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Abstract

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Keywords: profitability, financial corporations, nonfinancial corporations, business cycles, financialization.

JEL Classification: B50, C32, E11, E32, G20.

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1 Introduction

Profitability is a crucial determinant for the study of production, employment, and investment decisions in capitalist economies. Focusing on the profitability of the US nonfinancial and financial corporate business sectors, the current article aims at contributing to the extant literature on the political economy of profitability in three ways. First, we contribute to the discussion regarding the relevant conceptualizations and measurements of the rate of profit of the nonfinancial and financial sectors, which allows us to provide new measures of the profit rate for the nonfinancial corporate business (NFCB) sector and the financial corporate business (FCB) sector.[1] The great majority of the contributions in this field have focused on conceptualizing and measuring the profit rate for the economy as a whole, for nonfinancial corporations, or for nonfinancial subsectors (such as the manufacturing sector). By contrast, the contributions related to the conceptualization and measurement of the rate of profit of the financial sector have been scarce. In this paper, we assemble a new data set for the US economy using recently publicly available data published by the Organization for Economic Co-operation and Development (OECD), which follows the System of National Accounts 2008 (2008 SNA) methodology. Since the latter establishes the accounting for the US financial corporate sector, it is straightforward to measure the profit rate of financial corporations and to compare it with that of nonfinancial corporations.

Second, we contribute to the analysis of: (i) the individual cyclical dynamics of the rate of profit of the NFCB and FCB sectors; and (ii) the interactions over time of the cyclical components of the profitability measures between these two sectors. To do so, we introduce the use of wavelet analysis as a relevant method for studying the possible changing relationships of the profit rates across different frequencies, which allows us to deal with the possible instabilities associated with changes in the dynamics of US aggregate profitability—namely, instability over time due to nonlinearities at different frequencies, time-variations, and changing lead-lag relationships. In brief, we use wavelet analysis to study: (i) how the periodic components of the measures of profitability for the NFCB and FCB sectors have changed over time; (ii) how these cyclical components of the two profit rates have been correlated at different frequencies; and (iii) what has been the evolution of such correlations over time.

Our paper is mainly related to three strands of literature within the tradition of heterodox political economy. As mentioned above, few studies have tried to conceptualize and measure the profit rate of financial corporations and to compare it with that of nonfinancial corporations. Duménil and Lévy (2004) and Bakir and Campbell (2013) are, to the best of our knowledge, the only ones that have explicitly dealt with the problems associated with the conceptualization and measurement of the rate of profit of financial corporations. The main reason for this is the lack of official data available for analyzing the FCB sector. While the Bureau of Economic Analysis (BEA) and the Federal Reserve

[1] Financial corporations consist of two industries. First, the industry of finance and insurance, which is composed of the following subindustries: Federal Reserve banks; credit intermediation and related activities; securities, commodity contracts, and investments; insurance carriers and related activities; and funds, trusts, and other financial vehicles. Second, the industry of management of companies and enterprises, which consists of banks and other holding companies (Bureau of Economic Analysis , 2017).

(FED) publish a comprehensive amount of data covering different aspects of the NFCB sector, the same does not apply to the FCB sector, which is explained by the setup of the national accounting system in the USA. For instance, while the NFCB sector is divided between corporate and noncorporate subsectors, financial businesses do not possess the same treatment in the great majority of the Integrated Macroeconomic Accounts published by the BEA. Therefore, fewer data sets are available for financial corporations.

Given the difficulty of obtaining data for the FCB sector, Duménil and Lévy (2004) focus on defining a restricted US financial business sector, thus selecting only the subsectors that they consider relevant according to the criterion that such subsectors are driven by a profit motive. They compute a profit rate for this restricted financial business sector, which is then compared to the profit rate for an also restricted NFCB sector. The latter is constructed by excluding the highly capital-intensive industries, considering that these industries do not participate in the profit rate equalization process as their rate of return is significantly lower compared to the rest of the NFCB sector. Duménil and Lévy (2004) emphasize the importance of the return on equity for the comparison of the profitability ratios in their restricted financial and nonfinancial sectors. The most important conclusion derived from their study is the comparison between the two profit rates: the profitability of the financial sector was higher relative to that of the nonfinancial sector for the period 1952-1961, then it remained below during the period 1961-1986, and it soared during the decades of neoliberalism—from 1986, but more clearly since the 1990s—up until 2000 (which is the last data point in their paper).

One limitation of the approach followed by Duménil and Lévy (2004) is the following. For profits of the financial sector, they use Table 6.19 of the National Income and Product Accounts (NIPA) published by the BEA, which contains information on profits after tax of corporate businesses by sectors without inventory valuation adjustment (IVA) and capital consumption adjustment (CCAdj), and they then exclude the FED's profits. For the denominator, given that the BEA-NIPA does not publish data for the balance sheets of the FCB sector, they use data obtained from the FED's Financial Accounts, selecting only the financial domestic subsectors that they considered relevant. The problem is that in the numerator they have profits of the FCB sector; whereas in the denominator they only have a subsection of financial businesses (which includes both corporate and noncorporate business).

Bakir and Campbell (2013) contribute to the literature by following the work of Duménil and Lévy (2004), updating their calculations, and presenting additional profit rate measurements. One of their main conclusions is that the financial sector's profit rate has been higher and more volatile than the nonfinancial sector's profit rate during the neoliberal period, especially from the beginning of the 1990s until 2011 (the last data point in their paper). The authors present three different rates of return, two of them using fixed assets and one of them using net worth. There are some limitations associated with their approach. First, for the first return on fixed assets, which they call the 'NIPA profit rate', the authors use profits after tax obtained from the BEA-NIPA, Table 6.19, which includes only corporate businesses. For the denominator, they use fixed assets of the finance and insurance subsector obtained from the BEA-NIPA, Table 3.1ESI. The problem is that the latter includes fixed assets of both corporate and noncorporate financial businesses, which leads to an inconsistent measure of the return on fixed assets. This potential problem is

also present in a second measure that they call the 'Weisskopf profit rate', the only difference being that they use net operating surplus minus taxes for financial corporate profits. The third measurement follows more closely the approach proposed by Duménil and Lévy (2004), thus using the return on equity. Again, given the lack of data for balance sheets for the FCB sector, they follow Duménil and Lévy (2004)'s definition of restricted financial sector to construct the time-series data for the denominator, which has the same aforementioned limitation.

Although the works of Duménil and Lévy (2004) and Bakir and Campbell (2013) possess certain limitations that do not allow us to construct entirely consistent measures of the financial sector's profit rate, these are crucial and laudable efforts aimed at overcoming the lack of readily available official data for studying the US financial corporate sector—particularly with respect to balance sheets. In this article, we take advantage of a recently publicly available data set published by the OECD, which contains data on the balance sheets for both the FCB and NFCB sectors. This allows us to deal more easily with the problems faced by Duménil and Lévy (2004) and Bakir and Campbell (2013), and to construct more consistent measurements of profitability for financial corporations that can be compared to nonfinancial corporations. Specifically, we are able to construct three alternative measures of the profit rate for the financial sector—namely, the return on equity, the return on assets, and the dividend yield—and to discuss its relative merits and limitations vis-à-vis the ones constructed for the nonfinancial sector.

The present contribution is also related to the analysis of the cyclical dynamics of the rate of profit inaugurated by the seminal works of Weisskopf (1978, 1979) for the US NFCB sector, which was subsequently developed further by Henley (1987), Bakir and Campbell (2006, 2009) and Cámara-Izquierdo (2013), among others.[2] This body of work, however, has not paid attention either to the possible changes in the lengths of the cyclical components of the profit rate over time or to the possible existing cycles in the profitability of the financial sector. In our paper, we focus on these omitted elements in the study of the cyclical components of the profit rate. By using wavelet analysis, we are the first ones to provide new evidence on the cyclical dynamics of the profitability ratios in both the NFCB and FCB sectors over time and across different frequencies, and to discuss their main similarities and differences.

The use of wavelet analysis also allows us to study the correlations both over time and at different frequencies in the cycles of the profitability measures for the NFCB and FCB sectors, as well as the existing lead-lag relationships between them. The relevance of this analysis is that it opens the possibility to explore the interactions between the financial and nonfinancial sectors by emphasizing the role of profitability. Thus, the current article offers empirical evidence that complements the theoretical discussions regarding the interactions of profitability between financial and nonfinancial sectors, such as Norfield (2013)—who

[2]This literature has primarily focused on studying the components of the cyclical decline of the rate of profit, thus decomposing the profit rate into three main variables: the profit share in net income, the rate of capacity utilization, and the ratio of productive capacity to capital stock. Each of these can be associated with a different Marxian theory of economic crises: the rising strength of labor, the realization failure, and the rising composition of capital, respectively. One of the main results discussed by this literature is that the cyclical component of the rate of profit is associated with changes in the aggregate income distribution between capital and labor (i.e., changes in the strength of labor over the business cycles).

focuses on the interpretation of the Marxist concepts of the rate of profit and fictitious capital when analyzing the financial sector; Park (2020)—who develops a model of market for money capital and discusses the relationships between the profit rate, the interest rate, and the leverage ratio; and Di Bucchianico (2021, 2022)—who explores some theoretical channels through which financialization, financial speculation and financial regulation may impact profitability.

Finally, our paper is also related to the empirical contributions on financialization that have explicitly emphasized the importance of profitability between the financial and nonfinancial sectors, such as the seminal paper of Krippner (2005), who points out the increasing share of profits captured by financial corporations; or the works of Lapavitsas and Mendieta-Muñoz (2016, 2019A), where they link this phenomenon to changes in the net interest margin and non-interest income during the financialization period. In contrast to this literature, our contribution explicitly studies the interactions between the profit rates of the financial and nonfinancial sectors instead of the financial profits-to-nonfinancial profits ratio.

Besides this introduction, the rest of the paper is structured as follows. Section 2 discusses the conceptualization and measurement of the rate of profit in the NFCB and FCB sectors, summarizes the construction of the data sets, and shows the measures of profitability obtained for each sector. Section 3 introduces the wavelet methodology and summarizes how the latter was used in this article. Section 4 presents and discusses the main results. Finally, section 5 concludes.

2 Measuring financial and nonfinancial profitability

The rate of profit of corporate businesses is usually defined as the ratio of profits obtained during a period to the capital advanced to generate that profit income (Basu , 2013).[3] The numerator of the profit rate—i.e., profits—can adopt several definitions and conceptualizations. At the broadest level, profits can be measured as the net value-added minus the compensation of employees; while at the narrowest level profits can correspond to net dividends. Figure 1 below presents a summary of the different definitions of profits for corporate businesses, organized from broadest to narrowest, based on the accounting methodology of the BEA-NIPA. Crucially, the relevance of each definition depends on the specific phenomenon to be analyzed. For example, if the research question is about the influence of the profit rate on investment decisions, it is likely that after-tax profits is the most relevant measure since the latter represents the final income received by capitalists.

[INSERT FIGURE 1 ABOUT HERE]

In the same vein, the denominator of the profit rate—i.e., capital—also possesses different conceptualizations and measurements. Within the Marxist political economy tradition, capital is usually identified with fixed assets. Nevertheless, there are discussions regarding the inclusion of alternative variables in profitability measures, all of which

[3]Recent contributions on the conceptualization and measurement of the profit rate and on its crucial rule for political economy can found in Duménil and Lévy (2011), Shaikh (2016) and Basu (2021).

consider different sections of the corporate businesses' balance sheets. We summarize the latter in figure 2. For instance, some contributions include both inventories and fixed assets, which defines nonfinancial assets—as done by Duménil and Lévy (2004) in some of their measurements of the profit rate; while it is also possible to consider the total value of assets, which defines the return on assets (ROA), or the total net worth value to measure the return on equity (ROE).

[INSERT FIGURE 2 ABOUT HERE]

Other aspects of the corporate businesses' balance sheets are important to be considered. First, fixed assets can be measured both in current costs and historical costs. The difference between the two is the real estate component. Real state is valued at its market value in the current cost measure; while real state value depends on the original price of purchase and its depreciation rate in the historical cost measure. Basu (2013) presents a comprehensive study on how the difference between these two affects the measurement of US corporate businesses' profit rates.

Second, it is crucial to understand the difference between equity and corporate equity since these two concepts correspond to different elements of balance sheets. Equity is simply the difference between assets and liabilities, which is also known as net worth or shareholders' equity. By contrast, corporate equity (also known as corporate equities) refers to the aggregate value of shares, the price of individual shares multiplied by the number of shares. For a closely held corporation—that is, a company with the majority of its shares owned by a few individuals, so that its shares are not traded in public exchanges—the estimation of the value of its corporate equity is based both on its net worth and the market valuation of similar companies in the stock market (Ogden et al. , 2016).

The US national accounts consider two approaches to include corporate equity. In the BEA-NIPA tables, the value of corporate equity is included within liabilities. Corporate equity, in this case, is considered a debt that the company owes to its shareholders. On the other hand, corporate equity is part of the net worth in some of the balance sheets published by the FED's Financial Accounts. From this perspective, corporate equity is part of the company's own capital held by its shareholders. Consider, for example, the nonfinancial corporate business sector. The balance sheet of this sector can be found in Table S.5.a, published by both the BEA and the FED; and in Table B103, published only by the FED. The only difference between these two balance sheets is that corporate equity is included as liabilities in Table S.5.a; whereas it is included as net worth in Table B103. This accounting difference implies that the net worth of the nonfinancial corporate business sector is negative for several years in Table S.5.a; whereas it is always positive in Table B103.

In this sense, the net worth value in the US national accounts depends on the market dynamics of the shares of corporations. As the value of companies in the stock exchange market fluctuates, the balance sheet of corporations also varies. If, at a certain point, the market value of shares increases, it may look like the profit rate (measured by net worth) falls, even if profits are rising. By contrast, during a recession, because of a decline in the price of shares, it may look as if the profit rate is increasing, even if profits are falling. Thus, it is crucial to consider these possible effects when interpreting the dynamics of the rate of profit using either net worth or corporate equity.

To sum up, multiple approximations to the rate of profit of corporate businesses can be constructed by combining different measures of profits and capital, and the relevance of each measurement needs to be assessed according to the specific research interests or questions to be answered. In this article, we have used three different measures to study the evolution and interactions of the rates of profit of financial and nonfinancial corporations over time and across frequencies.

First, we used the ROE, which is likely the most relevant measure regarding capital allocation between the two sectors of interest. Since each sector uses not only its own funds but also the money borrowed from other agents in the economy to carry out its activities, this measure aims at capturing the profits obtained by each sector with respect to its own capital invested. The ROE is defined as the profits-to-shareholders' equity ratio, where shareholders' equity corresponds to net worth, and net worth is equal to assets minus liabilities. This is a similar measure to the one used by Duménil and Lévy (2004) and Bakir and Campbell (2013) when comparing financial and nonfinancial sectors.

Second, we constructed the ROA, defined as the ratio of profits to the value of total assets. Some authors have emphasized the relevance of this measure for studying capitalist dynamics during the financialization period (compared to the more traditional return on fixed assets) because of the more prominent role that financial assets have gained in order to generate profits (Elsner , 2013; Freeman , 2013). Other authors, however, have emphasized that the ROA can potentially be double accounting capital between the financial and nonfinancial sectors (Sato , 2015).[4] The difference between the ROE and the ROA is the leverage ratio since ROE=(ROA)(Assets/Net Worth), where the assets-to-net worth ratio corresponds to the leverage ratio. If a company operates only with its own resources, its liabilities are zero, total assets are equal to net worth, and, therefore, ROE and ROA would be equal.

Hence, it is also worth mentioning that, by construction, the ROA offers a less straightforward indicator to compare profitability across FCB and NFCB since the leverage ratio is considerably different in the two sectors: the financial sector's leverage ratio is much higher than the one in the nonfinancial sector since the capital financial intermediaries use for their operations includes money capital collected from other agents in the economy (for example, deposits).[5]

Third, we also constructed the dividend yield, defined as the ratio of dividends paid over the value of the shares. We consider that this measure of profitability can be relevant in order to compare the trajectories of profitability in the two sectors because some of the literature on the financialization of the US economy has highlighted that the interests of managers and shareholders have been more aligned since the 1970s (Lazonick and O'Sullivan , 2000). This implies that the dividends paid over the value of the shares of a company have become more relevant for managerial decisions, including new investments.

To compute the ROE and the ROA for the NFCB and FCB sectors in the USA, we considered profits after tax with IVA and CCAdj, which can be obtained from the BEA-NIPA, Table 1.14. We focus on profits after tax when measuring and comparing both rates

[4]For example, a loan issued by a bank is part of its financial assets. If the borrower is a manufacturing company that used the loan to purchase new machinery and equipment, this will be registered in its fixed assets. Thus, at the aggregate level, by adding up the total assets of the two companies, the same capital is double-counted.

[5]Thus, it is expected that the ROA of the FCB sector is considerably lower compared to the NFCB sector.

of profit in order to consider the final return obtained by corporations, and, therefore, the signal that these receive to carry out investment decisions. However, by definition, profits after tax correspond to the sum of net dividends—that is, dividends paid minus dividends received—plus undistributed profits. Since we are mainly interested in capturing the profits generated and distributed by each sector, we add back dividends received, which we obtain from the BEA-NIPA, Table 7.10. Therefore, we consider a definition of profits after tax that corresponds to dividends paid plus undistributed profits. This is the numerator that we employ for the construction of both the ROE and ROA.

With respect to the denominator of the ROE and the ROA, we considered data for the balance sheets of the FCB and NFCB sectors obtained from the OECD. Specifically, we used Table 9B, which contains the balance sheets for nonfinancial assets, and Table 0720, which shows the financial balance sheet data. The combination of these two tables corresponds to the total balance sheet for each sector. From these tables we obtain the time-series data for net worth and total assets for the NFCB and FCB sectors needed to compute the ROE and ROA, respectively.

It is important to clarify the measurement of the net worth that we obtain from the OECD data. According to the 2008 SNA methodology, corporate equities are included in the liabilities side of the balance sheets (as in Table S.5.a, published by both the BEA and the FED). As mentioned above, this sometimes yields values for the net worth that are negative or close to zero. As stated in the 2008 SNA, 'net worth of corporations is calculated in exactly the same way as for other sectors, as the sum of all assets less the sum of all liabilities. In doing so, the value of shares and other equity, which are liabilities of corporations, are included in the value of liabilities' (United Nations , 2009, pp. 268-269). Hence, to account for net worth in a way that represents the own funds of corporations, the 2008 SNA proposes to calculate net worth as 'the sum of its assets less the sum of its liabilities other than shares' (United Nations , 2009, p. 269). This is also the definition of net worth that we consider.[6]

Regarding the measurement of the dividend yield, we consider dividends paid as the numerator, which we obtain from the BEA-NIPA, Table 7.10. For the denominator, we obtain data for corporate equities from Table L.223 of the Financial Accounts, published by the FED.

We also adjusted the data for the FCB sector as follows. Given the 2008 SNA methodology (United Nations , 2009), the central bank is included in the financial corporate business sector data. However, the FED does not behave like the rest of the financial sector, namely, central banks are not driven by a profit motive like the rest of the financial corporations. Since we are interested in analyzing the interactions between the profitability of the financial and nonfinancial corporations, it is necessary to exclude the FED to obtain more accurate measures of the ROE, ROA, and dividend yield. Therefore, we used Tables 6.16 and 7.10 from the BEA-NIPA tables to subtract the FED's profits and dividends paid, respectively; Table S.61.a from the Financial Accounts to subtract the FED's fixed assets; and Table 0720 from the OECD to subtract the FED's financial assets, liabilities and corporate equity.

[6]The Financial Accounts published by the FED also consider the same definition of net worth, as shown in Table B103. Crucially, this balance sheet is only available for the NFCB sector.

Figures 3 and 4 present the results for the ROE and ROA, respectively, for both the NFCB and FCB sectors for the period 1970Q4-2019Q4. The dividend yields for the NFCB and FCB sectors for the period 1958Q4-2020Q4 are shown in figure 5.[7]

[INSERT FIGURE 3 ABOUT HERE]
[INSERT FIGURE 4 ABOUT HERE]
[INSERT FIGURE 5 ABOUT HERE]

The ROEs depicted in figure 3 show that: (i) both rates of return have fluctuated approximately around the same magnitude—the mean of the ROE for the NFCB sector is approximately 6.21%; while it is 7.20% in the FCB sector; (ii) the ROE of financial corporations declined during the 1970s but was higher than the ROE of nonfinancial corporations[8]; (iii) since the 1980s up until the 2007-9 crisis, the ROE of both financial and nonfinancial corporations experienced an increasing tendency—more pronounced for financial corporations; and (iv) since the Great Recession, the two ROEs have been closer to each other. The latter may indicate some of the tendencies recently emphasized by Lapavitsas and Mendieta-Muñoz (2018, 2019B), who have pointed out that the Great Recession may have acted as a threshold point in the financialization of the US economy, so that the profitability of the financial sector has not recovered to its previous higher levels and that a rebalancing of the nonfinancial and financial sectors may be under way.

Regarding the ROA of the NFCB and FCB sectors shown in figure 4, it is possible to observe that the ROA of financial corporations is much lower than the ROA of nonfinancial corporations: the sample mean of the ROA for the NFCB sector is 2.71%; while for the FCB sector is 0.66%. As mentioned above, this is not surprising given the higher leverage ratio of the FCB sector, which characterizes the nature of this sector. We can also observe: (i) a high co-movement between the cyclical fluctuations of the two series; and (ii) that the ROA in both sectors experienced a similar decline during the period 1970-1990 and a similar increase since the 1990s.

Finally, the shareholder's dividend yields plotted in figure 5 also exhibit similar trajectories, a result associated with the nature of stock markets. Shares are constantly purchased and sold based on the expectations of their rate of return, both as speculative behavior and long-term investments. The arbitrage behavior of the agents involved in the stock market looking for the highest rates of return is a force that generates similar patterns in the dynamics of the dividend yield of both sectors. It is also worth pointing out that: (i) the peaks in the dividend yield of both sectors coincide with recessionary periods[9];

[7] A limitation of our dataset is that not all the series of interest are available at quarterly frequencies, namely, the data contained in Tables 7.10, 9B, and S.61.a is only available at annual frequencies. This reduces the sample size considerably, which can affect the inference associated with wavelet analysis (see section 3). Therefore, we used a simple linear interpolation to obtain quarterly time series for this subsection of the data set.

[8] By contrast, Duménil and Lévy (2004, 2011) found that the rate of profit of the nonfinancial sector was higher than the profit rate of the financial sector for the period 1961-1986. In this sense, our results are closer to the ones presented by Bakir and Campbell (2013), who also found that the ROEs for both sectors frequently cross each other.

[9] This may be associated with the stronger response of the price of shares relative to dividends paid by companies during a recession. A drop in the price of shares decreases the value of corporate equities, which

and (ii) the dividend yield in the FCB sector is higher than the one in the NFCB sector during the whole period—the average return is 6.77% in the FCB sector; whereas it is 4.04% in the NFCB sector.[10]

3 Methodology

As described by Aguiar-Conraria and Soares (2014) and Torrens and Compo (1998), several questions about the evolution of economic time series data are connected to understanding their behavior at different frequencies. Wavelet analysis represents an alternative to study time series considering both the time domain and the frequency domain. This allows us to identify how the different period components of a time series have evolved over time via univariate analyses, and to capture the possible time-varying relationships between variables across different frequencies via multivariate analyses.[11]

A wavelet is a function that oscillates around the t-axis, but that loses strength as it moves away from the center, thus behaving like a small wave. Hence, wavelet analysis requires the choice of a wavelet function, which should be evaluated according to the trade-off between accuracy in the time-space and the frequency space. Following Aguiar-Conraria and Soares (2014) and Aguiar-Conraria et al. (2020), we select the following Morlet wavelet, $\psi(t)$, because of its optimal joint time-frequency concentration and excellent compromise between time and frequency accuracy:

$$\psi(t) = \pi^{-1/4} e^{6it} e^{-t^2/2}. \tag{1}$$

Given $\psi(t)$ and a time series of interest, $x(t)$, the continuous wavelet transform[12],

corresponds to the denominator of the dividend yield. If corporate equities fall more drastically than paid dividends—the numerator of the dividend yield, then the dividend yield would rise.

[10] More research is needed to understand the sustained difference in the level of these two series. A plausible hypothesis may be related to the differences in the heterogeneity of the firms in the FCB and NFCB sectors, so it may be necessary to consider the proportion of closely held corporations in each sector. Since paying dividends may result in double taxation for the owners, most closely held corporations do not pay dividends. However, these corporations are included in the aggregate data set, even if their paid dividends are zero. At the same time, their corporate equities are also included, thus affecting the denominator, which leads to a lower dividend yield level. If the nonfinancial sector were composed of a higher proportion of these companies than the financial sector, the aggregate measurement of the dividend yield would be lower for the NFCB sector relative to the FCB sector (as shown in figure 5).

[11] Wavelets are defined over a finite window in the time domain, which is re-sized according to the frequency of interest. The high-frequency movements of a time series can be isolated by using a short time window, whereas the low-frequency dynamics can be isolated by considering a large time window. Therefore, it is possible to analyze simultaneously both the time-varying and frequency-varying features of time series data by changing the size of the time window.

[12] There are two main kinds of wavelet transforms: discrete wavelet transforms and continuous wavelet transforms. The use of continuous wavelet analysis in economics has been growing rapidly, as documented by the outstanding survey of Aguiar-Conraria and Soares (2014). Selected recent contributions include Aguiar-Conraria et al. (2020), who focus on Okun's law in the US economy; Barrales-Ruiz and von Arnim (2017), who study the Goodwin pattern in the USA; Mandler and Scharnagl (2022), who focus on the cross-country dimension of financial cycles for six euro area countries; Si et al. (2019), who explore the relationship between the stock market cycle and business cycle in China; and Verona (2016, 2020), who studies the US financial cycle, and the relationship between investment, Tobin's Q and cash flow in the USA, respectively.

$W_x(\tau, s)$, is the function that projects the series into the time-frequency space, that is:

$$W_x(\tau, s) = \frac{1}{\sqrt{|s|}} \int_{-\infty}^{\infty} x(t) \overline{\psi} \left(\frac{t-\tau}{s} \right) \mathrm{d}t, \tag{2}$$

where s is a scaling parameter over the frequency space and τ is a translation parameter over the time space, which control the width and the location along the t-axis of the function $\psi\left((t-\tau)/s\right)$, respectively.[13]

Following equations (1) and (2), it is possible to employ different wavelet measures.[14] First, for the univariate analysis of each of the measures of profitability, we use the wavelet power spectrum, WPS_x:

$$WPS_x = W_x \overline{W_x} = |W_x|^2, \tag{3}$$

which yields a measure of the variance distribution of $x(t)$ in the time-frequency plane by plotting frequencies against time, thus allowing us to identify the dominant frequencies of $x(t)$ and how these have changed over time.

Second, in order to study the relationship between the profit rates in the NFCB and FCB sectors in the time-frequency domain, we use: (i) the complex wavelet coherency, R_{yx}, which allows us to observe the correlations of the series at different frequencies over time; and (ii) the wavelet phase difference, ϕ_{yx}, which allows us to obtain information on the possible delays between the oscillations of the two series as a function of time and frequency—that is, the lead-lag relationship of the series decomposed at different frequency bands.

Considering the two series of interest, $x(t)$ and $y(t)$, the R_{yx} corresponds to:

$$R_{yx} = |\varphi_{yx}| = \frac{|S_{yx}|}{\sigma_x \sigma_y}, \tag{4}$$

where φ_{yx} is the complex wavelet coherency between $x(t)$ and $y(t)$[15]; S_{yx} is the smoothed cross-wavelet transform between $x(t)$ and $y(t)$, that is, $S_{yx} = S\left(W_{yx}\right)$; and σ_x and σ_y are the square roots of the smoothed wavelet power of each of the two series, that is, $\sigma_x = \sqrt{S\left(|W_x|^2\right)}$ and $\sigma_y = \sqrt{S\left(|W_y|^2\right)}$, respectively.

Finally, the ϕ_{yx} is defined in equation (5):

$$\phi_{yx} = \arctan\left(\frac{\Im\left(\varphi_{yx}\right)}{\Re\left(\varphi_{yx}\right)} \right), \tag{5}$$

such that $\phi_{yx} \in (-\pi, \pi]$; and $\Re$ and $\Im$ are the real and imaginary parts of φ_{yx}, respectively.

To summarize, in our empirical analysis, we use the WPS_x shown in equation (3) to identify: (i) the dominant frequencies of the profit rate of the nonfinancial sector and the profit rate of the financial sector; and (ii) how these frequencies have changed over time for each measure of profitability. We then use both the R_{yx} shown in equation (4) and the ϕ_{yx} shown in equation (5) to study the possible changing interactions between the rate of profit of the nonfinancial sector and the rate of profit of the financial sector over time and across frequencies.

[13] An over-bar denotes complex conjugation in all of the equations in this paper.

[14] All of the following wavelet measures are functions of the argument (τ, s), which we do not include in the equations for simplicity.

[15] The complex wavelet coherency is defined as $\varphi_{yx} = |S\left(W_{yx}\right)| / \left[S\left(|W_y|^2\right) S\left(|W_x|^2\right)\right]^{1/2}$, where S denotes a smoothing operator both in time and scale.

4 Results

We first present the results for the ROEs. The univariate analyses derived from the WPS_x for NFCB and FCB sectors are presented in figures 6 and 7, respectively; while the multivariate analysis studying the interactions between the two ROEs derived from the R_{yx} and the ϕ_{yx} is presented in figure 8.

[INSERT FIGURE 6 ABOUT HERE]
[INSERT FIGURE 7 ABOUT HERE]
[INSERT FIGURE 8 ABOUT HERE]

Figure 6 shows that the dominant cyclical component of the ROE of the NFCB sector is between 6 and 10 years, corresponding mainly to business-cycle frequencies of the economy but also to a period slightly above the standard definition of business cycles (the 10-year cycle). The graph shows that this cyclical component has changed over time. It begins with a frequency of approximately 6 years in the 1970s, its frequency slowed down in the middle of the 1980s, and then reached a frequency of around 10 years at the beginning of the 1990s. Since the 2000s, this dominant cycle accelerates again and ends up being close to 6 years by 2019. The results highlight the fact that cycles larger than the standard business cycle definition (i.e., with a period larger than 8 years) are also relevant for understanding the dynamics of the ROE of the NFCB sector.

In contrast to the ROE of NFCB sector, the WPS_x of the ROE of the FCB sector (figure 7), shows two dominant cycles. The first one is between 5 and 8 years, which also exhibits some variation over time, but less than the one in the NFCB sector. It begins around 6 years in the 1970s, and it slightly increases its frequency in the 1990s. Since the 2000s, it slows down to approximately 8 years for the rest of the period. Hence, we can see that this cycle for the FCB sector, which corresponds to business-cycle frequencies, accelerates and slows down over time in the opposite direction relative to the cycle capturing business-cycle frequencies in the NFCB sector. The second dominant cycle appears around 25 years, corresponding to long-run frequencies in the economy, and it slightly reduces its frequency over time.

The R_{yx} shown in figure 8—shown in plot (a)—shows statistically significant correlations between the cycles of the ROE for the NFCB and FCB sectors.[16] These correlations occur mainly in the 4-8 years frequency band, corresponding to business-cycle frequencies, although there is also some evidence of statistically significant correlations within the 2-4 years frequency band.

On the other hand, the ϕ_{yx} corresponding to the 4-8 years frequency band—that is, plot (c) in figure 8—shows that this cyclical component of both series moves in-phase since $\phi_{yx} \in (0, \pi/2)$ from the 1970s to the mid-1990s and $\phi_{yx} \in (-\pi/2, 0)$ from the mid-1990s to 2019. This plot also shows another result of utmost importance: from the 1970s to the early 1990s, the ROE of the NFCB sector was leading; however, there has been a shift in the lead-lag relationship of the measures of profitability: the ROE of the FCB sector has been leading the ROE of the NFCB sector since the early 1990s.

The results for the ROA are presented in figures 9 through 11 below.

[16] By definition, this measure varies between 0 and 1, and it can be considered as a direct measure of the local correlation between two time series in the time-frequency space. Graphically, an area of high correlation appears as a red area, and low correlations are shown as blue areas.

[INSERT FIGURE 9 ABOUT HERE]
[INSERT FIGURE 10 ABOUT HERE]
[INSERT FIGURE 11 ABOUT HERE]

Figure 9 presents the WPS_x considering the ROA for the NFCB sector, which shows similar results to the ROE for this same sector, namely, the dominant cycle is between 6 and 10 years. This cycle has a frequency of 6 years at the beginning of the period, then declines to 10 years in the middle of the 1980s, and then increases by the beginning of the 2000s. The WPS_x also detects a lower frequency cycle of approximately 20-25 years which is statistically significant over the period.

Figure 10 presents the WPS_x for the ROA of the FCB sector, which detects three statistically significant cycles over the period. The dominant cycle has a frequency of around 6 to 8 years, which has the same behavior as the dominant cycle in the ROE of the FCB sector regarding its changes in frequency over time. The second and third cycles are located in the 12-16 years and 22-25 years frequency bands.

Figure 11 presents both the R_{yx} and ϕ_{yx} between the ROA of the two sectors. It can be seen that the R_{yx} shows a high correlation between the two series, mainly within the 4-8- and 16-32-years frequency bands. Compared to the results for the ROEs, the results obtained from the R_{yx} for the ROA also show a high correlation at business cycle frequencies (4-8 years); however, the correlations obtained using the ROA are statistically significant over longer periods. Likewise, the ϕ_{yx} for the 4-8 years frequency band shows that the series move in-phase, with the ROA of the nonfinancial sector leading the ROA of the financial sector up until the beginning of the 1990s since $\phi_{yx} \in (0, \pi/2)$. Nevertheless, there has been a shift in the lead-lag relationship since then, so that the FCB sector's ROA has been leading the NFCB sector's ROA since now $\phi_{yx} \in (-\pi/2, 0)$, thus corroborating the results found for the ROE. Regarding the other statistically significant frequency band of high coherency—the 16-32-frequency band (shown in plot (e) in figure 11), the series are shown to move in-phase with the financial sector leading during the entire period.

Figures 12 and 13 present the results obtained from the WPS_x for the NFCB sector's dividend yield and the FCB sector's dividend yield, respectively. The interactions between the two dividend yields captured by R_{yx} and ϕ_{yx} are shown in figure 14.

[INSERT FIGURE 12 ABOUT HERE]
[INSERT FIGURE 13 ABOUT HERE]
[INSERT FIGURE 14 ABOUT HERE]

Figures 12 and 13 show the existence of two statistically significant cycles over the period of analysis. The first one is a 32-years cycle, whereas the second one is a cycle with a frequency of approximately 16 years.

Figure 14 confirms the high coherency between the cycles of the dividend yield of both sectors. These correlations exist over the entire frequency range, including business-cycle frequencies (4-8 years), similar to the results found for the ROE and ROA. Within this frequency band, the ϕ_{yx} shown in plot (c) also shows a shift in the lead-lag relationship between the series: from 1970, the NFCB sector's dividend yield was leading, and since the late 1990s, the FCB sector's dividend yield has become the leading series.

The main results presented in this section can be summarized as follows. First, overall, profit rates in the NFCB sector exhibit mainly one dominant cycle, which corresponds approximately to business-cycle frequencies of the economy but also to a period slightly above the standard definition of business cycles (6-10 years). Second, profit rates in the FCB sector exhibit mainly two dominant cycles, which correspond to business-cycle frequencies (5-8 years) and to long-run frequencies (20-25 years). Third, with respect to the cyclical relationship between the different rates of return, the results consistently show that the statistically significant correlation occurs mainly in the frequency of 4-8 years—which corresponds to business cycle frequencies, and that the profit rates in both sectors move in-phase. Importantly, within this frequency band, there has been a shift in the lead-lag relationship between the rates of return of the two sectors: the profit rate of the nonfinancial sector was the leading variable up until the mid-1990s; however, since then, the profit rate of the financial sector has become the leading variable.

The intuition behind this last result is the following: up until the mid-1990s, the nonfinancial sector's profitability was affected first by business cycle fluctuations (expansions and recessions) relative to the financial sector's profitability; however, the profitability of the financial sector at business cycle frequencies has now been affected first since the mid-1990s. This change in the lead-lag relationship between the profitability ratios across the two sectors illustrates the importance of the period of financialization in the USA: at business cycle frequencies, profitability in the financial sector has gained a more prominent role relative to profitability in the nonfinancial sector.

5 Concluding remarks

The purpose of this paper has been threefold: (i) to contribute to the discussion on the conceptualization and measurement of the rate of profit of the financial and nonfinancial sectors, with a special emphasis on the relevant ways in which these can be compared; (ii) to analyze the individual cyclical fluctuations over time of these two profit rates; and (iii) to study the interactions over time between the measures of profitability for the financial and nonfinancial sectors.

First, the conceptualization and measurement of the profit rate of the financial corporate sector are problems that have had few developments in the literature. The main reason seems to be related to the inherent limitations in data sets. For the US economy, the official macroeconomic accounts do not publish enough data for financial corporations, in contrast to the nonfinancial corporate sector. In this paper, we have used recently publicly available data published by the OECD, which explicitly provides data for financial corporations. We construct new measures of the rate of profit for the US financial and nonfinancial corporate business sectors by focusing on the final return obtained by each sector. Specifically, we emphasize the relevance of the return on equity since it explicitly accounts for the relative profitability that business corporations obtain with respect to their own capital invested, thus allowing for a direct comparison across sectors. We also construct two additional measures of profitability for each sector: the return on assets and the shareholder's dividend yield.

The results show novel insights regarding the dynamics of the profitability of nonfinancial and financial corporations. During the period 1970Q1-2019Q4, the returns on equity of

both sectors cross each other periodically, with the two series fluctuating approximately around the same level. The return on equity of financial corporations declined during the 1970s, but it was higher than the one for nonfinancial corporations. From the 1980s until the Great Recession, the return on equity of both financial and nonfinancial corporations experienced an increasing tendency, which was more pronounced for the former. After the Great Recession, both returns on equity have been close to each other. Regarding the return on assets for the period 1970Q1-2019Q4, the level for financial corporations has been much lower than that of nonfinancial corporations, given that the leverage ratio is much higher in the financial sector. Finally, the co-movement of the dividend yield between financial and nonfinancial corporations during the period 1958Q1-2020Q4 is higher than the respective co-movement between the return on equities or the return on assets, which may illustrate the role of the stock market arbitrage and expectations in allocating capital to the higher possible rates of return.

Second, in order to study the cyclical fluctuations of the profit rates in each sector and their respective interactions, we have used wavelet analysis. The latter allowed us to identify how the different period components of the measures of profitability have evolved over time and to capture the possible time-varying relationships between these variables across different frequencies.

For the nonfinancial corporate business sector's profit rates, the results derived from the univariate wavelet analysis show that the dominant cycle is mainly located within the business cycle frequency band, but also within a period slightly above the traditional definition of business cycles (6-10 years). This cycle had a frequency of approximately 6 years during the 1970s, it reduced its frequency to approximately 10 years during the mid-1980s, and then it accelerated its frequency since the beginning of the 2000s. For the profitability of the financial corporate business sector, the univariate wavelet analysis shows the existence of two dominant cycles, one of which is also associated with business-cycle frequencies (5-8 years); while the other one corresponds to longer-run frequencies (20-25 years). Another important difference is that the cycle associated with business cycle frequencies in the financial sector has been relatively more stable over time relative to the nonfinancial sector (that is, it has had fewer accelerations and reductions). These results highlight that business cycle frequencies dominate the behavior of profitability in both sectors; however, medium-run and long-run frequencies are also important in order to understand the dynamics of profitability in the nonfinancial and financial corporate business sectors, respectively.

Finally, the results obtained from the multivariate wavelet analysis indicate: (i) a high correlation between the cycles of the profitability measures across both sectors, namely, the series move in-phase over the business cycle—mainly within the 4 to 8 years frequency band; and (ii) an important shift in the lead-lag relationship between the profitability of financial and nonfinancial corporations: from the early 1970s until the mid-1990s, the nonfinancial sector's profitability was leading the financial sector's profitability at business-cycle frequencies; however, since the mid-1990s, the financial sector's profitability has become the leading variable. A plausible explanation for this crucial finding is that, before the mid-1990s, the profitability of the nonfinancial sector at business cycle frequencies was affected first by expansions and recessions relative to the profitability of the financial sector; however, since the mid-1990s, financial profitability has now been the

one affected first by business cycle fluctuations. These results highlight a relevant pattern associated with a structural change in the relative relevance of each sector in the US economy since the period of financialization: fluctuations in the profitability of the financial sector have been leading fluctuations in the profitability of the nonfinancial sector at business cycle frequencies.

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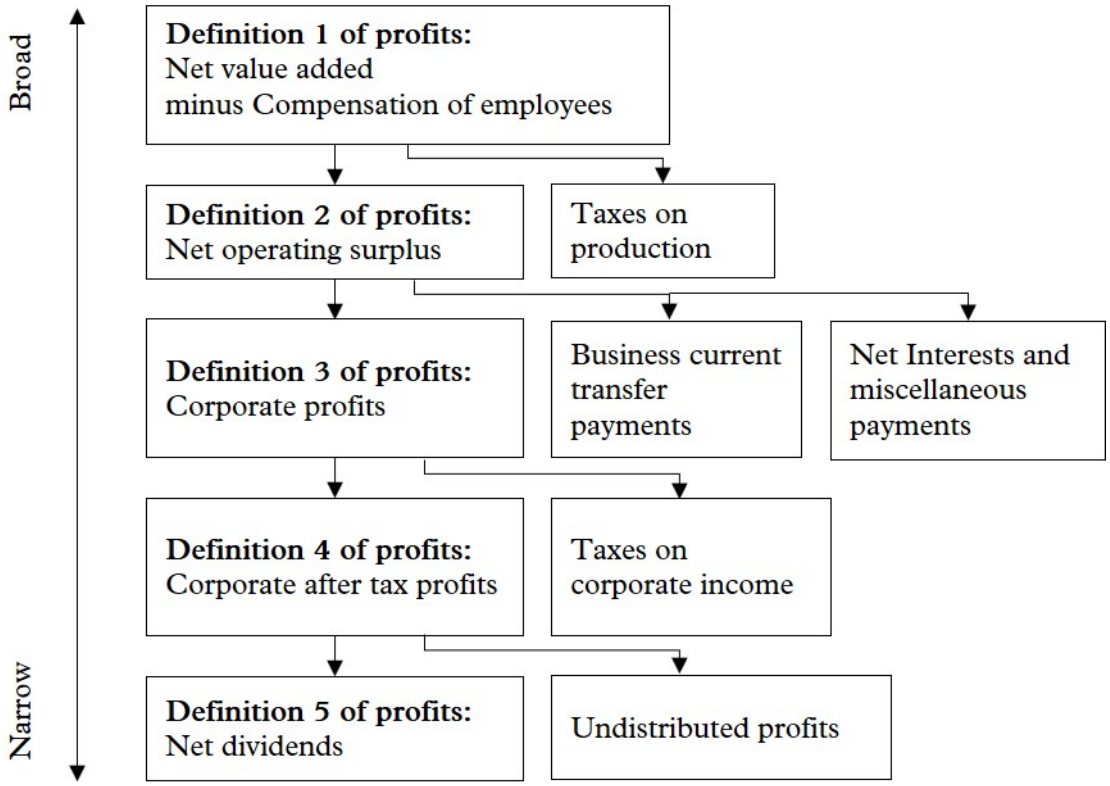

Figure 1: Different definitions of profits of corporate businesses based on the BEA-NIPA accounting methodology

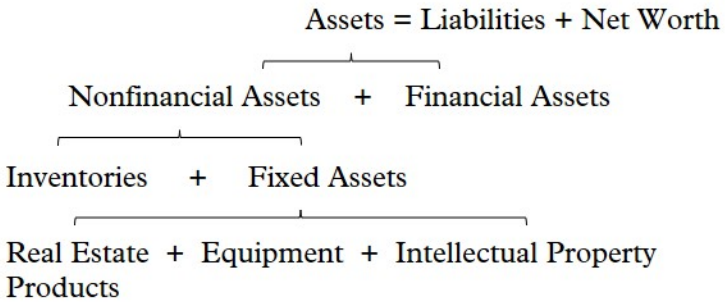

Figure 2: Main components of the balance sheet of corporate businesses

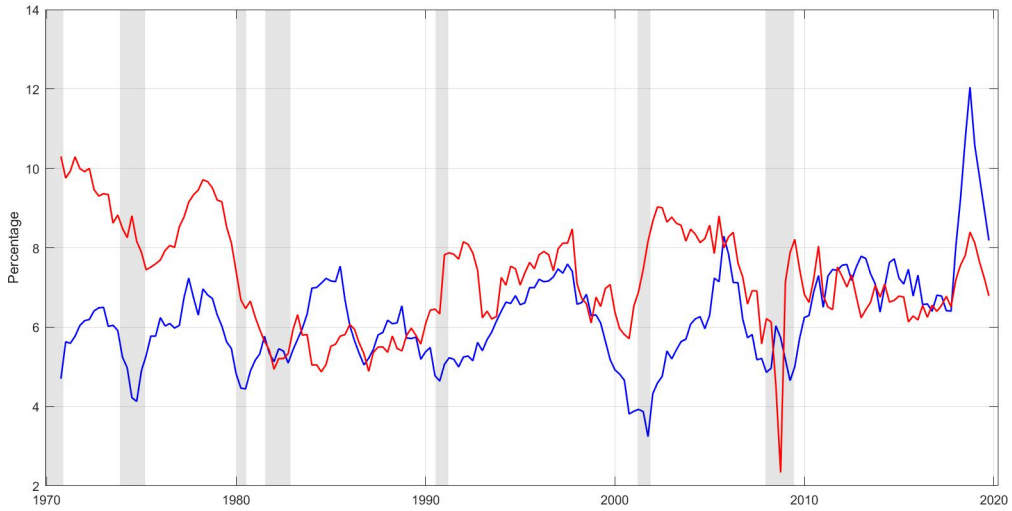

Figure 3: USA, 1970Q4-2019Q4. Return on equity (ROE) of nonfinancial corporations (blue) and financial corporations, excluding the Federal Reserve (red). Own elaboration using data from the BEA-NIPA, Tables 1.14, 6.16, and 7.10; Financial Accounts, Table S.61.a; and OECD statistics database, Tables 9B and 0720. Shaded areas indicate NBER recession dates.

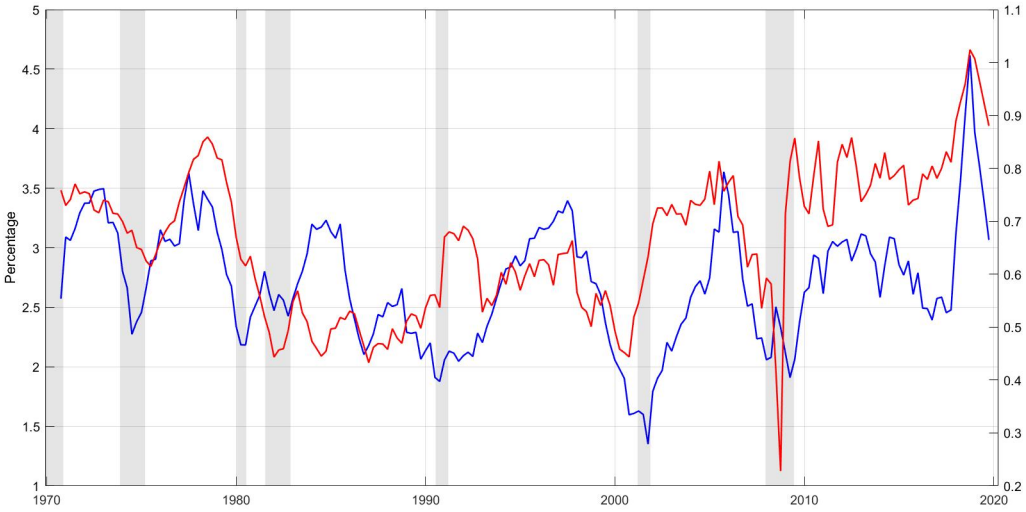

Figure 4: USA, 1970Q4-2019Q4. Return on assets (ROA) of nonfinancial corporations (blue, left axis) and financial corporations, excluding the Federal Reserve (red, right axis). Own elaboration using data from the BEA-NIPA, Tables 1.14, 6.16, and 7.10; Financial Accounts, Table S.61.a; and OECD statistics database, Tables 9B and 0720. Shaded areas indicate NBER recession dates.

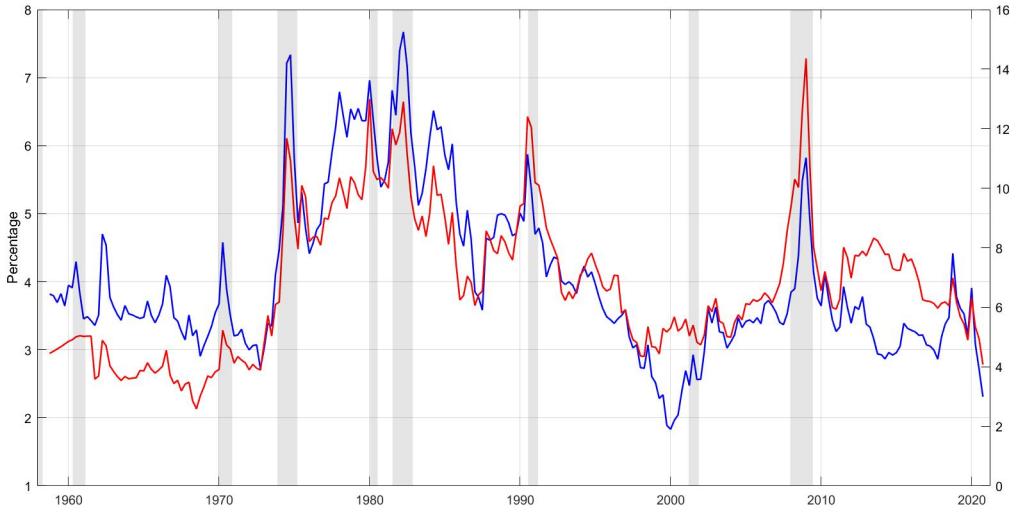

Figure 5: USA, 1958Q4-2020Q4. Shareholder's dividend yield of nonfinancial corporations (blue, left axis) and financial corporations, excluding the Federal Reserve (red, right axis). Own elaboration using data from the BEA-NIPA, Table 7.10; and Financial Accounts, Tables S.61.a and L.223. Shaded areas indicate NBER recession dates.

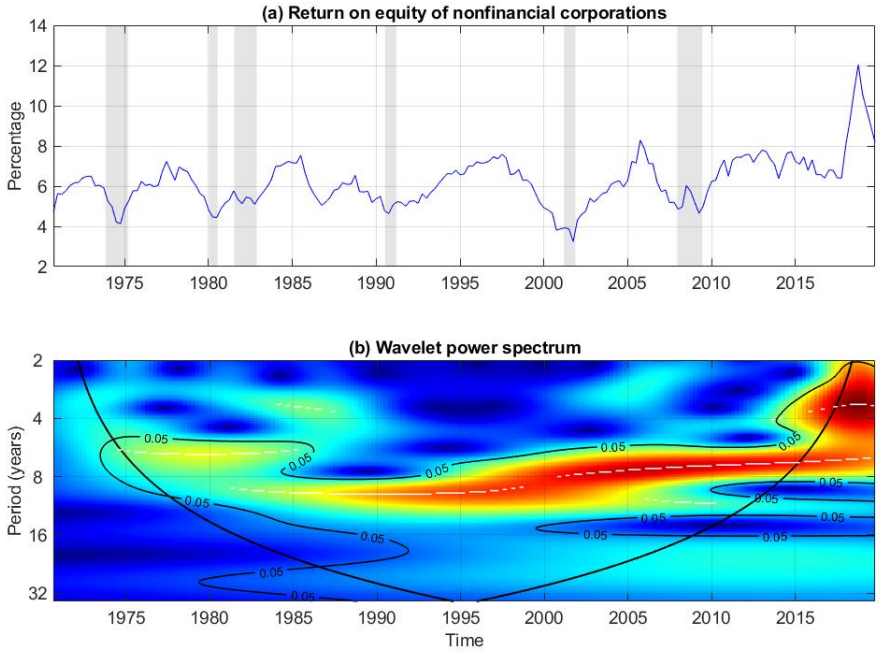

Figure 6: Return on equity (ROE) of nonfinancial corporations (plot (a)) and its wavelet power spectrum (plot (b)). The ROE in plot (a) corresponds to the blue line shown in figure 3. Shaded areas indicate NBER recession dates.

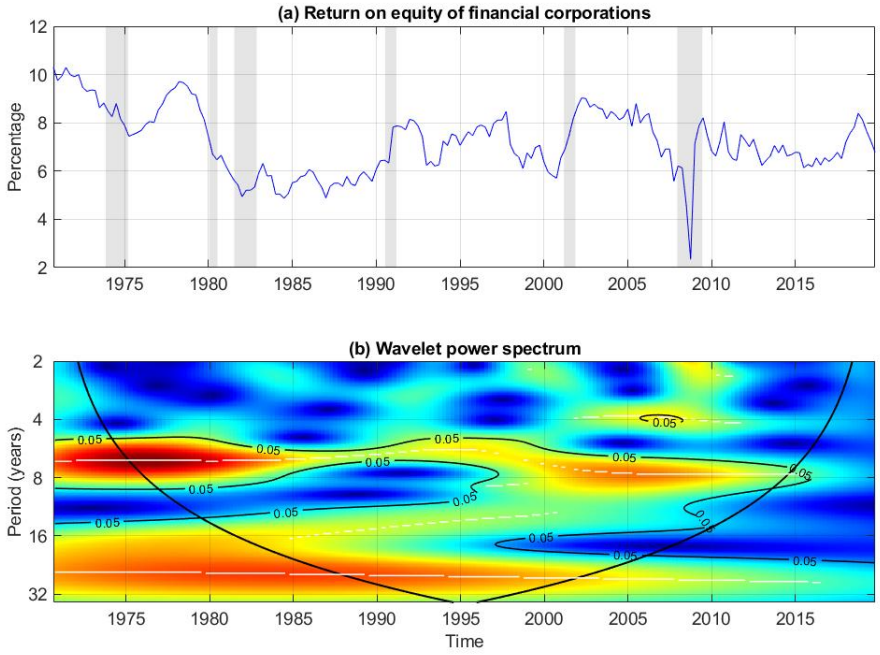

Figure 7: Return on equity (ROE) of financial corporations (plot (a)) and its wavelet power spectrum (plot (b)). The ROE in plot (a) corresponds to the red line shown in figure 3. Shaded areas indicate NBER recession dates.

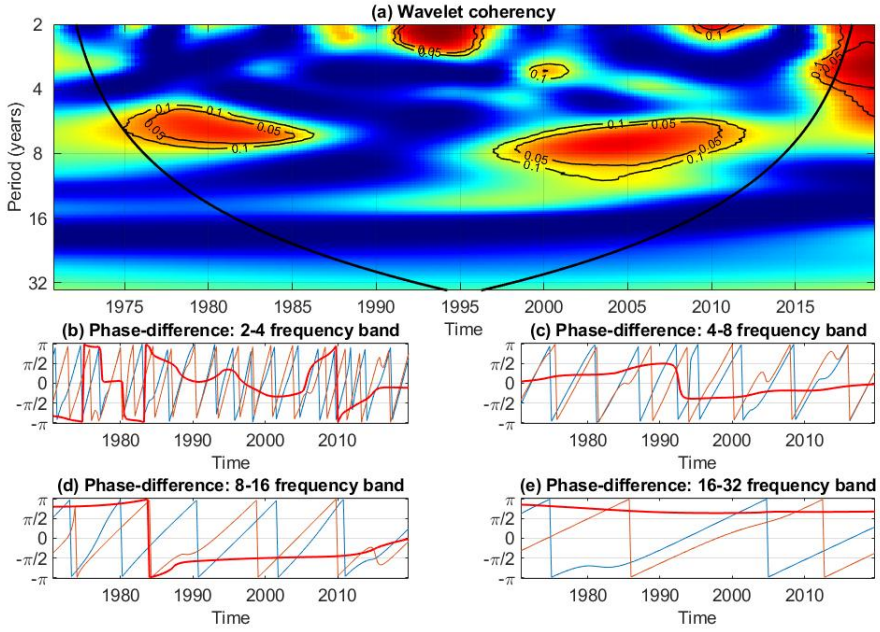

Figure 8: Complex wavelet coherency (plot (a)) and wavelet phase difference in four frequency bands (plots (b) through (e)) for the return on equity (ROE) between nonfinancial and financial corporations. The ROE for nonfinancial and financial corporations correspond to the blue and red lines shown in figure 3, respectively.

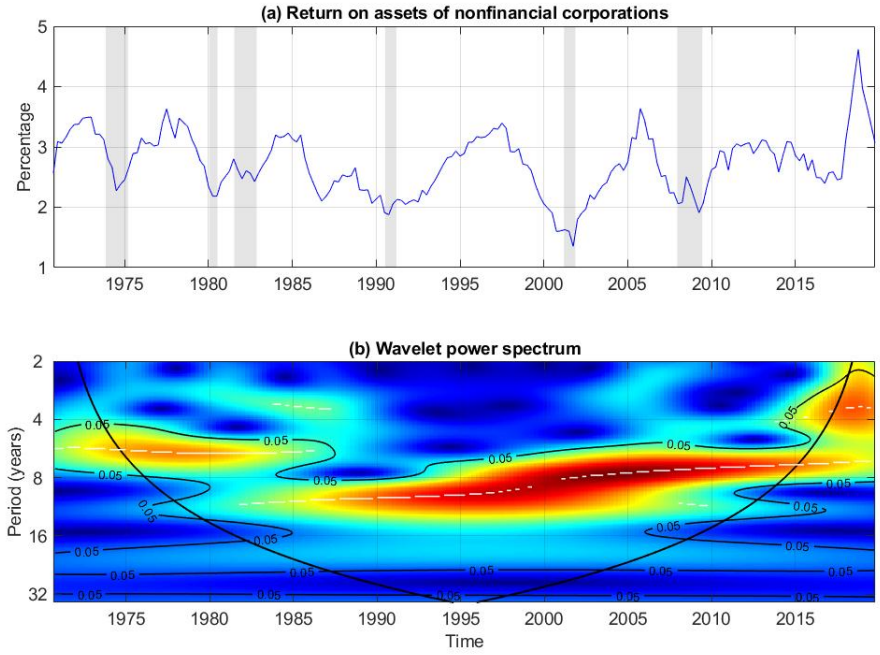

Figure 9: Return on assets (ROA) of nonfinancial corporations (plot (a)) and its wavelet power spectrum (plot (b)). The ROA in plot (a) corresponds to the blue line shown in figure 4. Shaded areas indicate NBER recession dates.

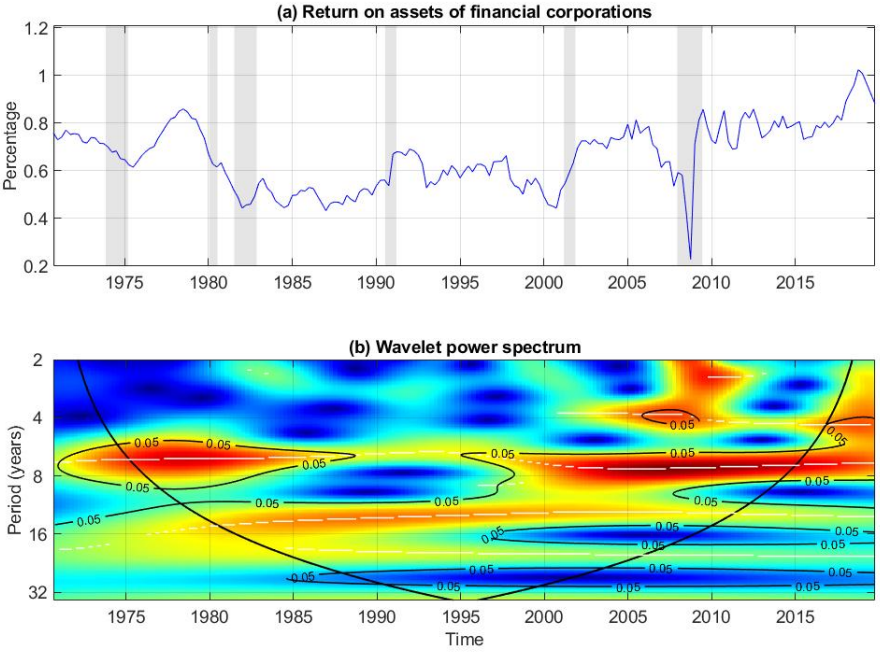

Figure 10: Return on assets (ROA) of financial corporations (plot (a)) and its wavelet power spectrum (plot (b)). The ROA in plot (a) corresponds to the red line shown in figure 4. Shaded areas indicate NBER recession dates.

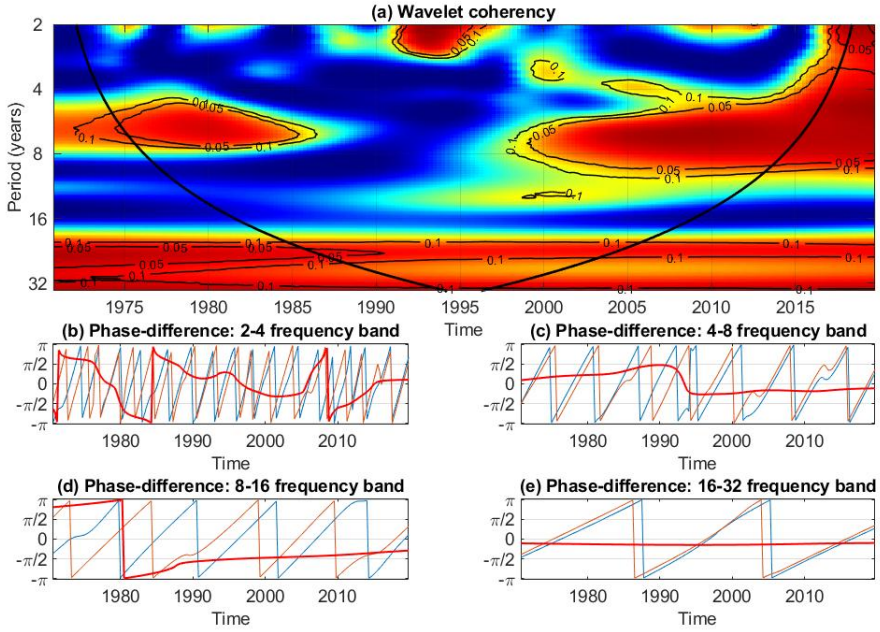

Figure 11: Complex wavelet coherency (plot (a)) and wavelet phase difference in four frequency bands (plots (b) through (e)) for the return on assets (ROA) between nonfinancial and financial corporations. The ROA for nonfinancial and financial corporations correspond to the blue and red lines shown in figure 4, respectively.

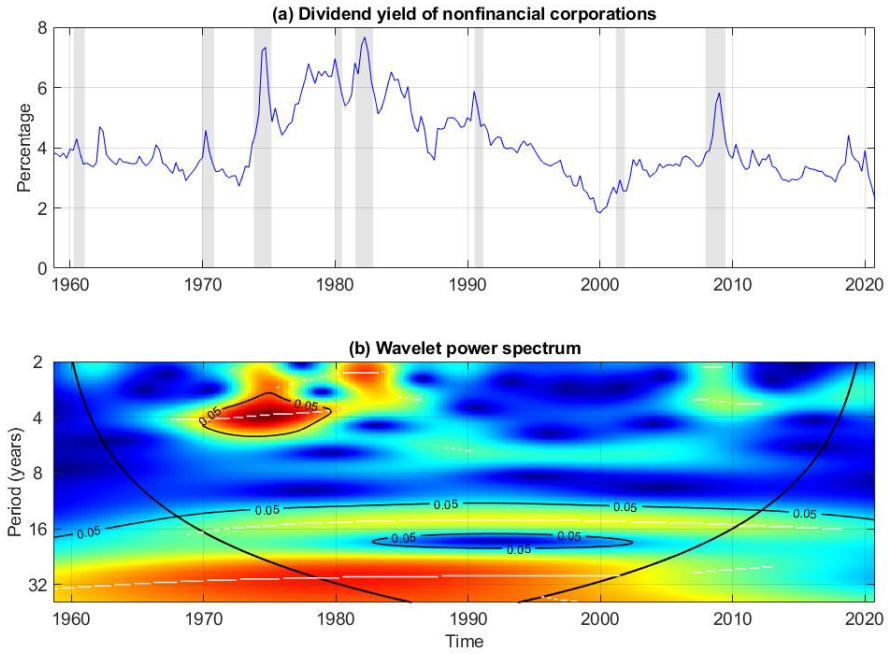

Figure 12: Shareholder's dividend yield of nonfinancial corporations (plot (a)) and its wavelet power spectrum (plot (b)). The dividend yield in plot (a) corresponds to the blue line shown in figure 5. Shaded areas indicate NBER recession dates.

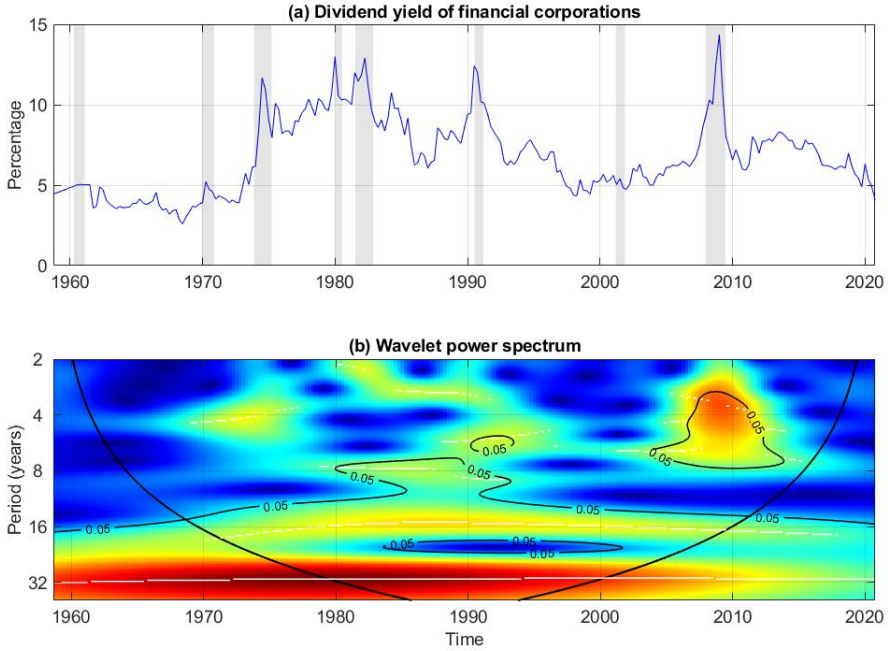

Figure 13: Shareholder's dividend yield of financial corporations (plot (a)) and its wavelet power spectrum (plot (b)). The dividend yield in plot (a) corresponds to the red line shown in figure 5. Shaded areas indicate NBER recession dates.

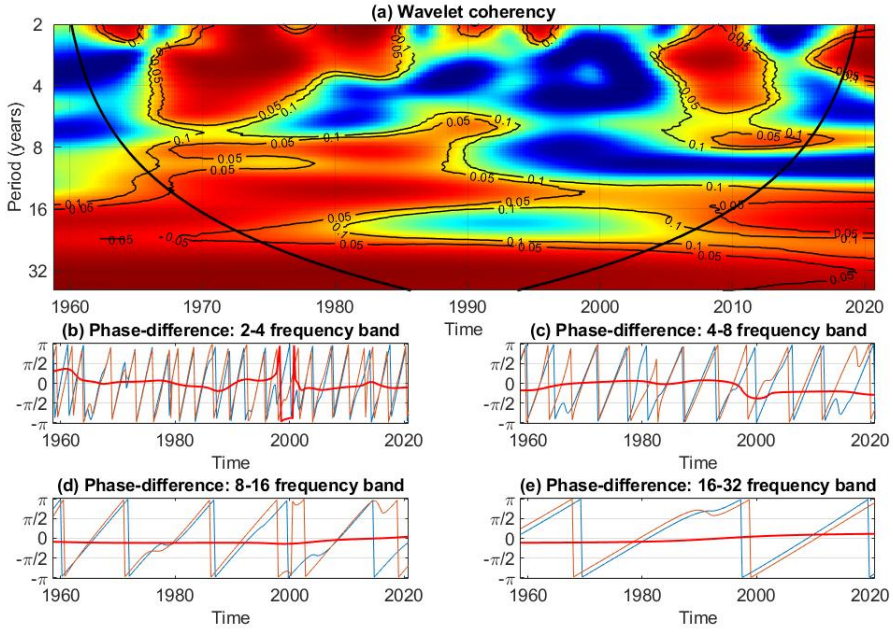

Figure 14: Complex wavelet coherency (plot (a)) and wavelet phase difference in four frequency bands (plots (b) through (e)) for the shareholder's dividend yield between nonfinancial and financial corporations. The dividend yield for nonfinancial and financial corporations correspond to the blue and red lines shown in figure 5, respectively.