Online Appendix for
"Quadrophobia: Strategic Rounding of EPS Data"

A.1 Which Mechanisms Are Used to Round Up EPS?

Many papers in the literature focus on two broad mechanisms of inflating earnings: the management of different types of accruals and real earnings management. In addition, a number of recent studies explore a third mechanism, referred to as "classification shifting" (e.g., McVay (2006), Fan, Barua, Cready, and Thomas (2010)). In this section, we discuss the use of these three mechanisms in rounding-up of EPS.

A.1.1 Management of Accruals

Das and Zhang (2003) conjecture that given the limited time frame between the calculation of the original pre-rounded EPS number and the earnings announcement, managers are unlikely to resort to non-working capital accruals, such as depreciation, and will mainly use working capital accruals. We follow Das and Zhang (2003) and analyze the association of working capital accruals with the prevalence of strategic rounding on the sample of firm-quarter observations merged with IBES. In line with their paper, we define working capital accruals as

$$WCACC = (\Delta CA - \Delta CASH) - (\Delta CL - \Delta STD)\,, \tag{A.1}$$

where ΔCA is the change in current assets, ΔCASH is the change in cash and short-term investments, ΔCL is the change in current liabilities, ΔSTD is the change in the current portion of long-term debt, and each of these variables is deflated by the previous quarter's total assets. Table A1 shows a significant negative association between WCACC and the frequency of the number four. This relation is robust to controlling for firm size, market-to-book ratio, the magnitude of EPS, the Q-score, and year fixed effects. Therefore,

the evidence is consistent with the use of working capital accruals management as one mechanism to round up reported EPS.

A.1.2 Real Earnings Management

To measure real earnings management, we follow Roychowdhury (2006), who develops three key measures to detect the manipulation of real activities: abnormal cash flow from operations, abnormal production costs, and abnormal discretionary expenses. We follow Roychowdhury (2006)'s definition and construct these measures at the firm-quarter level for the period 1987–2021. We next study whether any of these measures is associated with the under-representation of the number four, by studying the contemporaneous value of DUMMY4 (the indicator variable that is set to one if the firm has a "four" in its first post-decimal EPS digit in that quarter).

Table A2 shows no significant association between the frequency of the number four and any of these three variables, either as stand-alone explanatory variables or together with additional controls. In unreported results, we also do not see any significant association if we focus on the fourth quarter subsample (according to Xu, Taylor, and Dugan (2007), many real earnings management activities are concentrated in the fourth quarter).

Combined, these results suggest that real earnings management is not typically used to round up EPS. This is reasonable, given that real earnings management activities, such as the reduction in discretionary expenses (R&D or maintenance expenses) or manipulation of sales (e.g., through price discounts or more lenient credit terms), are likely to occur throughout the quarter and may be hard to implement quickly during the short period between the calculation of the original EPS number and the time when earnings need to be reported.

A.1.3 Classification Shifting

McVay (2006) notes that firms can overrepresent their financial strength by classifying a portion of their core operating expenses as "special items" (for example, as restructuring charges). Since special items are highly transitory, investors put less emphasis on them compared to non-transitory expenses, so such "classification shifting" allows managers to inflate investors' perception of core, i.e., pro forma, earnings. At the same

time, as McVay (2006) points out, classification shifting does not change GAAP earnings.

We follow McVay (2006) and define two firm-quarter level variables capturing the presence and magnitude of income-decreasing special items (income-increasing special items are set to zero). The first is an indicator variable SI_IND, which is set to one if the firm has an income-decreasing special item in that quarter, and zero otherwise. The other is %SI, which is the absolute value of income-decreasing special items scaled by sales. Following McVay (2006), if the data for special items are missing, we set special items to zero. However, the results remain unchanged if we alternatively drop such observations.

Note that we do not observe the distribution of digits in unrounded pro forma EPS: as explained in Section V.C, IBES reports this number already rounded to the nearest cent. We do, however, observe unrounded GAAP EPS and can use the frequency of the number four in GAAP EPS to provide indirect evidence consistent with the use of classification shifting.

Table A3 shows a strong positive association between the presence of the number four in the first post-decimal digit of GAAP EPS (measured by DUMMY4) and both SI_IND and %SI. Thus, GAAP EPS is less likely to be rounded up when it differs from pro forma EPS because of special items. This finding confirms our conclusion in Section V.C that managers target pro forma EPS, rather than GAAP EPS, when engaging in strategic rounding.

The lack of such a positive association would imply that managers' goal is to round up GAAP, rather than pro forma, EPS when the two numbers differ. Since GAAP EPS is not affected by classification shifting, the lack of such a positive association would therefore imply that classification shifting is unlikely to be used for strategic rounding. In contrast, the positive association observed in Table A3 is consistent with the use of classification shifting to round up pro forma EPS. At the same time, it is not direct evidence of the use of this channel. To see both of these points, note that two cases are possible:

1. The use of classification shifting to round up pro forma EPS. Suppose that the firm does not have "true" special expenses (i.e., it only has core expenses), and the first post-decimal digit of the firm's unrounded GAAP EPS is "four." The firm can then round up its pro forma EPS via classification shifting in the following way. If the firm reclassifies some of its core expenses as special items, i.e., engages in classification shifting, its pro forma EPS will increase, e.g., to the point where the first post-decimal digit in unrounded

pro forma EPS becomes "five," allowing pro forma EPS to be rounded up. However, since such classification shifting does not change GAAP earnings, the first post-decimal digit in GAAP EPS (captured by DUMMY4) remains "four."

2. The use of other methods to round up pro forma EPS. Suppose now that the firm has a "true" special expense in its income statement and is focused on inflating its pro forma EPS and not on inflating its GAAP EPS. The firm may then try to round up its pro forma EPS using other methods, e.g., accruals management. Hence, the number four will be underrepresented in the first post-decimal digit of pro forma EPS. However, since it is hard to simultaneously round up GAAP EPS given that the two EPS numbers are different, the frequency of the number four in GAAP EPS is not expected to be abnormal. In both cases, the frequency of the number four in unrounded GAAP EPS is higher when there is an income-decreasing special item compared to the case when there is not (which is exactly what Table A3 shows), but only in the first case the firm engages in classification shifting to round up pro forma EPS. Overall, we cannot reject the hypothesis that firms use classification shifting to round up, but our evidence is not sufficient to conclude that it is indeed used.

Table A1: The Use of Working Capital Accruals to Round Up EPS

The table presents the results of firm-quarter level probit regressions of DUMMY4 on company characteristics. DUMMY4 equals one if four is the first post-decimal digit in EPS reported in cents in that quarter, and equals zero otherwise. The variable WCACC (working capital accruals) is defined by equation (A.1). SIZE is the logarithm of total assets; M/B is the ratio of the market value of total assets to the book value of total assets; and EPS is earnings per share. Each of these variables is winsorized at 1% and 99%. Q-SCORE in quarter t is set to zero if there was at least one four in the first post-decimal digit of EPS reported by the firm over four quarters with positive earnings prior to but not including quarter t, and set to one otherwise. The sample consists of firm-quarter observations merged with IBES for which EPS is greater than 0.1 cents. T-statistics are reported in parentheses. Superscripts ***,**,* denote significance at the 0.01, 0.05 and 0.1 levels, respectively.

	DUMMY4			
	1	2	3	4
WCACC	-0.29***	-0.17**	-0.16**	-0.16**
	(-4.10)	(-2.35)	(-2.17)	(-2.05)
SIZE		0.02***	0.01***	0.01***
		(10.96)	(5.72)	(5.72)
M/B		-0.00	-0.00	-0.00
		(-0.70)	(-1.11)	(-1.37)
EPS		0.03***	0.03***	0.03***
		(4.86)	(4.11)	(4.22)
Q-SCORE				-0.04***
				(-4.76)
Constant	-1.39***	-1.56***	-1.41***	-1.38***
	(-393.38)	(-108.39)	(-45.73)	(-43.28)
Observations	265155	261465	261464	249335
Year FE	No	No	Yes	Yes

Table A2: The Use of Real Earnings Management to Round Up EPS

The table presents the results of firm-quarter level probit regressions of DUMMY4 on company characteristics. DUMMY4 equals one if four is the first post-decimal digit in EPS reported in cents in that quarter, and equals zero otherwise. The sample consists of firm-quarter observations with EPS greater than 0.1 cents over 1987–2021. The key explanatory variables capturing real earnings management are abnormal cash flow from operations (AB_CFO), abnormal production costs (AB_PROD), and abnormal discretionary expenses (AB_DISEXP), computed at the firm-quarter level, using the definitions in Roychowdhury (2006). SIZE is the logarithm of total assets; M/B is the ratio of the market value of total assets to the book value of total assets; and EPS is earnings per share. Each of these variables is winsorized at 1% and 99%. Variable ANALYST is set to one if the consensus analyst forecast is available for the corresponding firm-quarter observation, and set to zero otherwise. Q-SCORE in quarter t is set to zero if there was at least one four in the first post-decimal digit of EPS reported by the firm over four quarters with positive earnings prior to but not including quarter t, and set to one otherwise. T-statistics are reported in parentheses. Superscripts ***,**,* denote significance at the 0.01, 0.05 and 0.1 levels, respectively.

	DUMMY4								
	1	2	3	4	5	6	7	8	9
AB_CFO	0.03	0.15	-0.37						
	(0.10)	(0.43)	(-0.98)						
AB_PROD				-0.24	-0.49	-0.12			
				(-0.64)	(-1.24)	(-0.28)			
AB_DISEXP							-0.06	0.03	0.09
							(-0.34)	(0.16)	(0.46)
SIZE		0.00***	0.00**		0.00***	0.00*		0.00***	0.00
		(7.28)	(2.40)		(6.60)	(1.93)		(6.09)	(1.02)
M/B		0.00	0.00		0.00	-0.00		0.00	-0.00
		(0.64)	(0.32)		(0.75)	(-0.14)		(0.56)	(-0.24)
EPS		0.00***	0.00***		0.01***	0.01***		0.01***	0.01***
		(4.77)	(4.59)		(5.27)	(5.07)		(5.47)	(5.30)
ANALYST		-0.02***	-0.02***		-0.02***	-0.02***		-0.02***	-0.01***
		(-14.32)	(-12.90)		(-14.23)	(-12.86)		(-12.99)	(-11.17)
Q-SCORE			-0.01***			-0.01***			-0.01***
			(-5.32)			(-5.54)			(-5.76)
Constant	0.08***	0.08***	0.09***	0.08***	0.08***	0.09***	0.08***	0.08***	0.09***
	(177.23)	(58.58)	(14.46)	(184.16)	(62.14)	(29.36)	(174.75)	(58.62)	(27.95)
Observations	356537	339873	315179	377807	357543	331470	341776	323890	301427
Year FE	No	No	Yes	No	No	Yes	No	No	Yes

Table A3: The Use of Classification Shifting to Round Up EPS

The table presents the results of firm-quarter level probit regressions of DUMMY4 on company characteristics. DUMMY4 equals one if four is the first post-decimal digit in EPS reported in cents in that quarter, and equals zero otherwise. The sample consists of firm-quarter observations with EPS greater than 0.1 cents. The key explanatory variable capturing the presence of income-decreasing special items. SI_IND is an indicator variable set to one if the firm has an income-decreasing special item in that quarter, and zero otherwise. %SI is the absolute value of income-decreasing special items scaled by sales. As in McVay (2006), if the data for special items are missing or if special items are income-increasing, these variables are set to zero. SIZE is the logarithm of total assets; M/B is the ratio of the market value of total assets to the book value of total assets; and EPS is earnings per share. Each of these variables is winsorized at 1% and 99%. Variable ANALYST is set to one if the consensus analyst forecast is available for the corresponding firm-quarter observation, and set to zero otherwise. Q-SCORE in quarter t is set to zero if there was at least one four in the first post-decimal digit of EPS reported by the firm over four quarters with positive earnings prior to but not including quarter t, and set to one otherwise. T-statistics are reported in parentheses. Superscripts ***,**,* denote significance at the 0.01, 0.05 and 0.1 levels, respectively.

	DUMMY4							
	1	2	3	4	5	6	7	8
SI_IND	0.01***	0.01***	0.01***	0.01***				
	(6.57)	(8.41)	(5.07)	(5.14)				
%SI					0.04***	0.05***	0.04***	0.06***
					(3.04)	(4.07)	(3.19)	(3.83)
SIZE		0.00***	0.00**	0.00***		0.00***	0.00***	0.00***
		(5.78)	(2.49)	(3.03)		(7.49)	(3.04)	(3.51)
M/B		-0.00	-0.00	-0.00		-0.00	-0.00	-0.00
		(-0.32)	(-1.46)	(-0.61)		(-0.13)	(-1.51)	(-0.64)
EPS		0.00***	0.00***	0.00***		0.00***	0.00***	0.00***
		(6.68)	(6.66)	(6.65)		(6.20)	(6.43)	(6.47)
ANALYST		-0.01***	-0.01***	-0.01***		-0.01***	-0.01***	-0.01***
		(-16.24)	(-15.36)	(-14.31)		(-15.53)	(-14.99)	(-13.95)
Q-SCORE				-0.01***				-0.01***
				(-7.47)				(-7.48)
Constant	0.09***	0.08***	0.08***	0.09***	0.09***	0.08***	0.08***	0.09***
	(231.90)	(80.74)	(26.99)	(27.21)	(251.79)	(80.29)	(26.87)	(27.11)
Observations	681730	628223	628223	573375	681729	628222	628222	573374
Year FE	No	No	Yes	Yes	No	No	Yes	Yes

A.2 Distribution of Digits for Negative Earnings

Table A4 reports the frequency of the number four in the first post-decimal digit of negative EPS expressed in cents. Consistent with the existence of strategic rounding for negative earnings, the pattern is the opposite of the pattern for positive EPS: numbers one through four are overrepresented, and numbers five through nine are underrepresented.

Table A4: Distribution of the First Post-Decimal Digit in EPS: Negative Earnings Quarters

The frequency of numbers 0-9 in the first post-decimal digit in quarterly earnings per share. The sample includes all firm-quarter observations for which earnings per share are less than negative 0.1 cents. Z-statistics for the test of the null hypothesis that the frequency of each digit is equal to 10% are reported in parentheses. Superscripts ***,**,* denote significance at the 0.01, 0.05 and 0.1 levels, respectively.

0	1	2	3	4	5	6	7	8	9
0.1000	0.1111***	0.1058***	0.1039***	0.1033***	0.0959***	0.0955***	0.0944***	0.0940***	0.0961***
(-0.03)	(23.77)	(12.43)	(8.24)	(7.15)	(-8.77)	(-9.67)	(-11.93)	(-12.79)	(-8.41)

A.3 Executive Compensation and Quadrophobia

In this section, we show the robustness of our results in Section V.B to alternative measures of the CEO's equity incentives.

Measures of the sensitivity of the CEO's portfolio to the stock price. We follow Bergstresser and Philippon (2006) and use INCENTIVE_RATIO (defined by equation (2)) as our key measure of the CEO's equity incentives in Table 5. The construction of INCENTIVE_RATIO implicitly assumes that a dollar increase in the stock price translates one-for-one to the value of an option, i.e., that the "delta" of the options in the manager's portfolio equals one. This assumption is reasonable for in-the-money options, but may be inaccurate for out-of-the-money options. For this reason, Bergstresser and Philippon (2006) also consider a variation of this measure, INCENTIVE_RATIO^{CG}, which estimates the delta of the option portfolio based on the Black-Scholes option formula modified to account for dividend payouts, as in Core and Guay (2002). We follow Bergstresser and Philippon (2006) and define INCENTIVE_RATIO^{CG} using the following analog of equation (2):

$$INCENTIVE\_RATIO^{CG} = \frac{ONEPCT^{CG}}{ONEPCT^{CG} + SALARY + BONUS}, \tag{A.2}$$

where ONEPCT^{CG} is the sensitivity of the CEO's stock and option portfolio to a 1% change in the stock price; it is the analog of ONEPCT but using the estimated delta, which is estimated, as in Bergstresser and Philippon (2006), according to the Core and Guay (2002) Black-Scholes option formula technique.

Note that INCENTIVE_RATIO^{CG} is the analog of *ScaledDelta* (delta scaled by total cash compensation) in Table 8 of Armstrong, Larcker, Ormazabal, and Taylor (2013). Following Armstrong et al. (2013), we also consider unscaled delta, defined as

$$DELTA = ln(1 + ONEPCT^{CG}), \tag{A.3}$$

This is the analog of *Delta* in Armstrong et al. (2013); see Appendix A in their paper for definitions.

Measures of the sensitivity of the CEO's portfolio to equity risk. We start by defining ONEPCT_VOL as the sensitivity of the CEO's equity portfolio to a 1% change in stock return volatility using the Core and Guay (2002) technique (see Appendix A in Core and Guay (2002)). In constructing this variable, we follow Coles, Hertzel, and Kalpathy ((2006), p. 439), who use the vega of the option portfolio to measure the total vega of the stock and option portfolio, pointing out that according to Guay (1999), option vega is many times higher than stock vega. Next, following Armstrong et al. ((2013), p. 349), we introduce two measures of vega that we use in the regressions:

$$SC\_VEGA = \frac{ONEPCT\_VOL}{ONEPCT\_VOL + SALARY + BONUS}, \tag{A.4}$$

which is the analog of *ScaledVega* in Table 8 and Appendix A of Armstrong et al. (2013), and is constructed similar to INCENTIVE_RATIO^{CG} in equation (A.2), and

$$VEGA = ln(1 + ONEPCT\_VOL), \tag{A.5}$$

which is the analog of Armstrong et al. (2013)'s *Vega* and captures the unscaled vega.

As in Bergstresser and Philippon (2006), and consistent with our baseline analysis in Section V.B, the regressions use all the variables defined in this section measured for the previous fiscal year.

Results. Columns 1–2 and 4–5 in Table A5 presents the analogs of columns 4–5 in Table 5 of the paper, but using INCENTIVE_RATIO^{CG} and DELTA instead of INCENTIVE_RATIO. For robustness, we also control for unscaled vega (instead of scaled vega) in columns 3 and 6. The table shows that all measures of stock price performance sensitivity of the CEO's portfolio are significantly negatively related to the presence of the

number four in the first post-decimal EPS digit (i.e., are all significantly positively related to the incidence of quadrophobia), and controlling for portfolio vega does not change the magnitude or significance of these coefficients. Moroever, both unscaled and scaled vega are not significantly related to quadrophobia even if we consider them separately (see columns 7–8). These results are in line with those presented in Table 5.

In addition, following Armstrong et al. (2013), we define CASH_COMP as the natural logarithm of one plus total cash compensation (i.e., salary plus bonus) received by the CEO. In unreported results, we repeat all specifications in Table A5 controlling for CASH_COMP. The coefficient on CASH_COMP is not significant in any of the specifications, and the coefficients on other variables are not affected. Overall, we conclude that our results about the role of managerial equity incentives are robust.

A.4 Is Strategic Rounding Used to Avoid Covenant Violations?

As discussed in Section V.D, if quadrophobia is used to avoid covenant violations, we should see a positive relation between the likelihood of a covenant violation in a given quarter and the frequency of the number four in the first post-decimal digit of EPS in that quarter. We test this hypothesis in Table A6 and find no evidence of a contemporaneous relationship between the likelihood of a covenant violation and the frequency of the number four.

Table A5: Equity Incentives and Quadrophobia

The table presents the results of firm-quarter level probit regressions of DUMMY4 on company characteristics, in particular, measures of the CEO's equity incentives. DUMMY4 equals one if four is the first post-decimal digit in EPS reported in cents in that quarter, and equals zero otherwise. The sample consists of firm-quarter observations with EPS greater than 0.1 cents. SIZE is the logarithm of total assets; M/B is the ratio of the market value of total assets to the book value of total assets; and EPS is earnings per share. Each of these variables is winsorized at 1% and 99%. INCENTIVE_RATIO^{CG} captures the sensitivity of the CEO's equity portfolio to changes in the stock price; it is the analog of INCENTIVE_RATIO in Table 5, but using a measure of option delta estimated as in Core and Guay (2002), and is defined by equation (A.2). DELTA is the unscaled version of INCENTIVE_RATIO^{CG}, and is defined by equation (A.3). SC_VEGA is the sensitivity of the CEO's equity portfolio to changes in stock return volatility, scaled by total cash compensation, and is defined by equation (A.4). VEGA is the unscaled version of SC_VEGA, and is defined by equation (A.5). All executive compensation characteristics are measured for the previous fiscal year. The indicator variable ANALYST is set to one if the consensus analyst forecast is available for the corresponding firm-quarter observation, and to zero otherwise. Q-SCORE for firm i in quarter t is $Q^{(4)}_{i,t}$, as defined by equation (1). The sample is restricted to firms for which managerial stock and option holdings data is available in ExecuComp. T-statistics are reported in parentheses. Superscripts ***,**,* denote significance at the 0.01, 0.05 and 0.1 levels, respectively.

	DUMMY4							
	1	2	3	4	5	6	7	8
INCENTIVE_RATIO^{CG}	-0.08***	-0.09***	-0.08***					
	(-3.48)	(-3.58)	(-3.56)					
DELTA				-0.01***	-0.01***	-0.02***		
				(-4.19)	(-4.19)	(-4.48)		
SC_VEGA		0.06			0.04		-0.02	
		(1.28)			(0.96)		(-0.42)	
VEGA			0.00			0.00		-0.00
			(0.58)			(1.59)		(-0.15)
SIZE	0.01***	0.01***	0.01***	0.02***	0.02***	0.02***	0.01***	0.01***
	(4.60)	(4.27)	(4.25)	(5.39)	(5.22)	(5.04)	(4.11)	(3.98)
M/B	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.01**	-0.01**
	(-0.66)	(-0.88)	(-0.82)	(-0.32)	(-0.60)	(-0.48)	(-2.04)	(-2.04)
EPS	0.03***	0.03***	0.03***	0.03***	0.03***	0.03***	0.02***	0.02***
	(3.79)	(3.77)	(3.75)	(3.93)	(3.90)	(3.92)	(3.55)	(3.57)
ANALYST	-0.07***	-0.07***	-0.07***	-0.07***	-0.07***	-0.07***	-0.07***	-0.07***
	(-3.62)	(-3.48)	(-3.53)	(-3.45)	(-3.31)	(-3.38)	(-3.41)	(-3.43)
Q-SCORE	-0.04***	-0.04***	-0.04***	-0.04***	-0.04***	-0.04***	-0.04***	-0.04***
	(-4.15)	(-4.24)	(-4.19)	(-4.13)	(-4.22)	(-4.18)	(-4.28)	(-4.24)
Constant	-1.37***	-1.37***	-1.37***	-1.36***	-1.35***	-1.35***	-1.37***	-1.37***
	(-31.42)	(-30.96)	(-31.11)	(-31.11)	(-30.50)	(-30.45)	(-31.00)	(-31.08)
Obs.	147737	146940	147417	147751	146939	147431	146940	147432
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table A6: Is Strategic Rounding Used to Avoid Covenant Violations?

The table presents probit regressions, where the dependent variable for firm-quarter (i,t) is set to one if firm i has a covenant violation in quarter t, and to zero otherwise. The sample consists of firm-quarter observations with available data on the presence or absence of covenant violations over the period 1996–2012 and with EPS greater than 0.1 cents. The main explanatory variable is DUMMY4, which equals one if four is the first post-decimal digit in EPS reported in cents in that quarter, and equals zero otherwise. The control variables are the same as in Table 8 and are defined in the captions to that table. T-statistics are reported in parentheses. Superscripts ***,**,* denote significance at the 0.01, 0.05 and 0.1 levels, respectively.

	Covenant violation in the current quarter				
	1	2	3	4	5
DUMMY4	-0.03	-0.04	-0.04	-0.04	-0.04
	(-0.70)	(-0.76)	(-0.88)	(-0.86)	(-0.85)
AB_ACC		0.02	0.02	0.03	0.03
		(0.75)	(0.65)	(1.04)	(0.91)
SIZE			-0.12***	-0.12***	-0.12***
			(-17.57)	(-18.41)	(-18.00)
M/B			-0.09***	-0.10***	-0.10***
			(-8.02)	(-8.79)	(-8.62)
ISSUE			-0.21***	-0.19**	0.05
			(-2.58)	(-2.24)	(0.29)
LEVERAGE				0.32***	0.30***
				(7.84)	(7.46)
CURRENT_RATIO				-0.05***	-0.05***
				(-5.98)	(-5.86)
Constant	-2.79***	-2.72***	-1.95***	-1.86***	-2.31***
	(-237.55)	(-207.66)	(-49.98)	(-41.24)	(-25.28)
Observations	311723	210974	200269	192684	192684
Year FE	No	No	No	No	Yes

A.5 Robustness of Predictive Regressions

We start by showing the analog of firm-year level predictive regressions presented in Table 3, but for $Q^{(10)}$, i.e., the Q-score based on ten prior quarters with positive earnings. The sample size is smaller than for $Q^{(4)}$: more values of $Q^{(10)}$ are missing, because a higher N requires a larger number of prior observations with positive EPS to calculate $Q^{(N)}$.

Columns 1–5 of Table A7 show that $Q^{(10)}$ significantly predicts AAERs (Panel A) and restatements (Panel B) after controlling for discretionary accruals, as well as the M-score and F-score models. In columns 6–7 we augment the M-score + F-score model in column 5 with 11 additional predictors from Alawadhi et al. (2020), as in the "augmented model" in column 6 of Table 3: market capitalization, market-to-book ratio, leverage, profit margin, return on assets, basic earnings power, inventory turnover, ratio of intangibles to total assets, Altman's Z-score, financial distress indicator, and the indicator for negative earnings. We show that $Q^{(10)}$ continues to significantly predict AAERs after including all these variables (see column 7 in Panel A of Table A7), and in unreported results, we verify the same conclusion for $Q^{(20)}$ and $Q^{(40)}$. For restatement regressions, however, the inclusion of inventory turnover (which is often missing) leads to a large decline in sample size, as large as due to the inclusion of ten other variables from Alawadhi et al. (2020). (The sample size for restatement regressions is smaller than for AAERs because the restatement data are available for a shorter time period.) As a result, while $Q^{(10)}$ continues to significantly predict restatements if we do not include inventory turnover but include all the other variables (see column 6 in Panel B), it is not significant in predicting restatements upon its inclusion. For this reason, we report these results separately: first, without inventory turnover and with only ten additional variables from Alawadhi et al. (2020) in column 6 of Table A7, and then with inventory turnover also included in column 7 of Table A7.

We next present the robustness of our firm-year level predictive regressions to firm-quarter level analysis, controlling both for modified Jones discretionary accruals (in

Table A8) and performance-matched discretionary accruals (in Table A9). For consistency with the firm-year level regressions, we use the same, firm-year level, discretionary accruals as in Tables 3 and A7, but the coefficient and significance of the Q-scores remain unaffected if we instead use firm-quarter level discretionary accruals (computed as the residuals from the modified Jones model that is estimated cross-sectionally for every two-digit SIC code and quarter).

In Table A10, we show that the composite score, which accounts for missing threes and fours (or missing twos, threes, and fours) is also predictive of future accounting violations.

Finally, in Table A11, we show that the Q-scores are also predictive of class action securities fraud litigation.

Table A7: Firm-Year Level Predictive Regressions for $Q^{(10)}$

The table presents probit regressions, which are the analog of those in Table 3, but for the Q-score based on ten prior quarters: for firm-year (i,t), $Q^{(10)}$ is set to zero if there was at least one "four" in the first post-decimal digit of EPS reported by the firm over ten quarters with positive earnings ending with the last quarter of year t, and zero otherwise. Column 2 includes the modified Jones accruals (JONES_RES), column 3 includes the eight predictors from Beneish (1999)'s M-score model, column 4 includes the nine predictors from Dechow et al. (2011)'s F-score model 2, and column 5 combines the M-score and F-score model predictors. In column 6 we add ten predictors from Alawadhi et al., 2020 (market capitalization, market-to-book ratio, leverage, profit margin, return on assets, basic earnings power, the ratio of intangibles to total assets, Altman's Z-score, financial distress indicator, and the indicator for negative earnings) to the model in column 5. In column 7, we add another variable from Alawadhi et al., 2020 (inventory turnover) to the model in column 6, for a total of 11 additional predictors (corresponding to the augmented model in Table 4 and column 6 of Table 3). The list of all these predictors and their definitions are in Appendix A. T-statistics are reported in parentheses. Superscripts ***,**,* denote significance at the 0.01, 0.05 and 0.1 levels, respectively.

Panel A. Predicting AAERs

	AAER						
	1	2	3	4	5	6	7
$Q^{(10)}$	0.07***	0.09***	0.09***	0.12***	0.11***	0.12***	0.11***
	(3.87)	(4.57)	(3.71)	(5.02)	(3.94)	(3.97)	(3.27)
JONES_RES		0.04**					
		(2.20)					
RSST accruals			0.44***		0.34***	0.42***	0.46***
			(4.48)		(3.00)	(3.36)	(3.22)
Change in receivables			0.78***		0.62***	0.24	0.19
			(3.88)		(2.71)	(0.93)	(0.64)
Change in inventory			0.36		0.36	0.49	0.67*
			(1.41)		(1.32)	(1.57)	(1.96)
Percent soft assets			0.59***		0.60***	0.75***	0.75***
			(10.01)		(9.67)	(8.78)	(7.74)
Change in cash sales			0.14***		0.06**	0.04	0.04
			(6.83)		(2.13)	(1.22)	(0.95)
Change in ROA			-0.18		-0.17	-0.20	-0.03
			(-1.34)		(-1.13)	(-1.07)	(-0.16)
Security issue flag			0.41***		0.43***	0.44***	0.47***
			(6.08)		(5.93)	(5.13)	(4.90)
Abnormal change in employees			-0.04		-0.03	0.02	0.05
			(-0.96)		(-0.61)	(0.30)	(0.74)
Operating leases flag			0.23***		0.22***	0.19***	0.20***
			(8.96)		(8.02)	(5.69)	(5.49)
Days sales in receivables				0.07***	0.07*	0.07	0.06
				(2.70)	(1.84)	(1.55)	(1.19)
Gross margin index				0.02	0.02	0.05	0.05
				(1.31)	(0.83)	(1.55)	(1.13)
Asset quality index				0.01	0.02	0.02	0.02
				(1.10)	(1.23)	(1.14)	(1.33)
Sales growth index				0.29***	0.18***	0.17***	0.17***
				(12.43)	(4.25)	(3.51)	(2.98)
Depreciation index				0.09*	0.02	0.02	0.02
				(1.92)	(0.35)	(0.31)	(0.29)
SG&A index				0.07	0.10	0.04	0.09
				(1.07)	(1.29)	(0.41)	(0.80)
Leverage index				0.01	-0.03	-0.01	-0.02
				(0.35)	(-0.74)	(-0.18)	(-0.34)
Total accruals-to-total-assets ratio				0.35***	-0.10	-0.03	-0.01
				(3.66)	(-0.91)	(-0.23)	(-0.05)
Constant	-2.20***	-2.22***	-3.07***	-2.80***	-3.49***	-3.63***	-3.72***
	(-174.22)	(-150.23)	(-39.55)	(-30.10)	(-24.35)	(-20.07)	(-17.95)
Ten additional predictors for augmented model	No	No	No	No	No	Yes	Yes
Inventory turnover	No	No	No	No	No	No	Yes
Observations	122019	96472	60097	70044	54624	45668	40151

Panel B. Predicting Restatements

	Restatement						
	1	2	3	4	5	6	7
$Q^{(10)}$	0.02**	0.03***	0.03**	0.03**	0.04**	0.04**	0.02
	(2.41)	(2.61)	(2.11)	(2.28)	(2.43)	(2.51)	(1.39)
JONES_RES		0.02**					
		(2.24)					
RSST accruals			0.07		0.02	0.18***	0.15*
			(1.23)		(0.29)	(2.69)	(1.89)
Change in receivables			-0.05		-0.29*	-0.12	-0.21
			(-0.37)		(-1.83)	(-0.70)	(-1.09)
Change in inventory			-0.11		-0.22	-0.27	-0.23
			(-0.70)		(-1.25)	(-1.40)	(-1.12)
Percent soft assets			0.19***		0.22***	0.13***	0.04
			(6.03)		(6.69)	(2.99)	(0.88)
Change in cash sales			0.04**		-0.01	0.01	-0.00
			(2.43)		(-0.44)	(0.17)	(-0.09)
Change in ROA			-0.14**		-0.03	-0.05	-0.01
			(-2.14)		(-0.46)	(-0.64)	(-0.07)
Security issue flag			0.11***		0.12***	0.12***	0.10***
			(4.38)		(4.49)	(4.09)	(2.98)
Abnormal change in employees			-0.01		0.01	0.02	0.02
			(-0.34)		(0.48)	(0.80)	(0.47)
Operating leases flag			0.15***		0.15***	0.17***	0.17***
			(10.60)		(10.50)	(10.11)	(9.69)
Days sales in receivables				0.03	0.07***	0.06**	0.06**
				(1.51)	(2.82)	(2.35)	(2.21)
Gross margin index				0.00	0.01	-0.00	0.03
				(0.18)	(0.30)	(-0.07)	(1.32)
Asset quality index				-0.01	-0.01	-0.00	0.00
				(-0.85)	(-0.69)	(-0.09)	(0.05)
Sales growth index				0.11***	0.17***	0.13***	0.15***
				(5.30)	(4.10)	(3.00)	(2.65)
Depreciation index				0.02	0.01	0.01	0.01
				(0.75)	(0.42)	(0.27)	(0.37)
SG&A index				0.13***	0.12***	0.07	0.06
				(3.69)	(2.86)	(1.61)	(1.17)
Leverage index				0.01	0.01	-0.01	-0.01
				(0.31)	(0.30)	(-0.61)	(-0.53)
Total accruals-to-total-assets ratio				-0.02	-0.05	0.02	0.08
				(-0.41)	(-0.70)	(0.27)	(0.98)
Constant	-0.97***	-0.94***	-1.20***	-1.23***	-1.64***	-1.45***	-1.38***
	(-140.34)	(-113.36)	(-39.07)	(-19.61)	(-18.87)	(-14.98)	(-11.99)
Ten additional predictors for augmented model	No	No	No	No	No	Yes	Yes
Inventory turnover	No	No	No	No	No	No	Yes
Observations	84225	63544	45679	46897	41121	35952	30807

Table A8: Quarter-Level Predictive Regressions

The table presents results of firm-quarter level probit regressions, where the dependent variable for firm-quarter (i, t) is set to zero if firm i never experiences an AAER (restatement) after quarter t, or if the alleged violation period for this event starts later than five years after quarter t, and set to one if the alleged violation period starts within five years from quarter t. The sample consists of firm-quarter observations with available data on the presence or absence of accounting violations for the next five years: 1980Q1-2011Q4 for AAERs and 1995Q1-2015Q4 for restatements. $Q^{(N)}$ for a given firm in quarter t is set to zero if there was at least one four in the first post-decimal digit of EPS reported by the firm over N quarters with positive earnings prior to but not including quarter t, and set to one otherwise. JONES_RES is the absolute value of the residuals from the modified Jones model, which is estimated cross-sectionally for every two-digit SIC code and year. M/B is the ratio of the market value of total assets to the book value of total assets. LEVERAGE is the sum of short-term and long-term debt scaled by total assets. ROA is income before extraordinary items scaled by total assets, and ΔROA is $\text{ROA}_t - \text{ROA}_{t-1}$. ISSUE is set equal to one if the firm issued securities during that year and zero otherwise. Each continuous variable is winsorized at 1% and 99%, except JONES_RES, which we only winsorize at the 99% level. T-statistics are reported in parentheses. Superscripts ***,**,* denote significance at the 0.01, 0.05 and 0.1 levels, respectively.

	A: AAER				B: Restatement			
	1	2	3	4	1	2	3	4
$Q^{(4)}$	0.07***	0.08***			0.03***	0.03***		
	(8.02)	(7.65)			(5.75)	(4.35)		
$Q^{(10)}$			0.06***	0.09***			0.02***	0.03***
			(7.14)	(8.06)			(4.93)	(4.46)
JONES_RES		0.03***		0.03***		0.01**		0.01**
		(3.25)		(2.71)		(2.19)		(2.54)
M/B		0.02***		0.02***		-0.00***		-0.01***
		(17.28)		(17.33)		(-3.91)		(-4.48)
LEVERAGE		-0.10***		-0.04**		0.16***		0.17***
		(-6.58)		(-2.11)		(18.35)		(16.85)
ΔROA		0.04		0.05		0.01		0.02
		(0.89)		(0.81)		(0.29)		(0.53)
ISSUE		-0.26***		-0.26***		-0.11***		-0.11***
		(-6.91)		(-6.34)		(-15.88)		(-14.31)
Constant	-2.22***	-2.21***	-2.20***	-2.22***	-1.01***	-0.96***	-1.00***	-0.96***
	(-278.29)	(-218.00)	(-352.59)	(-257.06)	(-238.73)	(-170.29)	(-301.60)	(-185.25)
Observations	608408	427123	496808	354796	439504	304988	370892	259749

Table A9: Predictive Regressions: Controlling for Performance-Matched Discretionary Accruals

The table presents results of firm-quarter level probit regressions, where the dependent variable for firm-quarter (i, t) is set to zero if firm i never experiences an AAER (restatement) after quarter t, or if the alleged violation period for this event starts later than five years after quarter t, and set to one if the alleged violation period starts within five years from quarter t. The sample consists of firm-quarter observations with available data on the presence or absence of accounting violations for the next five years: 1980Q1-2011Q4 for AAERs and 1995Q1-2015Q4 for restatements. $Q^{(N)}$ for a given firm in quarter t is set to zero if there was at least one four in the first post-decimal digit of EPS reported by the firm over N quarters with positive earnings prior to but not including quarter t, and set to one otherwise. PMDA is performance matched discretionary accruals, which are computed by first matching a firm-year observation with another from the same two-digit SIC industry and fiscal year with the closest ROA and then deducting the matched firm's discretionary accruals (based on the modified Jones model) from those of the sample firm, as in Kothari et al. (2005). M/B is the ratio of the market value of total assets to the book value of total assets. LEVERAGE is the sum of short-term and long-term debt scaled by total assets. ROA is income before extraordinary items scaled by total assets, and ΔROA is $\text{ROA}_t - \text{ROA}_{t-1}$. ISSUE is set equal to one if the firm issued securities during that year and zero otherwise. Each continuous variable is winsorized at 1% and 99%. T-statistics are reported in parentheses. Superscripts ***,**,* denote significance at the 0.01, 0.05 and 0.1 levels, respectively.

	A: AAER				B: Restatement			
	1	2	3	4	1	2	3	4
$Q^{(4)}$	0.08***	0.09***			0.03***	0.03***		
	(7.06)	(7.64)			(5.29)	(4.41)		
$Q^{(10)}$			0.08***	0.08***			0.03***	0.02***
			(7.55)	(7.36)			(4.84)	(3.88)
PMDA	0.01	0.01*	0.00	0.01*	0.01**	0.01**	0.00	0.00
	(1.16)	(1.92)	(0.49)	(1.70)	(2.34)	(2.21)	(1.07)	(1.31)
M/B		0.02***		0.02***		-0.00***		-0.00***
		(19.59)		(18.46)		(-2.62)		(-2.88)
LEVERAGE		-0.10***		-0.04**		0.15***		0.17***
		(-6.28)		(-2.29)		(17.22)		(15.92)
ΔROA		0.03		0.05		0.01		0.02
		(0.67)		(0.80)		(0.39)		(0.59)
ISSUE		-0.26***		-0.24***		-0.12***		-0.11***
		(-6.62)		(-5.84)		(-15.84)		(-14.42)
Constant	-2.21***	-2.21***	-2.20***	-2.21***	-0.97***	-0.96***	-0.96***	-0.96***
	(-239.34)	(-213.48)	(-302.65)	(-253.82)	(-194.16)	(-166.71)	(-245.73)	(-182.23)
Observations	452206	405481	371867	337293	311600	290364	263879	247530

Table A10: Predictive Regressions Using the Composite Score

The table presents results of firm-quarter level probit regressions, where the dependent variable for firm-quarter (i,t) is set to zero if firm i never experiences an AAER (restatement) after quarter t, or if the alleged violation period for this event starts later than five years after quarter t, and set to one if the alleged violation period starts within five years from quarter t. The sample consists of firm-quarter observations with available data on the presence or absence of accounting violations for the next five years: 1980Q1-2011Q4 for AAERs and 1995Q1-2015Q4 for restatements. $\text{SCORE}^{(N)}[3,4]$ ($\text{SCORE}^{(N)}[2,3,4]$) in quarter t is set to zero if there was at least one "three" or "four" (at least one "two", "three", or "four") in the first post-decimal digit of EPS reported by the firm over N quarters with positive earnings prior to but not including quarter t, and set to one otherwise. JONES_RES is the absolute value of the residuals from the modified Jones model, which is estimated cross-sectionally for every two-digit SIC code and year. M/B is the ratio of the market value of total assets to the book value of total assets. LEVERAGE is the sum of short-term and long-term debt scaled by total assets. ROA is income before extraordinary items scaled by total assets, and ΔROA is $\text{ROA}_t - \text{ROA}_{t-1}$. ISSUE is set equal to one if the firm issued securities during that year and zero otherwise. Each continuous variable is winsorized at 1% and 99%, except JONES_RES, which we only winsorize at the 99% level. T-statistics are reported in parentheses. Superscripts ***,**,* denote significance at the 0.01, 0.05 and 0.1 levels, respectively.

Panel A. Predicting AAERs

	AAER							
	1	2	3	4	5	6	7	8
$\text{SCORE}^{(4)}[3,4]$	0.08***	0.09***						
	(9.91)	(9.48)						
$\text{SCORE}^{(4)}[2,3,4]$			0.10***	0.12***				
			(11.13)	(11.60)				
$\text{SCORE}^{(10)}[3,4]$					0.07***	0.07***		
					(7.16)	(6.40)		
$\text{SCORE}^{(10)}[2,3,4]$							0.08***	0.11***
							(6.84)	(7.55)
JONES_RES		0.03***		0.03***		0.03***		0.03***
		(3.31)		(3.36)		(2.69)		(2.73)
M/B		0.02***		0.02***		0.02***		0.02***
		(17.38)		(17.36)		(17.49)		(17.58)
LEVERAGE		-0.10***		-0.10***		-0.04**		-0.04**
		(-6.55)		(-6.55)		(-2.13)		(-2.13)
ΔROA		0.04		0.04		0.05		0.05
		(0.90)		(0.89)		(0.82)		(0.82)
ISSUE		-0.26***		-0.26***		-0.26***		-0.26***
		(-6.88)		(-6.90)		(-6.39)		(-6.40)
Constant	-2.21***	-2.20***	-2.20***	-2.19***	-2.21***	-2.23***	-2.23***	-2.27***
	(-375.03)	(-280.74)	(-435.70)	(-316.22)	(-267.43)	(-205.46)	(-201.34)	(-158.55)
Observations	608421	427130	608421	427130	496886	354830	496886	354830

Panel B. Predicting Restatements

	Restatement							
	1	2	3	4	5	6	7	8
$SCORE^{(4)}[3,4]$	0.02***	0.02***						
	(5.30)	(3.49)						
$SCORE^{(4)}[2,3,4]$			0.02***	0.02***				
			(4.72)	(2.86)				
$SCORE^{(10)}[3,4]$					0.03***	0.02***		
					(6.33)	(4.01)		
$SCORE^{(10)}[2,3,4]$							0.04***	0.04***
							(6.71)	(5.17)
JONES_RES		0.01**		0.01**		0.01**		0.01**
		(2.20)		(2.20)		(2.52)		(2.53)
M/B		-0.00***		-0.00***		-0.01***		-0.01***
		(-3.87)		(-3.86)		(-4.43)		(-4.42)
LEVERAGE		0.16***		0.16***		0.17***		0.17***
		(18.34)		(18.33)		(16.82)		(16.85)
ΔROA		0.01		0.01		0.02		0.02
		(0.29)		(0.30)		(0.53)		(0.53)
ISSUE		-0.11***		-0.11***		-0.11***		-0.11***
		(-15.89)		(-15.91)		(-14.34)		(-14.33)
Constant	-1.00***	-0.95***	-0.99***	-0.95***	-1.01***	-0.96***	-1.02***	-0.98***
	(-318.48)	(-209.16)	(-366.89)	(-228.65)	(-232.98)	(-155.72)	(-178.76)	(-127.77)
Observations	439514	304994	439514	304994	370926	259762	370926	259762

Table A11: Predictive Regressions: Class Action Litigation

The table presents results of probit regressions, where the dependent variable for firm-quarter (i,t) is set to zero if the firm never experiences a class action lawsuit after quarter t, or if the alleged violation period for this event starts later than five years after quarter t, and set to one if the alleged violation period starts within five years from quarter t. The sample consists of firm-quarter observations with available data on the presence or absence of a class action lawsuit for the next five years, i.e., 1992Q1-2007Q2. $Q^{(N)}$ for a given firm in quarter t is set to zero if there was at least one four in the first post-decimal digit of EPS reported by the firm over N quarters with positive earnings prior to but not including quarter t, and set to one otherwise. JONES_RES is the absolute value of the residuals from the modified Jones model, which is estimated cross-sectionally for every two-digit SIC code and year. M/B is the ratio of the market value of total assets to the book value of total assets. LEVERAGE is the sum of short-term and long-term debt scaled by total assets. ROA is income before extraordinary items scaled by total assets, and ΔROA is $\text{ROA}_t - \text{ROA}_{t-1}$. ISSUE is set equal to one if the firm issued securities during that year and to zero otherwise. Each continuous variable is winsorized at 1% and 99%, except JONES_RES, which we only winsorize at the 99% level. T-statistics are reported in parentheses. Superscripts ***,**,* denote significance at the 0.01, 0.05 and 0.1 levels, respectively.

	Litigation					
	1	2	3	4	5	6
$Q^{(4)}$	0.05***	0.06***	0.05***			
	(5.31)	(5.84)	(4.55)			
$Q^{(10)}$				0.07***	0.07***	0.06***
				(7.68)	(7.12)	(5.41)
JONES_RES		-0.04***	-0.05***		-0.06***	-0.08***
		(-4.28)	(-5.40)		(-5.36)	(-6.16)
M/B			0.02***			0.03***
			(26.78)			(23.99)
LEVERAGE			-0.23***			-0.15***
			(-14.94)			(-8.32)
ΔROA			0.15***			0.15***
			(3.76)			(2.83)
ISSUE			-1.33***			-1.33***
			(-15.24)			(-13.84)
Constant	-1.96***	-1.94***	-1.90***	-1.97***	-1.95***	-1.93***
	(-259.40)	(-218.94)	(-196.16)	(-327.24)	(-269.33)	(-230.95)
Observations	433863	328743	301615	361226	274981	254582

Table A12: Modified Q-Score Using Only the First Three Fiscal Quarters

The table is the analog of Table 2 and tests for the persistence of quadrophobia when the fourth quarter is excluded from the sample, i.e., both the Q-scores and the frequency of the four in future quarters are based solely on observations from the first three fiscal quarters. For firm-quarter (i,t), the variable $Q_{it}^{(N)}$ is set to zero if there was at least one four in the first post-decimal digit of EPS of firm i over N quarters (skipping fourth fiscal quarters) with positive earnings prior to but not including quarter t, and is set to one otherwise. We next divide the sample into two subsamples, based on the value of $Q_{it}^{(N)}$ being equal to either one (i.e., quadrophobia in the past) or zero (i.e, no quadrophobia in the past), and compute (for both of these subsamples) P_{t+k}, which is the frequency of the number four among firm-quarter observations (skipping fourth fiscal quarters) with EPS greater than 0.1 cents in quarter $t+k$, for $k = 0, 1, 2, 3$. Z-statistics for the test that the difference in the frequency P_{t+k} between the two subsamples is zero are reported in parentheses. Superscripts ***,**,* denote significance at the 0.01, 0.05 and 0.1 levels, respectively.

		$N=1$	$N=2$	$N=4$	$N=10$	$N=20$	$N=40$
P_t	$Q_t^{(N)}=1$	0.085	0.084	0.083	0.079	0.075	0.070
	$Q_t^{(N)}=0$	0.092	0.091	0.091	0.090	0.088	0.087
	z-test	(5.20)***	(6.53)***	(8.68)***	(11.00)***	(9.12)***	(5.27)***
P_{t+1}	$Q_t^{(N)}=1$	0.085	0.084	0.083	0.080	0.076	0.072
	$Q_t^{(N)}=0$	0.092	0.093	0.091	0.090	0.088	0.087
	z-test	(3.69)***	(6.14)***	(6.85)***	(8.45)***	(6.97)***	(3.77)***
P_{t+2}	$Q_t^{(N)}=1$	0.084	0.084	0.082	0.079	0.076	0.070
	$Q_t^{(N)}=0$	0.090	0.090	0.091	0.089	0.087	0.087
	z-test	(2.85)***	(4.85)***	(7.15)***	(8.71)***	(6.36)***	(4.35)***
P_{t+3}	$Q_t^{(N)}=1$	0.084	0.084	0.083	0.080	0.077	0.073
	$Q_t^{(N)}=0$	0.092	0.090	0.090	0.089	0.088	0.087
	z-test	(4.49)***	(4.63)***	(5.88)***	(7.15)***	(6.20)***	(3.45)***

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