSRN Electronic Journal* . [Crossref]
232. International Monetary Fund.. 2017. Republic of Kazakhstan: Selected Issues. *IMF Staff Country Reports* **17**:109, 1. [Crossref]
233. Kimberly Beaton, Serhan Cevik, Reza Yousefi. 2017. Smooth Operator: Remittances and Fiscal Shocks. *IMF Working Papers* **17**:165, 1. [Crossref]
234. Dmitry Plotnikov. 2017. What Prevents a Real Business Cycle Model from Matching the U.S. Data? Decomposing the Labor Wedge. *IMF Working Papers* **17**:201, 1. [Crossref]
235. International Monetary Fund.. 2017. Saudi Arabia: Selected Issues. *IMF Staff Country Reports* **17**:317, 1. [Crossref]
236. Éric Bosserelle. 2017. Cycles longs des prix des produits de base : cycles Kondratiev ou cycles Kuznets ?. *Revue d'économie politique* **127**:2, 255. [Crossref]
237. Claudio Borio, Piti Disyatat, Mikael Juselius. 2016. Rethinking potential output: embedding information about the financial cycle. *Oxford Economic Papers* **125**, gpw063. [Crossref]
238. Colin JONES, Nicola LIVINGSTONE, Neil DUNSE. 2016. THE CHANGING NATURE OF TRANSACTIONS ACTIVITY AND LIQUIDITY IN UK COMMERCIAL PROPERTY. *International Journal of Strategic Property Management* **20**:4, 384-396. [Crossref]
239. Thomas Conlon, John Cotter, Ramazan Gençay. 2016. Commodity futures hedging, risk aversion and the hedging horizon. *The European Journal of Finance* **22**:15, 1534-1560. [Crossref]
240. Ta-Sheng Chou, Ping-Hung Chou, Eric S. Lin. 2016. Improving the Timeliness of Turning Signals for Business Cycles with Monthly Data. *Journal of Forecasting* **35**:8, 669-689. [Crossref]
241. D. S. G. Pollock. 2016. Econometric Filters. *Computational Economics* **48**:4, 669-691. [Crossref]
242. Fatma Pınar Erdem, İbrahim Ünalmış. 2016. Revisiting super-cycles in commodity prices. *Central Bank Review* **16**:4, 137-142. [Crossref]
243. Myungkyu Shim, Hee-Seung Yang. 2016. New stylized facts on occupational employment and their implications: Evidence from consistent employment data. *Economic Modelling* **59**, 402-415. [Crossref]
244. Kim Abildgren. 2016. A century of macro-financial linkages. *Journal of Financial Economic Policy* **8**:4, 458-471. [Crossref]
245. James Lake, Maia K. Linask. 2016. Could tariffs be pro-cyclical?. *Journal of International Economics* **103**, 124-146. [Crossref]
246. Yoshito Funashima. 2016. Governmentally amplified output volatility. *Physica A: Statistical Mechanics and its Applications* **462**, 469-478. [Crossref]
247. L. Correia, P. Martins. 2016. Are remittances an instrument of stabilization and funding in the euro area?. *Applied Economics Letters* **23**:16, 1177-1181. [Crossref]
248. Solomon Hsiang. 2016. Climate Econometrics. *Annual Review of Resource Economics* **8**:1, 43-75. [Crossref]
249. Roberto G. Quercia, Anthony Pennington-Cross, Chao Yue Tian. 2016. Differential Impacts of Structural and Cyclical Unemployment on Mortgage Default and Prepayment. *The Journal of Real Estate Finance and Economics* **53**:3, 346-367. [Crossref]
250. César Calderón, Roberto Duncan, Klaus Schmidt-Hebbel. 2016. Do Good Institutions Promote Countercyclical Macroeconomic Policies?. *Oxford Bulletin of Economics and Statistics* **78**:5, 650-670. [Crossref]
251. Md. Samsul Alam, Muhammad Shahbaz, Sudharshan Reddy Paramati. 2016. The Role of Financial Development and Economic Misery on Life Expectancy: Evidence from Post Financial Reforms in India. *Social Indicators Research* **128**:2, 481-497. [Crossref]
252. Lisa Sella, Gianna Vivaldo, Andreas Groth, Michael Ghil. 2016. Economic Cycles and Their Synchronization: A Comparison of Cyclic Modes in Three European Countries. *Journal of Business Cycle Research* **12**:1, 25-48. [Crossref]
253. Sarah Lima, Marco Malgarini. 2016. Does a Survey Based Capacity Utilization Measure Help Predicting Brazilian Output Gap in Real-Time?. *Journal of Business Cycle Research* **12**:1, 119-139. [Crossref]
254. Ho-Chuan Huang, Pei-Chien Lin. 2016. The trade effects of counter-cyclical fiscal policies. *International Review of Economics & Finance* **45**, 82-95. [Crossref]
255. Darko Stosic, Dusan Stosic, Teresa Ludermir, Tatijana Stosic. 2016. Correlations of multiscale entropy in the FX market. *Physica A: Statistical Mechanics and its Applications* **457**, 52-61. [Crossref]
256. MICHAEL T. BELONGIA, PETER N. IRELAND. 2016. Money and Output: Friedman and Schwartz Revisited. *Journal of Money, Credit and Banking* **48**:6, 1223-1266. [Crossref]

257. Amir H. Shirdel, Jari M. Böling, Hannu T. Toivonen. 2016. System identification in the presence of trends and outliers using sparse optimization. *Journal of Process Control* **44**, 120-133. [Crossref]
258. Xiaohui Li, Guang Yang, Kenan An, Jiping Huang. 2016. Human behavioral regularity, fractional Brownian motion, and exotic phase transition. *Physics Letters A* **380**:37, 2912-2919. [Crossref]
259. Sayantan Bandhu Majumder, Ranjanendra Narayan Nag. 2016. Understanding the Behaviour of Capital Flow and its Components: The Indian Experience. *Margin: The Journal of Applied Economic Research* **10**:3, 355-380. [Crossref]
260. Georgios Karras. 2016. Macroeconomic Volatility and the Current Account: Evidence from a Panel of OECD Countries. *International Economic Journal* **30**:3, 322-338. [Crossref]
261. Kathleen Cleeren, Lien Lamey, Jan-Hinrich Meyer, Ko De Ruyter. 2016. How Business Cycles Affect the Healthcare Sector: A Cross-country Investigation. *Health Economics* **25**:7, 787-800. [Crossref]
262. Faisal Rana, Faruk Balli. 2016. WOULD AUSTRALIA-NEW ZEALAND BE A VIABLE CURRENCY UNION? EVIDENCE FROM INTERSTATE RISK-SHARING PERFORMANCES. *Contemporary Economic Policy* **34**:3, 531-552. [Crossref]
263. Nikolaos Antonakakis, Ioannis Chatziantoniou, George Filis. 2016. Business Cycle Spillovers in the European Union: What is the Message Transmitted to the Core?. *The Manchester School* **84**:4, 437-481. [Crossref]
264. Marco Percoco. 2016. Labour Market Institutions: Sensitivity to the Cycle and Impact of the Crisis in European Regions. *Tijdschrift voor economische en sociale geografie* **107**:3, 375-385. [Crossref]
265. Fabio Busetti, Michele Caivano. 2016. The trend–cycle decomposition of output and the Phillips curve: Bayesian estimates for Italy and the Euro area. *Empirical Economics* **50**:4, 1565-1587. [Crossref]
266. Hiranya K. Nath. 2016. A note on the cyclical behavior of sectoral employment in the U.S. *Economic Analysis and Policy* **50**, 52-61. [Crossref]
267. Theofanis Papageorgiou, Panayotis G. Michaelides, Efthymios G. Tsionas. 2016. Business cycle determinants and fiscal policy: A Panel ARDL approach for EMU. *The Journal of Economic Asymmetries* **13**, 57-68. [Crossref]
268. Konstantinos N. Konstantakis, Panayotis G. Michaelides, Angelos T. Vouldis. 2016. Non performing loans (NPLs) in a crisis economy: Long-run equilibrium analysis with a real time VEC model for Greece (2001–2015). *Physica A: Statistical Mechanics and its Applications* **451**, 149-161. [Crossref]
269. Rudan Wang, Bruce Morley, Javier Ordóñez. 2016. The Taylor Rule, Wealth Effects and the Exchange Rate. *Review of International Economics* **24**:2, 282-301. [Crossref]
270. Ginters Buss. 2016. Real-Time Signal Extraction with Regularized Multivariate Direct Filter Approach. *Journal of Forecasting* **35**:3, 206-216. [Crossref]
271. Dimitrios Thomakos. 2016. Smoothing Non-Stationary Time Series Using the Discrete Cosine Transform. *Journal of Systems Science and Complexity* **29**:2, 382-404. [Crossref]
272. Yoshito Funashima. 2016. The Fed-induced political business cycle: Empirical evidence from a time–frequency view. *Economic Modelling* **54**, 402-411. [Crossref]
273. Jaqueson K. Galimberti, Marcelo L. Moura. 2016. Improving the reliability of real-time output gap estimates using survey forecasts. *International Journal of Forecasting* **32**:2, 358-373. [Crossref]
274. Junaid Ahmed, Inmaculada Martinez-Zarzoso. 2016. Blessing or Curse. *Journal of South Asian Development* **11**:1, 38-66. [Crossref]
275. Pär Stockhammar, Pär Österholm. 2016. Effects of US policy uncertainty on Swedish GDP growth. *Empirical Economics* **50**:2, 443-462. [Crossref]
276. Mikio Ito, Akihiko Noda, Tatsuma Wada. 2016. The evolution of stock market efficiency in the US: a non-Bayesian time-varying model approach. *Applied Economics* **48**:7, 621-635. [Crossref]
277. Oumar Diallo, Sampawende J.-A. Tapsoba. 2016. Rising BRIC and Changes in Sub-Saharan Africa's Business Cycle Patterns. *The World Economy* **39**:2, 260-284. [Crossref]
278. Tomislav Globan, Vladimir Arčabić, Petar Sorić. 2016. Inflation in New EU Member States: A Domestically or Externally Driven Phenomenon?. *Emerging Markets Finance and Trade* **52**:1, 154-168. [Crossref]
279. Julimar da Silva Bichara, Sandro Eduardo Monsueto da Silva, André Moreira Cunha, Marcos Tadeu Caputi Lélis. 2016. Business cycle convergence and trade: Brazil and China in a changing world. *Journal of Economic Policy Reform* **19**:1, 39-64. [Crossref]
280. Thierry Aimar, Francis Bismans, Claude Diebolt. Empirics 29-49. [Crossref]
281. Ricardo Andrade-Pacheco, Martin Mubangizi, John Quinn, Neil Lawrence. Monitoring Short Term Changes of Infectious Diseases in Uganda with Gaussian Processes 95-110. [Crossref]
282. Terence C. Mills. Trends, Cycles, and Structural Breaks in Cliometrics 509-534. [Crossref]

283. Guglielmo Maria Caporale, Luis A. Gil-Alana. 2016. Persistence and cyclical dependence in the monthly euribor rate. *Journal of Economics and Finance* **40**:1, 157-171. [Crossref]
284. J.H. Stock, M.W. Watson. Dynamic Factor Models, Factor-Augmented Vector Autoregressions, and Structural Vector Autoregressions in Macroeconomics 415-525. [Crossref]
285. G.D. Hansen, L.E. Ohanian. Neoclassical Models in Macroeconomics 2043-2130. [Crossref]
286. Stavros Degiannakis, David Duffy, George Filis, Alexandra Livada. 2016. Business cycle synchronisation in EMU: Can fiscal policy bring member-countries closer?. *Economic Modelling* **52**, 551-563. [Crossref]
287. Roberto Duncan. 2016. Does the US current account show a symmetric behavior over the business cycle?. *International Review of Economics & Finance* **41**, 202-219. [Crossref]
288. Konstantinos Konstantakis, Panayotis Michaelides, Efthymios Tsionas. The Determinants of Economic Fluctuations in Greece: An Empirical Investigation (1995–2014) 265-273. [Crossref]
289. Irene Brunetti, Davide Fiaschi, Lisa Gianmoena, Angela Parenti. 2016. Volatility in European regions. *Papers in Regional Science* **50**, n/a-n/a. [Crossref]
290. Hiroshi Yamada, Gawon Yoon. 2016. Selecting the tuning parameter of the #1 trend filter. *Studies in Nonlinear Dynamics & Econometrics* **20**:1. . [Crossref]
291. Jinpeng Ma, Max Tang. 2016. A FIR Filter to Date Post-WWII Recessions. *SSRN Electronic Journal* . [Crossref]
292. Gabriele Galati, Irma Hindrayanto, Siem Jan Koopman, Marente Vlekke. 2016. Measuring Financial Cycles with a Model-Based Filter: Empirical Evidence for the United States and the Euro Area. *SSRN Electronic Journal* . [Crossref]
293. Koyin Chang, Yoonbai Kim, Marc Tomljanovich, Frank Ying. 2016. Do Political Parties Foster Business Cycles? An Examination of Developed Economies. *SSRN Electronic Journal* . [Crossref]
294. Lorenz Kueng. 2016. Tax News: The Response of Household Spending to Changes in Expected Taxes. *SSRN Electronic Journal* . [Crossref]
295. N V Vashchelyuk, Pavel Trunin. 2016. (Determination of the Output Gap for the Russian Economy). *SSRN Electronic Journal* . [Crossref]
296. Jacob B. Smith. 2016. Spurious Periodicity in Christiano-Fitzgerald Filtered Time Series. *SSRN Electronic Journal* . [Crossref]
297. Ruggero Caldana, Gianluca Fusai, Andrea Roncoroni. 2016. Electricity Forward Curves with Thin Granularity. *SSRN Electronic Journal* . [Crossref]
298. Shomesh Ernesto Chaudhuri, Andrew W. Lo. 2016. Spectral Portfolio Theory. *SSRN Electronic Journal* . [Crossref]
299. Dirk Drechsel, Stefan Neuwirth. 2016. Taming Volatile High Frequency Data with Long Lag Structure: An Optimal Filtering Approach for Forecasting. *SSRN Electronic Journal* . [Crossref]
300. Gunes Kamber, James Morley, Benjamin Wong. 2016. Intuitive and Reliable Estimates of the Output Gap from a Beveridge-Nelson Filter. *SSRN Electronic Journal* . [Crossref]
301. Siem Jan Koopman, Rutger Lit, Andre Lucas. 2016. Model-Based Business Cycle and Financial Cycle Decomposition for Europe and the U.S. *SSRN Electronic Journal* . [Crossref]
302. Ching-Wai (Jeremy) Chiu, Evarist Stoja, Michael Chin. 2016. Financial Market Volatility, Macroeconomic Fundamentals and Investor Sentiment. *SSRN Electronic Journal* . [Crossref]
303. Daniel Buncic, Oliver MMller. 2016. Measuring the Output Gap in Switzerland with Linear Opinion Pools. *SSRN Electronic Journal* . [Crossref]
304. Seong K. Byun, Valery Polkovnichenko, Michael J. Rebello. 2016. Dynamics of Firm Savings and Investment with Temporary and Persistent Shocks. *SSRN Electronic Journal* . [Crossref]
305. Michael Ellington, Costas Milas. 2016. Evolving Macroeconomic Dynamics: A Time-Varying Structural Approach Using the Correct Measure of Money. *SSRN Electronic Journal* . [Crossref]
306. Karim Barhoumi, Reda Cherif, Nooman Rebei. 2016. Stochastic Trends, Debt Sustainability and Fiscal Policy. *IMF Working Papers* **16**:59, 1. [Crossref]
307. W. A. Razzak. 2015. Wage, productivity and unemployment: microeconomics theory and macroeconomics data. *Applied Economics* **47**:58, 6284-6300. [Crossref]
308. Dennis Bergmann, Declan O'Connor, Andreas Thümmel. 2015. Seasonal and cyclical behaviour of farm gate milk prices. *British Food Journal* **117**:12, 2899-2913. [Crossref]
309. Rodrigo de Sá, Marcelo S. Portugal. 2015. Central bank and asymmetric preferences: An application of sieve estimators to the U.S. and Brazil. *Economic Modelling* **51**, 72-83. [Crossref]

310. Rui Albuquerque, Martin Eichenbaum, Dimitris Papanikolaou, Sergio Rebelo. 2015. Long-run bulls and bears. *Journal of Monetary Economics* **76**, S21-S36. [Crossref]
311. Francesco Grigoli, Alexander Herman, Andrew Swiston, Gabriel Di Bella. 2015. Output gap uncertainty and real-time monetary policy. *Russian Journal of Economics* **1**:4, 329-358. [Crossref]
312. Stan du Plessis, Gideon du Rand, Kevin Kotzé. 2015. Measuring Core Inflation in South Africa. *South African Journal of Economics* **83**:4, 527-548. [Crossref]
313. Mario J. Crucini, Mototsugu Shintani. 2015. Measuring international business cycles by saving for a rainy day. *Canadian Journal of Economics/Revue canadienne d'économique* **48**:4, 1266-1290. [Crossref]
314. Ufuk Devrim Demirel. 2015. Identification of technology shocks using misspecified VARs. *Canadian Journal of Economics/Revue canadienne d'économique* **48**:4, 1321-1349. [Crossref]
315. Georgios Karras. 2015. Low Inflation vs. Stable Inflation: Evidence from the UK, 1688-2009. *Scottish Journal of Political Economy* **62**:5, 505-517. [Crossref]
316. Kwangmin Park, SooCheong (Shawn) Jang. 2015. The cyclical effect of advertising. *International Journal of Contemporary Hospitality Management* **27**:7, 1386-1408. [Crossref]
317. Carlos Caceres, Serhan Cevik, Ricardo Fenochietto, Borja Gracia. 2015. Day After Tomorrow: Designing an Optimal Fiscal Strategy for Libya. *Journal of Banking and Financial Economics* **2**:4, 32-50. [Crossref]
318. Panchanan Das. 2015. Entrepreneurial Impulse, Investment Behavior, and Economic Fluctuations–A VAR Analysis with Indian Data. *Asian Development Review* **32**:2, 1-17. [Abstract] [Full Text] [PDF] [PDF Plus]
319. Matheus Albergaria de Magalhães, Victor Nunes Toscano. 2015. Ocorre um 'Mito Monetário' no Brasil? Um estudo do padrão cíclico de índices de preços nacionais. *Estudos Econômicos (São Paulo)* **45**:3, 567-591. [Crossref]
320. . Bibliography 247-253. [Crossref]
321. Ageliki Anagnostou, Ioannis Panteladis, Maria Tsiapa. 2015. Disentangling different patterns of business cycle synchronicity in the EU regions. *Empirica* **42**:3, 615-641. [Crossref]
322. Yoshito Funashima. 2015. Automatic stabilizers in the Japanese tax system. *Journal of Asian Economics* **39**, 86-93. [Crossref]
323. Alexander Meyer-Gohde, Daniel Neuhoff. 2015. Solving and estimating linearized DSGE models with VARMA shock processes and filtered data. *Economics Letters* **133**, 89-91. [Crossref]
324. Shomesh E. Chaudhuri, Andrew W. Lo. Spectral analysis of stock-return volatility, correlation, and beta 232-236. [Crossref]
325. Pascal Seppecher, Isabelle Salle. 2015. Deleveraging crises and deep recessions: a behavioural approach. *Applied Economics* **47**:34-35, 3771-3790. [Crossref]
326. Martyna Marczak, Víctor Gómez. 2015. Cyclicality of real wages in the USA and Germany: New insights from wavelet analysis. *Economic Modelling* **47**, 40-52. [Crossref]
327. Winifred Huang-Meier, Mark C. Freeman, Khelifa Mazouz. 2015. Why are aggregate equity payouts pro-cyclical?. *Journal of Macroeconomics* **44**, 98-108. [Crossref]
328. Petre Caraiani. 2015. Estimating DSGE models across time and frequency. *Journal of Macroeconomics* **44**, 33-49. [Crossref]
329. Mardi Dungey, Jan P.A.M. Jacobs, Jing Tian, Simon van Norden. 2015. TREND IN CYCLE OR CYCLE IN TREND? NEW STRUCTURAL IDENTIFICATIONS FOR UNOBSERVED-COMPONENTS MODELS OF U.S. REAL GDP. *Macroeconomic Dynamics* **19**:4, 776-790. [Crossref]
330. Priyanshi Gupta, Anurag Goyal. 2015. Impact of oil price fluctuations on Indian economy. *OPEC Energy Review* **39**:2, 141-161. [Crossref]
331. Aïcha El Alaoui. 2015. Identifying and characterising the business cycle: the case of Morocco. *The Journal of North African Studies* **20**:3, 415-431. [Crossref]
332. Cecilia Bermúdez, Carlos D. Dabús, Germán H. González. 2015. Reexamining the link between instability and growth in Latin America: A dynamic panel data estimation using k-median clusters. *Latin American Journal of Economics* **52**:2, 307-341. [Crossref]
333. Wasim Ahmad, Sanjay Sehgal. 2015. The investigation of destabilization effect in India's agriculture commodity futures market. *Journal of Financial Economic Policy* **7**:2, 122-139. [Crossref]
334. Rosaria Rita Canale, Oreste Napolitano. 2015. National disparities and cyclical dynamics in Italy (1892–2007): was the Mezzogiorno a sheltered economy?. *International Review of Applied Economics* **29**:3, 328-348. [Crossref]
335. Hiroaki Miyamoto. 2015. Cyclical behavior of real wages in Japan. *Economics Letters* **130**, 56-59. [Crossref]
336. Pau Rabanal, Juan F. Rubio-Ramírez. 2015. Can international macroeconomic models explain low-frequency movements of real exchange rates?. *Journal of International Economics* **96**:1, 199-211. [Crossref]

337. Antonis A. Michis. 2015. Multiscale Analysis of the Liquidity Effect in the UK Economy. *Computational Economics* **45**:4, 615-633. [Crossref]

338. Jens Boysen-Hogrefe. 2015. Konjunkturbereinigungsverfahren der Länder: Eine Quasi-Echtzeitanalyse am Beispiel Schleswig-Holsteins. *AStA Wirtschafts- und Sozialstatistisches Archiv* **9**:1, 41-57. [Crossref]

339. Alberto Baffigi, Maria Elena Bontempi, Emanuele Felice, Roberto Golinelli. 2015. The changing relationship between inflation and the economic cycle in Italy: 1861–2012. *Explorations in Economic History* **56**, 53-70. [Crossref]

340. Tackseung Jun, Lalith Munasinghe, David H. Rind. 2015. A New Metric for Indian Monsoon Rainfall Extremes. *Journal of Climate* **28**:7, 2842-2855. [Crossref]

341. Luca Sala. 2015. DSGE Models in the Frequency Domains. *Journal of Applied Econometrics* **30**:2, 219-240. [Crossref]

342. Phuong Nguyen-Hoang. 2015. Volatile earmarked revenues and state highway expenditures in the United States. *Transportation* **42**:2, 237-256. [Crossref]

343. Myungkyu Shim, Hee-Seung Yang. 2015. The implications of changes in hours fluctuations on welfare costs of business cycles. *Economics Letters* **128**, 75-78. [Crossref]

344. Kanda Naknoi. 2015. Exchange rate volatility and fluctuations in the extensive margin of trade. *Journal of Economic Dynamics and Control* **52**, 322-339. [Crossref]

345. Miao Wang, M.C. Sunny Wong, Jim Granato. 2015. International Comovement of Economic Fluctuations: A Spatial Analysis. *World Development* **67**, 186-201. [Crossref]

346. Pierre Guérin, Laurent Maurin, Matthias Mohr. 2015. TREND-CYCLE DECOMPOSITION OF OUTPUT AND EURO AREA INFLATION FORECASTS: A REAL-TIME APPROACH BASED ON MODEL COMBINATION. *Macroeconomic Dynamics* **19**:2, 363-393. [Crossref]

347. Soojin Kim, Qiushi Wang. 2015. State budget periodicity and general expenditure volatility: an empirical analysis. *Journal of Public Budgeting, Accounting & Financial Management* **27**:4, 419-454. [Crossref]

348. Arnold Zellner, Jacques Kibambe Ngoie. 2015. Evaluation of the Effects of Reduced Personal and Corporate Tax Rates on the Growth Rates of the U.S. Economy. *Econometric Reviews* **34**:1-2, 56-81. [Crossref]

349. Roberto Pancrazi. 2015. The heterogeneous Great Moderation. *European Economic Review* **74**, 207-228. [Crossref]

350. Guglielmo Maria Caporale, Roberta De Santis, Alessandro Girardi. 2015. Trade intensity and output synchronisation: On the endogeneity properties of EMU. *Journal of Financial Stability* **16**, 154-163. [Crossref]

351. Stefano Magrini, Margherita Gerolimetto, Hasan Engin Duran. 2015. Regional Convergence and Aggregate Business Cycle in the United States. *Regional Studies* **49**:2, 251-272. [Crossref]

352. Joël Cariolle, Michaël Goujon. 2015. MEASURING MACROECONOMIC INSTABILITY: A CRITICAL SURVEY ILLUSTRATED WITH EXPORTS SERIES. *Journal of Economic Surveys* **29**:1, 1-26. [Crossref]

353. Dimitrios Asteriou, Argiro Moudatsou. 2015. Business Cycle Synchronization in the Enlarged EU: The Role of Bilateral Trade and FDI. *Review of Development Economics* **19**:1, 196-207. [Crossref]

354. Juan Carlos Cuestas, Mercedes Monfort, Javier Ordóñez. 2015. Unemployment Convergence in Central and Eastern European Countries: Driving Forces and Cluster Behavior. *Emerging Markets Finance and Trade* **51**:1, 259-273. [Crossref]

355. Mauro Rota, Donatella Strangio. The Italian Monetary Policy in Perspective: Lessons from Monetary History of Italy before the EMU 3-27. [Crossref]

356. Gagari Chakrabarti, Chitrakalpa Sen. Greens—The Obvious Choice Over the Grays? 5-61. [Crossref]

357. John Maloney, Andrew Pickering. 2015. Voting and the economic cycle. *Public Choice* **162**:1-2, 119-133. [Crossref]

358. Mark W. Watson. Time Series: Cycles 331-336. [Crossref]

359. Sebastian-Florian Enea, Silvia Palaşcă, Claudiu Ţigănaş. 2015. G7 Countries – Advocates of the Global Business Cycle. *Procedia Economics and Finance* **20**, 193-200. [Crossref]

360. Jamel Gatfaoui, Eric Girardin. 2015. Comovement of Chinese provincial business cycles. *Economic Modelling* **44**, 294-306. [Crossref]

361. Vu Hong Thai Nguyen, Agyenim Boateng. 2015. An analysis of involuntary excess reserves, monetary policy and risk-taking behaviour of Chinese Banks. *International Review of Financial Analysis* **37**, 63-72. [Crossref]

362. James Fenske, Namrata Kala. 2015. Climate and the slave trade. *Journal of Development Economics* **112**, 19-32. [Crossref]

363. Hening Liu, Jianjun Miao. 2015. Growth uncertainty, generalized disappointment aversion and production-based asset pricing. *Journal of Monetary Economics* **69**, 70-89. [Crossref]

364. Ladislava Issever Grochová, Petr Rozmahel. 2015. On the Ideality of Filtering Techniques in the Business Cycle Analysis Under Conditions of European Economy. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis* **63**:3, 915-926. [Crossref]
365. Thomas Conlon, John Cotter, Ramazan Gencay. 2015. Long-Run International Diversification. *SSRN Electronic Journal* . [Crossref]
366. Ioannis Bournakis, Dimitris Christopoulos, Sushanta Mallick. 2015. Knowledge Spillovers, Absorptive Capacity and Growth: An Industry-Level Analysis for OECD Countries. *SSRN Electronic Journal* . [Crossref]
367. N A Sentyureva, Vitt Yaggvkinn, Evgeniya Kolomak, D A Uskov. 2015. (Improving the System of Tax Revenues Forecast). *SSRN Electronic Journal* . [Crossref]
368. Baran Doda, Luca Taschini. 2015. Carbon Dating: When is it Beneficial to Link ETSs?. *SSRN Electronic Journal* . [Crossref]
369. Lubos Hanus, Lukas Vacha. 2015. Business Cycle Synchronization of the Visegrad Four and the European Union. *SSRN Electronic Journal* . [Crossref]
370. Philipp Harting. 2015. Stabilization Policies and Long Term Growth: Policy Implications from an Agent-Based Macroeconomic Model. *SSRN Electronic Journal* . [Crossref]
371. Didier Nibbering, Richard Paap, Michel van der Wel. 2015. What Do Professional Forecasters Actually Predict?. *SSRN Electronic Journal* . [Crossref]
372. Nicholas Sly, Caroline E. Weber. 2015. Global Tax Policy and the Synchronization of Business Cycles. *SSRN Electronic Journal* . [Crossref]
373. Sandro Lera, Didier Sornette. 2015. Secular Bipolar Growth Rate of the Real US GDP Per Capita: Implications for Understanding Past and Future Economic Growth. *SSRN Electronic Journal* . [Crossref]
374. Onur Ince, Tanya Molodtsova. 2015. Real-Time Exchange Rate Predictability: High Frequency Forecasts with Low Frequency Data. *SSRN Electronic Journal* . [Crossref]
375. Jacob B. Smith. 2015. Trend and Cycle in the Yield Curve: A Procedure for Forecasting Recessions. *SSRN Electronic Journal* . [Crossref]
376. Adam McCloskey, Jonathan B. Hill. 2015. Parameter Estimation Robust to Low-Frequency Contamination. *SSRN Electronic Journal* . [Crossref]
377. Jorge Mario Uribe, Karol Carbonell. 2015. Ciclo de los negocios en Colombia: el papel de la política de estabilización. *Semestre Económico* **18**:38, 13-36. [Crossref]
378. Pritha Mitra, Amr Hosny, Gohar Abajyan, Mark Fischer. 2015. Estimating Potential Growth in the Middle East and Central Asia. *IMF Working Papers* **15**:62, 1. [Crossref]
379. Rafael Portillo, Luis-Felipe Zanna. 2015. On the First-Round Effects of International Food Price Shocks: the Role of the Asset Market Structure. *IMF Working Papers* **15**:33, 1. [Crossref]
380. Jitka Poměnková, Roman Maršálek. 2015. Empirical Evidence of Ideal Filter Approximation: Peripheral and Selected EU Countries Application. *Prague Economic Papers* **24**:5, 485-502. [Crossref]
381. Michael Jetter. 2014. Volatility and growth: Governments are key. *European Journal of Political Economy* **36**, 71-88. [Crossref]
382. Richard Ashley, Guo Li. 2014. Re-examining the impact of housing wealth and stock wealth on retail sales: Does persistence in wealth changes matter?. *Journal of Housing Economics* **26**, 109-118. [Crossref]
383. Martin Gächter, Aleksandra Riedl. 2014. One money, one cycle? The EMU experience. *Journal of Macroeconomics* **42**, 141-155. [Crossref]
384. Lean Yu, Yang Zhao, Ling Tang. 2014. A compressed sensing based AI learning paradigm for crude oil price forecasting. *Energy Economics* **46**, 236-245. [Crossref]
385. Bruce A. Blonigen, Jeremy Piger, Nicholas Sly. 2014. Comovement in GDP trends and cycles among trading partners. *Journal of International Economics* **94**:2, 239-247. [Crossref]
386. R. Basile, S. de Nardis, C. Pappalardo. 2014. Firm heterogeneity and regional business cycles differentials. *Journal of Economic Geography* **14**:6, 1087-1115. [Crossref]
387. Konstantinos Konstantakis, Panayotis G. Michaelides, Theofanis Papageorgiou. 2014. Sector size, technical change and stability in the USA (1957-2006): a Schumpeterian approach. *International Journal of Social Economics* **41**:10, 956-974. [Crossref]
388. Ivelina Pavlova, Jang Hyung Cho, A.M. Parhizgari, William G. Hardin. 2014. Long memory in REIT volatility and changes in the unconditional mean: a modified FIGARCH approach. *Journal of Property Research* **31**:4, 315-332. [Crossref]
389. Mazhar Y. Mughal, Junaid Ahmed. 2014. Remittances and Business Cycles: Comparison of South Asian Countries. *International Economic Journal* **28**:4, 513-541. [Crossref]

390. Richard Durech, Alexandru Minea, Lavinia Mustea, Lubica Slusna. 2014. Regional evidence on Okun's Law in Czech Republic and Slovakia. *Economic Modelling* **42**, 57-65. [Crossref]
391. Riccardo De Bonis, Andrea Silvestrini. 2014. The Italian financial cycle: 1861–2011. *Cliometrica* **8**:3, 301-334. [Crossref]
392. Kuo-Yuan Liang, Chen-Hui Yen. 2014. Dissecting the cycles: An intermarket investigation and its implications to portfolio reallocation. *International Review of Economics & Finance* **33**, 39-51. [Crossref]
393. Adrian Pagan, Tim Robinson. 2014. Methods for assessing the impact of financial effects on business cycles in macroeconometric models. *Journal of Macroeconomics* **41**, 94-106. [Crossref]
394. Alfred A. Haug, Ian King. 2014. In the long run, US unemployment follows inflation like a faithful dog. *Journal of Macroeconomics* **41**, 42-52. [Crossref]
395. Stavros Degiannakis, David Duffy, George Filis. 2014. Business Cycle Synchronization in EU: A Time-Varying Approach. *Scottish Journal of Political Economy* **61**:4, 348-370. [Crossref]
396. Muhammad Shahbaz, Mohamed Arouri, Frédéric Teulon. 2014. Short- and long-run relationships between natural gas consumption and economic growth: Evidence from Pakistan. *Economic Modelling* **41**, 219-226. [Crossref]
397. M. Ali Choudhary, M. Nadim Hanif, Javed Iqbal. 2014. On smoothing macroeconomic time series using the modified HP filter. *Applied Economics* **46**:19, 2205-2214. [Crossref]
398. Ufuk Devrim Demirel. 2014. ON THE CYCLICALITY OF CREDIT. *Macroeconomic Dynamics* **18**:5, 1129-1160. [Crossref]
399. Constantin-Marius Apostoaie, Stanislav Percic, Vasile Cocriş, Dan Chirleşan. 2014. Research on the Credit Cycle and Business Cycle with a Focus on Ten States from Central, Eastern, and Southeastern Europe. *Emerging Markets Finance and Trade* **50**:sup4, 63-77. [Crossref]
400. Ivan Kožić, Ivan Sever. 2014. Measuring business cycles: Empirical Mode Decomposition of economic time series. *Economics Letters* **123**:3, 287-290. [Crossref]
401. Baran Doda. 2014. Evidence on business cycles and emissions. *Journal of Macroeconomics* **40**, 214-227. [Crossref]
402. Astrid L. Keel, Brian Bourdeau. 2014. Should all service firms follow the recessionary advertising prescription?. *Journal of Services Marketing* **28**:3, 207-213. [Crossref]
403. M.J. Herrerias, J. Ordóñez. 2014. If the United States sneezes, does the world need "pain-killers"?. *International Review of Economics & Finance* **31**, 159-170. [Crossref]
404. Martin Feldkircher. 2014. The determinants of vulnerability to the global financial crisis 2008 to 2009: Credit growth and other sources of risk. *Journal of International Money and Finance* **43**, 19-49. [Crossref]
405. Florentine Schwark. 2014. Energy price shocks and medium-term business cycles. *Journal of Monetary Economics* **64**, 112-121. [Crossref]
406. Knut Are Aastveit, Tørres Trovik. 2014. Estimating the output gap in real time: A factor model approach. *The Quarterly Review of Economics and Finance* **54**:2, 180-193. [Crossref]
407. Rosmy Jean Louis, Daniel Simons. 2014. Business Cycles Synchronicity and Income Levels: Has Globalisation Brought us Closer Than Ever?. *The World Economy* **37**:5, 592-624. [Crossref]
408. Bedri Kamil Onur Taş, Hüseyin Ekrem Cunedioğlu. 2014. How Can Recessions Be Brought to an End? Effects of Macroeconomic Policy Actions on Durations of Recessions. *Journal of Applied Economics* **17**:1, 179-198. [Crossref]
409. Lien Lamey. 2014. Hard economic times: a dream for discounters. *European Journal of Marketing* **48**:3/4, 641-656. [Crossref]
410. Hiroshi Yamada, Gawon Yoon. 2014. When Grilli and Yang meet Prebisch and Singer: Piecewise linear trends in primary commodity prices. *Journal of International Money and Finance* **42**, 193-207. [Crossref]
411. John T. Cuddington, Grant Nülle. 2014. Variable long-term trends in mineral prices: The ongoing tug-of-war between exploration, depletion, and technological change. *Journal of International Money and Finance* **42**, 224-252. [Crossref]
412. Debdulal Mallick. 2014. FINANCIAL DEVELOPMENT, SHOCKS, AND GROWTH VOLATILITY. *Macroeconomic Dynamics* **18**:3, 651-688. [Crossref]
413. Luís Aguiar-Conraria, Maria Joana Soares. 2014. THE CONTINUOUS WAVELET TRANSFORM: MOVING BEYOND UNI- AND BIVARIATE ANALYSIS. *Journal of Economic Surveys* **28**:2, 344-375. [Crossref]
414. Rabah Arezki, Daniel Lederman, Hongyan Zhao. 2014. The Relative Volatility of Commodity Prices: A Reappraisal. *American Journal of Agricultural Economics* **96**:3, 939-951. [Crossref]
415. Guglielmo Maria Caporale, Luis Gil-Alana. 2014. Long-Run and Cyclical Dynamics in the US Stock Market. *Journal of Forecasting* **33**:2, 147-161. [Crossref]

416. Ioanna Konstantakopoulou, Efthymios G. Tsionas. 2014. Half a century of empirical evidence of business cycles in OECD countries. *Journal of Policy Modeling* **36**:2, 389-409. [Crossref]
417. Guglielmo Maria Caporale, Luis A. Gil-Alana. 2014. Persistence and cycles in US hours worked. *Economic Modelling* **38**, 504-511. [Crossref]
418. André MOREIRA CUNHA, Julimar Da Silva BICHARA, Marcos Tadeu Caputi LÉLIS. 2014. América Latina y el ascenso de China: una perspectiva desde Brasil. *América Latina Hoy* **65**:0, 185. [Crossref]
419. Gabe J. de Bondt, Elke Hahn. 2014. Introducing the Euro Area-wide Leading Indicator (ALI): Real-Time Signals of Turning Points in the Growth Cycle from 2007 to 2011. *Journal of Forecasting* **33**:1, 47-68. [Crossref]
420. Fredrik N. G. Andersson, Peter Karpestam. Short and Long Term Growth Effects of Financial Crises 227-248. [Crossref]
421. Theophilos Papadimitriou, Periklis Gogas, Georgios Antonios Sarantitis. European Business Cycle Synchronization: A Complex Network Perspective 265-275. [Crossref]
422. Rainer Metz, Helmut Thome. Zeitreihenanalyse 1063-1076. [Crossref]
423. Terence C. Mills. Trends, Cycles, and Structural Breaks in Cliometrics 1-24. [Crossref]
424. Melike Bildirici, Selçuk Alp. 2014. WITHDRAWN: Measurement of filters' efficiencies and application of NNSFDI method. *Applied Soft Computing* . [Crossref]
425. Giorgio Calcagnini, Giuseppe Travaglini. 2014. A time series analysis of labor productivity. Italy versus the European countries and the U.S. *Economic Modelling* **36**, 622-628. [Crossref]
426. Bing Zhang, Xiao-Ming Li. 2014. Has there been any change in the comovement between the Chinese and US stock markets?. *International Review of Economics & Finance* **29**, 525-536. [Crossref]
427. Haizhen Yang, Suxiao Li, Yanyi Ye, Xiaoguang Yang. 2014. Multi-dimension Monitoring System for Regional Economy: Exploration and Practice in Xinjiang Autonomous Region. *Procedia Computer Science* **31**, 318-327. [Crossref]
428. George Filis, Steve Letza. Business Cycles Synchronisation between the European Monetary Union and Poland 61-77. [Crossref]
429. Ayako Saiki, Sunghyun Henry Kim. 2014. Business Cycle Synchronization and Vertical Trade Integration: A Case Study of the Eurozone and East Asia. *SSRN Electronic Journal* . [Crossref]
430. Giovanni Dosi, Giorgio Fagiolo, Mauro Napoletano, Andrea Roventini, Tania Treibich. 2014. Fiscal and Monetary Policies in Complex Evolving Economies. *SSRN Electronic Journal* . [Crossref]
431. Hongying Sun. 2014. Time Series Decomposition: An Additional Methodology. *SSRN Electronic Journal* . [Crossref]
432. Francis White Loloh. 2014. Exchange Rate Pass Through in Ghana. *SSRN Electronic Journal* . [Crossref]
433. Eddie Gerba. 2014. Have the US Macro-Financial Linkages Changed? The Balance Sheet Dimension. *SSRN Electronic Journal* . [Crossref]
434. Ha Thanh Le. 2014. Dynamics of Business Cycles in Vietnam: A Comparison with Indonesia and Philippines. *SSRN Electronic Journal* . [Crossref]
435. Francis White Loloh, Benjamin Amoah. 2014. Analyzing Private Sector Credit Growth in Ghana. *SSRN Electronic Journal* . [Crossref]
436. Matteo Luciani. 2014. Large-Dimensional Dynamic Factor Models in Real-Time: A Survey. *SSRN Electronic Journal* . [Crossref]
437. Myungkyu Shim, Hee-Seung Yang. 2014. The Implications of Changes in Hours Fluctuations on Welfare Costs of Business Cycles. *SSRN Electronic Journal* . [Crossref]
438. Rizwan Mushtaq. 2014. Financial Development, Financial Instability and Poverty: A Novel Appraisal in the Presence of Structural Changes. *SSRN Electronic Journal* . [Crossref]
439. Martin Richard Goetz, Luc Laeven, Ross Levine. 2014. Does the Geographic Expansion of Bank Assets Reduce Risk?. *SSRN Electronic Journal* . [Crossref]
440. Rui A. Albuquerque, Martin Eichenbaum, Dimitris Papanikolaou, Sergio T. Rebelo. 2014. Long-Run Bulls and Bears. *SSRN Electronic Journal* . [Crossref]
441. Max Köhler, Stefan Sperlich. 2014. The Africa-Dummy: Gone with the Millennium?. *SSRN Electronic Journal* . [Crossref]
442. Rosmy Jean Louis, Faruk Balli. 2014. Oil Price and Stock Market Synchronization in Gulf Cooperation Council Countries. *Emerging Markets Finance and Trade* **50**:1, 22-51. [Crossref]
443. Oumar Diallo, Sampawende Tapsoba. 2014. Rising BRICs and Changes in Sub-Saharan Africa's Business Cycle Patterns. *IMF Working Papers* **14**:35. . [Crossref]

444. Magda Kandil. 2014. Does Demand Volatility Lower Growth and Raise Inflation? Evidence from the Caribbean. *IMF Working Papers* **14**:67, 1. [Crossref]

445. Evridiki Tsounta. 2014. Slowdown in Emerging Markets: Sign of a Bumpy Road Ahead?. *IMF Working Papers* **14**:205, 1. [Crossref]

446. International Monetary Fund. 2014. Russian Federation: Selected Issues. *IMF Staff Country Reports* **14**:176, 1. [Crossref]

447. Carlos Carvalho, Niels Arne Dam, Jae Won Lee. 2014. Real Rigidities and the Cross-Sectional Distribution of Price Stickiness: Evidence from Micro and Macro Data Combined. *SSRN Electronic Journal* . [Crossref]

448. Burkhard Heer, Bernd Süssmuth. 2013. Tax bracket creep and its effects on income distribution. *Journal of Macroeconomics* **38**, 393-408. [Crossref]

449. Adama Bah. 2013. Civil Conflicts as a Constraint to Regional Economic Integration in Africa. *Defence and Peace Economics* **24**:6, 521-534. [Crossref]

450. Anton Nakov, Galo Nuño. 2013. Saudi Arabia and the Oil Market. *The Economic Journal* **123**:573, 1333-1362. [Crossref]

451. Nir Jaimovich, Seth Pruitt, Henry E Siu. 2013. The Demand for Youth: Explaining Age Differences in the Volatility of Hours. *American Economic Review* **103**:7, 3022-3044. [Crossref]

452. M. Y. Çakır, A. Kabundi. 2013. Business cycle co-movements between South Africa and the BRIC countries. *Applied Economics* **45**:33, 4698-4718. [Crossref]

453. M. Rota. 2013. Credit and growth: reconsidering Italian industrial policy during the Golden Age. *European Review of Economic History* **17**:4, 431-451. [Crossref]

454. Hasan Engin Duran. 2013. CONVERGENCE OF REGIONAL ECONOMIC CYCLES IN TURKEY. *Review of Urban & Regional Development Studies* **25**:3, 152-175. [Crossref]

455. George Tawadros. 2013. The cyclicality of the demand for crude oil: evidence from the OECD. *Journal of Economic Studies* **40**:6, 704-719. [Crossref]

456. C.-C. Chang, T.-C. Lai. 2013. The Oil Energy Price Cycle in Economic Activities: A Stochastic Model. *Energy Sources, Part B: Economics, Planning, and Policy* **8**:4, 369-381. [Crossref]

457. Vu Hong Thai Nguyen, Agyenim Boateng. 2013. The impact of excess reserves beyond precautionary levels on Bank Lending Channels in China. *Journal of International Financial Markets, Institutions and Money* **26**, 358-377. [Crossref]

458. Yohei Yamamoto, Pierre Perron. 2013. Estimating and testing multiple structural changes in linear models using band spectral regressions. *The Econometrics Journal* **16**:3, 400-429. [Crossref]

459. Efrem Castelnuovo. 2013. What does a Monetary Policy Shock Do? An International Analysis with Multiple Filters*. *Oxford Bulletin of Economics and Statistics* **75**:5, 759-784. [Crossref]

460. Marcos Bujosa, Antonio García-Ferrer, Aránzazu de Juan. 2013. Predicting Recessions with Factor Linear Dynamic Harmonic Regressions. *Journal of Forecasting* **32**:6, 481-499. [Crossref]

461. Benoît Desmarchelier, Faïz Gallouj. 2013. Endogenous growth and environmental policy: are the processes of growth and tertiarization in developed economies reversible?. *Journal of Evolutionary Economics* **23**:4, 831-860. [Crossref]

462. Barbara Meller. 2013. The two-sided effect of financial globalization on output volatility. *Review of World Economics* **149**:3, 477-504. [Crossref]

463. Sofia Gouveia, Leonida Correia. 2013. Labour costs dynamics in the Euro area: some empirical evidence. *International Economics and Economic Policy* **10**:3, 323-347. [Crossref]

464. Jesús Crespo-Cuaresma, Octavio Fernández-Amador. 2013. Business cycle convergence in EMU: A first look at the second moment. *Journal of Macroeconomics* **37**, 265-284. [Crossref]

465. Laura Barbieri, Mario Faliva, Maria Grazia Zoia. 2013. Band-limited component estimation in time-limited economic series. *Journal of Applied Statistics* **40**:9, 2009-2023. [Crossref]

466. Ronald H. Lange. 2013. Monetary policy reactions and the exchange rate: a regime-switching structural VAR for Canada. *International Review of Applied Economics* **27**:5, 612-632. [Crossref]

467. Chengsi Zhang. 2013. Inflation Dynamics and an Extended New Keynesian Phillips Curve for China. *Emerging Markets Finance and Trade* **49**:5, 82-98. [Crossref]

468. Dennis Wesselbaum. 2013. Gender-specific differences in labor market adjustment patterns: Evidence from the United States. *The Social Science Journal* **50**:3, 381-385. [Crossref]

469. Igor Velickovski. 2013. Assessing independent monetary policy in small, open and euroized countries: evidence from Western Balkan. *Empirical Economics* **45**:1, 137-156. [Crossref]

470. Geoffrey R. Dunbar. 2013. Seasonal adjustment, demography, and GDP growth. *Canadian Journal of Economics/Revue canadienne d'économique* **46**:3, 811-835. [Crossref]
471. Matheus Albergaria de Magalhães, Victor Nunes Toscano. 2013. Ciclos de comércio exterior: um estudo comparativo entre Brasil e Espírito Santo. *Revista de Economia Contemporânea* **17**:2, 221-248. [Crossref]
472. Fethi Öğünç, Kurmaş Akdoğan, Selen Başer, Meltem Gülenay Chadwick, Dilara Ertuğ, Timur Hülagü, Sevim Kösem, Mustafa Utku Özmen, Necati Tekatlı. 2013. Short-term inflation forecasting models for Turkey and a forecast combination analysis. *Economic Modelling* **33**, 312-325. [Crossref]
473. Onur Ince, David H. Papell. 2013. The (un)reliability of real-time output gap estimates with revised data. *Economic Modelling* **33**, 713-721. [Crossref]
474. João Valle e Azevedo, Ana Pereira. 2013. Approximating and forecasting macroeconomic signals in real-time. *International Journal of Forecasting* **29**:3, 479-492. [Crossref]
475. Liu Iing-yi, Jian Zhi-hong. Optimal combination of fiscal and monetary policy in China 1502-1510. [Crossref]
476. Keen Meng Choy, Ichiro Sugimoto. 2013. Trade, the Staple Theory of Growth, and Fluctuations in Colonial Singapore, 1900-39. *Australian Economic History Review* **53**:2, 121-145. [Crossref]
477. Rafael Tiecher Cusinato, André Minella, Sabino da Silva Pôrto Júnior. 2013. Output gap in Brazil: a real-time data analysis. *Empirical Economics* **44**:3, 1113-1127. [Crossref]
478. François Benhmad. 2013. Dynamic cyclical comovements between oil prices and US GDP: A wavelet perspective. *Energy Policy* **57**, 141-151. [Crossref]
479. Lilia Cavallari, Stefano d'Addona. 2013. Nominal and real volatility as determinants of FDI. *Applied Economics* **45**:18, 2603-2610. [Crossref]
480. M. Uebele. 2013. What Drives Commodity Market Integration? Evidence from the 1800s. *CESifo Economic Studies* **59**:2, 412-442. [Crossref]
481. John Marangos, Vasiliki Fourmouzi, Minoas Koukouritakis. 2013. Factors that Determine the Decline in University Student Enrolments in Economics in Australia: An Empirical Investigation. *Economic Record* **89**:285, 255-270. [Crossref]
482. SEBNEM KALEMLI-OZCAN, ELIAS PAPAIOANNOU, JOSÉ-LUIS PEYDRÓ. 2013. Financial Regulation, Financial Globalization, and the Synchronization of Economic Activity. *The Journal of Finance* **68**:3, 1179-1228. [Crossref]
483. Terence Mills. 2013. Constructing U.K. Core Inflation. *Econometrics* **1**:1, 32-52. [Crossref]
484. Tim Bollerslev, Daniela Osterrieder, Natalia Sizova, George Tauchen. 2013. Risk and return: Long-run relations, fractional cointegration, and return predictability. *Journal of Financial Economics* **108**:2, 409-424. [Crossref]
485. Hiroaki Miyamoto. 2013. Ins and outs of the long-run unemployment dynamics. *Applied Economics Letters* **20**:7, 615-620. [Crossref]
486. Guglielmo Maria Caporale, Juncal Cuñado, Luis A. Gil-Alana. 2013. Modelling long-run trends and cycles in financial time series data. *Journal of Time Series Analysis* **34**:3, 405-421. [Crossref]
487. Martyna Marczak, Thomas Beissinger. 2013. Real wages and the business cycle in Germany. *Empirical Economics* **44**:2, 469-490. [Crossref]
488. Bilge Erten, José Antonio Ocampo. 2013. Super Cycles of Commodity Prices Since the Mid-Nineteenth Century. *World Development* **44**, 14-30. [Crossref]
489. Zafeira Kastrinaki, Paul Stoneman. 2013. Merger Cycles: A Frequency Domain Approach*. *Oxford Bulletin of Economics and Statistics* **75**:2, 259-275. [Crossref]
490. Panayotis G. Michaelides, Theofanis Papageorgiou, Angelos T. Vouldis. 2013. Business cycles and economic crisis in Greece (1960–2011): A long run equilibrium analysis in the Eurozone. *Economic Modelling* **31**, 804-816. [Crossref]
491. C. Planas, W. Roeger, A. Rossi. 2013. The information content of capacity utilization for detrending total factor productivity. *Journal of Economic Dynamics and Control* **37**:3, 577-590. [Crossref]
492. Chetan Ghate, Radhika Pandey, Ila Patnaik. 2013. Has India emerged? Business cycle stylized facts from a transitioning economy. *Structural Change and Economic Dynamics* **24**, 157-172. [Crossref]
493. Sean J. Gossel, Nicholas Biekpe. 2013. The Cyclical Relationships Between South Africa's Net Capital Inflows and Fiscal and Monetary Policies. *Emerging Markets Finance and Trade* **49**:2, 64-83. [Crossref]
494. Timo Teuber,. 2013. Interpreting Business Cycles as Generalized Two-Dimensional Loops Using Penalized Splines Regression Techniques. *Applied Economics Quarterly* **59**:1, 1-26. [Crossref]

495. Ansgar Belke, Jennifer Schneider. 2013. Portfolio choice of financial investors and European business cycle convergence: a panel analysis for EU countries. *Empirica* **40**:1, 175-196. [Crossref]
496. Koyin Chang, Yoonbai Kim, Marc Tomljanovich, Yung-Hsiang Ying. 2013. Do political parties foster business cycles? An examination of developed economies. *Journal of Comparative Economics* **41**:1, 212-226. [Crossref]
497. Masahiro Kodama. 2013. How Large Is the Cost of Business Cycles in Developing Countries?. *Review of Development Economics* **17**:1, 49-63. [Crossref]
498. Ionuţ Dumitru. Euro Adoption in Romania 61-81. [Crossref]
499. Ho-Chuan (River) Huang, Chih-Chuan Yeh. 2013. Okun's law in panels of countries and states. *Applied Economics* **45**:2, 191-199. [Crossref]
500. Saibal Ghosh. 2013. The economics and politics of output volatility: evidence from Indian states. *International Review of Applied Economics* **27**:1, 110-134. [Crossref]
501. Oleksiy Kryvtsov, Virgiliu Midrigan. 2013. Inventories, Markups, and Real Rigidities in Menu Cost Models. *The Review of Economic Studies* **80**:1, 249-276. [Crossref]
502. Sebastian Orbe, Oliver Pucker. 2013. Do Aggregate Company Outlooks have Macroeconomic Content?. *SSRN Electronic Journal* . [Crossref]
503. Alberto Baffigi, Maria Elena Bontempi, Roberto Golinelli. 2013. Output potenziale, gap e inflazione in Italia nel lungo periodo (1861-2010): un'analisi econometrica (Potential Output, Output Gap, and Inflation in Italy in the Long Term (1861-2010): An Econometric Analysis). *SSRN Electronic Journal* . [Crossref]
504. Xiang Zhang. 2013. Leisure, Consumption and Long Run Risk: An Empirical Evaluation. *SSRN Electronic Journal* . [Crossref]
505. Junaid Ahmed, Inmaculada Martinez-Zarzoso. 2013. Blessing or Curse: The Stabilizing Role of Remittance, Foreign Aid and FDI to Pakistan. *SSRN Electronic Journal* . [Crossref]
506. Arno Tausch. 2013. The Hallmarks of Crisis: A New Center-Periphery Perspective on Long Cycles. *SSRN Electronic Journal* . [Crossref]
507. Mardi H. Dungey, Jan P. A. M. Jacobs, Jing Tian, Simon van Norden. 2013. Trend-Cycle Decomposition: Implications from an Exact Structural Identification. *SSRN Electronic Journal* . [Crossref]
508. Martin Richard Goetz, Juan Carlos Gozzi. 2013. Financial Integration and Business Cycle Synchronization: Evidence from U.S. States. *SSRN Electronic Journal* . [Crossref]
509. Lisa Sella, Gianna Vivaldo, Andreas Groth, M. M. Ghil. 2013. Economic Cycles and Their Synchronization: A Survey of Spectral Properties. *SSRN Electronic Journal* . [Crossref]
510. Riccardo De Bonis, Andrea Silvestrini. 2013. The Italian Financial Cycle: 1861-2011. *SSRN Electronic Journal* . [Crossref]
511. Fabio Busetti, Michele Caivano. 2013. The Trend-Cycle Decomposition of Output and the Phillips Curve: Bayesian Estimates for Italy. *SSRN Electronic Journal* . [Crossref]
512. Myungkyu Shim, Hee-Seung Yang. 2013. Business Cycle Properties of Job Polarization Using Consistent Occupational Data. *SSRN Electronic Journal* . [Crossref]
513. Nurbek Jenish. 2013. Business Cycles in Central Asia and the Russian Federation. *SSRN Electronic Journal* . [Crossref]
514. IMF. Research Dept.. World Economic Outlook, October 2013: Transition and Tensions: Transiciones y tensiones . [Crossref]
515. Sebastian Sosa, Evridiki Tsounta, Hye S Kim. 2013. Is the Growth Momentum in Latin America Sustainable?. *IMF Working Papers* **13**:109, 1. [Crossref]
516. IMF. Research Dept.. World Economic Outlook, October 2013: Transition and Tensions . [Crossref]
517. IMF. Research Dept.. Perspectives de L'économie Mondiale, Octobre 2013: Transitions et tensions . [Crossref]
518. Carlos Caceres, Serhan Cevik, Ricardo Fenochietto, Borja Gracia. 2013. The Day After Tomorrow: Designing an Optimal Fiscal Strategy for Libya. *IMF Working Papers* **13**:79, 1. [Crossref]
519. Fabien Labondance. 2013. Synchronisation des cycles régionaux dans la zone euro. *Revue d'Économie Régionale & Urbaine* **avril**:2, 269. [Crossref]
520. Maria Dolores Gadea, Ana Gómez-Loscos, Antonio Montañés. 2012. Cycles inside cycles: Spanish regional aggregation. *SERIEs* **3**:4, 423-456. [Crossref]
521. Sumru Altug, Bilin Neyapti, Mustafa Emin. 2012. Institutions and Business Cycles. *International Finance* **15**:3, 347-366. [Crossref]

522. M. Martin Boyer, Eric Jacquier, Simon Van Norden. 2012. Are Underwriting Cycles Real and Forecastable?. *Journal of Risk and Insurance* **79**:4, 995-1015. [Crossref]
523. SEAN J. GOSSEL, NICHOLAS BIEKPE. 2012. SOUTH AFRICA'S POST-LIBERALISED CAPITAL FLOWS AND BUSINESS CYCLE FLUCTUATIONS. *South African Journal of Economics* **80**:4, 510-525. [Crossref]
524. 2012. Comments by Eu Chye Tan. *Asian Economic Papers* **11**:3, 107-109. [Citation] [PDF] [PDF Plus]
525. Xiaoshan Chen, Terence C. Mills. 2012. Measuring the Euro area output gap using a multivariate unobserved components model containing phase shifts. *Empirical Economics* **43**:2, 671-692. [Crossref]
526. Lisa Sella, Roberto Marchionatti. 2012. On the cyclical variability of economic growth in Italy, 1881–1913: a critical note. *Cliometrica* **6**:3, 307-328. [Crossref]
527. François Gourio. 2012. Disaster Risk and Business Cycles. *American Economic Review* **102**:6, 2734-2766. [Crossref]
528. George Selgin, William D. Lastrapes, Lawrence H. White. 2012. Has the Fed been a failure?. *Journal of Macroeconomics* **34**:3, 569-596. [Crossref]
529. Tommaso Proietti. 2012. SEASONALITY, FORECAST EXTENSIONS AND BUSINESS CYCLE UNCERTAINTY. *Journal of Economic Surveys* **26**:4, 555-569. [Crossref]
530. Georgios Efthyvoulou. 2012. The impact of financial stress on sectoral productivity. *Economics Letters* **116**:2, 240-243. [Crossref]
531. Viv B. Hall, C. John McDermott. 2012. Is there an unobserved components common cycle for Australasia? Implications for a common currency. *New Zealand Economic Papers* **46**:2, 119-141. [Crossref]
532. André Moreira Cunha, Marcos Tadeu Caputi Lélis, Julimar da Silva Bichara. 2012. O Brasil no espelho da China: tendências para o período pós-crise financeira global. *Revista de Economia Contemporânea* **16**:2, 208-236. [Crossref]
533. Bruno Eeckels, George Filis, Costas Leon. 2012. Tourism Income and Economic Growth in Greece: Empirical Evidence from Their Cyclical Components. *Tourism Economics* **18**:4, 817-834. [Crossref]
534. Kosei Fukuda. 2012. Illustrating extraordinary shocks causing trend breaks. *Economic Modelling* **29**:4, 1045-1052. [Crossref]
535. Parantap Basu, Max Gillman, Joseph Pearlman. 2012. Inflation, human capital and Tobin's q. *Journal of Economic Dynamics and Control* **36**:7, 1057-1074. [Crossref]
536. Jianfeng Yu. 2012. Using long-run consumption-return correlations to test asset pricing models. *Review of Economic Dynamics* **15**:3, 317-335. [Crossref]
537. ALFRED A. HAUG, WILLIAM G. DEWALD. 2012. MONEY, OUTPUT, AND INFLATION IN THE LONGER TERM: MAJOR INDUSTRIAL COUNTRIES, 1880-2001. *Economic Inquiry* **50**:3, 773-787. [Crossref]
538. Enrico Marelli, Marcello Signorelli, Joanna Tyrowicz. 2012. Crises and Joint Employment–Productivity Dynamics: A Comparative Perspective for European Countries. *Comparative Economic Studies* **54**:2, 361-394. [Crossref]
539. Stanislaw Cichocki. 2012. Self-employment and the business cycle: evidence from Poland. *Post-Communist Economies* **24**:2, 219-239. [Crossref]
540. Rui Zhu. Measurement and prediction on periodicity of Shanghai Composite Index fluctuation 19-22. [Crossref]
541. Jay Kathavate, Girijasankar Mallik. 2012. The impact of the Interaction between institutional quality and aid volatility on growth: theory and evidence. *Economic Modelling* **29**:3, 716-724. [Crossref]
542. Georgiana Nicoleta Rosoi. 2012. Financial integration and international transmission of business cycles: evidence from dynamic correlations. *Applied Economics Letters* **19**:8, 735-738. [Crossref]
543. S. Guillaumont Jeanneney, S. J-A. Tapsoba. 2012. Aid and Income Stabilization. *Review of Development Economics* **16**:2, 216-229. [Crossref]
544. Marianne Baxter. 2012. International risk-sharing in the short run and in the long run. *Canadian Journal of Economics/Revue canadienne d'économique* **45**:2, 376-393. [Crossref]
545. Göran Kauermann, Timo Teuber, Peter Flaschel. 2012. Exploring US Business Cycles with Bivariate Loops Using Penalized Spline Regression. *Computational Economics* **39**:4, 409-427. [Crossref]
546. Garth Heutel. 2012. How should environmental policy respond to business cycles? Optimal policy under persistent productivity shocks. *Review of Economic Dynamics* **15**:2, 244-264. [Crossref]
547. M. Mink, J. P. A. M. Jacobs, J. de Haan. 2012. Measuring coherence of output gaps with an application to the euro area. *Oxford Economic Papers* **64**:2, 217-236. [Crossref]
548. Alina Carare, Ashoka Mody. 2012. Spillovers of Domestic Shocks: Will They Counteract the 'Great Moderation'?. *International Finance* **15**:1, 69-97. [Crossref]

549. Estela Dagum, Alessandra Luati. Asymmetric Filters for Trend-Cycle Estimation 213-230. [Crossref]
550. Scott Holan. Error in Business Cycle Estimates Obtained from Seasonally Adjusted Data 109-133. [Crossref]
551. Ya-Hong YUAN, Dong-Mei YANG, Hua-Ran CHEN, Yu-Fei HE, Chuan-Hua CHEN. 2012. Analysis of the Temporal-Spatial Distribution Characteristics of the Geomagnetic Activity Index Vr. *Chinese Journal of Geophysics* **55**:2, 184-193. [Crossref]
552. Jarko Fidrmuc, Taro Ikeda, Kentaro Iwatsubo. 2012. International transmission of business cycles: Evidence from dynamic correlations. *Economics Letters* **114**:3, 252-255. [Crossref]
553. Tobias Schoch, Kaspar Staub, Christian Pfister. 2012. Social inequality and the biological standard of living: An anthropometric analysis of Swiss conscription data, 1875–1950. *Economics & Human Biology* **10**:2, 154-173. [Crossref]
554. Ching-Yang Lin, Hiroaki Miyamoto. 2012. Gross worker flows and unemployment dynamics in Japan. *Journal of the Japanese and International Economies* **26**:1, 44-61. [Crossref]
555. Kobe Millet, Lien Lamey, Bram Van den Bergh. 2012. Avoiding negative vs. achieving positive outcomes in hard and prosperous economic times. *Organizational Behavior and Human Decision Processes* **117**:2, 275-284. [Crossref]
556. Kim Abildgren. 2012. Business cycles and shocks to financial stability: empirical evidence from a new set of Danish quarterly national accounts 1948–2010. *Scandinavian Economic History Review* **60**:1, 50-78. [Crossref]
557. Jiho Lee. 2012. Are structural parameters of DSGE models stable in Korea?. *Journal of Asian Economics* **23**:1, 50-59. [Crossref]
558. Urban Jermann, Vincenzo Quadrini. 2012. Macroeconomic Effects of Financial Shocks. *American Economic Review* **102**:1, 238-271. [Crossref]
559. Maik Heinemann. Konjunkturelle Frühindikatoren und Konjunkturprognosen 95-120. [Crossref]
560. Rolando F. Peláez. 2012. The housing bubble in real-time: the end of innocence. *Journal of Economics and Finance* **36**:1, 211-225. [Crossref]
561. Egon Smeral. 2012. International tourism demand and the business cycle. *Annals of Tourism Research* **39**:1, 379-400. [Crossref]
562. Miguel de Carvalho, Paulo C. Rodrigues, António Rua. 2012. Tracking the US business cycle with a singular spectrum analysis. *Economics Letters* **114**:1, 32-35. [Crossref]
563. J. Loureiro, M. M. F. Martins, A. P. Ribeiro. 2012. Anchoring to the Euro (and Grouped Together)? The Case of African Countries. *Journal of African Economies* **21**:1, 28-64. [Crossref]
564. Svatopluk Kapounek, Jitka Poměnková. 2012. Spurious synchronization of business cycles – Dynamic correlation analysis of V4 countries. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis* **60**:4, 181-188. [Crossref]
565. Lien Lamey, Barbara Deleersnyder, Jan-Benedict E.M. Steenkamp, Marnik G. Dekimpe. 2012. The Effect of Business-Cycle Fluctuations on Private-Label Share: What has Marketing Conduct Got to do with it?. *Journal of Marketing* **76**:1, 1-19. [Crossref]
566. Jianfeng Yu. 2012. Using Long-Run Consumption-Return Correlations to Test Asset Pricing Models. *SSRN Electronic Journal* . [Crossref]
567. Narayan Bulusu, Javier Gómez Biscarri. 2012. Frequency of Consumption Adjustment and the Equity Premium. *SSRN Electronic Journal* . [Crossref]
568. Daniel N. Simons, Rosmy Jean Louis. 2012. Business Cycles Synchronicity and Income Levels: Has Globalization Brought Us Closer than Ever?. *SSRN Electronic Journal* . [Crossref]
569. Guglielmo Maria Caporale, Luis A. Gil-Alana. 2012. Persistence and Cycles in US Hours Worked. *SSRN Electronic Journal* . [Crossref]
570. William Miles. 2012. The Housing Bubble: Monetary Policy or Global Imbalances?. *SSRN Electronic Journal* . [Crossref]
571. Byoung Uk Kang, Francis Haeuck In, Tong Suk Kim. 2012. Timescale Betas and the Cross Section of Equity Returns: Framework, Application, and Implication for Interpreting the Fama-French Factors. *SSRN Electronic Journal* . [Crossref]
572. Mahmoud Botshekan, Andre Lucas. 2012. Long-Term Versus Short-Term Contingencies in Asset Allocation. *SSRN Electronic Journal* . [Crossref]
573. Roberto G. Quercia, Anthony N. Pennington-Cross, Chao Yue Tian. 2012. Differential Impacts of Structural and Cyclical Unemployment on Mortgage Default and Prepayment. *SSRN Electronic Journal* . [Crossref]
574. Andreas Groth, Michael Ghil, Stephane Hallegatte, Patrice Dumas. 2012. The Role of Oscillatory Modes in U.S. Business Cycles. *SSRN Electronic Journal* . [Crossref]
575. Galo Nuno, Carlos Thomas. 2012. Bank Leverage Cycles. *SSRN Electronic Journal* . [Crossref]
576. Julia Cage, Lucie Gadenne. 2012. The Fiscal Cost of Trade Liberalization. *SSRN Electronic Journal* . [Crossref]

577. Faisal Rana, Faruk Balli. 2012. Would Australia-New Zealand Be a Viable Currency Union? Evidence from Interstate Risk Sharing Performances. *SSRN Electronic Journal* . [Crossref]
578. Thomas Conlon, John Cotter, Ramazan Gencay. 2012. Commodity Futures Hedging, Risk Aversion and the Hedging Horizon. *SSRN Electronic Journal* . [Crossref]
579. Luca Sala. 2012. DSGE Models in the Frequency Domain. *SSRN Electronic Journal* . [Crossref]
580. Hema Yoganarasimhan. 2012. Identifying the Presence and Cause of Fashion Cycles in the Choice of Given Names. *SSRN Electronic Journal* . [Crossref]
581. Virginia Maestri, Andrea Roventini. 2012. Inequality and Macroeconomic Factors: A Time-Series Analysis for a Set of OECD Countries. *SSRN Electronic Journal* . [Crossref]
582. Federico M. Bandi, Benoit Perron, Andrea Tamoni, Claudio Tebaldi. 2012. The Scale of Predictability. *SSRN Electronic Journal* . [Crossref]
583. Andreas Hornstein. 2012. Accounting for Unemployment: The Long and Short of It. *SSRN Electronic Journal* . [Crossref]
584. Luca Benati, Thomas Lubik. 2012. Sales, Inventories, and Real Interest Rates: A Century of Stylized Facts. *SSRN Electronic Journal* . [Crossref]
585. Eugenia Panicara, Massimiliano Rigon, Gian Maria Tomat. 2012. Cyclically Adjusted Local Government Balances. *SSRN Electronic Journal* . [Crossref]
586. Adrian Pagan, Tim Robinson. 2012. Assesssing the Implications of Financial/Real Interactions for Business Cycles in Macroeconometric Models. *SSRN Electronic Journal* . [Crossref]
587. Pau Rabanal, Juan F. Rubio-Ramirez. 2012. Can International Macroeconomic Models Explain Low-Frequency Movements of Real Exchange Rates?. *IMF Working Papers* **12**:13, 1. [Crossref]
588. Chunhua Lan. 2012. The Dog that Did Bark: Evidence on Dividend Growth Predictability. *SSRN Electronic Journal* . [Crossref]
589. Tatiana Cesaroni. 2011. The cyclical behavior of the Italian business survey data. *Empirical Economics* **41**:3, 747-768. [Crossref]
590. Túlio A. Cravo. 2011. Are small employers more cyclically sensitive? Evidence from Brazil. *Journal of Macroeconomics* **33**:4, 754-769. [Crossref]
591. Tryphon Kollintzas, Ioanna Konstantakopoulou, Efthymios Tsionas. 2011. Stylized facts of money and credit over the business cycles. *Applied Financial Economics* **21**:23, 1735-1755. [Crossref]
592. Tommaso Proietti. 2011. Estimation of Common Factors under Cross-Sectional and Temporal Aggregation Constraints. *International Statistical Review* **79**:3, 455-476. [Crossref]
593. GORDON REIKARD. 2011. TOTAL FACTOR PRODUCTIVITY AND R&D IN THE PRODUCTION FUNCTION. *International Journal of Innovation and Technology Management* **08**:04, 601-613. [Crossref]
594. Nikolaos Giannellis, Minoas Koukouritakis. 2011. Behavioural equilibrium exchange rate and total misalignment: evidence from the euro exchange rate. *Empirica* **38**:4, 555-578. [Crossref]
595. Richard D.F. Harris, Evarist Stoja, Fatih Yilmaz. 2011. A cyclical model of exchange rate volatility. *Journal of Banking & Finance* **35**:11, 3055-3064. [Crossref]
596. Zafeira Kastrinaki, Paul Stoneman. 2011. Merger Patterns in the European Food Supply Chain. *International Journal of the Economics of Business* **18**:3, 463-487. [Crossref]
597. Matteo Iacoviello, Fabio Schiantarelli, Scott Schuh. 2011. INPUT AND OUTPUT INVENTORIES IN GENERAL EQUILIBRIUM*. *International Economic Review* **52**:4, 1179-1213. [Crossref]
598. André Moreira Cunha. 2011. A China e o Brasil na Nova Ordem Internacional. *Revista de Sociologia e Política* **19**:suppl 1, 9-29. [Crossref]
599. Rainer Metz. 2011. Do Kondratieff waves exist? How time series techniques can help to solve the problem. *Cliometrica* **5**:3, 205-238. [Crossref]
600. Ioanna Konstantakopoulou, Efthymios Tsionas. 2011. The business cycle in Eurozone economies (1960 to 2009). *Applied Financial Economics* **21**:20, 1495-1513. [Crossref]
601. Alexandra Ferreira-Lopes, Álvaro M. Pina. 2011. Business Cycles, Core, and Periphery in Monetary Unions: Comparing Europe and North America. *Open Economies Review* **22**:4, 565-592. [Crossref]
602. Hiroaki Miyamoto, Yuya Takahashi. 2011. Productivity growth, on-the-job search, and unemployment. *Journal of Monetary Economics* **58**:6-8, 666-680. [Crossref]
603. Andrea Vaona. 2011. Profit rate dynamics, income distribution, structural and technical change in Denmark, Finland and Italy. *Structural Change and Economic Dynamics* **22**:3, 247-268. [Crossref]

604. Samsul Ariffin Abdul Karim, Bakri Abdul Karim, Fredrik NG Andersson, Mohammad Khatim Hasan, Jumat Sulaiman, Radzuan Razali. Predicting Malaysia business cycle using wavelet analysis 379-383. [Crossref]
605. Jean-Claude Berthélemy. 2011. Health, Education and Emergence from the Development Trap. *African Development Review* **23**:3, 300-312. [Crossref]
606. BARBARA ROSSI, SARAH ZUBAIRY. 2011. What Is the Importance of Monetary and Fiscal Shocks in Explaining U.S. Macroeconomic Fluctuations?. *Journal of Money, Credit and Banking* **43**:6, 1247-1270. [Crossref]
607. Qi-lin Wu. Notice of Retraction: Research about dynamic inflation object impacting on our country's economy 4163-4167. [Crossref]
608. ALEX NIKOLSKO-RZHEVSKYY. 2011. Monetary Policy Estimation in Real Time: Forward-Looking Taylor Rules without Forward-Looking Data. *Journal of Money, Credit and Banking* **43**:5, 871-897. [Crossref]
609. Massimiliano Marcellino, Alberto Musso. 2011. The reliability of real-time estimates of the euro area output gap. *Economic Modelling* **28**:4, 1842-1856. [Crossref]
610. Marco Aiolfi, Luis A.V. Catão, Allan Timmermann. 2011. Common factors in Latin America's business cycles. *Journal of Development Economics* **95**:2, 212-228. [Crossref]
611. Jan-Benedict E. M. Steenkamp, Eric (Er) Fang. 2011. The Impact of Economic Contractions on the Effectiveness of R&D and Advertising: Evidence from U.S. Companies Spanning Three Decades. *Marketing Science* **30**:4, 628-645. [Crossref]
612. Jarko Fidrmuc, Neil Foster, Johann Scharler. 2011. Labour market rigidities and international risk sharing across OECD countries. *Journal of International Money and Finance* **30**:4, 660-677. [Crossref]
613. Alessandro Cavallero. 2011. The convergence of inflation rates in the EU-12 area: A distribution dynamics approach. *Journal of Macroeconomics* **33**:2, 341-357. [Crossref]
614. VIV. B. HALL, C. JOHN McDERMOTT. 2011. Unobserved Components Business Cycles for New Zealand. What Are They, and What Might Drive Them?*. *Economic Record* **87**:277, 294-317. [Crossref]
615. Hossein Kavand, Asghar Shahmoradi. 2011. Oil price changes and total productivity fluctuations in an oil-exporting country. *OPEC Energy Review* **35**:2, 157-173. [Crossref]
616. Hon-Chung Hui. 2011. Cycles in landed and non-landed housing sub-markets in Malaysia. *International Journal of Housing Markets and Analysis* **4**:2, 144-154. [Crossref]
617. José A. Tapia Granados, Edward L. Ionides. 2011. Mortality and Macroeconomic Fluctuations in Contemporary Sweden. *European Journal of Population / Revue européenne de Démographie* **27**:2, 157-184. [Crossref]
618. Gabriel P. Mathy, Christopher M. Meissner. 2011. Business cycle co-movement: Evidence from the Great Depression. *Journal of Monetary Economics* **58**:4, 362-372. [Crossref]
619. Xiaomeng Zhu, Weixin Luan, Yi-Sheng Zhu. Analysis of macroeconomic time series by the HP filter 1-4. [Crossref]
620. Tucker McElroy, Thomas M. Trimbur. 2011. On the Discretization of Continuous-Time Filters for Nonstationary Stock and Flow Time Series. *Econometric Reviews* **30**:5, 475-513. [Crossref]
621. Martin Uebele. 2011. National and international market integration in the 19th century: Evidence from comovement. *Explorations in Economic History* **48**:2, 226-242. [Crossref]
622. Chunming Yuan. 2011. Forecasting exchange rates: The multi-state Markov-switching model with smoothing. *International Review of Economics & Finance* **20**:2, 342-362. [Crossref]
623. Alexis Akira Toda. 2011. Income dynamics with a stationary double Pareto distribution. *Physical Review E* **83**:4. . [Crossref]
624. Travis J Berge, Óscar Jordá. 2011. Evaluating the Classification of Economic Activity into Recessions and Expansions. *American Economic Journal: Macroeconomics* **3**:2, 246-277. [Crossref]
625. Pedro André Cerqueira. 2011. How Pervasive is the World Business Cycle?. *Open Economies Review* **22**:1, 119-142. [Crossref]
626. Tommaso Proietti, Alessandra Luati. 2011. Low-pass filter design using locally weighted polynomial regression and discrete prolate spheroidal sequences. *Journal of Statistical Planning and Inference* **141**:2, 831-845. [Crossref]
627. Keen Meng Choy. 2011. BUSINESS CYCLES IN SINGAPORE: STYLIZED FACTS FOR A SMALL OPEN ECONOMY. *Pacific Economic Review* **16**:1, 18-35. [Crossref]
628. Theofanis Papageorgiou, Panayotis G. Michaelides, John G. Milios. 2011. Technology and economic fluctuations in the US food sector (1958-2006). *International Journal of Social Economics* **38**:2, 140-164. [Crossref]
629. Siem Jan Koopman, Soon Yip Wong. 2011. Kalman filtering and smoothing for model-based signal extraction that depend on time-varying spectra. *Journal of Forecasting* **30**:1, 147-167. [Crossref]

630. Shawn Chen-Yu Leu, Jeffrey Sheen. 2011. A small New Keynesian state space model of the Australian economy. *Economic Modelling* **28**:1-2, 672-684. [Crossref]
631. George B. Tawadros. 2011. The stylised facts of Australia's business cycle. *Economic Modelling* **28**:1-2, 549-556. [Crossref]
632. Anthony Garratt, James Mitchell, Shaun P. Vahey, Elizabeth C. Wakerly. 2011. Real-time inflation forecast densities from ensemble Phillips curves. *The North American Journal of Economics and Finance* **22**:1, 77-87. [Crossref]
633. Jean-Stéphane Mésonnier. 2011. The forecasting power of real interest rate gaps: an assessment for the Euro area. *Applied Economics* **43**:2, 153-172. [Crossref]
634. Bertrand Candelon, Norbert Metiu. Chapter 2 Linkages between Stock Market Fluctuations and Business Cycles in Asia 23-51. [Crossref]
635. ROGER ALIAGA-DÍAZ, MARÍA PÍA OLIVERO. 2011. THE CYCLICALITY OF PRICE-COST MARGINS IN BANKING: AN EMPIRICAL ANALYSIS OF ITS DETERMINANTS. *Economic Inquiry* **49**:1, 26-46. [Crossref]
636. M. S. Rafiq. 2011. UNDERSTANDING THE INTERACTION BETWEEN INTERNATIONAL AND EURO AREA OUTPUT VOLATILITY. *Bulletin of Economic Research* **63**:1, 53-81. [Crossref]
637. João Valle e Azevedo. 2011. A multivariate band-pass filter for economic time series. *Journal of the Royal Statistical Society: Series C (Applied Statistics)* **60**:1, 1-30. [Crossref]
638. Petr Rozmahel. 2011. Measuring the business cycles similarity and convergence trends in the Central and Eastern European countries towards the Eurozone with respect to some unclear methodological aspects. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis* **59**:2, 237-250. [Crossref]
639. Jitka Poměnková, Svatopluk Kapounek, Roman Maršálek. 2011. Comparison of methodological approaches to identify economic activity regularities in transition economy. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis* **59**:7, 283-292. [Crossref]
640. Maria Kasch, Jose Gonzalo Rangel, Moritz Weigand. 2011. Market Crashes. *SSRN Electronic Journal* . [Crossref]
641. Barbara Rossi, Sarah Zubairy. 2011. What is the Importance of Monetary and Fiscal Shocks in Explaining US Macroeconomic Fluctuations?. *SSRN Electronic Journal* . [Crossref]
642. Hiroaki Miyamoto, Yuya Takahashi. 2011. Productivity Growth, On-the-Job Search, and Unemployment. *SSRN Electronic Journal* . [Crossref]
643. Lilia Cavallari, Stefano d'Addona. 2011. Nominal and Real Volatility as Determinants of FDI. *SSRN Electronic Journal* . [Crossref]
644. Hiroaki Miyamoto. 2011. Ins and Outs of the Long-Run Unemployment Dynamics. *SSRN Electronic Journal* . [Crossref]
645. Elmar Mertens. 2011. Structural Shocks and the Comovements between Output and Interest Rates. *SSRN Electronic Journal* . [Crossref]
646. Vidhi Chhaochharia, George M. Korniotis, Alok Kumar. 2011. Prozac for Depressed States? Effect of Mood on Local Economic Recessions. *SSRN Electronic Journal* . [Crossref]
647. Steinar Holden. 2011. Do Government Purchases Affect Unemployment?. *SSRN Electronic Journal* . [Crossref]
648. Anita Doraisami. 2011. The Global Financial Crisis: Countercyclical Fiscal Policy Issues and Challenges in Malaysia, Indonesia, the Philippines, and Singapore. *SSRN Electronic Journal* . [Crossref]
649. Shaun P. Vahey, James Mitchell, Anthony Garratt. 2011. Measuring Output Gap Nowcast Uncertainty. *SSRN Electronic Journal* . [Crossref]
650. Stefano Magrini, Margherita Gerolimetto, Hasan Engin Duran. 2011. Understanding the Lead/Lag Structure Among Regional Business Cycles. *SSRN Electronic Journal* . [Crossref]
651. Stefano Magrini, Margherita Gerolimetto, Hasan Engin Duran. 2011. Distortions in Cross-Sectional Convergence Analysis When the Aggregate Business Cycle is Incomplete. *SSRN Electronic Journal* . [Crossref]
652. Hasan Engin Duran. 2011. Short-Run Dynamics of Income Disparities and Regional Cycle Synchronization. *SSRN Electronic Journal* . [Crossref]
653. Vittorio Corbo, Klaus Schmidt-Hebbel. 2011. The International Crisis and Latin America: Growth Effects and Development Strategies. *SSRN Electronic Journal* . [Crossref]
654. Vasco Curdia, Andrea Ferrero, Ging Cee Ng, Andrea Tambalotti. 2011. Evaluating Interest Rate Rules in an Estimated DSGE Model. *SSRN Electronic Journal* . [Crossref]
655. Akindynos-Nikolaos Baltas. 2011. Explaining Momentum Strategies Using Intrinsic Price Fluctuations. *SSRN Electronic Journal* . [Crossref]

656. Bedri Kamil Onur Tas. 2011. How Can Recessions Be Brought to an End? Effects of Macroeconomic Policy Actions on Durations of Recessions. *SSRN Electronic Journal* . [Crossref]
657. Alfred A. Haug, Ian Paul King. 2011. Empirical Evidence on Inflation and Unemployment in the Long Run. *SSRN Electronic Journal* . [Crossref]
658. Guglielmo Maria Caporale, Luis A. Gil-Alana. 2011. Persistence and Cyclical Dependence in the Monthly Euribor Rate. *SSRN Electronic Journal* . [Crossref]
659. Rochelle M. Edge, Ralf R. Meisenzahl. 2011. The Unreliability of Credit-to-GDP Ratio Gaps in Real-Time: Implications for Countercyclical Capital Buffers. *SSRN Electronic Journal* . [Crossref]
660. Valentina Aprigliano. 2011. The Relationship between the PMI and the Italian Index of Industrial Production and the Impact of the Latest Economic Crisis. *SSRN Electronic Journal* . [Crossref]
661. Alvaro Hurtado, Humberto Franco Gonzalez, Jesss Alonso Botero. 2011. Los Modelos DSGE: Una Respuesta De La Discusiin Macroeconomica (DSGE Models: An Answer to the Macroeconomic Discussion). *SSRN Electronic Journal* . [Crossref]
662. Leandro Medina, Nicolas E. Magud. 2011. The Chilean Output Gap. *IMF Working Papers* **11**:2, 1. [Crossref]
663. Serhan Cevik. 2011. Policy Coordination in Fiscal Federalism: Drawing Lessons From the Dubai Debt Crisis. *IMF Working Papers* **11**:147, 1. [Crossref]
664. International Monetary Fund. 2011. United Arab Emirates: Selected Issues and Statistical Appendix. *IMF Staff Country Reports* **11**:112, 1. [Crossref]
665. Serhan Cevik. 2011. Desynchronized: The Comovement of Non-Hydrocarbon Business Cycles in the GCC. *IMF Working Papers* **11**:286, i. [Crossref]
666. Jean-François Verne. 2011. Les principales caractéristiques du cycle économique et de la croissance tendancielle au Liban. *L'Actualité économique* **87**:2, 117-136. [Crossref]
667. Miroslav Plašil. 2011. Potential Product, Output Gap and Uncertainty Rate Associated with Their Determination while Using the Hodrick-Prescott Filter. *Politická ekonomie* **59**:4, 490-507. [Crossref]
668. James Laurenceson, Danielle Rodgers. 2010. The impact of volatility on growth in China. *Frontiers of Economics in China* **5**:4, 527-536. [Crossref]
669. António Afonso, Davide Furceri. 2010. Government size, composition, volatility and economic growth. *European Journal of Political Economy* **26**:4, 517-532. [Crossref]
670. Colin Bermingham. 2010. A critical assessment of existing estimates of US core inflation. *Journal of Macroeconomics* **32**:4, 993-1007. [Crossref]
671. Taro Ikeda. 2010. Time-varying asymmetries in central bank preferences: The case of the ECB. *Journal of Macroeconomics* **32**:4, 1054-1066. [Crossref]
672. W. H. Boshoff, J. Fourie. 2010. The significance of the Cape trade route to economic activity in the Cape Colony: a medium-term business cycle analysis. *European Review of Economic History* **14**:3, 469-503. [Crossref]
673. Jean Imbs. 2010. The First Global Recession in Decades. *IMF Economic Review* **58**:2, 327-354. [Crossref]
674. Mansor H. Ibrahim. 2010. Money-price relation in Malaysia: has it disappeared or strengthened?. *Economic Change and Restructuring* **43**:4, 303-322. [Crossref]
675. Eleonora Pierucci, Luigi Ventura. 2010. Risk Sharing: A Long Run Issue?. *Open Economies Review* **21**:5, 705-730. [Crossref]
676. Claudia M. Buch, Serkan Yener. 2010. Consumption volatility and financial openness. *Applied Economics* **42**:28, 3635-3649. [Crossref]
677. Dongmei Han, Xun Yuan, Bin Chang. Real Estate Indicator Construction Based on Spectrum Filtering 1-6. [Crossref]
678. Jian Zhi-hong, Li Shuang, Zheng Jun-yao. Impact of oil price shocks on China's economy: A DSGE-based analysis 1503-1512. [Crossref]
679. Feng Guo, Ying Huang. 2010. Hot Money and Business Cycle Volatility: Evidence from China. *China & World Economy* **18**:6, 73-89. [Crossref]
680. Carlo Ciccarelli, Stefano Fenoaltea, Tommaso Proietti. 2010. The effects of unification: markets, policy, and cyclical convergence in Italy, 1861–1913. *Cliometrica* **4**:3, 269-292. [Crossref]
681. Anthony Landry. 2010. State-dependent pricing, local-currency pricing, and exchange rate pass-through. *Journal of Economic Dynamics and Control* **34**:10, 1859-1871. [Crossref]
682. Giovanni Dosi, Giorgio Fagiolo, Andrea Roventini. 2010. Schumpeter meeting Keynes: A policy-friendly model of endogenous growth and business cycles. *Journal of Economic Dynamics and Control* **34**:9, 1748-1767. [Crossref]

683. Eric C.Y. Ng. 2010. Production fragmentation and business-cycle comovement. *Journal of International Economics* **82**:1, 1-14. [Crossref]

684. Joao Loureiro, Manuel M.f. Martins, Ana Paula Ribeiro. 2010. CAPE VERDE: THE CASE FOR EUROISATION. *South African Journal of Economics* **78**:3, 248-268. [Crossref]

685. Bin Li, Zhixiong Zeng. 2010. Fundamentals behind house prices. *Economics Letters* **108**:2, 205-207. [Crossref]

686. Christian Macaro. 2010. Bayesian non-parametric signal extraction for Gaussian time series. *Journal of Econometrics* **157**:2, 381-395. [Crossref]

687. Alessandra Luati, Tommaso Proietti. 2010. ON THE SPECTRAL PROPERTIES OF MATRICES ASSOCIATED WITH TREND FILTERS. *Econometric Theory* **26**:4, 1247-1261. [Crossref]

688. Ling Huang, Changdong Wang, Song Qin. A Multiresolution Wavelet Based Analysis of the Chinese Stock Market 305-309. [Crossref]

689. George Filis. 2010. Macro economy, stock market and oil prices: Do meaningful relationships exist among their cyclical fluctuations?. *Energy Economics* **32**:4, 877-886. [Crossref]

690. Hiroshi Yamada, Syuichi Nagata, Yuzo Honda. 2010. A comparison of two alternative composite leading indicators for detecting Japanese business cycle turning points. *Applied Economics Letters* **17**:9, 875-879. [Crossref]

691. Drew Creal, Siem Jan Koopman, Eric Zivot. 2010. Extracting a robust US business cycle using a time-varying multivariate model-based bandpass filter. *Journal of Applied Econometrics* **25**:4, 695-719. [Crossref]

692. Aaron Mehrotra, Tuomas Peltonen, Alvaro Santos Rivera. 2010. Modelling inflation in China—A regional perspective. *China Economic Review* **21**:2, 237-255. [Crossref]

693. James Laurenceson, Danielle Rodgers. 2010. China's macroeconomic volatility — How important is the business cycle?. *China Economic Review* **21**:2, 324-333. [Crossref]

694. Elmar Mertens. 2010. Structural shocks and the comovements between output and interest rates. *Journal of Economic Dynamics and Control* **34**:6, 1171-1186. [Crossref]

695. Pierre-Richard Agénor, Nihal Bayraktar. 2010. Contracting models of the Phillips curve empirical estimates for middle-income countries. *Journal of Macroeconomics* **32**:2, 555-570. [Crossref]

696. Hao Tan, John A. Mathews. 2010. Identification and analysis of industry cycles. *Journal of Business Research* **63**:5, 454-462. [Crossref]

697. Richard A. Ashley, Douglas M. Patterson. 2010. APPARENT LONG MEMORY IN TIME SERIES AS AN ARTIFACT OF A TIME-VARYING MEAN: CONSIDERING ALTERNATIVES TO THE FRACTIONALLY INTEGRATED MODEL. *Macroeconomic Dynamics* **14**:S1, 59-87. [Crossref]

698. Yuriy Gorodnichenko, Serena Ng. 2010. Estimation of DSGE models when the data are persistent. *Journal of Monetary Economics* **57**:3, 325-340. [Crossref]

699. Leigh Drake, Terence C. Mills. 2010. Trends and cycles in Euro area real GDP. *Applied Economics* **42**:11, 1397-1401. [Crossref]

700. Adriana Z. Fernández, Alex Nikolsko-Rzhevskyy. 2010. The changing nature of the U.S. economic influence in the World. *Journal of Policy Modeling* **32**:2, 196-209. [Crossref]

701. Sampawende Jules-Armand Tapsoba. 2010. Trade Intensity and Business Cycle Synchronicity in Africa. *African Development Review* **22**:1, 149-172. [Crossref]

702. Andrew Harvey. 2010. The local quadratic trend model. *Journal of Forecasting* **29**:1-2, 94-108. [Crossref]

703. Rainer Metz. Zeitreihenanalyse 1053-1090. [Crossref]

704. Rainer Metz. 2010. Filter-design and model-based analysis of trends and cycles in the presence of outliers and structural breaks. *Cliometrica* **4**:1, 51-73. [Crossref]

705. Grace H.Y. Lee, M. Azali. 2010. The endogeneity of the Optimum Currency Area criteria in East Asia. *Economic Modelling* **27**:1, 165-170. [Crossref]

706. Hens Steehouwer. A Frequency Domain Methodology for Time Series Modelling 280-324. [Crossref]

707. Svend Hylleberg. Seasonal adjustment 210-226. [Crossref]

708. Timothy Cogley. Data filters 68-75. [Crossref]

709. F. Carmignani. 2010. Endogenous Optimal Currency Areas: the Case of the Central African Economic and Monetary Community. *Journal of African Economies* **19**:1, 25-51. [Crossref]

710. Kajal Lahiri. Chapter 2 Composite Coincident Index of the Transportation Sector and Its Linkages to the Economy 39-56. [Crossref]
711. . References 125-130. [Crossref]
712. Jitka Poměnková, Roman Maršálek. 2010. Industrial production periodicity testing using R. A. Fisher test. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis* **58**:3, 189-196. [Crossref]
713. Jitka Poměnková. 2010. Cyclicality of industrial production in the context of time and frequency domain. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis* **58**:6, 355-368. [Crossref]
714. Aris Kartsaklas. 2010. Trader Type Effects on the Volatility-Volume Relationship: Evidence from the KOSPI 200 Index Futures Market. *SSRN Electronic Journal* . [Crossref]
715. Carlos Carvalho, Niels Arne Dam. 2010. The Cross-Sectional Distribution of Price Stickiness Implied by Aggregate Data. *SSRN Electronic Journal* . [Crossref]
716. Francois Gourio. 2010. Disaster Risk and Business Cycles. *SSRN Electronic Journal* . [Crossref]
717. Patrick M. M. Crowley. 2010. Long Cycles in Growth: Explorations Using New Frequency Domain Techniques with US Data. *SSRN Electronic Journal* . [Crossref]
718. Luis J. Álvarez, Guido Bulligan, Alberto Cabrero, Laurent Ferrara, Harald Stahl. 2010. Housing Cycles in the Major Euro Area Countries. *SSRN Electronic Journal* . [Crossref]
719. Richard D. F. Harris, Evarist Stoja, Fatih Yilmaz. 2010. A Cyclical Model of Exchange Rate Volatility. *SSRN Electronic Journal* . [Crossref]
720. Laurent Ferrara, Siem Jan Koopman. 2010. Common Business and Housing Market Cycles in the Euro Area from a Multivariate Decomposition. *SSRN Electronic Journal* . [Crossref]
721. Ching Yang Lin, Hiroaki Miyamoto. 2010. Gross Worker Flows and Unemployment Dynamics in Japan. *SSRN Electronic Journal* . [Crossref]
722. Luis J. Álvarez, Alberto Cabrero. 2010. Does Housing Really Lead the Business Cycle?. *SSRN Electronic Journal* . [Crossref]
723. Matteo M. Iacoviello, Fabio Schiantarelli, Scott D. Schuh. 2010. Input and Output Inventories in General Equilibrium. *SSRN Electronic Journal* . [Crossref]
724. Anthony Garratt, James Mitchell, Shaun P. Vahey, Elizabeth C. Wakerly. 2010. Real-Time Inflation Forecast Densities from Ensemble Phillips Curves. *SSRN Electronic Journal* . [Crossref]
725. George Selgin, William D. Lastrapes, Lawrence H. White. 2010. Has the Fed Been a Failure?. *SSRN Electronic Journal* . [Crossref]
726. Peter Reinhard Hansen, Asger Lunde, James M. Nason. 2010. The Model Confidence Set. *SSRN Electronic Journal* . [Crossref]
727. Ashoka Mody, Alina Carare. 2010. Spillovers of Domestic Shocks: Will they Counteract the "Great Moderation"?. *IMF Working Papers* **10**:78, 1. [Crossref]
728. Alexander Hoffmaister, Jens Clausen. 2010. Cyclical Behavior of Inventories and Growth Projections Recent Evidence from Europe and the United States. *IMF Working Papers* **10**:212, 1. [Crossref]
729. International Monetary Fund. 2010. Cyprus: Selected Issues. *IMF Staff Country Reports* **10**:289, i. [Crossref]
730. International Monetary Fund. 2010. Peru: Selected Issues. *IMF Staff Country Reports* **10**:99, 1. [Crossref]
731. . Paraguay **Vol. 117**, . [Crossref]
732. Andreas Billmeier. 2009. Ghostbusting: which output gap really matters?. *International Economics and Economic Policy* **6**:4, 391-419. [Crossref]
733. M. Karanasos, A. Kartsaklas. 2009. Dual long-memory, structural breaks and the link between turnover and the range-based volatility. *Journal of Empirical Finance* **16**:5, 838-851. [Crossref]
734. Atilla Cifter, Sait Yilmazer, Elif Cifter. 2009. Analysis of sectoral credit default cycle dependency with wavelet networks: Evidence from Turkey. *Economic Modelling* **26**:6, 1382-1388. [Crossref]
735. Ligang Liu. 2009. Impact of the Global Financial Crisis on China: Empirical Evidence and Policy Implications. *China & World Economy* **17**:6, 1-23. [Crossref]
736. Wong Hock Tsen. 2009. Terms-of-Trade and Trade Balance: Some Empirical Evidence of Asian Economies. *The International Trade Journal* **23**:4, 422-457. [Crossref]
737. Terence C. Mills. 2009. Modelling trends and cycles in economic time series: historical perspective and future developments. *Cliometrica* **3**:3, 221-244. [Crossref]

738. CARLO ALTAVILLA, MATTEO CICCARELLI. 2009. The Effects of Monetary Policy on Unemployment Dynamics under Model Uncertainty: Evidence from the United States and the Euro Area. *Journal of Money, Credit and Banking* **41**:7, 1265-1300. [Crossref]

739. Barbara Deleersnyder, Marnik G. Dekimpe, Jan-Benedict E.M. Steenkamp, Peter S.H. Leeflang. 2009. The Role of National Culture in Advertising's Sensitivity to Business Cycles: An Investigation across Continents. *Journal of Marketing Research* **46**:5, 623-636. [Crossref]

740. Robert A. Hart, James R. Malley, Ulrich Woitek. 2009. Real earnings and business cycles: new evidence. *Empirical Economics* **37**:1, 51-71. [Crossref]

741. Kosei Fukuda. 2009. Measuring major and minor cycles in univariate economic time series. *Economic Modelling* **26**:5, 1093-1100. [Crossref]

742. Richard D.F. Harris, Fatih Yilmaz. 2009. A momentum trading strategy based on the low frequency component of the exchange rate. *Journal of Banking & Finance* **33**:9, 1575-1585. [Crossref]

743. Pierre Perron, Tatsuma Wada. 2009. Let's take a break: Trends and cycles in US real GDP. *Journal of Monetary Economics* **56**:6, 749-765. [Crossref]

744. Mark C. Roberts. 2009. Duration and characteristics of metal price cycles. *Resources Policy* **34**:3, 87-102. [Crossref]

745. Melvin J. Hinich, John Foster, Phillip Wild. 2009. DISCRETE FOURIER TRANSFORM FILTERS: CYCLE EXTRACTION AND GIBBS EFFECT CONSIDERATIONS. *Macroeconomic Dynamics* **13**:4, 523-534. [Crossref]

746. Siem Jan Koopman, Kai Ming Lee. 2009. Seasonality with trend and cycle interactions in unobserved components models. *Journal of the Royal Statistical Society: Series C (Applied Statistics)* **58**:4, 427-448. [Crossref]

747. Jim Malley, Apostolis Philippopoulos, Ulrich Woitek. 2009. To react or not? Technology shocks, fiscal policy and welfare in the EU-3. *European Economic Review* **53**:6, 689-714. [Crossref]

748. Andrew Figura. 2009. Explaining cyclical movements in employment: Creative-destruction or changes in utilization?. *Labour Economics* **16**:4, 429-439. [Crossref]

749. Davide Furceri. 2009. Fiscal Convergence, Business Cycle Volatility, and Growth. *Review of International Economics* **17**:3, 615-630. [Crossref]

750. Samad Sarferaz, Martin Uebele. 2009. Tracking down the business cycle: A dynamic factor model for Germany 1820–1913. *Explorations in Economic History* **46**:3, 368-387. [Crossref]

751. GEORGE CHOULIARAKIS. 2009. COPING WITH UNCERTAINTY: HISTORICAL AND REAL-TIME ESTIMATES OF THE NATURAL UNEMPLOYMENT RATE AND THE UK MONETARY POLICY*. *The Manchester School* **77**:4, 479-511. [Crossref]

752. Anthony Landry. 2009. Expectations and exchange rate dynamics: A state-dependent pricing approach. *Journal of International Economics* **78**:1, 60-71. [Crossref]

753. Kosei Fukuda. 2009. Forecasting growth cycle turning points using US and Japanese professional forecasters. *Empirical Economics* **36**:2, 243-267. [Crossref]

754. Seung-Jean Kim, Kwangmoo Koh, Stephen Boyd, Dimitry Gorinevsky. 2009. ℓ_1 Trend Filtering. *SIAM Review* **51**:2, 339-360. [Crossref]

755. Nir Jaimovich, Henry E Siu. 2009. The Young, the Old, and the Restless: Demographics and Business Cycle Volatility. *American Economic Review* **99**:3, 804-826. [Crossref]

756. D.S.G. Pollock. 2009. Realisations of finite-sample frequency-selective filters. *Journal of Statistical Planning and Inference* **139**:4, 1541-1558. [Crossref]

757. Ricardo Nunes. 2009. LEARNING THE INFLATION TARGET. *Macroeconomic Dynamics* **13**:2, 167-188. [Crossref]

758. Apostolos Serletis. 2009. A BAYESIAN CLASSIFICATION APPROACH TO MONETARY AGGREGATION. *Macroeconomic Dynamics* **13**:2, 200-219. [Crossref]

759. Dan Andrews, Marion Kohler. 2009. International Business Cycle Co-Movements through Time: The Anglo-Saxon Experience. *Applied Economics Quarterly* **55**:2, 147-172. [Crossref]

760. Richard T. Carson, Clive Granger, Jeremy Jackson, Wolfram Schlenker. 2009. Fisheries Management Under Cyclical Population Dynamics. *Environmental and Resource Economics* **42**:3, 379-410. [Crossref]

761. Takeshi Kimura, Kyosuke Shiotani. 2009. Stabilized business cycles with increased output volatility at high frequencies. *Journal of the Japanese and International Economies* **23**:1, 1-19. [Crossref]

762. Martin Uebele, Albrecht Ritschl. 2009. Stock markets and business cycle comovement in Germany before World War I: Evidence from spectral analysis. *Journal of Macroeconomics* **31**:1, 35-57. [Crossref]

763. Rainer Metz. 2009. Comment on "Stock markets and business cycle comovement in Germany before world war I: Evidence from spectral analysis". *Journal of Macroeconomics* **31**:1, 58-67. [Crossref]

764. Andrew C. Harvey, Davide Delle Monache. 2009. Computing the mean square error of unobserved components extracted by misspecified time series models. *Journal of Economic Dynamics and Control* **33**:2, 283-295. [Crossref]

765. Carlo Rosa. 2009. Forecasting the Direction of Policy Rate Changes: The Importance of ECB Words. *Economic Notes* **38**:1-2, 39-66. [Crossref]

766. Orlando Gomes. 2009. On the stability of endogenous growth models. *Journal of Economic Studies* **36**:1, 17-35. [Crossref]

767. Petr Rozmahel. Business Cycles Similarity and EMU Enlargement: the Concordance Index for Central and Eastern European Countries 131-148. [Crossref]

768. Giovanni Dosi, Giorgio Fagiolo, Andrea Roventini. The microfoundations of business cycles: an evolutionary, multi-agent model 161-180. [Crossref]

769. Tuo Leng. 2009. Spectral properties and geometric interpretation of R-filters. *Applied Mathematics and Mechanics* **30**:1, 109-120. [Crossref]

770. Nikolaos Giannellis, Athanasios P. Papadopoulos. 2009. Testing for efficiency in selected developing foreign exchange markets: An equilibrium-based approach. *Economic Modelling* **26**:1, 155-166. [Crossref]

771. Oumar Diallo. 2009. Tortuous road toward countercyclical fiscal policy: Lessons from democratized sub-Saharan Africa. *Journal of Policy Modeling* **31**:1, 36-50. [Crossref]

772. Michael Artis. Globalization vs. Europeanization: Assessing the Impact of EMU on Business Cycle Affiliation 75-88. [Crossref]

773. D. S. G. Pollock. Investigating Economic Trends and Cycles 243-307. [Crossref]

774. Tommaso Proietti. Structural Time Series Models for Business Cycle Analysis 385-433. [Crossref]

775. Jordi Galí, Luca Gambetti. 2009. On the Sources of the Great Moderation. *American Economic Journal: Macroeconomics* **1**:1, 26-57. [Crossref]

776. Barbara Meller. 2009. The Two-Sided Effect of Financial Globalization on Output Volatility. *SSRN Electronic Journal* . [Crossref]

777. Seth Pruitt, Nir Jaimovich, Henry Siu. 2009. The Demand for Youth: Implications for the Hours Volatility Puzzle. *SSRN Electronic Journal* . [Crossref]

778. Menelaos Karanasos. 2009. Dual Long-Memory, Structural Breaks and the Link Between Turnover and the Range-Based Volatility. *SSRN Electronic Journal* . [Crossref]

779. Fabio Canova. 2009. Multiple Filtering Devices for the Estimation of Cyclical DSGE Models. *SSRN Electronic Journal* . [Crossref]

780. Hiroaki Miyamoto, Yuya Takahashi, ISER and Economic Research. 2009. Technological Progress, On-the-Job Search, and Unemployment. *SSRN Electronic Journal* . [Crossref]

781. Serena Ng, Yuriy Gorodnichenko. 2009. Estimation of DSGE Models When the Data are Persistent. *SSRN Electronic Journal* . [Crossref]

782. Travis J. Berge, Oscar Jorda. 2009. The Classification of Economic Activity. *SSRN Electronic Journal* . [Crossref]

783. Yueqing Jia, Tara M. Sinclair. 2009. Permanent and Transitory Macroeconomic Relationships between the US and China. *SSRN Electronic Journal* . [Crossref]

784. Maarten J. Gijsenberg, Harald J. van Heerde, M. G. Dekimpe, Jan-Benedict E. B. M. Steenkamp. 2009. Advertising and Price Effectiveness over the Business Cycle. *SSRN Electronic Journal* . [Crossref]

785. Olivier Vigna, Laurent Ferrara. 2009. Cyclical Relationships Between GDP and Housing Market in France: Facts and Factors at Play. *SSRN Electronic Journal* . [Crossref]

786. Jean-Paul Renne. 2009. Frequency-Domain Analysis of Debt Service in a Macro-Finance Model for the Euro Area. *SSRN Electronic Journal* . [Crossref]

787. Michal Gradzewicz. 2009. Endogenous Growth Mechanism as a Source of Medium Term Fluctuations in the Labor Market: Application to the US Economy. *SSRN Electronic Journal* . [Crossref]

788. Olivier Basdevant. 2009. How Can Burundi Raise its Growth Rate? the Impact of Civil Conflicts and State Interventionon Burundi'S Growth Performance. *IMF Working Papers* **09**:11, 1. [Crossref]

789. Emilio Pineda, Paul Cashin, Yan Sun. 2009. Assessing Exchange Rate Competitiveness in the Eastern Caribbean Currency Union. *IMF Working Papers* **09**:78, 1. [Crossref]

790. Fabien Tripier. 2009. Croissance et chômage à long terme. *Économie & prévision* **n° 189**:3, 57. [Crossref]
791. Laurent Ferrara. 2009. Caractérisation et datation des cycles économiques en zone euro. *Revue économique* **60**:3, 703. [Crossref]
792. Christopher Bajada, Friedrich Schneider. 2009. Unemployment and the Shadow Economy in the oecd. *Revue économique* **60**:5, 1033. [Crossref]
793. Thierry Aimar, Francis Bismans, Claude Diebolt. 2009. Le cycle économique : une synthèse. *Revue française d'économie* **XXIV**:4, 3. [Crossref]
794. Rainer Metz, Francis Bismans, Eulalia Damaso. 2009. Méthodes de recherche sur les fluctuations longues. *Revue française d'économie* **XXIV**:4, 93. [Crossref]
795. Daniel Jerrett, John T. Cuddington. 2008. Broadening the statistical search for metal price super cycles to steel and related metals. *Resources Policy* **33**:4, 188-195. [Crossref]
796. Richard Ashley, Randal J. Verbrugge. 2008. Frequency Dependence in Regression Model Coefficients: An Alternative Approach for Modeling Nonlinear Dynamic Relationships in Time Series. *Econometric Reviews* **28**:1-3, 4-20. [Crossref]
797. Tommaso Proietti. 2008. On the Model-Based Interpretation of Filters and the Reliability of Trend–Cycle Estimates. *Econometric Reviews* **28**:1-3, 186-208. [Crossref]
798. Hilde C. Bjørnland, Leif Brubakk, Anne Sofie Jore. 2008. Forecasting inflation with an uncertain output gap. *Empirical Economics* **35**:3, 413-436. [Crossref]
799. QIWEI XIE, BO XUAN, SILONG PENG, JIANPING LI, WEIXUAN XU, HUA HAN. 2008. BANDWIDTH EMPIRICAL MODE DECOMPOSITION AND ITS APPLICATION. *International Journal of Wavelets, Multiresolution and Information Processing* **06**:06, 777-798. [Crossref]
800. Satoshi Urasawa. 2008. Business cycle fluctuations in Japanese macroeconomic time series: 1980–2000. *Journal of the Asia Pacific Economy* **13**:4, 451-480. [Crossref]
801. Robert Grafstein, Kiki Caruson. 2008. Surprise party. *Public Choice* **137**:1-2, 315-328. [Crossref]
802. Gianluca Benigno, Christoph Thoenissen. 2008. Consumption and real exchange rates with incomplete markets and non-traded goods. *Journal of International Money and Finance* **27**:6, 926-948. [Crossref]
803. Philip N Jefferson. 2008. Educational Attainment and the Cyclical Sensitivity of Employment. *Journal of Business & Economic Statistics* **26**:4, 526-535. [Crossref]
804. Giancarlo Bruno, Edoardo Otranto. 2008. Models to date the business cycle: The Italian case. *Economic Modelling* **25**:5, 899-911. [Crossref]
805. Katrin Assenmacher-Wesche, Stefan Gerlach, Toshitaka Sekine. 2008. Monetary factors and inflation in Japan. *Journal of the Japanese and International Economies* **22**:3, 343-363. [Crossref]
806. Willem H. Boshoff, Johan Fourie. 2008. Explaining ship traffic fluctuations at the early Cape settlement 1652–1793. *South African Journal of Economic History* **23**:1-2, 1-27. [Crossref]
807. Mark C. Roberts. 2008. Synchronization and Co-Movement of Metal Prices. *Minerals & Energy - Raw Materials Report* **23**:3, 105-118. [Crossref]
808. Giovanni Dosi, Giorgio Fagiolo, Andrea Roventini. 2008. The microfoundations of business cycles: an evolutionary, multi-agent model. *Journal of Evolutionary Economics* **18**:3-4, 413-432. [Crossref]
809. Motohiro Yogo. 2008. Measuring business cycles: A wavelet analysis of economic time series. *Economics Letters* **100**:2, 208-212. [Crossref]
810. José García-Solanes, Ramón María-Dolores. 2008. The New Member States and the Process towards EMU. *Review of Development Economics* **12**:3, 655-667. [Crossref]
811. Victor M. Guerrero. 2008. Estimating Trends with Percentage of Smoothness Chosen by the User. *International Statistical Review* **76**:2, 187-202. [Crossref]
812. S. J.-A. Tapsoba. 2008. Trade Intensity and Business Cycle Synchronicity in Africa. *Journal of African Economies* **18**:2, 287-318. [Crossref]
813. P. A. David, F. Rullani. 2008. Dynamics of innovation in an "open source" collaboration environment: lurking, laboring, and launching FLOSS projects on SourceForge. *Industrial and Corporate Change* **17**:4, 647-710. [Crossref]
814. Sofia Gouveia, Leonida Correia. 2008. Business cycle synchronisation in the Euro area: the case of small countries. *International Economics and Economic Policy* **5**:1-2, 103-121. [Crossref]
815. U. Michael Bergman. 2008. Finnish and Swedish business cycles in a global context. *International Economics and Economic Policy* **5**:1-2, 49-69. [Crossref]

816. Michael J. Artis, Jarko Fidrmuc, Johann Scharler. 2008. The transmission of business cycles Implications for EMU enlargement. *The Economics of Transition* **16**:3, 559-582. [Crossref]
817. Robert S. Chirinko. 2008. σ: The long and short of it. *Journal of Macroeconomics* **30**:2, 671-686. [Crossref]
818. D. Furceri, G. Karras. 2008. Business-cycle synchronization in the EMU. *Applied Economics* **40**:12, 1491-1501. [Crossref]
819. Andrew Abbott, Joshy Easaw, Tao Xing. 2008. Trade Integration and Business Cycle Convergence: Is the Relation Robust across Time and Space?*. *Scandinavian Journal of Economics* **110**:2, 403-417. [Crossref]
820. Robert Inklaar, Richard Jong-A-Pin, Jakob de Haan. 2008. Trade and business cycle synchronization in OECD countries—A re-examination. *European Economic Review* **52**:4, 646-666. [Crossref]
821. Luís Aguiar-Conraria, Nuno Azevedo, Maria Joana Soares. 2008. Using wavelets to decompose the time–frequency effects of monetary policy. *Physica A: Statistical Mechanics and its Applications* **387**:12, 2863-2878. [Crossref]
822. Gisele Ferreira-Tiryaki. 2008. The Informal Economy and Business Cycles. *Journal of Applied Economics* **11**:1, 91-117. [Crossref]
823. Kanda Naknoi. 2008. Real exchange rate fluctuations, endogenous tradability and exchange rate regimes. *Journal of Monetary Economics* **55**:3, 645-663. [Crossref]
824. Jakob de Haan, Robert Inklaar, Richard Jong-A-Pin. 2008. WILL BUSINESS CYCLES IN THE EURO AREA CONVERGE? A CRITICAL SURVEY OF EMPIRICAL RESEARCH. *Journal of Economic Surveys* **22**:2, 234-273. [Crossref]
825. Philip N Jefferson. 2008. Poverty Volatility and Macroeconomic Quiescence. *American Economic Review* **98**:2, 392-397. [Crossref]
826. António Afonso, Davide Furceri. 2008. EMU enlargement, stabilization costs and insurance mechanisms. *Journal of International Money and Finance* **27**:2, 169-187. [Crossref]
827. DAVID SHEPHERD, ROBERT DIXON. 2008. The Cyclical Dynamics and Volatility of Australian Output and Employment. *Economic Record* **84**:264, 34-49. [Crossref]
828. Gisele Ferreira Tiryaki. 2008. A informalidade e as flutuações na atividade econômica. *Estudos Econômicos (São Paulo)* **38**:1, 97-125. [Crossref]
829. Katrin Assenmacher-Wesche, Stefan Gerlach. 2008. Money growth, output gaps and inflation at low and high frequency: Spectral estimates for Switzerland. *Journal of Economic Dynamics and Control* **32**:2, 411-435. [Crossref]
830. Javier Andrés, Rafael Doménech, Antonio Fatás. 2008. The stabilizing role of government size. *Journal of Economic Dynamics and Control* **32**:2, 571-593. [Crossref]
831. Jón Steinsson. 2008. The Dynamic Behavior of the Real Exchange Rate in Sticky Price Models. *American Economic Review* **98**:1, 519-533. [Crossref]
832. Timothy Cogley. Data Filters 1-7. [Crossref]
833. Svend Hylleberg. Seasonal Adjustment 1-14. [Crossref]
834. JAHYEONG KOO, W. MICHAEL COX. 2008. AN ECONOMIC INTERPRETATION OF SUICIDE CYCLES IN JAPAN. *Contemporary Economic Policy* **26**:1, 162-174. [Crossref]
835. Dimitrios D. Thomakos. 2008. Optimal Linear Filtering, Smoothing and Trend Extraction for Processes with Unit Roots and Cointegration. *SSRN Electronic Journal* . [Crossref]
836. Tommaso Proietti. 2008. Structural Time Series Models for Business Cycle Analysis. *SSRN Electronic Journal* . [Crossref]
837. Tommaso Proietti, Alessandra Luati. 2008. Real Time Estimation in Local Polynomial Regression, with Application to Trend-Cycle Analysis. *SSRN Electronic Journal* . [Crossref]
838. Alicia García-Herrero, Juan M. Ruiz. 2008. Do Trade and Financial Linkages Foster Business Cycle Synchronization in a Small Economy?. *SSRN Electronic Journal* . [Crossref]
839. Svend Hylleberg. 2008. Seasonal Adjustment. *SSRN Electronic Journal* . [Crossref]
840. Lisa Sella. 2008. Old and New Spectral Techniques for Economic Time Series. *SSRN Electronic Journal* . [Crossref]
841. Drew Creal, Siem Jan Koopman. 2008. The Effect of the Great Moderation on the U.S. Business Cycle in a Time-Varying Multivariate Trend-Cycle Model. *SSRN Electronic Journal* . [Crossref]
842. Kevin J. Lansing. 2008. Speculative Growth and Overreaction to Technology Shocks. *SSRN Electronic Journal* . [Crossref]
843. Richard D. F. Harris, Fatih Yilmaz. 2008. A Momentum Trading Strategy Based on the Low Frequency Component of the Exchange Rate. *SSRN Electronic Journal* . [Crossref]
844. Thomas Maag. 2008. Economic Correlates of Suicide Rates in OECD Countries. *SSRN Electronic Journal* . [Crossref]
845. Dimitrios D. Thomakos. 2008. Optimal Linear Filtering, Smoothing and Trend Extraction of M-Period Differences of Processes with a Unit Root. *SSRN Electronic Journal* . [Crossref]

846. Carlo Ciccarelli, Stefano Fenoaltea, Tommaso Proietti. 2008. The Effects of Unification: Markets, Policy and Cyclical Convergence in Italy, 1861-1913. *SSRN Electronic Journal* . [Crossref]
847. Christian Müller, Eva M. Maria Kberl. 2008. Business Cycle Measurement with Semantic Filtering: A Micro Data Approach. *SSRN Electronic Journal* . [Crossref]
848. Renaud Lacroix. 2008. Short Term Analysis of Raw Data and Business Cycle Estimation - Part 2: Empirical Implementation (Analyse Conjoncturelle de Données Brutes et Estimation de Cycles Partie 2: Mise en Oeuvre Empirique) (French). *SSRN Electronic Journal* . [Crossref]
849. Renaud Lacroix. 2008. Short Term Analysis of Raw Data and Business Cycle Estimation - Part 1: Estimation and Tests (Analyse Conjoncturelle de Données Brutes et Estimation de Cycles Partie 1: Estimation et Tests) (French). *SSRN Electronic Journal* . [Crossref]
850. Luc Dresse, Christophe Van Nieuwenhuyze. 2008. Do Survey Indicators Let Us See the Business Cycle? A Frequency Decomposition. *SSRN Electronic Journal* . [Crossref]
851. Itir Ozer, Ibrahim Ozkan. 2008. Practical insights from OCA variable combinations. *Ekonomski anali* **53**:176, 38-60. [Crossref]
852. Jeromin Zettelmeyer, Ivanna Vladkova Hollar. 2008. Fiscal Positions in Latin America: Have they Really Improved?. *IMF Working Papers* **08**:137, 1. [Crossref]
853. Nasser Ary Tanimoune, Jean-Louis Combes, Patrick Plane. 2008. La politique budgétaire et ses effets de seuil sur l'activité en Union Economique et Monétaire Ouest Africaine (UEMOA). *Économie & prévision* **n° 186**:5, 145. [Crossref]
854. DAVID NORMAN, THOMAS WALKER. 2007. CO-MOVEMENT OF AUSTRALIAN STATE BUSINESS CYCLES*. *Australian Economic Papers* **46**:4, 360-374. [Crossref]
855. Eran Yashiv. 2007. U.S. Labor Market Dynamics Revisited. *Scandinavian Journal of Economics* **109**:4, 779-806. [Crossref]
856. Maurizio Bovi. 2007. Shadow Employment and Labor Productivity Dynamics. *Labour* **21**:4-5, 735-761. [Crossref]
857. MICHAEL BERLEMANN, GUNTHER MARKWARDT. 2007. Unemployment and Inflation Consequences of Unexpected Election Results. *Journal of Money, Credit and Banking* **39**:8, 1919-1945. [Crossref]
858. Bradley T. Ewing, Mark A. Thompson. 2007. Dynamic cyclical comovements of oil prices with industrial production, consumer prices, unemployment, and stock prices. *Energy Policy* **35**:11, 5535-5540. [Crossref]
859. Howard L. Weinert. 2007. Efficient computation for Whittaker–Henderson smoothing. *Computational Statistics & Data Analysis* **52**:2, 959-974. [Crossref]
860. A. Maravall, A. del Río. 2007. Temporal aggregation, systematic sampling, and the Hodrick–Prescott filter. *Computational Statistics & Data Analysis* **52**:2, 975-998. [Crossref]
861. Tommaso Proietti. 2007. Signal extraction and filtering by linear semiparametric methods. *Computational Statistics & Data Analysis* **52**:2, 935-958. [Crossref]
862. Jean-Stéphane Mésonnier, Jean-Paul Renne. 2007. A time-varying "natural" rate of interest for the euro area. *European Economic Review* **51**:7, 1768-1784. [Crossref]
863. Andrew C. Harvey, Thomas M. Trimbur, Herman K. Van Dijk. 2007. Trends and cycles in economic time series: A Bayesian approach. *Journal of Econometrics* **140**:2, 618-649. [Crossref]
864. STEFANO SCHIAVO. 2007. Financial Integration, GDP Correlation and the Endogeneity of Optimum Currency Areas. *Economica*, ahead of print070924100058005-???. [Crossref]
865. Siem Jan Koopman, João Valle E Azevedo. 2007. Measuring Synchronization and Convergence of Business Cycles for the Euro area, UK and US. *Oxford Bulletin of Economics and Statistics*, ahead of print070921170652007-???. [Crossref]
866. Rodrigo A. Cerda. 2007. Inflation of tradable goods. *Applied Economics Letters* **14**:11, 795-798. [Crossref]
867. Giovanni Dosi, Giorgio Fagiolo, Andrea Roventini. 2007. LUMPY INVESTMENT AND ENDOGENOUS BUSINESS CYCLES IN AN EVOLUTIONARY MULTI-AGENT MODEL. *Cybernetics and Systems* **38**:7, 631-666. [Crossref]
868. Kosei Fukuda. 2007. Reexamination of the effects of monetary policy using spectral decomposition. *Applied Economics Letters* **14**:10, 769-774. [Crossref]
869. Carlo Ciccarelli, Stefano Fenoaltea. 2007. Business fluctuations in Italy, 1861–1913: The new evidence. *Explorations in Economic History* **44**:3, 432-451. [Crossref]
870. Julián Messina, Giovanna Vallanti. 2007. Job Flow Dynamics and Firing Restrictions: Evidence from Europe. *The Economic Journal* **117**:521, F279-F301. [Crossref]
871. ÖZER KARAGEDIKLI, KIRDAN LEES. 2007. Do the Central Banks of Australia and New Zealand Behave Asymmetrically? Evidence from Monetary Policy Reaction Functions. *Economic Record* **83**:261, 131-142. [Crossref]

872. Nikolaos Giannellis, Athanasios P. Papadopoulos. 2007. Estimating the Equilibrium Effective Exchange Rate for Potential EMU Members. *Open Economies Review* **18**:3, 307-326. [Crossref]

873. Ester Faia. 2007. Finance and international business cycles. *Journal of Monetary Economics* **54**:4, 1018-1034. [Crossref]

874. Oscar Bajo-Rubio, Carmen Díaz-Roldán, Vicente Esteve. 2007. Change of regime and Phillips curve stability: The case of Spain, 1964–2002. *Journal of Policy Modeling* **29**:3, 453-462. [Crossref]

875. Gustavo A. Marrero. 2007. Traditional versus unobserved components methods to forecast quarterly national account aggregates. *Journal of Forecasting* **26**:2, 129-153. [Crossref]

876. César Calderón, Alberto Chong, Ernesto Stein. 2007. Trade intensity and business cycle synchronization: Are developing countries any different?. *Journal of International Economics* **71**:1, 2-21. [Crossref]

877. Luca Dedola, Stefano Neri. 2007. What does a technology shock do? A VAR analysis with model-based sign restrictions. *Journal of Monetary Economics* **54**:2, 512-549. [Crossref]

878. Arabinda Basistha, Charles R. Nelson. 2007. New measures of the output gap based on the forward-looking new Keynesian Phillips curve. *Journal of Monetary Economics* **54**:2, 498-511. [Crossref]

879. JONATHAN McCARTHY, EGON ZAKRAJŠEK. 2007. Inventory Dynamics and Business Cycles: What Has Changed?. *Journal of Money, Credit and Banking* **39**:2-3, 591-613. [Crossref]

880. Davide Furceri. 2007. Is Government Expenditure Volatility Harmful for Growth? A Cross-Country Analysis. *Fiscal Studies* **28**:1, 103-120. [Crossref]

881. Ansgar Belke, Jens Heine. 2007. On the endogeneity of an exogenous OCA-criterion: specialisation and the correlation of regional business cycles in Europe. *Empirica* **34**:1, 15-44. [Crossref]

882. Harrison Hong, Walter Torous, Rossen Valkanov. 2007. Do industries lead stock markets?. *Journal of Financial Economics* **83**:2, 367-396. [Crossref]

883. D.S.G. Pollock. 2007. WIENER–KOLMOGOROV FILTERING, FREQUENCY-SELECTIVE FILTERING, AND POLYNOMIAL REGRESSION. *Econometric Theory* **23**:01. . [Crossref]

884. Pedro J. Perez, Denise R. Osborn, Marianne Sensier. 2007. Business cycle affiliations in the context of European integration. *Applied Economics* **39**:2, 199-214. [Crossref]

885. Norbert Fiess. 2007. Business Cycle Synchronization and Regional Integration: A Case Study for Central America. *The World Bank Economic Review* **21**:1, 49-72. [Crossref]

886. Lien Lamey, Barbara Deleersnyder, Marnik G. Dekimpe, Jan-Benedict E.M. Steenkamp. 2007. How Business Cycles Contribute to Private-Label Success: Evidence from the United States and Europe. *Journal of Marketing* **71**:1, 1-15. [Crossref]

887. Benoit Mojon. 2007. Monetary Policy, Output Composition and the Great Moderation. *SSRN Electronic Journal* . [Crossref]

888. Arturo Estrella. 2007. Extracting Business Cycle Fluctuations: What Do Time Series Filters Really Do?. *SSRN Electronic Journal* . [Crossref]

889. Giovanni Furio Veronese, Mario Forni, Marco Lippi, Filippo Altissimo, Riccardo Cristadoro. 2007. New Eurocoin: Tracking Economic Growth in Real Time. *SSRN Electronic Journal* . [Crossref]

890. Ana Del-Rio, Agustín Maravall. 2007. Temporal Aggregation, Systematic Sampling, and the Hodrick-Prescott Filter. *SSRN Electronic Journal* . [Crossref]

891. Monica Billio, Massimiliano Caporin, Guido Cazzavillan. 2007. Dating EU15 Monthly Business Cycle Jointly Using GDP and IPI. *SSRN Electronic Journal* . [Crossref]

892. Michael Tomz, Mark L. J. Wright. 2007. Do Countries Default in 'Bad Times'?. *SSRN Electronic Journal* . [Crossref]

893. Robert W. Rich, Charles Steindel. 2007. A Comparison of Measures of Core Inflation. *SSRN Electronic Journal* . [Crossref]

894. Matteo M. Iacoviello, Fabio Schiantarelli, Scott D. Schuh. 2007. Input and Output Inventories in General Equilibrium. *SSRN Electronic Journal* . [Crossref]

895. Rafal Kierzenkowski, Vichett Oung. 2007. Housing Loans' Development in France: An Analysis in Terms of Cycles. *SSRN Electronic Journal* . [Crossref]

896. Shushanik Papanyan. 2007. The Dynamics of the Permanent and Transitory Components in International Business Cycles. *SSRN Electronic Journal* . [Crossref]

897. Antonio Afonso, Davide Furceri. 2007. Sectoral Business Cycle Synchronization in the European Union. *SSRN Electronic Journal* . [Crossref]

898. Shigeru Fujita, Garey Ramey. 2007. Reassessing the Shimer Facts. *SSRN Electronic Journal* . [Crossref]

899. Shigeru Fujita, Christopher J. Nekarda, Garey Ramey. 2007. The Cyclicality of Worker Flows: New Evidence from the SIPP. *SSRN Electronic Journal* . [Crossref]

900. Bruce C. Fallick, Jonathan F. Pingle. 2007. A Cohort-Based Model of Labor Force Participation. *SSRN Electronic Journal* . [Crossref]

901. Javier Andrés, Rafael Doménech, Antonio Fatás. 2007. The Stabilizing Role of Government Size. *SSRN Electronic Journal* . [Crossref]

902. Nicholas Apergis, Alexandros Panethimitakis. 2007. Stylized Facts of Greek Business Cycles: New Evidence from Aggregate and Across Regimes Data. *SSRN Electronic Journal* . [Crossref]

903. Itir Ozer, Ibrahim Ozkan, Okan Aktan. 2007. Optimum Currency Areas Theory: An Empirical Application to Turkey. *South East European Journal of Economics and Business* **2**:2. . [Crossref]

904. IMF. Research Dept.. World Economic Outlook, October 2007: Globalization and Inequality . [Crossref]

905. Fabien Tripier. 2006. Sticky prices, fair wages, and the co-movements of unemployment and labor productivity growth. *Journal of Economic Dynamics and Control* **30**:12, 2749-2774. [Crossref]

906. Michael Funke. 2006. INFLATION IN CHINA: MODELLING A ROLLER COASTER RIDE. *Pacific Economic Review* **11**:4, 413-429. [Crossref]

907. Ansgar Belke, Jens M. Heine. 2006. Specialisation patterns and the synchronicity of regional employment cycles in Europe. *International Economics and Economic Policy* **3**:2, 91-104. [Crossref]

908. Kerk L. Phillips, Jeff Wrase. 2006. Is Schumpeterian 'creative destruction' a plausible source of endogenous real business cycle shocks?. *Journal of Economic Dynamics and Control* **30**:11, 1885-1913. [Crossref]

909. Victor Zarnowitz, Ataman Ozyildirim. 2006. Time series decomposition and measurement of business cycles, trends and growth cycles. *Journal of Monetary Economics* **53**:7, 1717-1739. [Crossref]

910. BORJA LARRAIN. 2006. Do Banks Affect the Level and Composition of Industrial Volatility?. *The Journal of Finance* **61**:4, 1897-1925. [Crossref]

911. L. A. Gil-Alana. 2006. Measuring length of business cycles across countries using a new non-stationary unit-root cyclical approach. *Applied Stochastic Models in Business and Industry* **22**:4, 385-395. [Crossref]

912. Thomas M. Trimbur. 2006. Detrending economic time series: a Bayesian generalization of the Hodrick–Prescott filter. *Journal of Forecasting* **25**:4, 247-273. [Crossref]

913. Li Gan, Qinghua Zhang. 2006. The thick market effect on local unemployment rate fluctuations. *Journal of Econometrics* **133**:1, 127-152. [Crossref]

914. Viviana Fernandez. 2006. Does domestic cooperation lead to business-cycle convergence and financial linkages?. *The Quarterly Review of Economics and Finance* **46**:3, 369-396. [Crossref]

915. João Valle e Azevedo, Siem Jan Koopman, António Rua. 2006. Tracking the Business Cycle of the Euro Area. *Journal of Business & Economic Statistics* **24**:3, 278-290. [Crossref]

916. Arthur Grimes. 2006. Intra & inter-regional industry shocks: A new metric with application to Australasian currency union. *New Zealand Economic Papers* **40**:1, 23-44. [Crossref]

917. Giovanni Dosi, Giorgio Fagiolo, Andrea Roventini. 2006. An Evolutionary Model of Endogenous Business Cycles. *Computational Economics* **27**:1, 3-34. [Crossref]

918. Anthony Garratt, Donald Robertson, Stephen Wright. 2006. Permanent vs transitory components and economic fundamentals. *Journal of Applied Econometrics* **21**:4, 521-542. [Crossref]

919. Charles Ka Yui Leung, Youngman Chun Fai Leong, Siu Kei Wong. 2006. Housing Price Dispersion: An Empirical Investigation. *The Journal of Real Estate Finance and Economics* **32**:3, 357-385. [Crossref]

920. D.S.G. Pollock. 2006. Econometric methods of signal extraction. *Computational Statistics & Data Analysis* **50**:9, 2268-2292. [Crossref]

921. Diego Comin, Mark Gertler. 2006. Medium-Term Business Cycles. *American Economic Review* **96**:3, 523-551. [Crossref]

922. Jim Lee. 2006. The comovement between output and prices: Evidence from a dynamic conditional correlation GARCH model. *Economics Letters* **91**:1, 110-116. [Crossref]

923. Ho-Chuan (River) Huang, Shu-Chin Lin. 2006. Time-varying discrete monetary policy reaction functions. *Applied Economics* **38**:4, 449-464. [Crossref]

924. Guglielmo Maria Caporale, Luis A. Gil-Alana. 2006. Long memory at the long run and at the cyclical frequencies: modelling real wages in England, 1260–1994. *Empirical Economics* **31**:1, 83-93. [Crossref]

925. Jean Imbs. 2006. The real effects of financial integration. *Journal of International Economics* **68**:2, 296-324. [Crossref]
926. Riccardo Cristadoro, Giovanni Veronese. Tracking the Economy in the Largest Euro Area Countries: a Large Datasets Approach 63-93. [Crossref]
927. Siem Jan Koopman, Kai Ming Lee, Soon Yip Wong. Chapter 8 Trend-Cycle Decomposition Models with Smooth-Transition Parameters: Evidence from U.S. Economic Time Series 199-219. [Crossref]
928. Juan J. Dolado, Ramón María-Dolores. Chapter 12 State Asymmetries in the Effects of Monetary Policy Shocks on Output: Some New Evidence for the Euro-Area 311-331. [Crossref]
929. Pu Chen, Carl Chiarella, Peter Flaschel, Willi Semmler. Chapter 8 Keynesian Macrodynamics and the Phillips Curve: An Estimated Model for the U.S. Economy 229-284. [Crossref]
930. Massimiliano Marcellino. Chapter 16 Leading Indicators 879-960. [Crossref]
931. Thomas M. Trimbur. 2006. Properties of higher order stochastic cycles. *Journal of Time Series Analysis* **27**:1, 1-17. [Crossref]
932. Norman R Swanson, Dick van Dijk. 2006. Are Statistical Reporting Agencies Getting It Right? Data Rationality and Business Cycle Asymmetry. *Journal of Business & Economic Statistics* **24**:1, 24-42. [Crossref]
933. Jordi Galí, Luca Gambetti. 2006. On the Sources of the Great Moderation. *SSRN Electronic Journal* . [Crossref]
934. Marco Lamieri. 2006. Capturing Complexity Through Agent-Based Models and the Quest for the Enterprise. *SSRN Electronic Journal* . [Crossref]
935. Gianluca Benigno, Christoph Thoenissen. 2006. Consumption and Real Exchange Rates With Incomplete Markets and Non-Traded Goods. *SSRN Electronic Journal* . [Crossref]
936. Matthias F. Mohr. 2006. The Missing Cycle in the HP Filter and the Measurement of Cyclically-Adjusted Budget Balances. *SSRN Electronic Journal* . [Crossref]
937. Martin Everts. 2006. Band-Pass Filters. *SSRN Electronic Journal* . [Crossref]
938. Alicia Garcia-Herrero, Juan Manuel Ruiz Perez. 2006. How Much Do Trade and Financial Linkages Matter for Business Cycle Synchronization in a Small Economy?. *SSRN Electronic Journal* . [Crossref]
939. Katrin Assenmacher-Wesche, Stefan Gerlach. 2006. Interpreting Euro Area Inflation at High and Low Frequencies. *SSRN Electronic Journal* . [Crossref]
940. Luca Benati. 2006. UK Monetary Regimes and Macroeconomic Stylised Facts. *SSRN Electronic Journal* . [Crossref]
941. Kevin J. Stiroh. 2006. Volatility Accounting: A Production Perspective on Increased Economic Stability. *SSRN Electronic Journal* . [Crossref]
942. Tommaso Proietti. 2006. On the Model Based Interpretation of Filters and the Reliability of Trend-Cycle Estimates. *SSRN Electronic Journal* . [Crossref]
943. Martin P. Everts. 2006. Duration of Business Cycles. *SSRN Electronic Journal* . [Crossref]
944. Martin P. Everts. 2006. Sectoral and Industrial Business Cycles. *SSRN Electronic Journal* . [Crossref]
945. Maurizio Bovi. 2006. The Cyclical Behavior of Shadow and Regular Employment. *SSRN Electronic Journal* . [Crossref]
946. Shigeru Fujita, Garey Ramey. 2006. The Cyclicality of Job Loss and Hiring. *SSRN Electronic Journal* . [Crossref]
947. Andrew Figura. 2006. Explaining Cyclical Movements in Employment: Creative Destruction or Changes in Utilization. *SSRN Electronic Journal* . [Crossref]
948. Siem Jan Koopman, Soon Y. Wong. 2006. Extracting Business Cycles using Semi-Parametric Time-Varying Spectra with Applications to US Macroeconomic Time Series. *SSRN Electronic Journal* . [Crossref]
949. Andrew Figura. 2006. Why are Plant Deaths Countercyclical: Reallocation Timing or Fragility?. *SSRN Electronic Journal* . [Crossref]
950. Jean-Claude Berthélemy. 2006. Clubs de convergence et équilibres multiples : comment les économies émergentes ont-elles réussi à échapper au piège du sous-développement ?. *Revue d'économie du développement* **14**:1, 5. [Crossref]
951. Allan Timmermann, Luis Catão, Marco Aiolfi. 2006. Common Factors in Latin America's Business Cycles. *IMF Working Papers* **06**:49, 1. [Crossref]
952. Serdar Sayan. 2006. Business Cycles and Workers' Remittances: How Do Migrant Workers Respond to Cyclical Movements of GDP At Home?. *IMF Working Papers* **06**:52, 3. [Crossref]
953. Ebrima Faal. 2006. Growth and Productivity in Papua New Guinea. *IMF Working Papers* **06**:113, 1. [Crossref]
954. Ravi Balakrishnan, Sam Ouliaris. 2006. U.S. Inflation Dynamics: What Drives them Over Different Frequencies?. *IMF Working Papers* **06**:159, 1. [Crossref]

955. Charalambos G. Tsangarides, Yasser Abdih. 2006. FEER for the CFA Franc. *IMF Working Papers* **06**:236, 1. [Crossref]
956. Martin Petri, Tahsin Saadi-Sedik. 2006. To Smooth or Not to Smooth: The Impact of Grants and Remittanceson the Equilibrium Real Exchange Rate in Jordan. *IMF Working Papers* **06**:257, 1. [Crossref]
957. Jean-Claude Berthélemy. 2006. Convergence Clubs and Multiple Equilibria: How Did Emerging Economies Escape the Under-Development Trap?. *Revue d'économie du développement* **14**:5, 5. [Crossref]
958. Claudia M. Buch, Alexander Lipponer. 2005. Business Cycles and FDI: Evidence from German Sectoral Data. *Review of World Economics* **141**:4, 732-759. [Crossref]
959. Philip N. Jefferson. 2005. Why Have Poverty Rates Fallen? . *The Review of Black Political Economy* **33**:3, 7-19. [Crossref]
960. David Aadland. 2005. Detrending time-aggregated data. *Economics Letters* **89**:3, 287-293. [Crossref]
961. Marco Sunder, Ulrich Woitek. 2005. Boom, bust, and the human body: Further evidence on the relationship between height and business cycles. *Economics & Human Biology* **3**:3, 450-466. [Crossref]
962. Gordon Reikard. 2005. Endogenous technical advance and the stochastic trend in output: A neoclassical approach. *Research Policy* **34**:10, 1476-1490. [Crossref]
963. Yi Wen. 2005. Understanding the inventory cycle. *Journal of Monetary Economics* **52**:8, 1533-1555. [Crossref]
964. Viktoria Hnatkovska, Norman Loayza. Volatility and Growth 65-100. [Crossref]
965. Regina Kaiser, Agustín Maravall. 2005. Combining filter design with model-based filtering (with an application to business-cycle estimation). *International Journal of Forecasting* **21**:4, 691-710. [Crossref]
966. Claudia M. Buch, Joerg Doepke, Christian Pierdzioch. 2005. Financial openness and business cycle volatility. *Journal of International Money and Finance* **24**:5, 744-765. [Crossref]
967. CARSTEN BURHOP, GUNTRAM B. WOLFF. 2005. A Compromise Estimate of German Net National Product, 1851–1913, and its Implications for Growth and Business Cycles. *The Journal of Economic History* **65**:03. . [Crossref]
968. James H. Stock, Mark W. Watson. 2005. Understanding Changes in International Business Cycle Dynamics. *Journal of the European Economic Association* **3**:5, 968-1006. [Crossref]
969. Daniel Chiquiar, Manuel Ramos-Francia. 2005. Trade and business-cycle synchronization: evidence from Mexican and U.S. manufacturing industries. *The North American Journal of Economics and Finance* **16**:2, 187-216. [Crossref]
970. Francisco Javier Alonso, Publio Pintado, José María Del Castillo. 2005. Filtering of Kinematic Signals Using the Hodrick-Prescott Filter. *Journal of Applied Biomechanics* **21**:3, 271-285. [Crossref]
971. António Rua, Luis C. Nunes. 2005. Coincident and leading indicators for the euro area: A frequency band approach. *International Journal of Forecasting* **21**:3, 503-523. [Crossref]
972. Mark D. Partridge, Dan S. Rickman. 2005. Regional cyclical asymmetries in an optimal currency area: an analysis using US state data. *Oxford Economic Papers* **57**:3, 373-397. [Crossref]
973. Gary A. Wagner, Erick M. Elder. 2005. The Role of Budget Stabilization Funds in Smoothing Government Expenditures over the Business Cycle. *Public Finance Review* **33**:4, 439-465. [Crossref]
974. J. M. Binner *, R. K. Bissoondeeal, A. W. Mullineux. 2005. A composite leading indicator of the inflation cycle for the Euro area. *Applied Economics* **37**:11, 1257-1266. [Crossref]
975. Arthur Grimes. 2005. Regional and industry cycles in Australasia: Implications for a common currency. *Journal of Asian Economics* **16**:3, 380-397. [Crossref]
976. Jaan Masso, Karsten Staehr. 2005. Inflation dynamics and nominal adjustment in the Baltic States. *Research in International Business and Finance* **19**:2, 281-303. [Crossref]
977. Peter C.B. Phillips. 2005. Challenges of trending time series econometrics. *Mathematics and Computers in Simulation* **68**:5-6, 401-416. [Crossref]
978. Francisco A. Gallego *, Christian A. Johnson. 2005. Building confidence intervals for band-pass and Hodrick–Prescott filters: an application using bootstrapping. *Applied Economics* **37**:7, 741-749. [Crossref]
979. Tommaso Proietti. 2005. New algorithms for dating the business cycle. *Computational Statistics & Data Analysis* **49**:2, 477-498. [Crossref]
980. Lee Redding. 2005. Endogenous liquidity in emerging markets. *Journal of International Financial Markets, Institutions and Money* **15**:2, 159-171. [Crossref]
981. Ahmad. B. Afrasiabi *, Tomas W. Nonnenmacher. 2005. High and low frequency variations and the cyclical behaviour of real wages. *Applied Economics* **37**:5, 571-579. [Crossref]

982. Marianne Baxter, Dorsey D. Farr. 2005. Variable capital utilization and international business cycles. *Journal of International Economics* **65**:2, 335-347. [Crossref]
983. Apostolos Serletis, Asghar Shahmoradi. 2005. Business cycles and natural gas prices. *OPEC Review* **29**:1, 75-84. [Crossref]
984. Lili Sun, G. Cornelis Van Kooten, Graham M. Voss. 2005. Demand for Wildlife Hunting in British Columbia. *Canadian Journal of Agricultural Economics/Revue canadienne d'agroeconomie* **53**:1, 25-46. [Crossref]
985. Alessandra Iacobucci, Alain Noullez. 2005. A Frequency Selective Filter for Short-Length Time Series. *Computational Economics* **25**:1-2, 75-102. [Crossref]
986. Don Harding, Adrian Pagan. 2005. A suggested framework for classifying the modes of cycle research. *Journal of Applied Econometrics* **20**:2, 151-159. [Crossref]
987. Marianne Baxter, Michael A. Kouparitsas. 2005. Determinants of business cycle comovement: a robust analysis. *Journal of Monetary Economics* **52**:1, 113-157. [Crossref]
988. Hiroshi Yamada *, Yuzo Honda. 2005. Do stock prices contain predictive information on business turning points? A wavelet analysis. *Applied Financial Economics Letters* **1**:1, 19-23. [Crossref]
989. Ibrahim A. Elbadawi. 2005. Reviving Growth in the Arab World. *Economic Development and Cultural Change* **53**:2, 293-236. [Crossref]
990. Michael Funke. 2005. Inflation in Mainland China - Modelling a Roller Coaster Ride. *SSRN Electronic Journal* . [Crossref]
991. Jaan Masso, Karsten Sthaer. 2005. Inflation Dynamics and Nominal Adjustment in the Baltic States. *SSRN Electronic Journal* . [Crossref]
992. Massimiliano Giuseppe Marcellino. 2005. Leading Indicators: What Have We Learned?. *SSRN Electronic Journal* . [Crossref]
993. Stefano Schiavo. 2005. Financial Integration, GDP Correlation and the Endogeneity of Optimum Currency Areas. *SSRN Electronic Journal* . [Crossref]
994. Viviana Fernandez, Ali M. Kutan. 2005. Do Regional Integration Agreements Increase Business-Cycle Convergence? Evidence From APEC and NAFTA. *SSRN Electronic Journal* . [Crossref]
995. Norbert M. Fiess. 2005. Business Cycle Synchronization and Regional Integration: A Case Study for Central America. *SSRN Electronic Journal* . [Crossref]
996. Siem Jan Koopman, Kai Ming Lee. 2005. Measuring Asymmetric Stochastic Cycle Components. *SSRN Electronic Journal* . [Crossref]
997. Zsolt Darvas, Gabor Vadas. 2005. A New Method for Combining Detrending Techniques with Application to Business Cycle Synchronization of the New EU Members. *SSRN Electronic Journal* . [Crossref]
998. Feng Zhu. 2005. The Fragility of the Phillips Curve: A Bumpy Ride in the Frequency Domain. *SSRN Electronic Journal* . [Crossref]
999. Jordi Galí. 2005. Trends in Hours, Balanced Growth and the Role of Technology in the Business Cycle. *SSRN Electronic Journal* . [Crossref]
1000. Juha Seppala, Lili Xie. 2005. The Cyclical Properties of the Term Structure of Interest Rates. *SSRN Electronic Journal* . [Crossref]
1001. Robert W. Rich, Charles Steindel. 2005. A Review of Core Inflation and an Evaluation of its Measures. *SSRN Electronic Journal* . [Crossref]
1002. Matteo M. Pelagatti. 2005. Business Cycle and Sector Cycles: Model-Based Filtering and Application to Italian Data. *SSRN Electronic Journal* . [Crossref]
1003. Arthur Grimes. 2005. Intra & Inter-Regional Industry Shocks: A New Metric with an Application to Australasian Currency Union. *SSRN Electronic Journal* . [Crossref]
1004. Arthur Grimes. 2005. Regional and Industry Cycles in Australasia: Implications for a Common Currency. *SSRN Electronic Journal* . [Crossref]
1005. Claudia Cicconi. 2005. Building Smooth Indicators Nearly Free of End-of-Sample Revisions. *SSRN Electronic Journal* . [Crossref]
1006. International Monetary Fund. 2005. Remoteness and Real Exchange Rate Volatility. *IMF Working Papers* **05**:1, 1. [Crossref]
1007. International Monetary Fund. 2005. Trade Costs and Real Exchange Rate Volatility: The Role of Ricardian Comparative Advantage. *IMF Working Papers* **05**:5, 1. [Crossref]
1008. Silvia Sgherri. 2005. Long-Run Productivity Shifts and Cyclical Fluctuations: Evidence for Italy. *IMF Working Papers* **05**:228, 1. [Crossref]
1009. Alfredo Baldini. 2005. Fiscal Policy and Business Cycles in an Oil-Producing Economy: The Case of Venezuela. *IMF Working Papers* **05**:237, 1. [Crossref]

1010. César Calderón, Roberto Duncan, Klaus Schmidt-Hebbel. 2004. The role of credibility in the cyclical properties of macroeconomic policies in emerging economies. *Review of World Economics* **140**:4, 613-633. [Crossref]

1011. Wouter J. den Haan, Steven W. Sumner. 2004. The comovement between real activity and prices in the G7. *European Economic Review* **48**:6, 1333-1347. [Crossref]

1012. Antonio Matas-Mir, Denise R. Osborn. 2004. Does seasonality change over the business cycle? An investigation using monthly industrial production series. *European Economic Review* **48**:6, 1309-1332. [Crossref]

1013. Raphael Bergoeing, Norman Loayza, Andrea Repetto. 2004. Slow recoveries. *Journal of Development Economics* **75**:2, 473-506. [Crossref]

1014. Charles Leung. 2004. Macroeconomics and housing: a review of the literature. *Journal of Housing Economics* **13**:4, 249-267. [Crossref]

1015. Fernando Alvarez, Urban J. Jermann. 2004. Using Asset Prices to Measure the Cost of Business Cycles. *Journal of Political Economy* **112**:6, 1223-1256. [Crossref]

1016. CARLO ALTAVILLA. 2004. Do EMU Members Share the Same Business Cycle?*. *JCMS: Journal of Common Market Studies* **42**:5, 869-896. [Crossref]

1017. Alexandra Krystalogianni *, George Matysiak, Sotiris Tsolacos. 2004. Forecasting UK commercial real estate cycle phases with leading indicators: a probit approach. *Applied Economics* **36**:20, 2347-2356. [Crossref]

1018. Claudia M. Buch, Joerg Doepke, Christian Pierdzioch. 2004. Business Cycle Volatility in Germany. *German Economic Review* **5**:4, 451-479. [Crossref]

1019. Mark Crosby. 2004. Exchange Rate Volatility and Macroeconomic Performance in Hong Kong. *Review of Development Economics* **8**:4, 606-623. [Crossref]

1020. David Aadland. 2004. Cattle cycles, heterogeneous expectations and the age distribution of capital. *Journal of Economic Dynamics and Control* **28**:10, 1977-2002. [Crossref]

1021. Michael Artis, Massimiliano Marcellino, Tommaso Proietti. 2004. Dating Business Cycles: A Methodological Contribution with an Application to the Euro Area. *Oxford Bulletin of Economics and Statistics* **66**:4, 537-565. [Crossref]

1022. Jean Imbs. 2004. Trade, Finance, Specialization, and Synchronization. *Review of Economics and Statistics* **86**:3, 723-734. [Abstract] [PDF] [PDF Plus]

1023. Lilia Maliar, Serguei Maliar. 2004. Preference shocks from aggregation: time series data evidence. *Canadian Journal of Economics/ Revue Canadienne d`Economique* **37**:3, 768-781. [Crossref]

1024. Pierre-Richard Agénor, Joshua Aizenman. 2004. Savings and the terms of trade under borrowing constraints. *Journal of International Economics* **63**:2, 321-340. [Crossref]

1025. Jan Jacobs, Vincent Tassenaar. 2004. Height, income, and nutrition in the Netherlands: the second half of the 19th century. *Economics & Human Biology* **2**:2, 181-195. [Crossref]

1026. Gerhard Rünstler. 2004. Modelling phase shifts among stochastic cycles. *The Econometrics Journal* **7**:1, 232-248. [Crossref]

1027. David Cobham, Peter Macmillan, David G. Mcmillan. 2004. The inflation/output variability trade-off: further evidence. *Applied Economics Letters* **11**:6, 347-350. [Crossref]

1028. Rolando F Peláez. 2004. Dating the productivity slowdown with a structural time-series model. *The Quarterly Review of Economics and Finance* **44**:2, 253-264. [Crossref]

1029. Robert Metz, Rebecca Riley, Martin Weale. 2004. Economic Performance in France, Germany and the United Kingdom: 1997–2002. *National Institute Economic Review* **188**:1, 83-99. [Crossref]

1030. Ray Barell, Sylvia Gottschalk. 2004. The Volatility of the Output Gap in the G7. *National Institute Economic Review* **188**:1, 100-107. [Crossref]

1031. Gerald A. Carlino, Robert H. DeFina. 2004. How strong is co-movement in employment over the business cycle? Evidence from state/sector data. *Journal of Urban Economics* **55**:2, 298-315. [Crossref]

1032. Sergio I. Restrepo-Ochoa, Jesús Vázquez. 2004. Cyclical features of the Uzawa–Lucas endogenous growth model. *Economic Modelling* **21**:2, 285-322. [Crossref]

1033. Stefan Gerlach, Matthew S. Yiu. 2004. Estimating output gaps in Asia: A cross-country study. *Journal of the Japanese and International Economies* **18**:1, 115-136. [Crossref]

1034. Amit Goyal. 2004. Demographics, Stock Market Flows, and Stock Returns. *Journal of Financial and Quantitative Analysis* **39**:1, 115-142. [Crossref]

1035. Paul Cashin, Sam Ouliaris. 2004. Key Features of Australian Business Cycles. *Australian Economic Papers* **43**:1, 39-58. [Crossref]

1036. Robert-Paul Berben. 2004. Exchange rate pass-through in the Netherlands: has it changed?. *Applied Economics Letters* **11**:3, 141-143. [Crossref]

1037. Klaus Wälde, Ulrich Woitek. 2004. R&D expenditure in G7 countries and the implications for endogenous fluctuations and growth. *Economics Letters* **82**:1, 91-97. [Crossref]

1038. Jörg Döpke. 2004. How Robust is the Empirical Link between Business-Cycle Volatility and Long-Run Growth in OECD Countries?. *International Review of Applied Economics* **18**:1, 103-121. [Crossref]

1039. Christian J. Murray, Shushanik Papanyan. 2004. The Relative Importance of Permanent and Transitory Components in Macroeconomic Time Series. *SSRN Electronic Journal* . [Crossref]

1040. Jean-Stéphane Mésonnier, Jean-Paul Renne. 2004. A Time-Varying Natural Rate for the Euro Area. *SSRN Electronic Journal* . [Crossref]

1041. Jean M. Imbs. 2004. The Real Effects of Financial Integration. *SSRN Electronic Journal* . [Crossref]

1042. Michael J. Artis, Massimiliano Giuseppe Marcellino, Tommaso Proietti. 2004. Characterising the Business Cycle for Accession Countries. *SSRN Electronic Journal* . [Crossref]

1043. Borja Larrain. 2004. Do Banks Affect the Level and Composition of Industrial Volatility and How?. *SSRN Electronic Journal* . [Crossref]

1044. Theodore M. Crone. 2004. A Redefinition of Economic Regions in the U.S. *SSRN Electronic Journal* . [Crossref]

1045. Marianne Baxter, Michael A. Kouparitsas. 2004. Determinants of Business Cycle Comovement: A Robust Analysis. *SSRN Electronic Journal* . [Crossref]

1046. John C. Williams. 2004. Robust Estimation and Monetary Policy with Unobserved Structural Change. *SSRN Electronic Journal* . [Crossref]

1047. Andrew Figura. 2004. Workweek Flexibility and Hours Variation. *SSRN Electronic Journal* . [Crossref]

1048. Jorg Polzehl, V. Spokoiny, Catalin Starica. 2004. When Did the 2001 Recession Really Start?. *SSRN Electronic Journal* . [Crossref]

1049. Simon van Norden, Athanasios Orphanides. 2004. The Reliability of Inflation Forecasts Based on Output Gap Estimates in Real Time. *SSRN Electronic Journal* . [Crossref]

1050. David C. Parsley, Shang-Jin Wei. 2004. A Price Based Approach to Estimate the Effects of Monetary Arrangements on Trade Integration. *SSRN Electronic Journal* . [Crossref]

1051. Luca Benati. 2004. Evolving Post-World War II UK Economic Performance. *SSRN Electronic Journal* . [Crossref]

1052. Ricardo Cavaco Nunes. 2004. Learning the Inflation Target. *SSRN Electronic Journal* . [Crossref]

1053. James Bullard, John Duffy. 2004. Learning and Structural Change in Macroeconomic Data. *SSRN Electronic Journal* . [Crossref]

1054. Christoph Schleicher. 2004. Kolmogorov-Wiener Filters for Finite Time Series. *SSRN Electronic Journal* . [Crossref]

1055. Borja Larrain. 2004. Financial Development, Financial Constraints, and the Volatility of Industrial Output. *SSRN Electronic Journal* . [Crossref]

1056. Kajal Lahiri, Wenxiong Yao, Peg Young. 2004. Transportation and the Economy: Linkages at Business-Cycle Frequencies. *Transportation Research Record: Journal of the Transportation Research Board* **1864**:1, 103-111. [Crossref]

1057. Andreas Billmeier. 2004. Measuring a Roller Coaster: Evidenceon the Finnish Output Gap. *IMF Working Papers* **04**:57, 1. [Crossref]

1058. Paul Cashin. 2004. Caribbean Business Cycles. *IMF Working Papers* **04**:136, 1. [Crossref]

1059. Andreas Billmeier. 2004. Ghostbusting: Which Output Gap Measure Really Matters?. *IMF Working Papers* **04**:146, 1. [Crossref]

1060. Jordi Galí, Pau Rabanal. 2004. Technology Shocks and Aggregate Fluctuations: How Well Does the RBC Model Fit Postwar U.S. Data?. *IMF Working Papers* **04**:234, 1. [Crossref]

1061. . Monetary Policy Transmission in the Euro Area **121**, . [Crossref]

1062. Oleksandr Movshuk. 2003. Does the choice of detrending method matter in demand analysis?. *Japan and the World Economy* **15**:3, 341-359. [Crossref]

1063. Juan-Luis Vega, Mark A. Wynne. 2003. A First Assessment of Some Measures of Core Inflation for the Euro Area. *German Economic Review* **4**:3, 269-306. [Crossref]

1064. Harm Bandholz, Michael Funke. 2003. In search of leading indicators of economic activity in Germany. *Journal of Forecasting* **22**:4, 277-297. [Crossref]

1065. Ulrich Woitek. 2003. Height cycles in the 18th and 19th centuries. *Economics & Human Biology* **1**:2, 243-257. [Crossref]

1066. Andrew C. Harvey, Thomas M. Trimbur. 2003. General Model-Based Filters for Extracting Cycles and Trends in Economic Time Series. *Review of Economics and Statistics* **85**:2, 244-255. [Abstract] [PDF] [PDF Plus]

1067. Zacharias Psaradakis, Martin Sola. 2003. On detrending and cyclical asymmetry. *Journal of Applied Econometrics* **18**:3, 271-289. [Crossref]

1068. Terence C. Mills, Eric J. Pentecost. 2003. Is there a relationship between real exchange rate movements and the output cycle?. *Economic Modelling* **20**:3, 593-603. [Crossref]

1069. Lawrence J. Christiano, Robert J. Vigfusson. 2003. Maximum likelihood in the frequency domain: the importance of time-to-plan. *Journal of Monetary Economics* **50**:4, 789-815. [Crossref]

1070. D.S.G. Pollock. 2003. Sharp filters for short sequences. *Journal of Statistical Planning and Inference* **113**:2, 663-683. [Crossref]

1071. Lawrence J. Christiano, Terry J. Fitzgerald. 2003. The Band Pass Filter*. *International Economic Review* **44**:2, 435-465. [Crossref]

1072. Stephane Pallage, Michel A. Robe. 2003. On the Welfare Cost of Economic Fluctuations in Developing Countries*. *International Economic Review* **44**:2, 677-698. [Crossref]

1073. Carlos Lenz. 2003. A different look at the Census X-11 filter. *Economics Letters* **79**:1, 1-6. [Crossref]

1074. Jonathan Heathcote, Fabrizio Perri. 2003. Why Has the U.S. Economy Become Less Correlated with the Rest of the World?. *American Economic Review* **93**:2, 63-69. [Crossref]

1075. D.S.G. Pollock. 2003. Improved frequency selective filters. *Computational Statistics & Data Analysis* **42**:3, 279-297. [Crossref]

1076. Peter C. B. Phillips. 2003. Laws and Limits of Econometrics. *The Economic Journal* **113**:486, C26-C52. [Crossref]

1077. David I. Harvey, Terence C. Mills. 2003. Modelling trends in central England temperatures. *Journal of Forecasting* **22**:1, 35-47. [Crossref]

1078. Michael Massmann, James Mitchell, Martin Weale. 2003. Business Cycles and Turning Points: A Survey of Statistical Techniques. *National Institute Economic Review* **183**:1, 90-106. [Crossref]

1079. Weshah A. Razzak. 2003. Wage-Price Dynamics, the Labour Market and Deflation in Hong Kong. *SSRN Electronic Journal* . [Crossref]

1080. César Calderón, Alberto Chong, Ernesto Hugo Stein. 2003. Trade Intensity and Business Cycle Synchronization: Are Developing Countries Any Different?. *SSRN Electronic Journal* . [Crossref]

1081. Harrison G. Hong, Walter N. Torous, Rossen I. Valkanov. 2003. Do Industries Lead the Stock Market? Gradual Diffusion of Information and Cross-Asset Return Predictability. *SSRN Electronic Journal* . [Crossref]

1082. Wouter J. den Haan, Steven Sumner. 2003. The Comovement Between Real Activity and Prices in the G7. *SSRN Electronic Journal* . [Crossref]

1083. Lawrence J. Christiano, Terry J. Fitzgerald. 2003. Inflation and Monetary Policy in the Twentieth Century. *SSRN Electronic Journal* . [Crossref]

1084. Jean M. Imbs. 2003. Trade, Finance, Specialization and Synchronization. *SSRN Electronic Journal* . [Crossref]

1085. Jonas D.M. Fisher. 2003. Technology Shocks Matter. *SSRN Electronic Journal* . [Crossref]

1086. Athanasios Orphanides, John C. C. Williams. 2003. Robust Monetary Policy Rules with Unknown Natural Rates. *SSRN Electronic Journal* . [Crossref]

1087. Massimiliano Giuseppe Marcellino, Michael J. Artis, Tommaso Proietti. 2003. Dating the Euro Area Business Cycle. *SSRN Electronic Journal* . [Crossref]

1088. S.J. Koopman, João Valle e Azevedo. 2003. Measuring Synchronisation and Convergence of Business Cycles. *SSRN Electronic Journal* . [Crossref]

1089. Philip Rothman. 2003. Reconsideration of the Markov Chain Evidence on Unemployment Rate Asymmetry. *SSRN Electronic Journal* . [Crossref]

1090. David N. DeJong, Roman Liesenfeld, Jean-Francois Richard. 2003. A Non-Linear Forecasting Model of GDP Growth. *SSRN Electronic Journal* . [Crossref]

1091. João Valle e Azevedo, S.J. Koopman, Antonio Rua. 2003. Tracking Growth and the Business Cycle: A Stochastic Common Cycle Model for the Euro Area. *SSRN Electronic Journal* . [Crossref]

1092. Camilla Mastromarco, Ulrich Woitek. 2003. Regional Business Cycles in Italy. *SSRN Electronic Journal* . [Crossref]

1093. David C. Parsley, Shang-Jin Wei. 2003. How Big and Heterogeneous are the Effects of Currency Arrangements on Market Integration? A Price Based Approach. *SSRN Electronic Journal* . [Crossref]

1094. Andrew Figura. 2003. The Effect of Restructuring on Unemployment. *SSRN Electronic Journal* . [Crossref]

1095. Michael A. Kouparitsas. 2003. International Business Cycles Under Fixed and Flexible Exchange Rate Regimes. *SSRN Electronic Journal* . [Crossref]

1096. Todd E. Clark, Michael W. McCracken. 2003. The Predictive Content of the Output Gap for Inflation: Resolving In-Sample and Out-of-Sample Evidence. *SSRN Electronic Journal* . [Crossref]

1097. Gerald A. Carlino, Robert H. DeFina. 2003. How Strong is Co-Movement in Employment over the Business Cycle? Evidence from State/Industry Data. *SSRN Electronic Journal* . [Crossref]

1098. Siem Jan Koopman, Andre Lucas, Robert Daniels. 2003. A Non-Gaussian Panel Time Series Model for Estimating and Decomposing Default Risk. *SSRN Electronic Journal* . [Crossref]

1099. International Monetary Fund. 2003. Finland: Selected Issues. *IMF Staff Country Reports* **03**:326, 1. [Crossref]

1100. Sergio L. Schmukler, Graciela Laura Kaminsky. 2003. Short-Run Pain, Long-Run Gain: The Effects of Financial Liberalization. *IMF Working Papers* **03**:34, 1. [Crossref]

1101. Thomas Helbling, Tamim Bayoumi. 2003. Are they All in the Same Boat? the 2000-2001 Growth Slowdown and the G-7 Business Cycle Linkages. *IMF Working Papers* **03**:46, 1. [Crossref]

1102. Jean Imbs. 2003. Trade, Finance, Specialization, and Synchronization. *IMF Working Papers* **03**:81, 1. [Crossref]

1103. Joannes Mongardini, Tahsin Saadi-Sedik. 2003. Estimating Indexes of Coincident and Leading Indicators: An Application to Jordan. *IMF Working Papers* **03**:170, 1. [Crossref]

1104. John Rand, Finn Tarp. 2002. Business Cycles in Developing Countries: Are They Different?. *World Development* **30**:12, 2071-2088. [Crossref]

1105. Dean Scrimgeour. 2002. Exchange rate volatility and currency union: New Zealand evidence. *Journal of Policy Modeling* **24**:7-8, 739-749. [Crossref]

1106. Terence C. Mills, Geoffrey E. Wood. 2002. Wages and prices in the UK. *Applied Economics* **34**:17, 2143-2149. [Crossref]

1107. . Monetary Transmission in Diverse Economies **25**, . [Crossref]

1108. Michael Massmann, James Mitchell. 2002. Have UK and Eurozone Business Cycles Become More Correlated?. *National Institute Economic Review* **182**:1, 58-71. [Crossref]

1109. Jagjit S. Chadha, Charles Nolan. 2002. A Long View of the UK Business Cycle. *National Institute Economic Review* **182**:1, 72-89. [Crossref]

1110. Michael Artis. 2002. Dating the Business Cycle in Britain. *National Institute Economic Review* **182**:1, 90-95. [Crossref]

1111. Christopher Otrok, B. Ravikumar, Charles H. Whiteman. 2002. Habit formation: a resolution of the equity premium puzzle?. *Journal of Monetary Economics* **49**:6, 1261-1288. [Crossref]

1112. Jagjit S. Chadha, Lucio Sarno. 2002. Short- and long-run price level uncertainty under different monetary policy regimes: an international comparison+. *Oxford Bulletin of Economics and Statistics* **64**:3, 183-212. [Crossref]

1113. Gisele Ferreira da Silva. 2002. The impact of financial system development on business cycles volatility: cross-country evidence. *Journal of Macroeconomics* **24**:2, 233-253. [Crossref]

1114. Hironobu Nakagawa. 2002. Real exchange rates and real interest differentials: implications of nonlinear adjustment in real exchange rates. *Journal of Monetary Economics* **49**:3, 629-649. [Crossref]

1115. Marco Del Negro. 2002. Asymmetric shocks among U.S. states. *Journal of International Economics* **56**:2, 273-297. [Crossref]

1116. Monnie McGee. 2002. Practical Time Series. *Journal of the American Statistical Association* **97**:457, 363-364. [Crossref]

1117. Timothy Cogley. 2002. Measuring Business Cycles in Economic Time Series. *Journal of the American Statistical Association* **97**:457, 364-364. [Crossref]

1118. Thorsten Rheinlaender. 2002. Continuous Stochastic Calculus With Applications to Finance. *Journal of the American Statistical Association* **97**:457, 364-365. [Crossref]

1119. Michał Kruszka. Business Fluctuations and Changes on the Money Market in the Polish Economy under Transition 163-177. [Crossref]

1120. . BIBLIOGRAPHY 323-348. [Crossref]

1121. Michael A. Kouparitsas. 2002. Is The United States an Optimum Currency Area? An Empirical Analysis of Regional Business Cycles. *SSRN Electronic Journal* . [Crossref]

1122. Darrel S. Cohen. 2002. Linear Data Transformations Used in Economics. *SSRN Electronic Journal* . [Crossref]

1123. Andrew Figura. 2002. The Cyclical Behavior of Short-Term and Long-Term Job Flows. *SSRN Electronic Journal* . [Crossref]

1124. Benoit Mojon, Anna Maria Agresti. 2002. Some Stylized Facts About the Euro Area Business Cycle. *SSRN Electronic Journal* . [Crossref]

1125. Andrew Figura. 2002. Is Reallocation Related to the Cycle? A Look at Permanent and Temporary Job Flows. *SSRN Electronic Journal* . [Crossref]

1126. Christian Pierdzioch, Claudia M. Buch, Jörg Döpke. 2002. Financial Openness and Business Cycle Volatility. *SSRN Electronic Journal* . [Crossref]

1127. Weshah A. Razzak. 2002. Money in the Era of Inflation Targeting. *SSRN Electronic Journal* . [Crossref]

1128. Dean Scrimgeour. 2002. Exchange Rate Volatility and Currency Union: Some Theory and New Zealand Evidence. *SSRN Electronic Journal* . [Crossref]

1129. Todd E. Clark, Eric van Wincoop. 2001. Borders and business cycles. *Journal of International Economics* **55**:1, 59-85. [Crossref]

1130. Donald G. Freeman. 2001. Panel Tests of Okun's Law for Ten Industrial Countries. *Economic Inquiry* **39**:4, 511-523. [Crossref]

1131. Terence C. Mills. 2001. Business cycle asymmetry and duration dependence: An international perspective. *Journal of Applied Statistics* **28**:6, 713-724. [Crossref]

1132. Otmar Issing, Vitor Gaspar, Ignazio Angeloni, Oreste Tristani. Monetary Policy in the Euro Area **83**, . [Crossref]

1133. Shin-ichi Fukuda, Takashi Onodera. 2001. A new composite index of coincident economic indicators in Japan: how can we improve forecast performances?. *International Journal of Forecasting* **17**:3, 483-498. [Crossref]

1134. Jörg Breitung, Bertrand Candelon. 2001. Is There a Common European Business Cycle?. *Vierteljahrshefte zur Wirtschaftsforschung* **70**:3, 331-338. [Crossref]

1135. Christopher Otrok. 2001. On measuring the welfare cost of business cycles. *Journal of Monetary Economics* **47**:1, 61-92. [Crossref]

1136. M.W. Watson. Time Series: Cycles 15714-15721. [Crossref]

1137. Mark Crosby, Glenn Otto. 2001. Growth and the Real Exchange Rate - Evidence from Eleven Countries. *SSRN Electronic Journal* . [Crossref]

1138. U. Michael Michael Bergman. 2001. Finnish and Swedish Business Cycles in a Global Context. *SSRN Electronic Journal* . [Crossref]

1139. Mark W. French. 2001. Estimating Changes in Trend Growth of Total Factor Productivity: Kalman and H-P filters Versus a Markov-Switching Framework. *SSRN Electronic Journal* . [Crossref]

1140. Luca Benati. 2001. Band-Pass Filtering, Cointegration, and Business Cycle Analysis. *SSRN Electronic Journal* . [Crossref]

1141. Bjarne Brendstrup, Svend Hylleberg, Morten Ørregaard Nielsen, Lars Skipper, Lars Stentoft. 2001. Seasonality in Economic Models. *SSRN Electronic Journal* . [Crossref]

1142. D.S.G. Pollock. 2001. Improved Frequency-Selective Filters. *SSRN Electronic Journal* . [Crossref]

1143. Paul Cashin, Sam Ouliaris. 2001. Key Features of Australian Business Cycles. *IMF Working Papers* **01**:171, 1. [Crossref]

1144. Kevin J. Lansing. 2000. Learning About a Shift in Trend Output: Implications for Monetary Policy and Inflation. *SSRN Electronic Journal* . [Crossref]

1145. Klaus Reiner Reiner Schenk-Hoppé. 2000. Economic Growth and Business Cycles: A Critical Comment on Detrending Time Series. *SSRN Electronic Journal* . [Crossref]

1146. Alessandra Iacobucci. Spectral Analysis for Economic Time Series 203-219. [Crossref]

1147. Thomas A. Knetsch. Evaluating the German Inventory Cycle Using Data from the Ifo Business Survey 61-92. [Crossref]

1148. Henk Kranendonk, Jan Bonenkamp, Johan Verbruggen. A Leading Indicator for the Dutch Economy 115-142. [Crossref]

1149. Rainer Metz. „Lange Wellen“ im deutschen Bildungswachstum? 15-51. [Crossref]

1150. Stephen Pollock. Filters for Short Nonstationary Sequences: The Analysis of the Business Cycle 531-545. [Crossref]

1151. . Die Unsicherheit über den Wahlausgang 53-90. [Crossref]