What, Me Worry? Financial Knowledge Overconfidence and the Perception of Emergency Fund Needs

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We examined the association between financial knowledge overconfidence and the perception of emergency fund needs using the 2016 Survey of Consumer Finances (SCF) dataset. Only 28% of respondents reported a perceived amount of emergency funds needed that would cover at least three months of estimated spending. We conducted an OLS regression analysis on the log of the ratio of perceived emergency fund needs to household monthly expenditure. Overconfident respondents perceived a ratio 21.4% lower than those who had objective and subjective financial knowledge above median levels. Overconfident respondents might be underestimating emergency fund needs, suggesting the importance of not only increasing objective financial knowledge but also making consumers aware of the limitations of their financial knowledge.

Keywords: emergency fund, financial knowledge, overconfidence, subjective emergency fund, survey of consumer finances

After periods of prosperity, many might think that there was little chance of an emergency impacting them, and, for instance, few people anticipated the impact of the Great Recession in 2007 or the COVID-19 pandemic in 2020 before they began. During the Great Recession, the stock market crashed as the S&P 500 index dropped over 50% between 2007 and 2009 (Federal Reserve Bank Database, 2018). The average duration of unemployment was about 40 weeks during 2009, which was twice as long as before the Great Recession (Bureau of Labor Statistics, 2018). During the COVID-19 pandemic, the unemployment rate in the U.S. increased from 3.5% in February 2020 to 14.7% in April 2020, a shock unmatched since the Great Depression (Bureau of Labor Statistics, 2020). Unexpected events that affect households' income or expenses could take place at any point. In order to prepare for uncertainty due to income changes or unexpected expenses, experts suggest the need to accumulate emergency funds. Overconfident respondents might not worry about the risk of substantial income decreases.

An emergency fund is a fund individuals or households can use without penalty in case of an emergency (Johnson & Widdows, 1985). Many previous studies defined adequate emergency funds as having financial assets sufficient to cover at least three months of spending (Chang & Huston, 1995; Chang et al., 1997; Hanna & Wang, 1995). However, there is controversy over what is an adequate level of emergency funds. One additional limitation of most previous studies is that they focused on actual emergency funds (Babiarz & Robb, 2014; Bhargava & Lown, 2006; Chang & Huston, 1995; Lee & Kim, 2016), and examined financial assets respondents owned at the time of the survey. However, some households might have already depleted the funds because of emergencies when they were surveyed. Bi and Montalto (2004) compared the ratios of a comprehensive measure of financial assets and respondents' perceptions of the emergency funds needed to monthly expenditures. The study found that the median ratio was 2.1 for the comprehensive asset measure and 2.3 for the subjective measure. Almost all studies have had a focus on whether households met particular guidelines, such as having a ratio equivalent to at least three months of expenditures, rather than analyzing factors related to the ratio itself. In addition, no studies have analyzed the effect of financial knowledge overconfidence on the ratio of perceived emergency fund needs to monthly spending.

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http://dx.doi.org/10.1891/JFCP-2021-0045

While there have been many studies on emergency fund adequacy, previous studies have the aforementioned limitations which we further elaborate on in the literature review section. Analysis of the subjective measure, and of the ratio of perceived needs to expenses rather than of whether households met particular guidelines, should provide new insights into respondent perceptions of emergency funds. Also, past studies of emergency funds using Survey of Consumer Finances (SCF) datasets did not have financial knowledge measures. The 2016 SCF was the first SCF dataset to add objective and subjective financial knowledge measures, so we could analyze the association between financial knowledge overconfidence and the perception of emergency fund needs using a nationally representative dataset. Therefore, the primary objective of our study was to identify the relationship between financial knowledge and financial knowledge overconfidence and the ratio of perceived needs of emergency funds to monthly expenditures.

Literature Review, Conceptual Model, and Hypothesis

Definition of Emergency Fund

Johnson and Widdows (1985) discussed three categories of emergency funds: Quick, intermediate, and comprehensive. Quick funds include monetary assets such as checking accounts and savings accounts. Intermediate funds include quick funds plus long-term savings instruments such as CDs. Comprehensive funds include all financial assets other than retirement accounts. These definitions of emergency funds have been used for over 30 years by numerous researchers.

In most studies, estimates of the percentages of households having enough emergency funds were based on these three measures, using SCF datasets, which is the most commonly used data for emergency fund research (Anong & DeVaney, 2010; Bhargava & Lown, 2006; Bi & Montalto, 2004). In order to evaluate the appropriate amount of emergency funds, a liquidity ratio is computed. The amount in emergency funds is divided by household monthly spending or income, and this ratio indicates how many months a household could cover spending if income suddenly became zero.

Johnson and Widdows (1985) suggested having liquid assets be at least two to six months' worth of expenses, using typical periods of unemployment as the basis for their guideline. Based on the average length of unemployment in the 1990s, many researchers used three months as a criterion for the adequate emergency fund (Chang et al., 1997; DeVaney, 1995; Hanna & Wang, 1995). Articles in mass media about emergency funds typically assume the three-month guideline as well (Antonelli, 2019; Berry-Johnson, 2019). However, Rodriquez-Flores and DeVaney (2007) used a five-month guideline and Anong and DeVaney (2010) used a six-month guideline, based on the reasoning that an increase in unemployment duration should lead to an increase in emergency funds needed.

Theoretical Issues in the Literature

Bi and Montalto (2004) reviewed how the Ando and Modigliani (1963) lifecycle model could be applied to emergency fund adequacy, as a way to smooth consumption in case of a sudden cut of income or surge of expenses to minimize utility loss. Hanna et al. (1993) and Chang et al. (1997) simulated a three-period model of consumption and suggested that the optimal level of emergency funds is not the same for all households, being affected by expected income growth pattern and uncertainty associated with it.

The precautionary saving model posits that higher uncertainty leads to a higher need for precautionary saving (Cagetti, 2003; Carroll & Samwick, 1998) and risk aversion has a significant effect on the need (Kimball, 1990). Hatcher (2000) examined the necessity of emergency funds based on cost-benefit analysis. The cost of holding emergency funds would be a loss of investment opportunities with higher returns, and the benefit would be preventing loss due to borrowing costs in case of an emergency. Hatcher (2000) concluded that the appropriate emergency fund should be determined by the interest rates and the likelihood of an emergency.

When applying economic models to examine factors related to emergency funds, individuals or households could be considered rational agents whose purpose is maximizing utility by accumulating emergency funds to smooth the impact of unexpected financial risks (Anong & DeVaney, 2010; Bi & Montalto, 2004; Chang et al., 1997; Hanna et al., 1993; Hatcher, 2000). However, given the low levels of emergency funds among the general population of U.S. households (Lusardi et al., 2011), there is a question of whether individuals are capable of appropriately predicting their emergency needs.

Babiarz and Robb (2014) noted that low emergency fund levels might be due to the lack of financial knowledge, and provided empirical evidence supporting their hypothesis. Brown et al. (2017) asserted that people who are less financially knowledgeable have more difficulty assessing the monetary value of annuities, due to cognitive constraints. As we elaborate in the following sections, financial knowledge has been linked to savings (Beckmann, 2013; Lusardi, 2007), but further analysis is needed to examine the relationship between financial knowledge and perceived needs for emergency saving.

Emergency Fund Adequacy

Even though theoretical models support the need for emergency funds, the amount of emergency funds that each household needs should depend on a number of characteristics. This raises the question of whether the three-month guideline is an appropriate criterion for all households. Fixing the level of adequate amount of emergency funds at three months of spending may be unreasonable when diverse social safety net programs and heterogeneity in characteristics of households are taken into account. For instance, even when the typical length of unemployment increases during a recession, not only the duration of unemployment but also the length of unemployment benefits will affect optimal emergency fund holdings. During the Great Recession, unemployment benefits could last up to 99 weeks due to the American Recovery and Reinvestment Act (Babcock et al., 2012).

The existence of various types of income-conditioned social safety net programs can mitigate the impact of emergencies (Lusardi et al., 2011). There are programs specifically targeting low-income households such as SNAP, Medicaid, EITC, and TANF. The income and asset requirements for these programs might provide a disincentive for low-income households to accumulate wealth (Hubbard et al., 1995). High replacement rates from Social Security and unemployment benefits could be expected for low-income households (Anderson et al., 2003; Yuh & Hanna, 2010).

Additionally, households may have different perceptions of acceptable resources in case of emergencies. Households can use credit or low liquidity assets in case of emergencies. Those who can borrow against a retirement account may perceive less need for emergency funds (Bi & Montalto, 2004). Using a home equity line of credit could be a possible alternative to emergency funds as well (Bhargava & Lown, 2006; Bi & Montalto, 2004). Alternative servcies such as payday loans, income tax refund loans, pawnshops, and auto title loans are additional options, although they may be costly (Chase et al., 2011).

While the three-month guideline has been a useful rule of thumb for emergency funds in the past, it may be too arbitrary for the reasons discussed above. Therefore, we focus on the ratio of perceived need for emergency funds to spending, rather than whether the perceived level exceeds three months of spending.

Financial Knowledge and Financial Knowledge Overconfidence

A number of studies have examined the association between financial knowledge and savings. Lusardi (2007) pointed out that financial illiteracy could lead to limited ability to save due to the lack of understanding of basic financial concepts required, and found positive correlations between financial knowledge and wealth and saving. Beckmann (2013) found that financial knowledge is related to the number of saving accounts and having a pension fund. Babiarz and Robb (2014) investigated the association between financial knowledge and emergency funds and found objective and subjective financial knowledge levels were positively correlated with the likelihood of meeting a three-month guideline. Reyers (2019) found no evidence of a significant relationship between objective financial knowledge and the likelihood of having emergency funds covering three months of spending, based on a survey in South Africa.

However, the combined effect of objective and subjective financial knowledge was not tested in those studies. One's perception of ability might not align with actual capacity. While Babiarz and Robb (2014) examined the effects of the objective and subjective measures of financial knowledge, each measure was included in separate regression models. It is unclear from their study whether there is an interaction between the effects of subjective and objective financial knowledge on emergency fund adequacy. Therefore, we extended research on the effects of financial knowledge on emergency funds by analyzing the effects of the inconsistency between objective and subjective financial knowledge (financial knowledge overconfidence) on emergency savings.

In this study, we defined financial knowledge overconfidence as the overrating of self-efficacy in the understanding of cognitively complex financial concepts compared to one's and other's actual abilities. Lim et al. (2014) concluded that self-efficacy often leads to positive financial behaviors of individuals. However, this may not be the case for excessive levels of self-efficacy, or in other words, overconfidence. Individuals tend to overestimate personal ability when it comes to the initial judgment of self-efficacy (Stone, 1994), and having too much faith in one's own ability and knowledge could inhibit households from taking appropriate actions, due to the illusion of control (Porto & Xiao, 2016).

Moore and Healy (2008) noted that the psychological literature defined overconfidence in three ways: Overestimation, overplacement, and overprecision. While studies on financial knowledge overconfidence generally have not identified which of these three definitions was used, it is clear that studies of financial knowledge overconfidence have definitions related to overestimation (e.g., a student who expects to get an "A" on a test but gets a "C") and overplacement (e.g., I believe I am an above-average driver). Barber and Odean (2001) presented empirical evidence of the detrimental effects of overconfidence. Individuals who conducted excessive trading in the stock market had lower rates of return, and the researchers attributed this to overconfidence. However, they used gender as the proxy of overconfidence rather than directly examining the discrepancy between ability and perceived ability.

A few studies have attempted to apply the concept of overconfidence to the context of financial knowledge. Previous studies operationalized the concept of overconfidence in financial knowledge based on the discrepancy between objective and subjective financial knowledge, with objective financial knowledge measured by the level of financial knowledge, and subjective financial knowledge measured by perceived understanding. Xia et al. (2014) defined financial knowledge overconfidence as having lower than average objective financial knowledge and higher than average subjective financial knowledge. Porto and Xiao (2016) also used this specification to measure overconfidence while Robb et al. (2015) used sample medians as the criteria rather than sample means.

Individuals who are overconfident in financial knowledge are less likely to seek financial advice from professional planners (Porto & Xiao, 2016), more prone to using alternative financial services (Robb et al., 2015), and show undesirable money management behaviors (Ameer & Khan, 2020), compared to those who are not overconfident. Xia et al. (2014) found that Chinese respondents who were overconfident were more likely to participate in the stock market, which, given the lack of a history of regulation in the Chinese stock market, could be considered risky behavior.

Conceptual Model

If consumers were rational, factors relevant to the extended life cycle model (Yuh & Hanna, 2010) as well as alternatives to liquid assets (Bi & Montalto, 2004) should affect their perceptions of the level of emergency funds needed. As noted earlier, due to the higher replacement rates of unemployment and other government benefits among lower-income households (Anderson et al., 2003; Yuh & Hanna, 2010), lower-income households might rationally save a lower proportion of income than higher-income households. The perceived level of emergency funds needed should decrease with the increase in illiquid assets to the extent that illiquid components of net worth are considered as alternatives to liquid emergency funds. However, higher net worth also implies less eligibility for some government programs, and net worth might be positively related to the perceived need for emergency funds as a result. For those with negative net worth, more negative net worth might imply a greater need for emergency funds because of the lack of alternatives to liquid assets.

Rodriquez-Flores and DeVaney (2007) found that as age increases, the perceived need for emergency funds increases. Older individuals are more likely to have had past experiences of income fluctuations, to perceive that income adjustments will become more difficult in the future, and to be exposed to an increased risk of health problems. Couples might perceive a lower need for emergency funds than single-head households because of having more alternatives for income if the earned income of one partner decreases (Bhargava & Lown, 2006).

Households with a salaried worker head might perceive a lower need for emergency funds than those with a self-employed head, because of the greater variability of self-employment income. Retired households might perceive

less need because of having secure retirement pensions, but on the other hand, as combined with age, the increasing risk of health problems might lead to a higher perceived need for emergency funds. Those with a longer financial planning horizon might perceive a greater need for emergency funds because they can imagine more potential problems in the future. In a similar way, the perceived need for emergency funds might increase with education.

If all factors related to rational saving decisions are controlled, and all households behaved rationally, we expect that financial knowledge overconfidence would not be related to the perception of emergency funds needed relative to spending. However, consumers might have bounded rationality when it comes to financial decision-making (Kim et al., 2019; Robb et al., 2015). Cognitive constraints from a lack of financial knowledge to understand the implication of emergency saving, combined with high confidence in one's ability to do so, could lead to miscalculation of emergency needs. If misplaced confidence in financial knowledge plays a role, the misjudgment is likely to be made by underestimating emergency funds needed. Therefore, we test for whether financial knowledge overconfidence is negatively related to the ratio of perceived emergency fund needs to spending.

Based on the conceptual framework presented in the previous section, here we propose the following main hypothesis.

Hypothesis. Those who are overconfident in financial knowledge will have lower perceived needs of emergency funds compared to those without overconfidence in financial knowledge.

Methodology

Data and Sample

The dataset used for analysis is the 2016 Survey of Consumer Finances, a triennial cross-sectional survey sponsored by the Federal Reserve Board (Bricker et al., 2017). Most previous studies on emergency funds were conducted before the Great Recession took place or full recovery from the Great Recession (Anong & DeVaney, 2010; Bhargava & Lown, 2006; Bi & Montalto, 2004; Rodriquez-Flores & DeVaney, 2007). In addition, the 2016 SCF dataset includes financial knowledge variables, which were not available in previous years. We take advantage of the new variables to test for the association between financial knowledge overconfidence and the subjective emergency fund ratio. The total sample size in the public release of the dataset is 6,248, with each primary economic unit (referred to in this paper as "household") having five implicates of data (Lindamood et al., 2007). Our main dependent variable, discussed below, is coded X7187 in the dataset. We deleted cases for which the shadow variable for X7187 equaled 99 or higher, following a suggestion by Hanna et al. (2018), and as a result, our analytic sample size is 5,423.

Variables

Dependent Variable. The dependent variable of this study is the ratio of subjective emergency funds to monthly spending. A question in the SCF (X7187) is "About how much do you think you (and your family) need to have in savings for emergencies and other unexpected things that may come up?" This variable represents the respondent's perception of the appropriate amount of emergency funds.

The emergency fund ratio was computed by dividing the perceived emergency fund needed by estimated monthly spending. However, since there is no appropriate measure of total spending in SCF datasets, we followed procedures described by Hong (2015, pp. 59–62) to estimate total spending for each household. In addition to the SCF, posted tables from the Consumer Expenditure Survey (CEX) were used in the process. Due to the skewed distribution of the ratio, the natural log of the ratio was used as the dependent variable in our multivariate analyses. Cases with a subjective emergency fund ratio of 0.0 were assigned the value of Ln(0.01). Details about the estimation of spending and the emergency fund ratio are available from the authors upon request.

Independent Variables. To examine the association between financial knowledge overconfidence and the subjective emergency fund ratio, categorical group indicators of financial knowledge were included in the model. We classified respondents into four categories based on the combination of objective and subjective financial knowledge levels, following the approach suggested by Xia et al. (2014), Robb et al. (2015), and Kim et al. (2019). If the respondents had an objective financial knowledge score no higher than the sample median (2) and a subjective financial knowledge higher than the sample median (7), they were categorized as being overconfident in financial knowledge (the "Overconfident" group). Those having

both objective and subjective financial knowledge higher than sample median scores were categorized as being in the "Appropriate High" group. Those having both objective and subjective financial knowledge higher than the sample medians were categorized as being in the "Appropriate Low" group. Lastly, those who had objective financial knowledge higher than the sample median and a subjective score no higher than the sample median were categorized as being in the "Underconfident" group.

Our selection of control variables and our hypotheses were developed based on normative theoretical considerations similar to the discussion by Yuh and Hanna (2010). First, sociodemographic variables such as respondent age, years of education, racial/ethnic identity, work status, household composition, perceived health, and the number of children under the age of 18 were included. Second, economic variables such as net worth and income were included. Due to the skewed distribution of income, the natural log of income was used in the model. In addition, instead of controlling for the level of net worth itself, two spline variables were used based on previous studies (Hanna et al., 2015; Suits et al., 1978). By including the net worth of households, we controlled for possible alternative sources that could be utilized in an emergency. Applying spline variables allowed for the estimation of different slopes for positive and negative net worth effects.

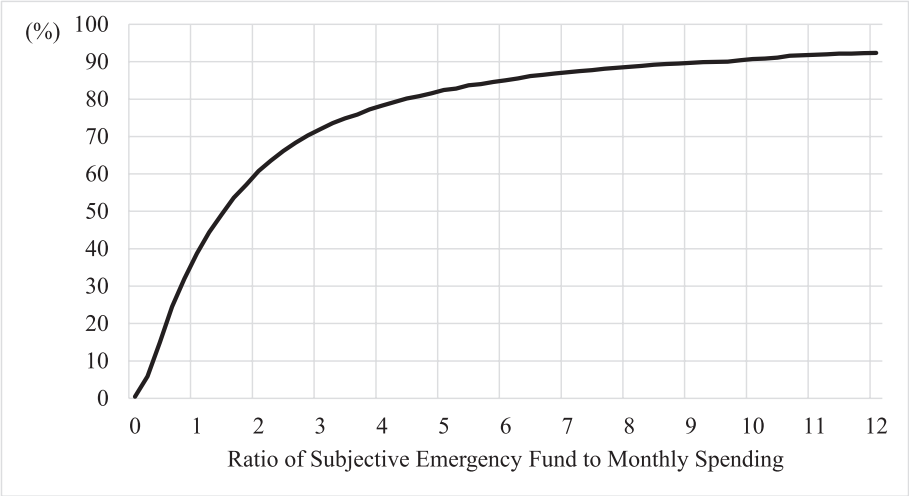
We also included some variables that might be related to differences in preferences and also differences in respondent cognitive ability. Attitudinal/behavioral variables such as spending relative to income, possible assistance for an emergency, the possibility of withdrawal from a retirement account, the expectation for the economy in five years, the expectation for whether the household income will increase, possible usage of credit for an emergency, risk tolerance, certainty of income, planning horizon for saving, overall expenses over last 12 months, and income compared to a normal year were included. Details about the independent variables are available from the authors upon request.

Analysis

OLS regression analysis on the natural log of subjective emergency fund ratio was conducted. Figure 1 presents the cumulative distribution of the subjective emergency fund ratio. As it is evident in Figure 1, the distribution of the ratio is extremely skewed. Therefore, we used the natural log of the subjective emergency fund ratio as a dependent variable. With this transformation, we can interpret the effect of a regression coefficient as a percent change of 100 × [exp (coefficient) –1].

For descriptive analyses (Table 2) and OLS regression analysis (Table 3), the RII technique was applied to estimate the variances appropriately (Lindamood et al., 2007).

Figure 1. Cumulative distribution of subjective emergency fund ratio.



Note. Weighted analyses by authors of 2016 SCF, sample size = 5,423. There are values higher than 12, but to make graph easier to read, the horizontal axis only extended to 12.

Results

Descriptive Analysis

As shown in Figure 1 and Table 1, the distribution of the subjective emergency fund ratio is very skewed. The median subjective emergency fund ratio was 1.4, representing a perceived emergency fund needed equivalent to covering 1.4 months of expenses. The 99th percentile of the ratio was 59.7, and the maximum ratio was almost 6,400. Only 28% of respondents reported a perceived amount of emergency funds needed that would cover at least three months of estimated spending. Bi and Montalto (2004) reported that 42% of respondents perceived three months of spending as appropriate, a difference that might be due to a different time period or differences in the estimation of expenditures.

Table 2 shows the difference in average emergency fund needs by various characteristics. (Age, education, risk tolerance, income, and net worth were included as continuous variables in the regression in Table 3 but categorized for descriptive purposes in Table 2.) Over a quarter of the respondents (26%) were overconfident, and 24% had appropriately high confidence. Overconfident respondents had a lower mean emergency fund ratio (4.53) than respondents who were above the median in both objective and subjective financial knowledge (9.11). The mean ratios were different by age, education, household composition, work status, racial/ethnic status, net worth, income, spending behavior, alternative sources of income in case of emergency, and saving horizon as well. The means tests examined whether

TABLE 1. Distribution of Key Variables, 2016 SCF

Panel A: Distribution of subjective emergency fund, ratio, and monthly expenditure			
	Emergency fund	**Monthly expenditure**	**Emergency fund ratio**
Mean	25,217.3	5,796.5	5.5
Max	50,000,000	105,224.0	6,391.8
99%	250,000	27,482.7	59.7
95%	80,000	15,424.5	18.2
90%	50,000	11,520.0	9.5
75%	18,000	7,165.2	3.4
50%	6,000	4,273.5	1.4
25%	2,500	2,484.2	0.6
10%	1,000	1,509.6	0.3
Panel B: Percentage of respondents meeting guideline (%)			
	2-Month guideline	**3-Month guideline**	**6-Month guideline**
Emergency fund ratio	39.3	28.1	14.9

Note. Weighted analyses by authors of 2016 SCF, sample size = 5,423.

TABLE 2. Mean Emergency Fund Ratio by Selected Characteristics, 2016 SCF

	Proportion in sample	**Mean ratio by category**	***p*-value**
Financial knowledge			
Overconfident (obj. ≤ median, sub. > median)	26.0	4.53	<0.001
Underconfident (obj. > median, sub. ≤ median)	18.6	5.97	0.006
Appropriate low (obj. ≤ median, sub. ≤ median)	31.1	3.13	<0.001
Appropriate high (obj. > median, sub. > median)	24.4	9.11	
Respondents' age			
Younger than 35	21.9	1.95	
35–45	16.9	2.14	0.093
45–55	18.1	4.62	0.022
55–65	19.7	6.71	<0.001
65 and over	23.4	10.78	<0.001

(*Continued*)

TABLE 2. Mean Emergency Fund Ratio by Selected Characteristics, 2016 SCF *(Continued)*

	Proportion in sample	Mean ratio by category	*p*-value
Respondents' education			
Less than high school	11.0	2.93	
High school	23.0	3.99	<0.001
Some college	30.4	4.92	0.006
College degree	35.6	7.69	<0.001
Respondents' household composition			
Couple with male respondent	30.7	7.13	
Couple with female respondent	25.8	4.41	0.007
Single male	16.9	5.23	0.107
Single female	26.7	4.76	0.013
Respondents' work status			
Work for someone else	55.2	3.35	
Self-employed/partnership	9.5	6.61	<0.001
Retired/disabled	27.0	10.34	<0.001
Other groups not working	8.4	2.56	0.445
Respondents' Racial/ethnic identity			
White	68.1	6.70	
Black/African American	15.8	2.48	<0.001
Hispanic	11.4	2.83	<0.001
Other	4.7	4.20	0.102
Respondents' Perceived health			
Excellent	31.0	6.31	
Good	49.4	5.15	0.110
Fair or poor	19.6	4.97	0.224
Have a child < age 18			
Yes	30.2	2.07	<.001
No	69.8	6.95	
Net worth			
<$0	11.0	1.81	
$0–$9,980	14.0	2.17	0.109
$9,980–$94,480	25.0	2.45	<0.001
$94,480–$355,490	25.0	4.76	<0.001
>$355,490	25.0	12.68	<0.001
Income			
<$27,341	24.6	4.02	
$27341–$52,657	25.0	4.63	0.016
$52,657–$97,231	25.4	5.17	0.039
>$97,231	25.0	8.08	<0.001

TABLE 2. Mean Emergency Fund Ratio by Selected Characteristics, 2016 SCF *(Continued)*

	Proportion in sample	Mean ratio by category	*p*-value
Spending relative to income			
Exceed income	17.7	4.57	
Same as income	36.1	4.21	0.520
Less than income	46.2	6.81	0.016
Assistance of $3,000 in case of emergency			
Yes	63.8	5.66	0.404
No	36.2	5.16	
Possible to withdraw funds from a retirement account			
Yes	23.5	3.34	<0.001
No	76.5	6.13	
Usage of credit in case of unemployment			
Yes	56.9	4.50	<0.001
No	43.1	6.76	
Expectation for the economy (5 years)			
Better	37.7	5.31	
Worse	21.6	4.89	0.428
About the same	40.7	5.93	0.389
Expectation for the income			
Up more	22.7	6.04	
Up less	23.9	6.40	0.746
About the same	53.4	4.82	0.133
Risk tolerance (Scale of 0–10)			
Less than 5	48.1	5.73	
5 and over	51.9	5.24	0.380
Certainty of income			
Yes	72.6	5.62	0.423
No	27.4	5.10	
Saving horizon (years)			
One year or less	36.6	4.20	
One to five years	28.0	4.25	0.898
Five or more years	35.4	7.76	<0.001
Households' overall expenses over last 12 months			
Unusually high	24.8	6.10	
Unusually low	5.4	3.96	0.072
Normal	69.8	5.37	0.300
Income compared to normal year			
Higher	8.8	5.65	
Lower	14.9	3.72	<0.001
Same	76.3	5.80	0.891

Note. Weighted analyses by authors of 2016 SCF. Two-tail *P*-value from RII *t*-test of difference of emergency fund ratio compared to reference category. The reference category used in the means test is indicated in boldface. Significance test is for mean difference from reference category for each variable, with two-tail *p* value.

TABLE 3. OLS Regression Analysis Results on Natural Log of Subjective Emergency Fund Ratio, 2016 SCF

	Coef.	Std. err.	*p*-value
Financial knowledge (Reference: Appropriate High, obj. > median & sub. > median)			
Overconfident (obj. ≤ median, sub. > median)	−0.241	0.052	<0.001
Underconfident (obj. > median, sub. ≤ median)	−0.035	0.053	0.508
Appropriate Low (obj. ≤ median, sub. ≤ median)	−0.150	0.053	0.005
Age	−0.024	0.007	<0.001
Age squared/10,000	3.522	0.637	<0.001
Years of education	0.018	0.007	0.014
Household composition (Reference: Couple with male respondent)			
Couple with female respondent	−0.160	0.048	0.001
Single male	0.168	0.058	0.004
Single female	0.060	0.053	0.261
Work status (Reference: salaried worker)			
Self-employed/partnership	0.133	0.056	0.017
Retired/disabled	0.302	0.060	<0.001
Other groups not working	0.112	0.071	0.114
Racial/ethnic identity (Reference: White)			
Black/African American	−0.008	0.056	0.890
Hispanic	0.138	0.063	0.027
Other	0.059	0.081	0.466
Perceived health (Reference: Excellent)			
Good	−0.042	0.040	0.297
Fair or poor	−0.060	0.060	0.322
Number of children < age18	−0.084	0.020	<0.001
Log (Positive net worth)	0.174	0.009	<0.001
Log (Negative net worth)	0.165	0.011	<0.001
Log (Income)	0.021	0.012	0.071
Spending relative to income (Reference: Exceed income)			
Same as income	−0.013	0.054	0.811
Less than income	0.283	0.054	<0.001
Assistance from friends or families (Reference: Not possible)	0.064	0.042	0.123
Possible to withdraw funds from a retirement account (Reference: No)	−0.105	0.048	0.027
Credit for emergency (Reference: Not possible)	−0.106	0.037	0.004
Expectation for economy (Reference: Better)			
Worse	0.081	0.049	0.100
About the same	0.013	0.040	0.737
Expectation for income (Reference: Up more)			
Up less	0.037	0.053	0.491
About the same	−0.106	0.044	0.017
Risk tolerance	0.000	0.007	0.959
Certainty of income (Reference: Not certain)	−0.089	0.042	0.036

TABLE 3. OLS Regression Analysis Results on Natural Log of Subjective Emergency Fund Ratio, 2016 SCF *(Continued)*

	Coef.	Std. err.	*p*-value
Planning horizon for saving	0.025	0.004	<0.001
Overall expenses last year (Reference: Usually high)			
Usually low	−0.093	0.087	0.289
Normal	−0.035	0.042	0.410
Income compared to normal year (Reference: Higher)			
Lower	0.059	0.076	0.435
Normal	−0.039	0.060	0.519
Intercept	−0.976	0.246	<0.001
Adjusted R^2		0.323	

Note. Unweighted RII analysis. Sample size = 5,423.

TABLE 4. Pairwise Comparison of Natural Log of Subjective Emergency Fund Ratio by Financial Knowledge Categories, 2016 SCF

	Contrast	Std. err.	*P* > t
Appropriate High vs Overconfident	0.241	0.052	<0.001
Underconfident vs Overconfident	0.206	0.055	<0.001
Appropriate Low vs Overconfident	0.091	0.050	0.069
Underconfident vs Appropriate High	−0.035	0.053	0.508
Appropriate Low vs Appropriate High	−0.150	0.053	0.005
Appropriate Low vs Underconfident	−0.115	0.054	0.033

Note. Based on OLS regression with independent variables in Table 3. RII technique was used. Two-tail *p* values.

the differences were statistically significant but did not control for the heterogeneity in other variables. Thus, we present a multivariate analysis in the following section.

Multivariate Analysis

OLS regression analysis was conducted to examine the determinants of subjective emergency fund ratio (Table 3). The coefficient of the dummy variable for financial knowledge overconfidence showed that those who were overconfident had a perceived ratio 21.4% lower than otherwise similar respondents with appropriately high confidence (above average objective and subjective financial knowledge), according to the calculation based on regression result in Table 3. The significance levels for the confidence categories in Table 3 are only for comparison to the reference category of appropriately high confidence, so we created Table 4 to show significance levels of other differences. Overconfident respondents had a significantly lower ratio than those who were underconfident and lower than those who had appropriately low confidence, though the latter difference was only significant at the .07 level using a two-tail test.

Some control variables were found to be salient factors. Both age and age squared had statistically significant coefficients. Based on the combined effects of age and age squared, the calculated ratio decreases slightly from age 20 to 33, then the ratio increases with age after 33, with a doubling of the log-ratio by age 81, at mean levels of other variables. Education was positively related to the subjective emergency fund ratio. Gender had significant effects, as couples with a female respondent had a subjective ratio 14.8% lower than otherwise similar couples with a male respondent. Single females had a lower ratio than otherwise similar single males. Retired or disabled and self-employed respondents had a higher level of the ratio compared to salaried workers. As the number of children under age 18 increased, the ratio decreased. The ratio was higher as net worth increased above 0 and also was higher as net worth decreased below zero, implying a V-shaped pattern.

Compared to those who spent more than income, those who spent less than income perceived a needed ratio about 33% higher. Both being able to withdraw from a retirement account and being willing to use credit for an emergency were negatively related to the ratio. Having a longer planning horizon for saving was related to a higher level of the subjective emergency fund ratio.

Discussion

The ratio of perceived emergency funds needed to monthly spending was lower for those who were overconfident in financial knowledge, controlling for household characteristics. A low level of emergency funds might be rational for some of the overconfident respondents, although many factors that might be rationally related to emergency fund needs were controlled. Therefore, the negative relationship between overconfidence and the emergency fund ratio suggests that some people might be mistaken in their perceptions of the amount of emergency funds needed. Overconfident respondents could have had an inappropriately optimistic view of the need for emergency funds, and thus be poorly prepared for economic shocks such as what happened in 2020 with the Covid-19 Pandemic.

Babiarz and Robb (2014) found a positive relationship between objective financial knowledge and a binary indicator of having emergency fund worth three months spending, and also a positive relationship between subjective financial knowledge and the indicator. However, objective and subjective financial knowledge measures were included in separate Probit models, thus not allowing for estimation of the combined effect of the two indices. Our results imply that objective and subjective financial knowledge measures do not have independent effects on the perception of emergency fund needs.

Respondents with high objective financial knowledge (Appropriate High & Underconfident) perceived higher levels of emergency fund needs than respondents with low objective financial knowledge (Appropriate Low & Overconfident). Higher subjective financial knowledge was marginally related to a lower perceived need of emergency funds among the groups with low objective financial knowledge (Appropriate Low & Overconfident). The result implies that the level of objective financial knowledge has a dominating relationship with the perceived need, but unjustified confidence in subjective financial knowledge could have an unexpected outcome of misperceiving emergency fund needs when the objective financial knowledge is low.

The comparison between respondents with high subjective financial knowledge (Appropriate High & Overconfident) and respondents with low subjective financial knowledge (Appropriate Low & Underconfident) also yields an interesting result. The differenece between those with low and those with high objective financial knowledge is associated with a higher perceived emergency fund ratio among the respondents with high subjective financial knowledge (log ratio change of 0.241) compared to the difference for respondents with low subjective financial knowledge (log ratio change of 0.115). This result suggests that increasing objective financial knowledge could lead to more accurate perceptions of emergency savings needs, especially for those with high subjective financial knowledge.

Tokar Asaad (2015) asserted that financial knowledge overconfidence provokes risky and costly financial behaviors. As noted earlier, previous researchers have found that financial knowledge overconfidence is associated with costly behaviors and attributed the relationship between financial knowledge overconfidence and costly financial behaviors to the bounded rationality of individuals (Kim et al., 2019; Robb et al., 2015). Overconfident individuals are more confident in their capability to understand financial concepts. Cognitive constraints in financial decision-making could lead individuals to inappropriately predict their emergency needs, overestimate emergency assets they own and take unnecessary risks due to bounded rationality.

If people do not have enough emergency funds and encounter unexpected financial crises, possible alternatives to emergency funds they could utilize, such as borrowing against retirement accounts or using credit card loans, could result in high penalties and interest. The consistency of objective and subjective financial knowledge could be crucial in properly evaluating the need for emergency funds.

The positive relationship between the subjective emergency fund ratio and education may be due to more educated respondents being more future-oriented (Chao et al., 2009). The difference in subjective emergency fund ratios by occupation status might be related to the need for the self-employed and retirees to accumulate emergency funds for possible medical expenses.

Those who spent more than income had a lower ratio than otherwise similar respondents who spent less than income, which is worrisome because it is the opposite of what would seem reasonable, as overspenders would be more vulnerable to emergencies.

Limitations

One of the limitations is that our analyses focused only on the subjective emergency fund. The studies by Rodriquez-Flores and DeVaney (2007) or Anong and DeVaney (2010) attempted to address both objective and subjective emergency funds of households. Thus, additional research is needed to ascertain the relation of financial knowledge to both objective and subjective emergency fund levels. Without comprehensive analyses, our understanding of the link between intentions and actions will be limited.

In addition, the endogeneity of financial knowledge is a concern in multivariate analyses. The multicounty study by Chambers et al. (2019) shows that there is a difference in financial knowledge level by one's socioeconomic status, gender, and parents' characteristics. Thus, the multivariate analyses we conducted in this study could only confirm the correlation between variables. Future research which applies different methodological approaches such as instrumental variables should be conducted to examine the causal relationship.

We did not attempt to ascertain the optimal level of emergency funds for each household. Future study is needed, especially in terms of rigorous analyses to determine rational levels of emergency funds for households in a variety of circumstances. Not every household needs emergency funds that would cover three months spending. Other private and public resources may lead some households to rationally perceive low levels of emergency funds needed, e.g., government assistance (Hubbard, et al., 1995).

Our result shows that the difference in the ratio by household composition persists even after controlling for financial knowledge overconfidence, and other variables. The latent factors which might lead to the difference should be further examined. For instance, our results in Table 3 showing that female respondents perceive a need lower than otherwise similar households with male respondents is puzzling and merits further research.

Implications

Analysis of the emergency fund ratio rather than of a binary indicator for emergency fund adequacy contributed to better insights into factors related to the perception of emergency fund needs. We did not rely on an arbitrary criterion of emergency fund adequacy. Acknowledging that three months spending of emergency funds is not necessary for all households, we considered the possibility that heterogeneity in household characteristics could lead to the difference in emergency fund needs.

Some findings of our study could provide implications for financial advisors and financial educators. First, financial advisors should explain the need and potential benefits of emergency funds thoroughly and help households plan for accumulating emergency funds. One salient result from our study is that most respondents do not perceive a need for emergency funds consistent with the usual expert recommendation, as only 28% of respondents gave an emergency fund level that would cover at least three months of spending, suggesting the possibility that many people may not be aware of the need for emergency funds. However, given that those who are overconfident in financial knowledge are less likely to consult professional financial advisors (Porto & Xiao, 2016), overconfidence in financial knowledge could exacerbate the misperception of emergency fund needs.

We found many characteristics to be significantly related to the subjective emergency fund ratio, which could help financial educators designing education programs to strengthen the capability of households when the unexpected strikes. To be specific, the negative association between financial knowledge overconfidence and the perceived need for emergency funds suggests that respondents might have bounded rationality when determining their emergency fund needs. Thus, financial education should be focused on not only improving objective financial knowledge but also narrowing the gap between objective and subjective financial knowledge. The balance between the two indices should be reached to prevent non-optimal financial behaviors (Atlas et al., 2019). Wagner (2019) found that having any type of financial education regardless of the delivery channel or stage was positively related to higher financial knowledge. However, giving the participants of financial education programs the false illusion of being knowledgeable while lacking actual capability could lead

to misestimation of emergency fund needs. As Kim et al. (2019) suggested, helping realistic assessment may be more beneficial than a simple distribution of financial information. Appropriate assessment tools should be offered to evaluating the financial knowledge level in both objective and subjective aspects.

Based on the assessments of both objective and subjective financial knowledge, financial educators could provide tailored financial education targeting specific groups. As noted earlier, the differences in subjective financial knowledge only mattered among the respondents with low objective knowledge. Higher levels of objective financial knowledge were associated with higher levels of perceived need among the respondents with high subjective knowledge. This result suggests that the Overconfident group could benefit most from financial education by improving objective financial knowledge and appropriately assessing their knowledge level. On the other hand, the Appropriate Low group would also need to enhance objective financial knowledge while has matching subjective financial knowledge in the process. The specific strategies or contents of financial education could be personalized to maximize the result.

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Disclosure. The authors have no relevant financial interest or affiliations with any commercial interests related to the subjects discussed within this article.

Acknowledgements. This manuscript has not been published in any form. The material in the manuscript will not infringe upon any statutory copyright. The paper will not be submitted elsewhere while under JFCP review.

Funding. The author(s) received no specific grant or financial support for the research, authorship, and/or publication of this article.