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Asset diversification, financial well-being, quality of life, and mental health: a study in Brazil*

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ABSTRACT

This study sought to investigate the relationship between diversification, financial well-being (FWB), quality of life (QoL), and mental health, and to see how FWB mediates this relationship, considering a sample of 1,047 Brazilian investors registered with the Brazilian Securities and Exchange Commission (Comissão de Valores Mobiliários [CVM]). In the national and international literature, no studies were found that sought to identify the mediating role of FWB between diversification, QoL, and mental health, as proposed in this study. This research may help brokers and financial institutions, allowing a new look at the profile of investors and their portfolios. It also widens the perspectives on studies of personal finance and mental health in Brazil and around the world. Mediation was conducted through structural equation modeling estimated by robust diagonally weighted least squares (RDWLS). 'Asset classes' was adopted as a proxy for diversification. For QoL, the World Health Organization Quality of Life (WHOQOL-100) scale was adopted, while the Beck inventories were used to measure mental health (depression and anxiety). For FWB, the measure of the Brazilian Credit Protection Service (Serviço de Proteção ao Crédito [SPC Brasil]) was used. The results showed a strong relationship between the FWB mediation between the diversification degree (asset classes) and the QoL and mental health scales (anxiety and depression). It was found that the diversification level is related to increased levels of anxiety and depression and decreased QoL in the short term, but when mediated by FWB, it decreases the anxiety and depression levels and increases QoL.

Keywords: asset diversification, financial well-being, quality of life, mental health, Brazilian investor.

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1. INTRODUCTION

In recent decades, asset diversification has stood out as a theme in the Brazilian economic scenario (Bertucci et al., 2006; Hanson & Kalthoff, 2018). At the end of 2019, Brazil experienced a 1.1% growth in gross domestic product (GDP) in comparison to the previous year. Although it indicates a slow growth rate, a positive scenario emerged, since it was the third consecutive year in which GDP showed advances (Instituto Brasileiro de Geografia e Estatística [IBGE], 2020). This scenario inspired investors and resulted in R$ 3.3 trillion in investments in the retail and private sectors in 2019, regarded as the biggest growth in the volume of investments since 2015 (Associação Brasileira das Entidades dos Mercados Financeiro e de Capitais [ANBIMA], 2020). Also, it provided greater asset diversification and migration of investments from fixed to variable income (AMBIMA, 2020).

Individual investor migration to the stock exchange is also related to the scenario of consecutive reduction in the SELIC rate experienced in Brazil in the past six years. Brazil dealt with one of the lowest interest rate levels in history, set at 3.5% in May 2021, according to information from the Central Bank of Brazil (Banco Central do Brasil [BACEN], 2020), which made fixed income investments less interesting. Then, there was a substantial increase in the number of individual investors on the stock exchange, coming from 813,291 at the end of 2018 to 3.5 million individuals at the beginning of 2021 (Brasil, Bolsa, Balcão [B3], 2021).

In Brazil, the year 2020 was marked by recession in the economy due to the coronavirus disease 2019 (COVID-19) pandemic. This scenario of uncertainty and falling interest rates makes investors look for a rational investment analysis and for more efficient portfolios through diversification (B3, 2021; Bertucci et al., 2006).

Diversification has attracted the attention of many scholars (Abreu & Mendes, 2010; Guiso & Jappelli, 2008; Hanson & Kalthoff, 2018). Fonseca et al. (2007), Hibbert et al. (2012), and Mendes and Abreu (2006) highlighted that the diversification measured by the proxy 'asset classes' aims to minimize risks and maximize investor returns. According to Santos and Coelho (2010), it is possible to diversify a portfolio through various types of assets, such as stocks, government bonds, and real estate values. However, Hanson and Kalthoff (2018) highlighted that investors have taken a portfolio non-diversification attitude.

Market uncertainties and behavioral biases are among the main causes that make the activity of holding and managing a portfolio more complex (Marvin, 2015),

since the results of financial decisions reflect on financial well-being (FWB) (Hanson & Kalthoff, 2018), on quality of life (QoL), and on mental health (Nogueira et al., 2021; O'Neill et al., 2005).

From this perspective, the discussion and the relevance of well-being and mental health as a theme grew in the literature. In the international context, Mahendru (2020) introduced the objective and subjective concepts of FWB. Other authors have addressed the relationship between diversification and FWB (Chu et al., 2017; Davis, 2018), well-being, QoL, and mental health (Skevington & Böhnke, 2018), and well-being, life satisfaction, and mental health (Siahpush et al., 2008).

Studies dealing with the relationship between diversification/investments and mental health have also attracted the attention of scholars in recent years (Bressan et al., 2014; Patterson & Daigler, 2014). O'Neill et al. (2005) highlighted that studies are needed on the effects of mental health on personal finances and the effects of personal finances on health.

In the Brazilian context, studies addressed global satisfaction with life, FWB, and QoL (Campara et al., 2017), indebtedness, QoL, and mental health (Souza et al., 2019). Another major study is Rogers et al. (2020), who analyze the relationship between FWB, health, and QoL with 1,546 Brazilian investors relying on information from the Brazilian Securities and Exchange Commission (Comissão de Valores Mobiliários [CVM]). The authors did not analyze the construct 'diversification level,' proposed by this investigation. In turn, Mendes and Abreu (2006) addressed the impact of investors' financial literacy levels on the diversification of their portfolio. The authors concluded that investors' education levels positively impact the diversification of their assets. However, Mendes and Abreu (2006) did not analyze QoL, mental health, and FWB. The research is innovative, as it proposes to bridge a gap by analyzing the relationship between asset diversification, QoL, and mental health and verifying the relationship of these variables with individual FWB.

In the international scenario, for instance, Calvet et al. (2007), Chu et al. (2017), Davis (2018), Mugenda et al. (1990), and Patterson and Daigler (2014), among others, but none of them brought a proposal identical to this investigation's. Studies in the international literature having the same objective are rare, and this characterizes its innovative nature. Davis (2018) investigates how individual current FWB affects the building of her/his portfolio and finds that more financially organized people allocate a higher percentage of resources to stocks.

It is worth emphasizing that one of the biggest concerns regarding diseases in the world has been depression and anxiety (Nogueira et al., 2021), which cause, in the global economy, a loss of approximately US$ 1 trillion per year in productivity (World Health Organization [WHO], 2019).

In Brazil, there is a lack of studies addressing investor's diversification and its relation to QoL and mental health. Studies that sought to identify the mediating role of FWB between diversification, QoL, and mental health were also not found. Thus, to fill this gap, the following research question was formulated: how is the asset diversification level related to the Brazilian investors' FWB, QoL, and mental health (depression and anxiety)? Could the relationship between asset diversification, QoL, and mental health be mediated by FWB?

Therefore, this paper sought to investigate the relationship between diversification, FWB, QoL, and mental health, in addition to seeing how FWB mediates this relationship, considering a sample of 1,047 Brazilian investors registered with the CVM.

Regarding the method, this study adopted structural equation modeling (SEM) estimated by robust diagonally weighted least squares (RDWLS). In a first step, through confirmatory factor analysis (CFA), the FWB measurement models, Beck Anxiety Inventory (BAI), Beck Depression Inventory (BDI), and QoL and Health (QoLH) scale (World Health Organization Quality of Life instrument-Abbreviated version [WHOQOL-Bref]) were individually assessed in order to, in a second step, adjust the complete structural model via SEM, considering the sample of 1,047 Brazilian investors.

As main results, a strong mediation relationship of FWB was found between the diversification degree and the QoL and anxiety and depression scales. FWB showed a positive relation to diversification and QoL and a negative relation to the anxiety and depression scales. In short, findings showed that diversification can impact by increasing the anxiety and depression levels and decreasing QoL in the short term, but when mediated by FWB, it can impact by decreasing the anxiety and depression levels and increasing QoL. This paper widens the perspectives on finance and mental health studies and allows us to take a new look at the profile of investors and their investment portfolios.

2. THEORETICAL FOUNDATION

2.1 Asset Diversification and FWB

Market movements and individual and family behaviors are influenced by credit concessions, indebtedness level, household income, default, unemployment level, and interest rate fluctuations (Bacciotti & Marçal, 2020). Such factors, according to the Instituto de Pesquisa Econômica Aplicada (Ipea, 2020), have changed due to the economic impacts of the COVID-19 pandemic, motivating many investors to change their investment strategies and seek to diversify their portfolios.

It is known that diversification is a key practice for investment decision making that makes it possible to build a portfolio of assets with mean-variance combinations (Markowitz, 1999; Marvin, 2015). Investment diversification can take place by investing in various classes, aiming to dilute investor risk and maximize investor return (Fonseca et al., 2007; Hibbert et al., 2012; Mendes & Abreu, 2006). According to Santos and Coelho (2010), one of the diversification alternatives is portfolios consisting of assets, government bonds, or international indexes.

The finance literature points out that there is a low level of asset diversification by individuals (Abreu & Mendes, 2010; Guiso & Jappelli, 2008; Hanson & Kalthoff, 2018). For Guiso and Jappelli (2008), optimally combining a portfolio of assets and choosing the most assertive combination of stocks require mastering the variance-covariance matrix of asset returns and portfolio risk.

Calvet et al. (2007) and Chu et al. (2017) reported that return on investment is a relevant indicator for FWB. In this regard, seeking to grasp FWB has gained notoriety in several countries, such as the United States of America (USA), the United Kingdom (UK), Ireland, Australia, Canada, among others (Mahendru, 2020). According to Santana et al. (2019) and Vieira et al. (2021), FWB has become an increasingly relevant issue, as financial markets are gradually more complex due to the variability of investment options, loans, and access to credit.

2.2 FWB and QoL and Mental Health

The literature points out that FWB can be measured by objective and subjective indicators (Mahendru, 2020; Xiao & Porto, 2017). Objective FWB is related to income and wealth and involves financial results that can be observed through individual financial records (Potrich et al., 2015). Subjective FWB is measured by perceptions, expectations, and assessment of financial status/satisfaction (Consumer Financial Protection Bureau [CFPB], 2019; Mahendru, 2020; Xiao & Porto, 2017). According to Siahpush et al. (2008) and Xiao (2015), subjective well-being is associated

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with life satisfaction, QoL, and happiness, contributing to positive effects on health.

In this regard, Rogers et al. (2020) mentioned that higher FWB levels are related to lower anxiety and depression scores. It is worth mentioning that, according to the WHO (2020), depression is among the main diseases causing disability in the world. In the Brazilian scenario, depression-related disorders reached 11.5 million (5.8%) individuals and, in relation to anxiety, more than 8.6 million (9.3%) (Governo Federal, 2017).

In recent years, mental health and investments have been discussed as a theme in the literature (Bressan et al., 2014; Patterson & Daigler, 2014). Patterson and Daigler (2014) reported that return on an investment and diversification degree are associated with some pathological characteristics of mental health (such as depression).

Taffler et al. (2017) emphasized that the investment process gives rise to a state of endemic anxiety among fund managers. Also, Catunda and Ruiz (2008) highlighted that the lack of a satisfactory QoL level can have a negative relation to individual mental health. Mugenda et al. (1990) and Skevington and Böhnke (2018) associated FWB with QoL. In turn, Rogers et al. (2020) reported that higher FWB scores are associated with increased individual QoL. It is worth noticing that QoL is indirectly influenced by satisfaction with one's financial status (Mugenda et al., 1990).

2.2.1 Study hypotheses

This research is innovative, as it proposes to cover a gap by analyzing the relationship between diversification (asset classes), QoL, and mental health, and verifying the relation of these variables to FWB. There is a lack of studies dealing with these variables together. In the international scenario, Chu et al. (2017) and Clark and Liu (2019) highlighted that knowing how to manage their assets can help consumers in making decisions and obtaining a positive return on the portfolio, key factors for FWB. Siahpush et al. (2008) and Skevington and Böhnke (2018) assessed well-being, satisfaction, QoL, and mental health. Bressan et al. (2014) and Patterson and Daigler (2014) analyzed diversification and psychological factors.

In the Brazilian context, no studies were found that examine this relationship altogether, since the vast majority of studies have addressed aspects of indebtedness (Campara et al., 2017; Souza et al., 2019). In order to meet the research objectives and having Rogers et al. (2020) as a basis, the variable 'diversification level' was added to the authors' original model and a relation to QoL and mental health (anxiety and depression) was found, analyzing whether this relationship could be partially mediated by individual FWB. To map the relationships at stake, a conceptual research model was designed, as shown in Figure 1.
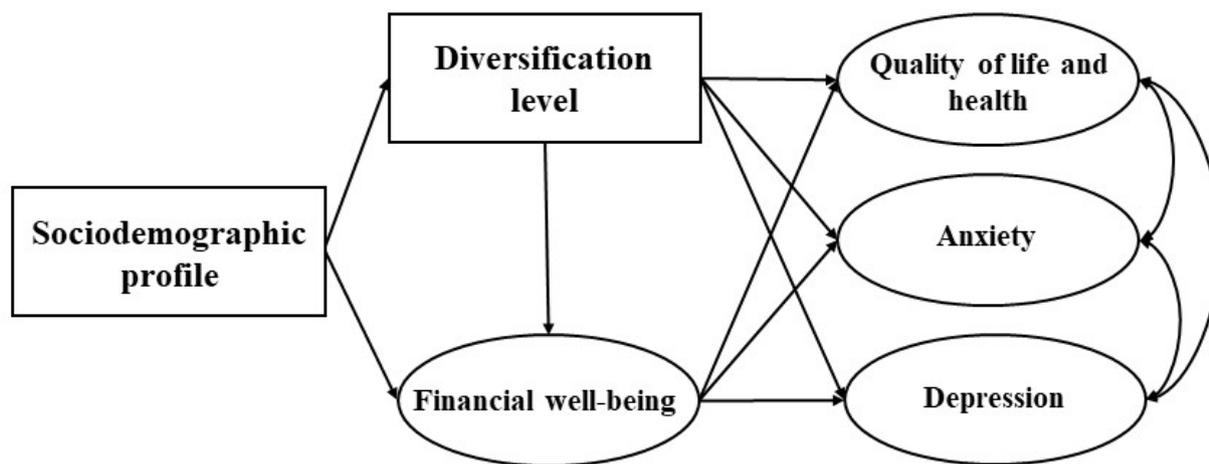
Figure 1 *Conceptual research model*
Note: *Sociodemographic profile involving sex, age, schooling, income, number of dependentes, and marital status.*
Source: *Prepared by the authors.*

The alternative hypotheses of this study were outlined by means of the conceptual model (Figure 1), according to Table 1.

Table 1
Alternative study hypotheses

Hypotheses	Description
H₁	A positive direct effect of the investor's diversification level is expected on the FWB score.
H₂	A total negative effect of the investor's diversification level is expected on the anxiety score.
H₃	A total negative effect of the investor's diversification level is expected on the depression score.
H₄	A total positive effect of the investor's diversification level is expected on the QoL score.
H₅	FWB is expected to partially mediate the relationship between the investor's diversification level and the QoL and mental health (anxiety and depression) scores.

FWB = financial well-being; QoL = quality of life.
Source: *Prepared by the authors.*

The alternative hypotheses in Table 1 were based on the authors mentioned in the theoretical foundation, namely: (i) Calvet et al. (2007) and Chu et al. (2017), who addressed diversification and FWB; (ii) Taffler et al. (2017), who studied anxiety and investments; (iii) Patterson and Daigler (2014), who investigated mental health and investments; (iv) Mugenda et al. (1990), who investigated the financial status and QoL; and (v) Rogers et al. (2020) and Skevington and Böhnke (2018), who reported the association between FWB and QoL and mental health.

3. METHODOLOGY

3.1 Sample and Data Sources

This research used data collected by Rogers et al. (2020). From April to December 2018, the researchers collected information on sociodemographic profile, investment profile, FWB, and QoL and mental health of investors registered with the CVM. After evaluating inconsistency, quality of answers, and approach to missings and outliers, the researchers obtained 1,047 observations; however, they used only 918, as they excluded individuals who said they are not currently investing. Unlike Rogers et al. (2020), this study used all observations (n = 1,047) and information from individual investment profile to build a diversification variable, an issue not addressed by the authors and discussed in greater detail below.

3.2 Analysis of Variables and Scales Used

To estimate the investor's sociodemographic profile, we adopted: sex, age, marital status, schooling, number of dependents, and income. To measure the individual mental health construct, a structured questionnaire having BAI and BDI as a basis was used. These instruments are used in the literature of psychoanalysis to measure depression and anxiety levels, and their good psychometric properties have been proven by Gomes-Oliveira et al. (2012).

As for the QoL scale, we resorted to the WHOQOL-Bref, an instrument abbreviated from the WHOQOL-100, which has been used and recognized by several authors due to its satisfactory psychometric characteristics, which complied with standards and protocols to obtain a validated set (Perera et al., 2018; Skevington et al., 2004; The World Health Organization Quality of Life Assessment Group, 1998).

As an indicator of the investor's FWB, the Financial Welfare Indicator provided by the Brazilian Credit Protection Service (Serviço de Proteção ao Crédito [SPC Brasil]) was used, which, supported by researchers from the CVM's Behavioral Studies Center and the Federal University of Rio de Janeiro (Universidade Federal do Rio de Janeiro [UFRJ]), launched the Brazilian Financial Well-Being indicator, which follows the CFPB proposal and is validated nationwide.

To analyze the asset diversification degree, this study used asset portfolio classes. Authors like Fonseca et al. (2007), Hibbert et al. (2012), and Mendes and Abreu (2006) used the asset category; Mendes and Abreu (2006) considered deposits, treasury bills, and government bond certificates, stocks, bonds, investment funds, or derivatives; Fonseca et al. (2007) used assets related to fixed and variable income; and Hibbert et al. (2012) used a set of categories [(i) security assets, current and savings accounts, deposit receipts, and government bills and government bonds; (ii) federal and municipal agency bonds, corporate and other bonds divided separately into mutual funds, real estate investment funds (REITs), derivatives, and stocks]. Table 2 refers to the acronyms and description, domains and indicators of all variables in this study.

Table 2
Description, domains, scales and indicators of variables

Variables	Acronyms	Description (domains, scales, and indicators)
Sociodemographic profile		Sex, age, marital status, schooling, number of dependentes, and income.
Financial well-being	FWB	Control over finances, protection from unforeseen events, financial goals, and freedom to choose. The indicator is obtained by the average of sample scores.
Diversification	DIV	Savings, stocks, government bonds, CDB, LCI/LCA, debentures, fixed income funds, hedge funds, stock funds, real estate funds, COE, options, gold, foreign exchange, other investments types, and none.
Anxiety	BAI	Anxiety levels (individual scores – 0 to 3): 0-10 minimal; 11-19 mild; 20-30 moderate; and 31-63 severe.
Depression	BDI	Depression levels (individual scores 0 to 3*): 0-13 minimal; 14-19 mild; 20-28 moderate; 29-66 severe.
Quality of life and health	QoLH	Physical, psychological, social relationships and environment (Likert-type response - 1 to 5).

CDB = Brazilian Bankary Deposit Receipt; COE = Brazilian Structured Operations Certificate; LCA = Brazilian Agribusiness Letter of Credit; LCI = Brazilian Real Estate Letter of Credit.
* = except for an item ranging from 0 to 6 points.
Source: *Prepared by the authors.*

3.3 Methodological Procedures and Data Analysis

To estimate parameters for the research conceptual model (Figure 1), we sought to adjust a complete structural model (measurement model + structural model) via SEM in two steps. Thus, as recommended by Brown (2015), before assessing the main parameters at stake (i.e. structural weights), a separate and individual evaluation of the measurement models – FWB, BAI, BDI, and QoLH – was carried out by means of four CFA models. The FWB, BAI, and BDI scales are one-dimensional; in the case of QoLH, although there are four factors (social, environmental, physical, and psychological), only the greater QoL construct was used (Perera et al., 2018).

For both the complete structural equation model (SEM) and the measurement models (CFA), assessment was performed by using the RDWLS estimation method, suitable for Likert-type ordinal data (Li, 2016; Nestler, 2013) or non-parametric. To assess the global fit of models, the following measures were used: x^2; x^2/gL; comparative fit index (CFI); Tucker-Lewis Index (TLI); standardized root mean residual (SRMR); and root mean square error of approximation (RMSEA). According to Kline (2016), the goal is: $x^2/gL \leq 3$; CFI and TLI > 0.95; RMSEA $\leq$ 0.06 [90% confidence interval (90% CI) 0.00-0.10]; and SRMR $\leq$ 0.08. To assess local fit, we paid attention to factor weights (< 0.5), modification indexes (> 4), and standardized residuals (> 2.5).

The reliability of measurements was assessed by using the McDonald's omega (ω). As these are scales widely used in various contexts, even nationally, therefore showing good psychometric properties, it is believed that additional validation procedures become unnecessary. The CFA and SEM models were estimated through the software JASP 0.14.1.

4. RESULTS

4.1 Sample Profile

The sample consisted of 1,047 participants and their profile can be seen in Table 3. Respondents ranged in age from 20 to 86 years with an average of 46 years. As for the individual investment classes, about 52% of the sample has up to four investment types, 11.9% do not have any investment type.

Table 3
Profile of respondents according to the variables schooling, marital status, dependents, monthly family income, anxiety and depression

Variables	n	%
	(mean)	**(standard deviation)**
Gender		
Male	842	80.4
Female	205	19.6
Marital status		
Single	249	23.8
Married/marriage-like relationship	687	65.6
Divorced	95	9.1
Widow(er)	16	1.5
Schooling		
Elementary School	5	5.0
High School	100	9.6
Higher Education	399	38.1
Graduate studies	543	51.9
Number of dependents		
None	344	32.9
1	273	26.1
2	204	19.5
3	132	12.6
4	67	6.4
5 or more	27	2.6
Income (MW)		
Up to 2	81	7.7
2 to 4	166	15.9
4 to 10	367	35.1
10 to 20	246	23.5
Above 20	187	17.9
Age (years)	**(46.07)**	**(13.98)**
20 to 46	576	55.0
47 to 86	471	43.1
BAI	**(8.00)**	**(8.24)**
Minimal	776	74.1
Mild	162	15.5
Moderate	86	8.2
Severe	23	2.2
BDI	**(8.61)**	**(7.58)**
Minimal	789	75.4
Mild	148	14.1
Moderate	79	7.5
Severe	31	3.0
FWB	**(26.21)**	**(9.24)**
Below average	516	49.3
Above average	531	43.6

Table 3
Cont.

Variables	n	%
	(mean)	(standard deviation)
QoLH (WHOQOL-Bref)	**(67.16)**	**(13.50)**
Below average	490	46.8
Above average	557	53.1
Diversification level (asset classes)	**(3.93)**	**(3.15)**
0 to 4	672	64.2
5 to 9	301	20.2
10 to 14	74	4.3

Note: *The variables comprising the mean values and standard deviations were collected in scale form, whose measurement units refer to years (age), score {Beck Anxiety Inventory BAI), Beck Depression Inventory (BDI), FWB (financial well-being), and World Health Organization Quality of Life instrument (Abbreviated version [QoLH WHOQOL-Bref])}, and asset classes in the portfolio (diversification level). The other variables were collected through the categories shown in the table.*
Source: *Prepared by the authors.*

The results showed that 49% of individuals invest in stocks, 42% invest their resources in savings, 43% in government bonds, and 40% in fixed income funds. The Brazilian Bankary Deposit Receipt (CDB) represents 36% of investments, multimarket funds represent 31%, Brazilian Real Estate Letter of Credit (LCI)/Brazilian Agribusiness Letter of Credit (LCA) represent 28%, real estate funds represent 26%, and equity funds represent 22%. Debentures had a 16% share, Options had 14% and Brazilian Structured Operations Certificate (COE) had 10%. These values do not refer to asset share in the investor's portfolio, but to the proportion of investors who indicated at least one of the answers; i.e. in the case of stocks, for instance, 49% of investors reported investing, at least, in stocks. In essence, the asset class that the individual has in a portfolio was asked, which is a multiple-answer question.

It is worth mentioning, for comparison purposes, that Bressan et al. (2014) measured depression using a depression scale from 0 to 12. The authors highlighted that only 6% of the sample have a depression score higher than 7, just as in this study, which showed low percentages (10%) for higher depression levels. Regarding QoL, Catunda and Ruiz (2008) pointed out that the results were above 70%; for this study, most of the sample (53%) had values above the average of 67 points. As for the FWB calculated by the SPC Brasil (2019), the Brazilian Financial Well-Being Indicator had, on average, 48 points.

4.2 Bivariate Analysis

Table 4 shows a bivariate correlation between the study variables. The variable 'number of dependents' showed a weak correlation with diversification. Regarding schooling and income, it may be said, based on the correlation, that the higher the individual education and income levels, the higher asset diversification and FWB.

Table 4
Spearman's Correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
DIV (1)	1.00								
FWB (2)	0.56**	1.00							
Age (3)	-0.10**	-0.08**	1.000						
School. (4)	0.30**	0.27**	-0.07*	1.00					
Depen. (5)	-0.06*	-0.09**	0.28**	0.04	1.00				
Income (6)	0.41**	0.42**	0.23**	0.40**	0.30**	1.00			

Table 4
Cont.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
QoLH (7)	0.24**	0.43**	0.10**	0.12**	0.01	0.22**	1.00		
BAI (8)	-0.18**	-0.34**	-0.07*	-0.09**	-0.06*	-0.19**	-0.76**	1.00	
BDI (9)	-0.18**	-0.34**	-0.13**	-0.07*	-0.02	-0.18**	-0.60**	0.66**	1.00

FWB = financial well-being; Depen. = number of dependents; DIV = diversification level (asset classes in the portfolio); School. = schooling; BAI = Beck Anxiety Inventory; BDI = Beck Depression Inventory; QoLH (WHOQOL-Bref) = World Health Organization General Quality of Life Scale (Abbreviated version).
*** = p < 0.01; * = p < 0.05.*
Source: *Prepared by the authors.*

Positive correlation between diversification and FWB indicates that the higher the asset diversification, the higher the individual FWB. Regarding depression and anxiety, the inverse correlation indicates that the lower the FWB, the higher the depression and anxiety scores, or vice versa. Anxiety showed no statistical correlation with number of dependents.

As for QoL, the highest FWB and portfolio asset class indexes are associated with the highest QoL levels. The results suggest a strong correlation with FWB. QoL did not show a significant correlation with number of dependents. The correlations between the variables pointed out a path consistent with the conceptual model (Figure 1) and delimit what is expected for the adjusted structural model.

4.3 Measurement Models

Through four CFA models, it was possible to prove the good psychometric properties of the measurement models, as shown in Table 5.

Table 5
Confirmatory factor analysis (CFA)

Measures/scales	FWB	BAI	BDI	QoL
χ^2(df)	152.058 (35)	324.306 (189)	271.043 (170)	653.754 (246)
p value χ^2	< 0.001	< 0.001	< 0.001	< 0.001
χ^2/(df)	4.344	1.715	1.594	2.657
CFI	0.981	0.987	0.989	0.983
TLI	0.975	0.986	0.988	0.981
SRMR	0.054	0.064	0.051	0.052
RMSEA (90% CI)	0.057 (0.048-0.066)	0.026 (0.021-0.031)	0.024 (0.018-0.029)	0.040 (0.036-0.044)
McDonald's omega (95% CI)	0.853 (0.840-0.867)	0.915 (0.907-0.922)	0.891 (0.881-0.900)	0.909 (0.901-0.917)

Note: *According to Perera et al. (2018), there is a global latent variable that explains the factors of the World Health Organization Quality of Life instrument-Abbreviated version (QoLH WHOQOL-Bref), thus using the general scale score becomes feasible; omega refers to McDonald's reliability coefficient. All models were fitted by robust diagonally weighted least squares (RDWLS) through the software JASP 0.14.1, with no need for adjustment, according to the evaluation of local fit proposed in the methodology.*
FWB = financial well-being; CFI = comparative fit index; df = degrees of freedom; BAI = Beck Anxiety Inventory; CI = confidence interval; BDI = Beck Depression Inventory; RMSEA = root mean square error of approximation; SRMR = standardized root mean residual; TLI = Tucker-Lewis index; χ^2 = chi-square test.
Source: *Prepared by the authors.*

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Table 5 indicates that the RMSEA statistics had desired values between 0.06 and 0.08, with 90% CI, and the other statistics also indicated satisfactory values, such as CFI > 0.95 and TLI > 0.95 (Brown, 2015). The four scales passed all the sieves, without any adjustment, and the reliability (McDonald's ω) was high for all scales.

4.4 Structural Model

The initial model fit, according to the conceptual model proposed in Figure 1, was satisfactory {χ^2 [chi-square test]/ [degrees of freedom – df] = 2.533; CFI = 0.963; TLI = 0.962; SRMR = 0.055; RMSEA [90% CI] = 0.038 [0.038; 0.039]}, however, the evaluation of factorial/structural weights indicated some non-significant paths and values outside

the acceptable ranges. Thus, at first, it was decided to eliminate the path of schooling on FWB and to exclude the variable marital status, since none of these paths was significant. Finally, we also address the direct effect of age on anxiety, depression, and QoL, according to Kadoya and Khan (2018) and McAlinden and Oei (2006).

The final complete structural model (measurement model + structural model) is illustrated in Figure 2. The global fit measurements were adequate and the remaining paths were significant ($p < 0.05$). Despite the modification indexes indicating other changes to improve the global fit in the final model, none were considered, due to the lack of theoretical appeal, and it was found that the complete structural model estimated showed to be consistent with the literature review presented.
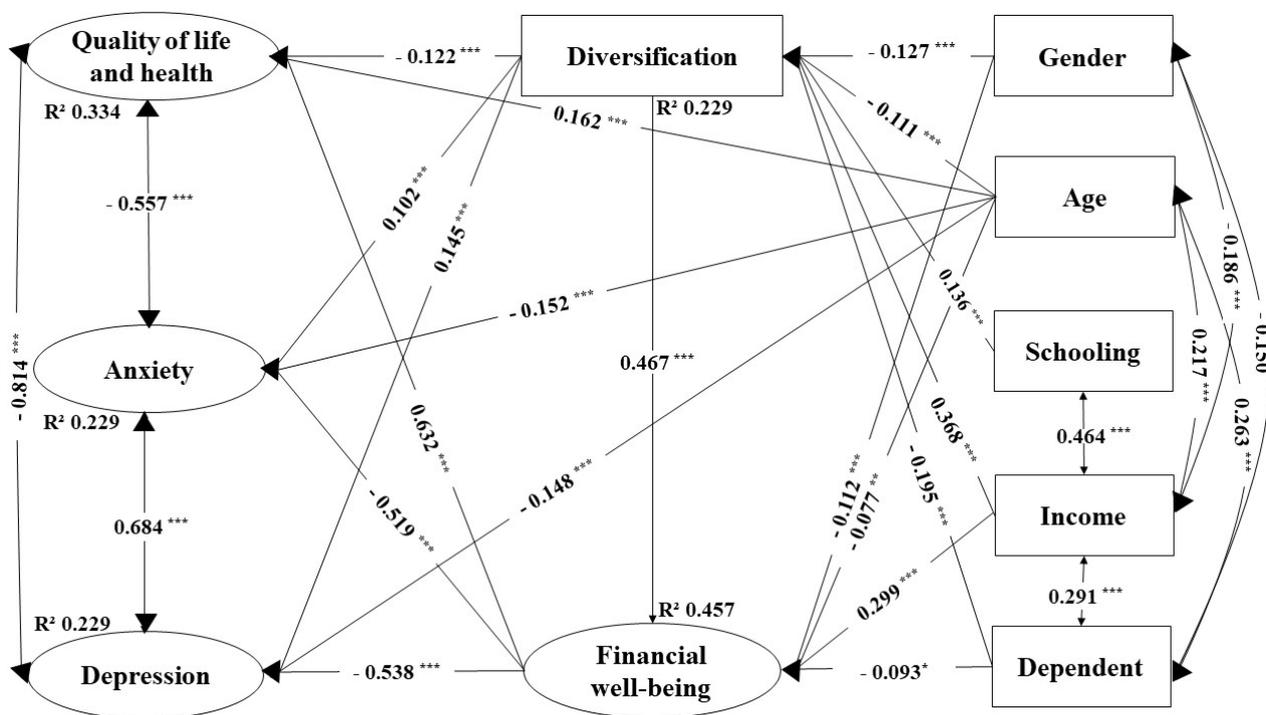
Figure 2 *Complete structural model*
Note: χ^2 *(chi-square test)/[degrees of freedom (df)] = 7792.464 (3137); p value (χ^2) < 0.000; χ^2/df = 2.484; comparative fit index (CFI) = 0.965; Tucker-Lewis Index (TLI) = 0.964; standardized root mean residual (SRMR) = 0.056; root mean square error of approximation (RMSEA) [90% confidence interval (90% CI)] = 0.038 (0.037-0.039). For parsimony, we did not show in the diagram the items/indicators of latent variables and the errors of endogenous variables. The values on arrows refer to standardized weights (directional arrows) and correlations (bidirectional arrows) estimated by robust diagonally weighted least squares (RDWLS) through the software JASP 0.14.1. The value above endogenous variables refers to R^2.*
*** = p < 0.01; ** = p < 0.05.*
Source: *Prepared by the authors.*

The estimates in Figure 2 indicate a strong positive and significant relationship (0.467, p < 0.001) between diversification and FWB. This study confirmed (Figure 2) the relevance of age in the model, as the numbers suggested a direct and significant relationship between the age of the

individuals in the sample and the scores for depression (-0.148, p < 0.001), anxiety (-0.152, p < 0.001), and QoLH (0.162, p < 0.001).

Diversification showed significant values using the scales of QoLH (-0.122, p < 0.001), depression (0.102, p < 0.001),

and anxiety (0.145, p < 0.001). Regarding FWB and the QoLH scale, they showed a strong positive and significant relationship (0.632, p < 0.001). Another finding was that FWB negatively affected anxiety (-0.519, p < 0.001) and depression (-0.519, p < 0.001), indicating that higher FWB levels are related to lower anxiety and depression scores.

The analysis of adjusted structural model (Figure 2) indicates that the strongest direct effects (> 0.45) are those coming from diversification to FWB, and from this construct to anxiety, depression, and QoL. The directions of these effects are consistent with what was expected: positive effect of diversification on FWB and of FWB on anxiety, depression, and QoL. The more diverse the individual, the higher her/his FWB score, and the higher the FWB score, the higher the QoL levels and the lower the anxiety and depression levels.

However, when assessing the direct effect of diversification on QoL, anxiety, and depression, we found an inverse relationship. Despite a weak effect (< 0.15),

its directions suggest that the largest asset class in the portfolio (i.e. the highest diversification level) decreases the QoL score and increases the anxiety and diversification levels. This finding, in contrast to the result of direct effects mentioned in the previous paragraph, deserves further discussion and examination on the indirect and total relationship of diversification on QoL and mental health (anxiety and depression).

4.5 Indirect and Total Effects

For more robust and effective approaches to indirect effects between the variables (Table 6), it is highlighted that FWB points out the mediating relationship between the diversification degree and the QoLH, BAI, and BDI scales, whose results of direct effects were worthy of interest: diversification has a negative relation to QoL and a positive relation to anxiety and depression.

Table 6
Total and indirect effects associated with diversification

	Estimate	SE	Z score	P value	Lower threshold	Upper threshold	Standardized effect
Total effects							
DIV → QoLH	0.025	0.005	4.682	< 0.001	0.014	0.035	0.173
DIV → BAI	-0.014	0.004	-3.985	< 0.001	-0.021	-0.007	-0.140
DIV → BDI	-0.014	0.004	-3.278	< 0.001	-0.023	-0.006	-0.107
Indirect effects							
DIV → FWB → QoLH	0.042	0.005	7.895	< 0.001	0.031	0.052	0.295
DIV → FWB → BAI	-0.024	0.004	-6.569	< 0.001	-0.032	-0.017	-0.242
DIV → FWB → BDI	-0.034	0.004	-7.651	< 0.001	-0.042	-0.025	-0.251

Note: *Estimate values refer to non-standard effects estimated by robust diagonally weighted least squares (RDWLS) through the software JASP 0.14.1 applying the complete structural model shown in Figure 2. The standardized effect refers to the standardized factor weights for better visualization of the effect size.*
FWB = financial well-being; DIV = diversification level; IAB = Beck Anxiety Inventory; IDB = Beck Depression Inventory; QoLH = quality of life and health; SE = standard error.
Source: *Prepared by the authors.*

Diversification was used as a predictor and FWB as a mediator, in order to examine the results of the relationship using the anxiety, depression, and QoLH scales. The significance and direction of the direct effect DIV → FWB (0.467, p < 0.001), as shown in Figure 2, show evidence to support hypothesis 1 (H₁), the significance and directions of total effects in Table 6 show evidence to

corroborate H₂, H₃, and H₄, and considering that all paths (direct, indirect, and total effect) of DIV for FWB, BAI (-0.140, p < 0.001), BDI (-0.107, p < 0.001), and QoLH (0.173, p < 0.001) were significant, there is evidence to support H₅ [FWB is expected to partially mediate the relationship between investor diversification level and QoL and mental health (anxiety and depression) scores].

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5. DISCUSSION OF RESULTS

In this study, diversification has revealed a negative association with QoL and a positive association with anxiety and depression. These results are in line with the findings of Patterson and Daigler (2014), who reported that depression is positively related to portfolio diversification. On the other hand, according to Kadoya and Khan (2018), assets and income are likely to be able to decrease anxiety, because these properties provide greater financial solidity. It is inferred that there may be an 'optimal diversification level,' i.e. a non-linear relationship between diversification and psychological variables, meaning that a certain diversification degree might be good for the individual, insofar as it would increase her/his FWB, but beyond a certain level, diversification could become an anxiogenic factor.

Considering the data and sample of this study, it may be inferred that if an investor has a shorter-term profile, she/he monitors her/his assets more constantly, and the more assets in her/his portfolio, the greater her/his effort. The greater recurrence and engagement with such monitoring requires that the investor is well informed about what has been happening in the market as a whole, as well as in the segments of all portfolio investments; more diversified investors will need more time, effort, and work than less diversified investors, who will possibly have a relevant relationship with QoL and mental health levels.

The perception that this negative relationship of diversification with QoL occurs in the short term stems from the characteristics of research instruments themselves. In the statement of the instruments QoLH, BDI, and BAI, we explicitly asked individuals about their symptoms (BAI), feelings (BDI), and values, aspirations, pleasures and concerns (QoLH), in the past week or two weeks. In the case of diversification, the question is about the number of investments, in a list of 15 investment types that an investor has in her/his portfolio. The composition of this portfolio certainly did not take place within the past two weeks prior to the survey. Thus, according to the research design, despite the information being collected simultaneously, diversification precedes measuring (short-term) the levels of QoL and mental health (anxiety and depression).

Regarding the question about the FWB scale, in the statement, no time lapse was presented. However, the conditions that the investor is asked to describe are not like those faced in the short term. Questions such as "Am I safeguarding my financial future?" or "Am I falling short in taking care of my finances?" or "Does my financial status control my life?" refer to issues and considerations that investors are believed to have described (in terms of intensity) and thought through, taking into account the mid-/long term. These situations do not take place in the short term, they accompany the and occur to investors throughout their lives.

The explanatory variable with the strongest relationship (total effect) with FWB was income, a structural condition that proved to be one of the main predictors of FWB in empirical research (Rogers et al., 2020; Vieira et al., 2021) and highly correlated with other explanatory structural conditions (schooling) and characteristics (age, sex, and number of dependents).

Finally, just as diversification, FWB is believed to be a condition engendered in the mid-/long term, although it is assumed that diversification precedes FWB. Thus, the constituent factors of diversification seem more contemporary to us, given that, generally, the relationship (direct effect) of explanatory variables with diversification was stronger than in FWB, and the main structural condition (income → proxy for wealth) turns it into a prerequisite for diversification, corroborating the studies by Chu et al. (2017) and Guiso and Jappelli (2008), who highlighted that wealthier, financially sophisticated families tend to be more diversified and have greater possibilities for a positive return on investment.

To diversify, the investor must have income/wealth and, even lacking diversification, but having income/wealth, she/he can enjoy FWB. In the sample, all investors reported having some income, but 143 did not invest in any type of asset at the time of survey, i.e. they showed a lower diversification degree (i.e. only their workforce).

Additionally, FWB negatively affected anxiety and depression, indicating that its higher levels are related to lower anxiety and depression scores, corroborating the results of Rogers et al. (2020). As for QoLH, estimates showed that the higher the FWB, the higher the QoL indexes in the long term, according to Mugenda et al. (1990), Rogers et al. (2020), and Skevington and Böhnke (2018).

Thus, the results suggest that, in the long term, diversification is positively related to QoL, decreasing the anxiety and depression levels. This occurs through FWB mediation, consisting of structural factors and a strong effect (direct effect) on QoL and mental health.

As diversification also has a relevant (intermediate) effect on FWB, the total net effect (i.e. moderate indirect positive effect minus small direct negative effect) on QoL and mental health was positive. Although in the short term the investor's 'commitment' to diversification minimally decreases QoL and increases the anxiety and depression levels, in the long term such 'commitment' is moderately compensated by increased FWB.

Additionally, the effects mediated through indirect effects indicate that when the variable values for direct effects are divided by the totals minus 1, 0.281 is found for QoLH, 0.193 for anxiety, and 0.345 for depression. Therefore, the proportion of this mediation implies that FWB mediates approximately 28.14% of the relationship between diversification and QoL and it explains around 19.31% of the relationship with anxiety and 34.56% with regard to depression. It is observed that the relationship with depression shows the highest percentage of mediation, i.e. FWB has a greater association with this variable than with the others.

It was found, in this study, that the (direct) investor's diversification level may be related to increased anxiety and depression levels and decreased QoL, but along with indirect FWB, as it has a relevant relation to FWB, and the latter's relation to the anxiety, depression, and QoL levels can decrease the anxiety and depression levels and increase QoL. These results are consistent with Rogers et al. (2020), who concluded that FWB is a major factor in explaining variation in QoL and in the investor's anxiety and depression levels.

This takes place through FWB mediation, constituted by structural factors, which has a strong effect (direct effect) on QoL and mental health. As diversification also has a relevant (intermediate) effect on FWB, the total net effect (i.e. the indirect moderate positive effect minus the small direct negative effect) on QoL and mental health was positive. Although in the short term the investor's 'commitment' to diversification minimally decreases QoL and increases the anxiety and depression levels, in the long term such 'commitment' is moderately compensated by increased FWB. The classifications small, intermediate/moderate, and large effect size are taken from Hattie (2009).

It is noteworthy that the FWB mediation between variables is partial, since the direct effects remain significant (Table 6). A possible interpretation of the conclusion of mediation between variables may be explained by the findings of Patterson and Daigler (2014), who highlighted that maybe some mental pathology levels, including depression, have less intuitive relationships with financial decision-making, they have more to do with general well-being. Another major issue refers to criticisms reported by Kline (2016) concerning mediation analysis conducted with data collected at the same point in time.

6. FINAL REMARKS

This research aimed to address the relationship between diversification level and QoL and mental health and to see how FWB mediates this relationship, based on the study by Rogers et al. (2020) and adding diversification as the main study variable. Regarding the method, a separate and individual assessment of the FWB, BAI, BDI, and QoLH models was done using four CFA models, in addition to a complete SEM structural model in two steps to estimate the direct/indirect and total effects on a sample of 1,047 individuals.

The results showed that diversification had a positive direct effect on FWB, corroborating the first hypothesis of this study:

H$_1$: a positive direct effect of the investor's diversification level is expected on the FWB score.

Additionally, the following hypotheses were also supported by the results found.

H$_2$: a total negative effect of the investor's diversification level is expected on the anxiety score;

H$_3$: a total negative effect of the investor's diversification level is expected on the depression score; and

H$_4$: a total positive effect of the investor's diversification level is expected on the QoL score.

After calculating the significant estimates of indirect effects of the investor's diversification level on QoL and mental health, it is suggested to indicate a partial FWB mediation, which accounts for around 28% of the relationship between diversification and QoL, 19% of the relationship with anxiety, and 34% in relation to depression.

These results bring major practical and theoretical implications that deserve to be addressed, since we found that the investor's diversification level, if analyzed in isolation, can show increased levels of anxiety and depression in the short term and decreased QoL, but when it is along with FWB, as the latter has a positive and relevant association with the anxiety, depression, and QoL levels, it may be related to decreased levels of anxiety and depression and increased QoL.

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In general, diversification was related to FWB, QoL, depression, and anxiety. These findings provide evidence that contribute to the literature, addressing mental health factors, in order to enrich the area by presenting the mediation behavior in the relationship between the investors' diversification degree and FWB in relation to QoL and mental health (depression and anxiety). And, as a practical contribution, it provides managers with a line of reasoning that enables greater familiarity with the investors' profile and their investment portfolios. Also, this research proves to be relevant due to the lack of studies addressing diversification, FWB, QoL, and mental health altogether.

This paper has some limitations, as the sample used includes individuals who mentioned the effects of pathological symptoms within the past two weeks. It may be necessary to repeat the analysis for a longer period, so further research may resort to other scales exploring a longer period of time. Furthermore, the following aspects could have a better approach in new studies: (i) the research instrument does not address the respondents' equity, rather prioritizing their income; (ii) the investor was not asked about the proportion of the portfolio invested in each asset, only the asset classes in which she/he usually invests (according to Mendes & Abreu, 2006); (iii) the sample of respondents cannot be generalized, as it deals with the subpopulation of investors registered with the Brazilian CVM; and (iv) it is not a longitudinal study, the inferences made through mediation analysis have some constraints. So, it is suggested that further studies seek to go beyond these boundaries and constraints.

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