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Review

Cyclical capital structure decisions

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A B S T R A C T

Past literature has documented clear trends in the leverage ratio and other capital structure choices made by US firms. We expand this line of research by showing that aggregate capital structure ratios of US firms, during the last decades, are characterised not only by time trends but also by clear cycles. We set the start and end dates of these cycles using a 'classical approach'. The cycles relating to the ratio of new shares versus debt are shorter and are more intense than the cycles regarding the term of the new debt obligations. The cycles that describe the ratio of retained earnings versus new equity issues are wider in relative terms and with similar duration to the cycles of decisions on external versus internal financing. This means that the decision to substitute debt for shares (or vice versa) is much more common, frequent and significant, than the decision term debt.

1. Introduction

Capital structure, which refers to the mix of financing sources that a corporation prefers (or is able to hold), is a widely studied topic in the corporate finance literature. We introduce the concept of 'capital structure cycles' which explains the temporal dynamics of the three main decisions on financing composition made by firms: i) the split of total financing between new shares issued and new debt obligations; ii) the division of new debt between the short- and long-term; and iii) the division of total new equity financing between retained earnings and shares issued.

We date these aggregate cycles, study their dynamics in terms of duration, amplitude and symmetry, following a branch of the literature on macroeconomics, known as the 'classical approach to measuring business cycles', which has several advantages over other competing methodologies based on filters and detrending techniques.

Our contribution is relevant because capital structure, and hence its cycles, may impact diverse aspects of a firm's strategy such as decisions about pricing policy (e.g., Pichler et al. 2008), how a firm interacts with labour unions (e.g., Bronars & Deere, 1991), or even its propensity to carry out innovative projects (Lin et al., 2008; Lang et al., 1996).

The rest of this paper consists of the review of the literature in Section 2; the methodology in Section 3; description of our data in Section 4, which comprises the universe of firms with information available in the Compustat database from 1963 to 2018; the presentation of our main results in Section 5; and the conclusions and limitations of our study in Section 6.

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2. Literature review and contribution

Observed capital structures made by firms have been explored in the extant literature from two complementary perspectives: i) cross-sectional determinants of the observed financing mix, which refer to differences among firms that explain variations in capital structure choices and, heterogeneous patterns observed in the data, for example across industries; and ii) time-series determinants of capital structure, which mainly refer to recurrent factors that affect companies at different life stages, which generally are thought to keep them from exhibiting their preferred target levels of leverage. For instance, it has been studied how firms' characteristics, such as their size or asset tangibility, help explain their observed capital structure, or how a firm's life events may cause it to be over-leveraged (or under-leveraged) in relation to its preferred leverage targets. Such events are mainly associated with 'market timing' opportunities that the company would aim to exploit; the cyclicality of a firm's profitability; or significant changes in expected future earnings, which are reflected in the current market prices. See Parsons and Titman (2007) for a review.

There are three main models for understanding capital structure choices made by companies: the pecking order theory, the trade-off model, and the market conditions model. Their predictions vary, as the three of them naturally differ about the assumptions made regarding the presence of taxes, transaction costs, asymmetric information, or different kinds of market incompleteness (see for instance Baker & Wurgler, 2002; Tsyplakov, 2008; Morellec & Schürhoff, 2011; Katagiri, 2014; Li and Mauer, 2016). Seeking to unify and organise some of the testable predictions of the most popular capital structure theories within a single framework, Fama and French (2012) developed a simple, yet complete, regression architecture that may potentially nest the three theories and that could be easily expanded to nest other theories, similarly. Their framework consists of three pairs of cross-section regressions focused on distinct aspects of capital structure decisions, which we study below: the split of total new external financing between shares issued and debt obligations; the division of new debt between short- and long-term; and the division of total new equity financing between retained earnings and shares issued.

Fama and French's framework is, however, static. That is, it was developed to test cross-sectional differences between firms' capital structure choices, or at most, different timing opportunities that are not common to all firms and hence depend on firms' idiosyncrasies. The kind of idiosyncrasies that are indeed at the core of the recent literature such as: different executive compensation policies (Freund, Latif, & Phan, 2018), firm's age (Kieschnick & Moussawi, 2018), ownership structure (Díaz-Díaz, Garcia-Teruel, & Martinez-Solano, 2016), or information environment in the location of a firm (An, Li, & Yu, 2015), to mention some recent notable examples. Fama and French's framework says nothing about the common time variations in the aggregate of firms, which are nevertheless a fundamental part of the explanation of a firm's observed capital structure, as emphasised by DeAngelo and Roll (2015) and Graham, Leary and Roberts (2015).

These latter studies put forward a convincing claim about the importance of common time-varying determinants explaining firms' leverage ratios. On the one hand, DeAngelo and Roll (2015) show that leverage cross-sections more than a few years apart differ markedly, with similarities evaporating as the time between them lengthens. Those authors document that time-series effects common to all firms have substantial explanatory power. On the other hand, those results are strongly supported by Graham et al. (2015), who find that unregulated US corporations dramatically increased their debt usage over the past hundred years, contrary to the popular belief at the time that it had remained stable. The authors also document the inability of firms' changing characteristics to explain this fact and they analyse the role of time-varying macroeconomic factors such as changes in government borrowing, financial sector development and even macroeconomic uncertainty, to explain leverage ratios. They find that, indeed, two of these factors (financial development and macroeconomic uncertainty) have had an important role in explaining firms' leverage. Other authors have also studied how macroeconomic conditions affect the capital structure (see Korajczyk & Levy, 2003; Hackbarth, Miao, & Morellec, 2006; Dittmar & Dittmar, 2008; Bhamra, Kuehn, & Strebulaev, 2010; Karabarbounis, Macnamara, & McCord, 2014; Daskalakis, Balios, & Dalla, 2017; Begenau & Salomao, 2019; Demirgüç-Kunt, Martinez, & Tressel, 2020; Restrepo, Uribe, & Manotas, 2020; Gómez-González, Hirs, & Uribe, 2022). Also, other studies have documented a relationship between the business cycle and capital structure (see Dasgupta, NOE & Wang, 2011; Halling, Yu, & Zechner, 2016; Levy & Hennessy, 2007).

The closest study to ours is due to Al-Zoubi, O'Sullivan, and Alwathnani (2018) who conduct a periodogram-based analysis of firms' leverage. Their results emphasise that firms tend to change their capital structure in response to business cycles, and that such dynamics may be theoretically suggested by the trade-off, pecking order and, market timing models. According to these authors leverage is cyclical and persistent, and for this reason in sharp contrast to the mean reversion prediction of the trade-off theory, or to overpricing dynamics that emerge from temporary financial cycles, as implied by the pecking order theory. In sum, their results point to persistent and cyclical leverage.

In our study, we further expand this line of the literature by directly investigating the properties of the dynamics of capital structure choices in the aggregate over time, without resorting to *filtering* the data, which is problematic and may induce spurious correlations between the variables analysed (see Canova (1998)). Moreover, we aim to expand the analysis beyond leverage ratios, and compare the cyclical dynamics of the term of the debt and the distribution of earnings with that of leverage. Unlike previous literature, our aggregate capital structure variables reflect *marginal decisions* made on a yearly basis instead of the product of decisions cumulated over several years and perhaps decades, which is the case when one computes leverage ratios and averages them in the cross-section of firms. Instead, we use paired regressions that allow us to focus on changes and therefore on marginal financing decisions, as we will see. Then, we date the cycles of capital structure by the first time, using a classical approach, instead of resorting to filtering techniques; we describe their properties in terms of amplitude, duration and symmetry, and analyse them with respect to past important macroeconomic and political events observed during the last six decades, which is novel to the literature.

In other words, although the referenced studies directly imply that capital structure is time varying, which in turn can be seen as a consequence of underlying macroeconomic factors that determine the availability of financing sources, and also firms' preferences for a specific source of financing, they do not address the question about the shape of this variability (e.g. amplitude, duration and symmetry of their cycles). For example, Graham et al. (2015) document changes in the “trend” of corporations’ leverage levels, but they say nothing about whether such changes are cyclical, which means they are characterised by peaks followed by troughs of leverage, as occurs in the business cycles of the macroeconomic literature. This is crucial for understanding common determinants of capital structure choices. The presence of these cycles would mean that capital structure choices might not be a matter of choice after all, but rather, are determined by general underlying macro states like market liquidity, financing opportunities, macroeconomic uncertainty, and so on. Understanding this is, in turn, fundamental for asset-liability management, and also useful from the point of view of a policy maker seeking to identify the full effects of monetary and fiscal policies on investment dynamics, which are of course cyclical in nature.

3. Methodology

To identify the cycles in our variables we draw inspiration from the classical approach to dating business cycles in macroeconomics, pioneered by Bry and Boschan (1971) and more recently revisited by Harding and Pagan (2002, 2006). This approach provides a robust alternative to the techniques based on ‘filtering’, which are also frequently employed in that branch of macroeconomics The pitfalls that can arise in the construction of an ’optimal’ filter and the level of uncertainty associated with the selection of a specific filtering technique in applied work are well-documented (see Canova, 1998, 2007). In section 3.1 we describe how we construct our variables on capital structure, and in section 3.2, we describe the way in which we date the cycles.

3.1. Construction of the variables

We follow Fama and French (2012). Unlike them, we estimate our regressions year by year (instead of averaging across time) and report our results, accordingly. These authors develop paired regressions that describe three different types of firm financing decisions: i) the division of new external financing between shares issued and debt, ii) the division of new debt obligations between short- and long-terms, and iii) the division of new equity financing between shares issued and retained earnings. The proposed regressions are based on basic cash flow constraints that describe the flows between sources and uses of funds.

i) shares issued against debt

According to Fama and French (2012) we can start from cash flow constraint given by:

$$dS_t + dL_t = dA_t + D_t - Y_t \tag{1}$$

Eq. (1) above is used to conduct a pair of regressions that show the division of new external financing. dS_t refers to the change in the book value of common stocks issued during fiscal year t; dL_t regards the change in liabilities, including preferred stocks within a year; dA_t is the new total investment, defined as the yearly variation in assets; D_t refers to paid dividends; and Y_t means yearly earnings. d denotes a yearly change, thus we are analysing decisions made within a year. The pair-regressions that we fit to the data in this case are the following:

$$dS_t = a + b_1 dA_t + b_2 D_t + b_3 Y_t + e_t \tag{2}$$

$$dL_t = a^* + b_1^* dA_t + b_2^* D_t + b_3^* Y_t + e_t^* \tag{3}$$

The coefficients in Eq. (3) are restricted by the cash flow identity, so that $a^* = -a$, $b_1^* = (1 - b_1)$, $b_2^* = (1 - b_2)$, and $-1 = b_3^* + b_3$. Note that the coefficient before the change in assets (investment) might be interpreted as the weight of the corresponding financing source: shares (Eq. (2) or debt (Equation (3).

ii) Division of new debt financing between short- and long-term obligation

We use this time a different cash flow constraint:

$$dSTD_t + dLTD_t = dA_t + D_t - Y_t - dS_t \tag{4}$$

$dSTD_t$ refers to the change in short-term debt obligations, that is, the variation in current liabilities during year t. $dLTD_t$ is the change in long-term debt for year t, estimated as the residual of total minus current liabilities.dS_t is the change in outstanding shares in the year t. According to (4), we can use the following two equations to run our complementary regressions:

$$dSTD_t = a + b_1 dA_t + b_2 D_t + b_3 Y_t + b_4 dS_t + e_t \tag{5}$$

$$dLTD_t = a^* + b_1^* dA_t + b_2^* D_t + b_3^* Y_t + b_4^* dS_t + e_t^* \tag{6}$$

In Eqs. (5) and (6) the coefficients associated with variables dA_t, D_t, Y_t, and dS_t indicate how, on average, these variables are divided between short- and long-term financing. In this case it also holds that $a^* = -a$, $b_1^* = (1 - b_1)$, $b_2^* = (1 - b_2)$, $b_3^* = -(1 + b_3)$ and $b_4^* = -(1 + b_4)$.

iii) Shares issued and retained earnings

A third pair of cash-flow equations refers to the divisions between retained earnings and new equity. Given that earnings are not a variable a firm can choose freely, the analysis of retained earnings is conducted through the analysis of dividends:

$$dS_t - D_t = dA_t - Y_t - dL_t \quad (7)$$

The third cash flow constraint in Eq. (7) expresses that investment that is not funded by earnings or new debt must be secured through net share issuance- shares issued minus dividends. In this case the pair regressions taken to the data are:

$$D_t = a + b_1 dA_t + b_2 dL_t + b_3 Y_t + e_t \quad (8)$$

$$dS_t = a^* + b_1^* dA_t + b_2^* dL_t + b_3^* Y_t + e_t^* \quad (9)$$

Note that $a^* = a$, $b_1^* = (1 + b_1)$, $b_2^* = (b_2 - 1)$, and $b_3^* = (b_3 - 1)$.

3.2. Setting the dates of the cycles

There are different definitions of what constitutes a "cycle" in macroeconomics, alongside different ways of optimally dating them. Harding and Pagan (2005) identify three: i) the first tradition, also known as the "classical" approach, following Burns and Mitchell (1946), proposes dating a cycle by the presence of a breakpoint in a continuous variable that contains information about the economy at a given time, which is called y_t. In this strand, the general idea consists of constructing a random binary variable that takes different values according to the current phase of the economic cycle: either expansion or contraction (before or after the breakpoint respectively). ii) The second tradition focuses on what is known in the literature as "growth cycles" (Lucas, 1977; Kydland & Prescott, 1990). In this case, the idea is to separate the series y_t between a trend component and a residual. The trend component is extracted and the residual is designated as the "cycle". In this way, the cycle can be understood as reflecting deviations of the variable (usually the national product of the economy) from its long-term trend. This approximation can also be understood as an exercise of finding a peak in the spectral density of the series of the residuals. There are many statistical filters that are used for this purpose (see for instance Baxter and King (1999) and Christiano and Fitzgerald (2003)). iii) Finally, Blinder and Fischer (1981) propose another way to identify cycles, through the determination of the serial correlation in the series of residuals. This approach is widely followed by macroeconomists in the fields of dynamic stochastic general equilibrium models. Nevertheless, the latter two approaches, which rely on the extraction of a stochastic trend from the data to identify the cycles, have been subjected to strong criticism, due to the fact that statistical filters used for detrending do not conserve many of the original characteristics of the time series under study, and therefore they do not allow a robust identification of the economic cycles [see Canova (1998)].

We aligned in this document with the first tradition, the classical dating approach. Within this view, the most widely used technique for dating cycles is the algorithm proposed by Bry and Boschan (1971) which serves to detect local maxima and minima for reference time series, subject to certain rules of censorship. The identified points are considered peaks and troughs that represent breakpoints in the series and differentiate expansions of contractions on it. The technique has been expanded more recently by Harding and Pagan (2002, 2005) and applied for instance, in recent works by Canova and Schlaepfer (2015).

Bry–Boschan's methodology can be summarised as follows: consider an observation y_t that is a candidate to be a peak of the series if $y_t \in \max\{y_{t-2}, y_{t-1}, y_t, y_{t+1}, y_{t+2}\}$, while it is a candidate for a minimum if $y_t \in \min\{y_{t-2}, y_{t-1}, y_t, y_{t+1}, y_{t+2}\}$. Some additional restrictions must be imposed in the identification process to guarantee meaningful results:

a) Peaks and troughs must alternate. In case of a violation, the largest peak is retained, and all of the others are eliminated.
b) A peak (trough) must be greater (less) than the prior trough (peak).
c) The minimum length from peak to peak is five years.
d) Breakpoints which occur between the first two years or the last two years are eliminated.
e) The peaks (troughs) at the beginning or the end of the sample that are lower (higher) than the baseline values (final) are dropped.

4. Data

All data used in our regressions were retrieved from Compustat. The study sample has a yearly frequency and from 1963 to 2018. Table 1 presents descriptive statistics for the cash-flow variables included in our empirical models. We have excluded firms with information missing in a given year. All variables in the table are divided by assets at the end of fiscal year t, and multiplied by 100. In order to build the table, yearly means, standard deviations (s.d.) and skewness (skew) are estimated, and after this we average across

Table 1
Summary statistics of capital structure decisions.

	dCSTt	dAt	dSt	dLt	dSTDt	dLTDt	Yt	Dt
Average	4.71	8.48	5.11	3.77	2.19	1.58	0.89	1.29
Average s.d.	21.99	23.14	20.08	20.75	14.40	17.18	17.58	4.41
Average skew.	1.72	−0.14	5.98	−1.94	−1.40′	−2.03	−1.92	16.28

time. The number of firms with complete information varies from year to year; starting in 502 (year 1963) and ending in 3653 (year 2018). The minimum is 502 and the maximum 6294. We have trimmed the annual samples, deleting 0.5% of the left-tail observations of dA_t, to avoid the influence of outliers in our OLS regressions.

In Table 1 dS_t represents the change in the book value of common stocks issued during fiscal year t; dL_t refers to the change in liabilities, including preferred stocks, also on a annual basis; dA_t is new total investment, which is defined as the yearly change in assets; D_t represents paid dividends; Y_t represents earnings in a year; $dSTD_t$ is the change in short-term debt obligations, which consists of the variation in current liabilities during year t; $dLTD_t$ is the change in long-term debt for year t, constructed by subtracting current liabilities from total liabilities; and $dCST_t$ is the change in common equity.

5. Results

5.1. Shares issued against debt

Fig. 1 and Table 2, show the cross-sectional estimates of the "new shares" regression corresponding to Eqs. (2) and (3). In Table 2 we also include corrected-standard errors for the slope coefficients. While the figure presents the results for all years, the table only reports estimates at five-years intervals for the sake of space. In the table, significant effects are highlighted in bold. In Fig. 1 we can notice that the weight of shares as a source of financing has increased considerably during the sample period (from 11% in 1965 to roughly 70% in 2015) against new debt that has reduced accordingly. Both the annual point estimates and the difference from the beginning to the end of the sample of these estimates are statistically significant at any traditional confidence level. This increase in financing via shares issued is, however, not constant, but it exhibits cycles of considerable magnitude.

We identify five "peaks" during the sample, that fulfill the criteria above: 1969 (34.0%), 1983 (51.5%), 1993 (67.9%), 2004 (67.9%), 2014 (92.7%), and six local minima: 1965 (11.4%), 1977 (6.1%), 1988 (25.0%), 2001 (26.7%), 2009 (41.0%) and 2016 (56.0%). A cycle is measured either from peak to peak or from trough to trough. From peak to peak we found four cycles and from trough to trough five cycles. We use the latter as reference. According to our results, the leverage cycles identified are i) from 1965 to 1977, ii) from 1977 to 1988, iii) from 1988 to 2001, iv) from 2001 to 2009 and v) from 2009 to 2016.

The duration of the cycles corresponds to the number of years the cycle lasts, so the durations of the corresponding cycles are 12, 11, 13, 8 and 7 years respectively. The expansion phases (from trough to peak) tend to be slightly shorter than the contraction phases (from peak to trough) lasting 4.6 and 5.6 years on average, respectively. The duration of the cycles in years has therefore reduced in our sample, implying that the frequency of the capital structure cycles is increasing. The first result contrasts sharply with the well-known properties of the cycles of macroeconomic variables such as real GDP, production or credit aggregates, which tend to be highly asymmetrical and to last longer in expansions than in contractions.

We also calculate the amplitude of the cycles, which refers to the depth of the expansion and contraction phases. On average, the expansion phases of the cycles have amplitude of 40.7%, while contraction of 31.86%. The difference indicates that financing by shares (instead of debt) has a positive drift. Nevertheless, it is worth mentioning the amplitude of contractions and expansions for individual cycles, which are respectively 22.7%, 45.4%, 42.9%, 41.2%, 51.7% for expansions and 28.0%, 26.5%, 41.2%, 26.9%, 36.7% for contraction phases. These numbers indicate that both contraction and expansion phases have greater amplitude at the end of the sample period than at the beginning of it, so leverage cycles have become more pronounced.

During the sample period, there were several macroeconomic recessions in the US: 1970, 1973–75, 1980–82, 1990–91, 2001 and 2007–09. But there does not seem to be a clear pattern that describes the relation between macroeconomic and leverage cycles. Indeed,

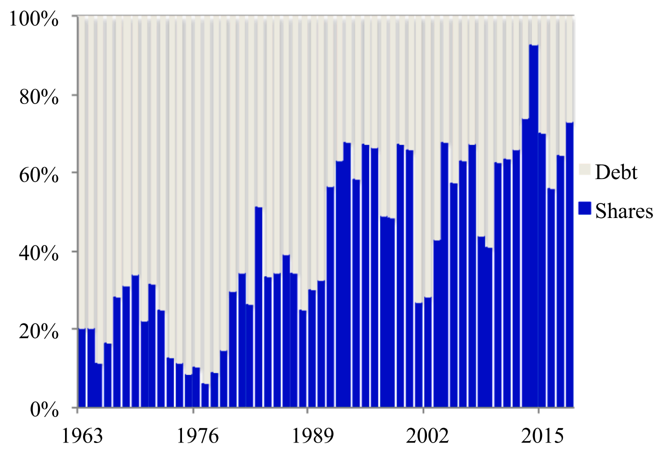

Fig. 1. Capital Structure Choices: New Debt Against Shared Issues. Note: We conduct separate complementary regressions as in equations $dS_t = a + b_1 dA_t + b_2 D_t + b_3 Y_t + e_t$ and $dL_t = a^* + b_1^* dA_t + b_2^* D_t + b_3^* Y_t + e_t^*$. The figure presents new yearly investment (dAt) financed through issues of new shares (dark blue, b_1) and new external financing (grey, b_1^*). The associated t-statistics for the first regression and some years can be consulted in Table 2. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

Table 2
Summary of the results for Share Issues Regression. Significant coefficients at 95% level of confidence are marked in bolds.

	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	2015
a	−0.40	−0.21	**−0.24**	0.38	0.20	**1.09**	0.11	**4.28**	**0.78**	**2.03**	0.61
t-stat	−1.25	−1.46	−1.97	1.87	0.76	2.60	0.33	2.03	2.21	4.23	1.59
dAt	**0.11**	**0.22**	**0.08**	**0.29**	**0.34**	**0.32**	**0.67**	**0.66**	**0.57**	**0.63**	**0.70**
t-stat	5.06	10.42	5.83	13.50	15.11	6.41	22.85	12.86	13.66	13.78	15.35
Dt	−0.06	**0.24**	**0.12**	**0.23**	**0.57**	**0.64**	**0.43**	0.25	**0.51**	**0.63**	**0.53**
t-stat	−0.42	3.00	2.66	2.76	4.10	2.59	2.97	0.80	4.93	5.70	5.10
Yt	0.01	**−0.25**	**−0.08**	**−0.33**	**−0.37**	**−0.28**	**−0.76**	**−0.46**	**−0.73**	**−0.95**	**−0.94**
t-stat	0.13	−5.96	−4.07	−6.58	−9.05	−2.31	−16.81	−2.19	−9.19	−7.45	−18.44
R2	**9.62**	**27.74**	**5.01**	**26.89**	**31.02**	**27.92**	**54.84**	**50.13**	**34.40**	**37.81**	**60.28**
N.Obs	960	2841	4471	4050	4262	4200	5623	5855	4430	3946	3838

Note: We conduct separate complementary regressions as in Eqs. (1) and (2). In the table we present the estimated coefficients and their associated t-statistics (constructed using heteroscedasticity and autocorrelation- robust standard errors), adjusted R-squared, and number of observations of the regressions, where dSt is the dependent variable, namely: $dS_t = a + b_1 dA_t + b_2 D_t + b_3 Y_t + e_t$. We report the results for every five years starting in 1965 and ending in 2015.

after the recessions in 1980, 1990, and 2001, financing via new shares increased in proportion with respect to financing via new debt, but the opposite seems to be the case after the recessions starting in 1973 and 2007.

In Table 2 we observe that the explanatory power of the regression of dSt (or alternatively dLt) reported in Eqs. (1) and (2), ranges from 9.62% at the beginning of the sample to 60.28% at the end. This means that the cash flow constraint variables do not offer a homogenous explanatory power across time, making it more advisable to conduct the analysis without pooling time series results as generally done in the literature, while validating the approach taken herein. Additionally, in Table 2 the slope coefficient associated with the asset variation dAt is always statistically significant with a 95% confidence level.

We document different dynamics in capital structure cycles. The first regime, from 1965 to 1988, has less than 40% financing through new share issues. In these years significant economic and political events took place, such as the end of the gold standard system in 1971, oil crises in 1973 and 1979, and "Black Monday" in 1987, to name a few. A second regime, from 1989 to 2018, attributes a greater weight of financing to new shares, between 50% and 80%. In these decades we observed a series of major economic and political events, such as the Asian financial crisis in 1997, the dot-com crisis in 2000, the 9/11 attacks in 2001 in New York City, the Great Recession of 2007 to 2010 and the $/Yuan Currency War causing imbalances on a global scale. Thus, it seems that more turbulent periods in the stock markets have not prevented companies from resorting to a greater proportion of external financing through shares.

In summary, we have identified a cyclical pattern with a positive trend that describes capital structure decisions made by US corporations during the sample period, regarding the choice between financing through the issuance of shares, or financing through third parties. This positive trend means that at the beginning of the sample (in the 1960 s), the share-to-debt ratio was 20/80, while at

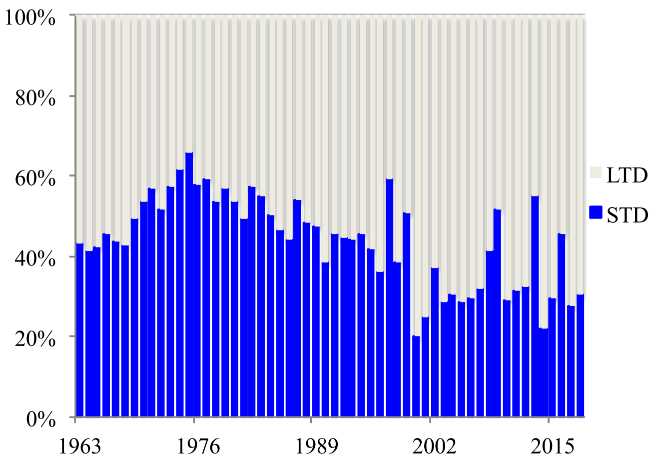

Fig. 2. Capital Structure Choices: Short Term Debt against Long Term Debt. Note: We conduct separated complementary regressions as in equations $dSTD_t = a + b_1 dA_t + b_2 D_t + b_3 Y_t + b_4 dS_t + e_t$ and $dLDT_t = a^* + b_1^* dA_t + b_2^* D_t + b_3^* Y_t + b_4^* dS_t + e_t^*$. The figure shows the proportion of new yearly investment (dAt) financed through short-term-debt (dark blue, b_1) and long-term-debt (grey, b_1^*) from 1963 to 2018. The real uncertainty index is plotted as a dark solid line. The associated t-statistics for the first regression and some years can be consulted in Table 2. All data were retrieved from Compustat in February 2020. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

the end of it (in the 2010 s) it reversed to approximately 80/20. The capital structure cycles of shares versus debt have an average duration of 10.2 years and an average amplitude of 40.8% in expansions and 31.86% in contractions. They are becoming more pronounced and shorter.

5.2. Division of new debt financing between short- and long-term obligation

Fig. 2 and Table 3 show the cross-sectional estimates regarding the term of new debt obligations (Eqs. (5) and (6) contracted during the year. In Table 3, significant effects are bolded. In this case, the weight of Short-Term Debt (dSTDt) has fallen considerably during the sample period. Nevertheless, as before, this reduction has not been constant, but there are clear cycles in the estimates of considerable magnitude. Indeed, the cycles exhibit a longer duration at the beginning than at the end of the sample, and they are longer than those observed in Fig. 1.

In general, we document a change in the debt maturity policy of US companies over time. Our study period starts with a ratio of 40% (STD) −60% (LTD) and ends with a ratio of 30% (STD) −70% (LTD). However, when comparing the beginning of the samples in 1963 and 1975, we observe a considerable increase in the proportion of short-term-debt obligations, which peaked at a ratio of 70% (STD) −30% (LTD), almost the exact opposite of the ratio at the beginning of the sample. 1975 is the most obvious turning point in our sample (as we will see below, it corresponds to a peak in the cycles), and after this year the trend reverses once again until 2017, when the ratio reverses to values below even those at the beginning of the sample 30% (STD) −70% (LTD). It is therefore advisable to differentiate between two periods, with the turning point in 1975: from 1963 to 1976, when there is a tendency to increase short-term debt at the expense of long-term debt; and from 1977 to 2017, when the trend has been steadily downward over the years.

Following the same criteria to date the cycles, we identify the following peaks: 1975 (65.6%), 1997 (59.4%), 2009 (51.2%), and the following troughs: 1990 (38.7%), 2000 (20.0%), 2014 (21.2%). According to these dates, there are two cycles from peak to peak in the sample period (1995–1997; 1997–2009), with a duration of 3–5 years in the contraction phase and 7–9 years in the expansion phase, adding up to 10 and 14 years for the first and the second cycle. These durations are considerably longer than the duration for the cycles in Fig. 1. Indeed, the contraction phase from 1975 to 1990 lasted 15 years, which is the longest observed in the sample period. In this case, the expansion phase starts before the first year in the sample according to our dating principles, so we cannot establish how long it lasted in total. In any case, it was longer than 12 years (running from 1963 to 1975), so this cycle lasted about 30 years. Other differences with respect to the cycles in Fig. 1 are in the asymmetry of the cycles. The terms of the debt cycles are more asymmetrical, with considerably longer expansion than contraction phases, which is similar to what is often found in the macroeconomic literature.

Following the results, we find that decisions about the term of the debt tend to be significantly more persistent than those regarding whether to contract new debt or raise capital via share issuing to finance new investment. Connecting the amplitude of the cycles, which measures their intensity, the average contraction has an amplitude of 19.2% and the average expansion 17.3%, which reflects the fact that short-term debt has a decreasing trend as a proportion of total debt in our sample period. Compared to the analysis regarding the ratio of shares to debt, the amplitude of debt-term cycles is lower, which means that decisions about the term of the debt vary in a highly significant fashion, but are not as volatile as those regarding the first decision. Firms may find it easier to switch between debt and new share issues, but they are relatively less prompted to substitute the term of the debt (as a financing source for new investment projects), and once they decide to do so, the substitution is smoother.

In Table 3, the explanatory power of the regression of dSTDt (or alternatively dLTDt) ranges from a minimum of 11.31% in 2000, to a maximum of 58.35% in 1975. The slope coefficient associated to the asset variation dAt is always statistically significant with a 95% confidence level. The variation in the R2 is larger than in the two previous complementary regressions when we analysed new shares issued in the year versus new debt.

Table 3
Summary results of the regressions of Short-Term Debt.

	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	2015
a	0.18	−0.64	**−1.16**	0.03	0.32	**1.10**	0.21	**2.40**	0.88	0.68	−0.15
t-stat	0.54	−3.73	−4.97	0.10	1.02	3.38	0.70	5.68	4.28	2.87	−0.73
dAt	**0.42**	**0.54**	**0.66**	**0.54**	**0.46**	**0.39**	**0.42**	**0.20**	**0.29**	**0.29**	**0.29**
t-stat	14.92	29.09	27.83	18.96	15.66	5.52	17.39	3.52	10.66	8.25	8.79
Dt	**0.32**	**0.61**	**0.64**	**0.56**	**0.35**	**0.19**	**0.46**	0.11	**0.18**	**0.20**	**0.21**
t-stat	4.10	10.37	6.86	7.79	4.83	2.15	6.95	1.17	3.32	3.24	4.94
Yt	**−0.29**	**−0.58**	**−0.64**	**−0.58**	**−0.58**	**−0.30**	**−0.46**	−0.12	**−0.22**	**−0.22**	**−0.29**
t-stat	−6.00	−15.82	−11.65	−9.57	−8.77	−2.03	−9.24	−1.42	−5.63	−4.47	−7.75
dSt	**−0.34**	**−0.50**	**−0.81**	**−0.54**	**−0.43**	**−0.32**	**−0.35**	**−0.13**	**−0.15**	**−0.18**	**−0.22**
t-stat	−5.16	−16.71	−7.76	−9.65	−9.61	−4.53	−12.85	−2.03	−3.79	−3.64	−5.53
R2	**45.22**	**55.62**	**58.35**	**45.09**	**28.24**	**22.33**	**32.82**	**11.31**	**23.23**	**21.69**	**25.51**
N.Obs	960	2841	4471	4050	4262	4200	5623	5855	4430	3946	3838

Note: We conduct separate complementary regressions as in Eqs. (5) and (6). In the table we present the estimated coefficients and their associated t-statistics (constructed using heteroscedasticity and autocorrelation- robust standard errors), adjusted R-squared, and number of observations, of the regressions, where dSt is the dependent variable, namely: $dSTD_t = a + b_1 dA_t + b_2 D_t + b_3 Y_t + b_4 dS_t + e_t$. We trimmed our annual samples, deleting 0.5% left-tail observations of the variable dA_t to avoid the influence of outliers. We report the results for every five years starting in 1965 and ending in 2015. The coefficients for other years and for the regressions that use dLTDt as the dependent variable can be consulted in Fig. 2.

Once again, the cycles are not particularly synchronised with notable economic events as measured by recessions indicated in the NBER series. However, this time it seems that the first major oil crisis in our sample period, around the mid-1970s, may have had a significant impact in terms of short- and long-term financing decisions.

5.3. Shares issued and retained earnings

The last decision a firm makes in our framework relates to financing its operations by issuing shares or retaining earnings. We present our results in Fig. 3 and Table 4. This time, we have normalised the plots to be comparable with those presented before, but it is worth noting that the coefficients in Eqs. (8) and (9) add up to one, because by construction b_1^* is negative, and b_1 is greater than one. We have changed the colour of the b_1^* slopes to emphasise this fact, but the interpretation in terms of the weight that each financing decision has as a financing source remains similar to the ones from the previous subsections.

In Fig. 3 and in Table 4 we observe that the weight of retained earnings (Dt), as opposed to share issues, has fallen as a financing source during the sample period. Nevertheless, the reduction is not constant, but it is characterised by cycles of considerable magnitude.

The composition of equity in terms of self-financing has changed significantly during the sample period. Although oscillations are observed between periods, there is a general negative trend. Specifically, the ratio between retained earnings and new equity has fallen from a ratio of 15% to 85%, at the beginning of the period, to a ratio of 5% to 95% in 2018. In this case, the cycles that we identify following the same criteria presented before are more volatile. We identify the following local maxima in the participation of retained earnings as the preferred financing sources for new investment during the sample period, which satisfy the requirement to be considered a peak of a cycle: 1965 (19.2%), 1974 (11.8%), 1988 (12.1%), 1998 (14.3%), 2012 (8.8%), and the corresponding local minima at 1971(1.9%), 1983 (2.1%), 1993 (1.5%), 2000 (1.0%), 2014 (1.3%). These turning points configure the following cycles from peak to peak: 1965–1974, 1974–1988, 1988–1998, 1998–2012, with their corresponding durations for expansion phases: 3, 5, 5, and 12 years, and for contraction phases: 6, 9, 5, and 2 years (also 2 years for the half cycles at the end from 2012 to 2014). Contraction and expansion phases of the five cycles average up to a duration of 11.8 years, with an important asymmetry: contractions average to 4.8 years, and expansions 6.3 years. Therefore, the series stay longer in expansion than in contraction phases. Nevertheless, the average amplitude is greater in contractions (11.7%) than in expansions (10.1%). These numbers mean that the average financing by retained earnings during the sample period (1963–2018) was 5.8%. Thus, the documented variations in amplitude are indeed the largest in relative terms that we have observed so far, regarding all three capital structure choices.

In Table 4, it can be observed that the explanatory power of the regressions of Dividends joint to its complementary regression is very volatile. The minimum was 4.23% in 1990 and the maximum was 47.36% in 1965. Moreover, there is a clear reduction of the explanatory power of the regression after 1980, and currently the explanatory power is very low, around 5.26%. Nevertheless, once again, the slope coefficient associated with asset variations dAt is always statistically significant with a 95% confidence level.

5.4. Summary of the results

Several insights follow from our empirical results, reading capital structure decisions made by corporations to finance new investment opportunities: i) the weight of shares as opposed to debt has increased considerably during the sample. Nevertheless, the

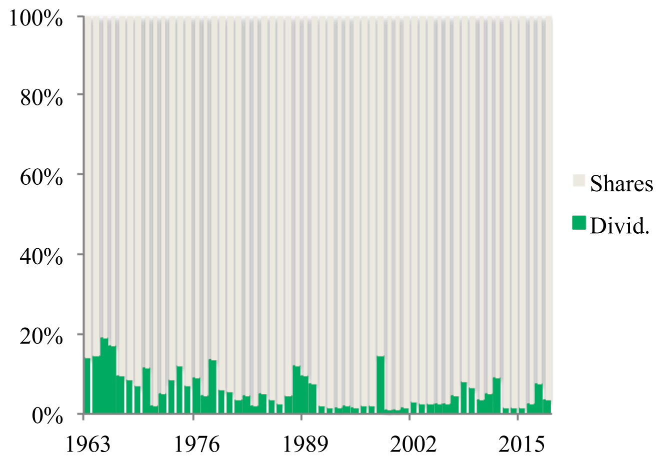

Fig. 3. Capital Structure Choices: Retained Earnings against Shared Issues. Note: We conduct separate complementary regressions as in equations $dD_t = a + b_1 dA_t + b_2 dL_t + b_3 Y_t + e_t$ and $dS_t = a^* + b_1^* dA_t + b_2^* dL_t + b_3^* Y_t + e_t^*$. The figure shows the proportion of new yearly investment (dAt) financed through retained earnings (green, b_1) and new share issues (light grey, b_1^*) from 1963 to 2018. Associated t-statistics for the first regression and some years can be consulted in Table 4. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

Table 4
Summary results of the Dividends Regression.

	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	2015
a	**0.70**	**1.35**	**0.72**	**1.09**	**1.16**	**1.41**	**0.93**	**0.72**	**1.16**	**1.48**	**1.66**
t-stat	4.39	24.87	19.24	23.98	19.71	9.24	15.82	8.67	15.58	12.63	22.33
dAt	**−0.19**	**−0.11**	**−0.07**	**−0.05**	**−0.04**	**−0.08**	**−0.01**	**−0.01**	**−0.02**	**−0.03**	**−0.02**
t-stat	−8.58	−5.93	−3.76	−4.25	−4.62	−2.35	−6.12	−2.65	−5.41	−3.45	−6.26
dSt	**0.41**	**0.19**	**0.13**	**0.11**	**0.06**	**0.10**	**0.03**	**0.01**	**0.04**	**0.06**	**0.03**
t-stat	12.81	7.65	6.35	6.95	5.92	2.78	8.87	6.69	7.68	5.72	9.84
Yt	**0.17**	**0.10**	**0.07**	**0.05**	**0.03**	0.08	**0.01**	**0.01**	**0.01**	0.01	**0.01**
t-stat	7.31	5.02	3.38	3.85	4.22	1.78	4.23	5.04	2.70	1.59	3.11
R2	**47.36**	**27.09**	**15.93**	**12.20**	**4.04**	**4.23**	**5.26**	**1.69**	**5.34**	**5.75**	**5.26**
N.Obs	960	2841	4471	4050	4262	4200	5623	5855	4430	3946	3838

Note: We conduct separate complementary regressions as in Eqs (8) and (9). In the table we present the estimated coefficients and their associated t-statistics (constructed using heteroscedasticity and autocorrelation- robust standard errors), adjusted R-squared, and number of observations, of the regressions, where Dt is the dependent variable, namely: $D_t = a + b_1 dA_t + b_2 dL_t + b_3 Y_t + e_t$. We report the results for every five years starting in 1965 and ending in 2015. The coefficients for other years and for the regressions that use dSt as the dependent variable can seen in Fig. 3.

increments are not constant, but they exhibit cycles of considerable magnitude. ii) Short-term debt has considerably reduced relative to total debt during the sample period. Again, the reduction exhibits clear cycles of considerable magnitude, wider at the beginning than at the end of the sample. iii) The weight of retained earnings in opposition to new shares issued has decreased as a financing source during the sample period, describing cycles. iv) We establish the chronology of five cycles of leverage, regarding the first decision, which is the most determinant: from 1965 to 1977 the first one, the second from 1977 to 1988, the third from 1988 to 2001, the fourth from 2001 to 2009 and the fifth from 2009 to 2016. The average duration of these cycles is 10.2 years, and their average amplitude is 31.9% for recessions and 40.7% for expansions. These cycles are shorter and more intense than the cycles regarding the term of the new debt obligations. The cycles that describe the ratio of retained earnings versus new equity issuing are the most frequent and most asymmetrical in our study, which means that expansions are of different length than contractions.

6. Conclusions

Studies that seek to understand capital structure decisions made by firms have traditionally focused on cross-sectional determinants of leverage and debt maturity. However, a recent branch of the literature has started to successfully draw attention to some common macroeconomic determinants that act as the main drivers of capital structure decisions on the side of firms, particular attention having been paid to recessions and macroeconomic uncertainty as potential macro-factors underlying observed trends of capital structure mixes in the aggregate of firms in the economy.

Our contribution is documenting that capital structure decisions, on average, with regard to financing new investment via issuing of shares, or contracting of new debt obligations; the term of the debt; and financing via retained earnings or new equity, are certainly described by cycles. These decisions not only react to recessions (which indeed show little correlation with the cycles we identify) but clearly deviate from their time trend, following a regular pattern above and below that "trend," which we refer to as a cycle. The cycles relating to the ratio of new shares versus debt have a shorter duration, and are wider, than the cycles regarding the term of the new debt contracts, and the cycles that describe the ratio of retained earnings versus new share issuing. We interpret this as meaning that the decision to switch between debt and shares is much more frequent and significant, in the aggregate, than the decision of switching between debt maturities or between retained earnings and new equity.

Our findings have important implications for traditional capital structure theories that focus solely on cross-sectional determinants of capital structure mixes. In short, if there is a cyclical component – on top of the trend component that other authors such as Graham et al. (2015) have previously identified – capital structures theories should ideally be extended to incorporate permanent and cyclical components, to explain reality.

Our results also open the door to future research from a macro–micro perspective that can identify the drivers of capital structure cycles, for which a structural macroeconometric approach is required, able to provide causal relationships. Although some important political and economic events such as the oil crises in the mid-1970s may have had an impact on capital structure cycles, there is no conclusive evidence to show these cycles are determined by macroeconomic or political cycles.

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Data sharing

The data used belong to WRDS services, which is proprietary.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix

Variable definition

All variables are multiplied by 100 and divided by value assets at the end of fiscal year. Traditional Compustat item numbers are in parentheses are:

dA_t: Investment: Change in assets (6) during fiscal year t.
Y_t: Earnings: Income before extraordinary items available for common (237) plus extraordinary income (48) during fiscal year t.
$dCST_t$: Change in common equity (Compustat data item 60).
D_t: Dividends: Dividends per share by ex-date (26) at the end of fiscal year t times shares outstanding (25) at the end of t.
dS_t: Book value of shares issued: Change in common equity (Compustat data item 60) plus dividends, D_t, minus earnings, Y_t, during fiscal year t.
dL_t: Change in total liabilities, including preferred: Change in assets (6) minus change in common equity (60) during fiscal year t.
$dSTD_t$: Change in short-term debt: Change in current liabilities (5) during fiscal year t.
$dLTD_t$: Change in long-term debt: Change in total liabilities, dL_t, minus change in current liabilities, $dSTD_t$.

We exclude Standard Industrial Classification codes between 6000 and 6999 and also firms that did not report information in any given year. We also did not include firms from the regressions for year t if we are missing: Compustat shares outstanding, income before extraordinary items available for common, and extraordinary income for the fiscal year ending in t; assets, common equity, and current liabilities for the fiscal year ends in calendar years t − 1 and t; and book equity for the fiscal year ending in calendar year t − 1. Finally, we did not include firms whose common equity at the end of year t − 1 exceeds their assets at the end of t − 1.

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