Financial Well-being, Investment and the Asymmetric Effect of Savings in South Africa: The Mediating Role of Financial Literacy

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Abstract- *Researchers have not agreed on what should constitute a measure of financial well-being (FWB). This is especially problematic for South Africa as the level of households' financial satisfaction is deteriorating. Previous studies focused on socio-demographic determinants and measured FWB using subjective or objective approaches. This study argues that both approaches undermine and limit its scope. Hence, it calculates a multi-dimensional index for FWB and ascertain its determinants. Five socio-economic composite datasets were employed in a principal component analytical (PCA) technique to calculate this index. The PCA result reveals that FWB in South Africa is more susceptible to economic indicators than socio-demographic factors. Hence, the study modelled a dynamic equation based on the life-cycle hypothesis to examine the impacts of savings and investment and their interaction with financial literacy on households' FWB in South Africa from 1980 to 2023. Results from the nonlinear autoregressive distributed lag (NARDL) estimation technique reveal that savings emits an asymmetric impact on FWB during the short run with no asymmetric impact in the long run. The result also reveals that financial literacy improved the impact of investment and savings as a transmission channel to better FWB, especially in the long run. The study concludes that FWB is more predisposed to economic determinants in the long run, with improved impact through higher financial literacy. Therefore, it recommends diversifying savings to profitable investment through better financial literacy to improve financial well-being.*

Index Terms- Financial well-being, Household Disposable Income, Savings, Investment, Financial literacy.

JEL Classification : D14, D15, D12; O47

I. Introduction

Financial well-being (FWB) as an emerging area in the field of finance (Brüggen et al., 2017) is receiving wide attention from researchers and policymakers all over the globe in recent times. However, given its subjective perception, studies have not been able to critically and analytically conceptualize it as there remain lots of inconsistencies and lack of consensus among researchers on the issue. Besides the attempts to measure and conceptualize it, there are lots of ambiguous findings and conclusions on its short-run and long-run determinants.

According to a study by the Consumer Financial Protection Bureau (CFPB, 2015), FWB is a state of being in which an individual is capable of satisfying current and future financial obligations, feels secure in their financial future and can make choices that allow enjoyment of life. This implies that having financial security and freedom of choice, in the present and in the future is the core focus of FWB. Consequently, FWB is beyond accumulating wealth and having financial assets but a multidimensional concept, finance just being one aspect of it. This means that FWB can be construed as both an objective and a subjective construct depending on the focus of the reviewer, hence, the objective and subjective dichotomy in the literature about it. Therefore, its subjectivity which is based on feelings about one's present financial condition makes it difficult to quantify it using one indicator (Joo, 2008).

Besides the debate on its conceptualization in the literature, the extent of impact of different factors on it were also examined, part

of which is income of the household. Whiles income underestimates the true state of an individual's FWB however, Earl et al. (2015) observed that FWB is directly proportional to it. On the other hand, West et al. (2021) asserts that better income does not always guarantee better FWB, especially under conditions of money illusion[1], however, it still determine its flow. Therefore, this study argues that the extent to which income could drive FWB depends on the income's alternative uses/management. Since households either consume or save their income, consistent FWB, therefore, translates to how well they diversify these savings to profitable investments to maintain steady streams of income and better FWB.

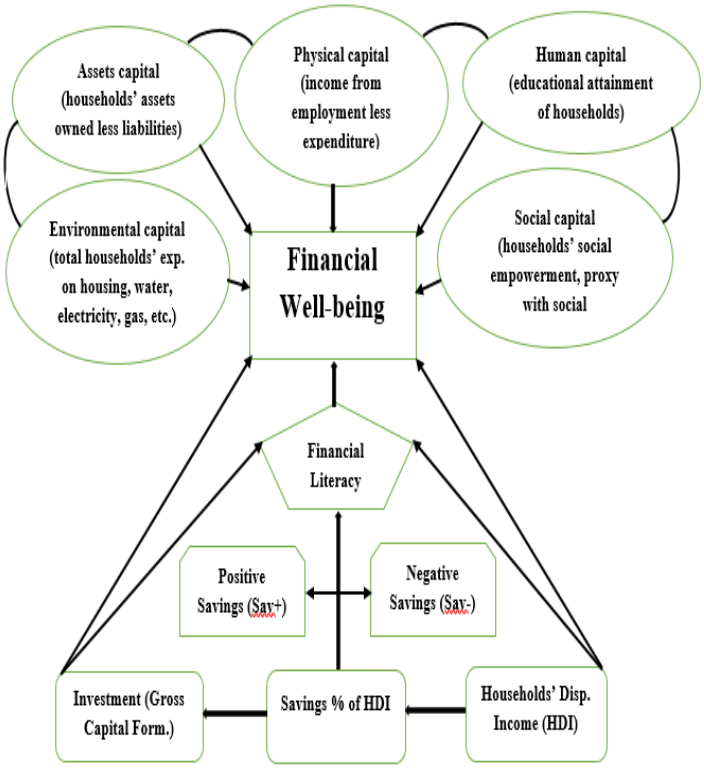

Figure 1: A Schematic Diagram of the Determinants of FWB in South Africa
Source: Authors' Compilation

This implies that apart from income, FWB is also a function of savings and the ability to invest. This connection between income, FWB and its determinant factors is illustrated in figure The diagram reveals that financial literacy translates savings, investment and ultimately income to FWB. Hence, the ability to diversify savings to profitable investments depends on the level of one's financial literacy. Consequently, the study aims to examine the impact of savings asymmetry on FWB as well as find how savings and investment affect households' FWB through financial literacy as a transmission channel in South Africa.

The remainder of the study is structured into four unique sections. The next section reviews various literature and identified gaps in the literature. Section three focuses on the theoretical framework, specifies the model, presents the data sources, measurements and scope, as well as the various estimation techniques used in the study. Section four presents and discusses the results while section five is the conclusions and policy implications.

2. Literature Review

2.1 Financial Well-being

As an emerging issue, researchers are yet to reach a consensus on how to conceptualise and measure FWB. Two strands of interrelated views exist in the literature. The first view focused on the objective indicators of an individual's financial condition. They place emphasis on income (Dolan et al., 2008; Gerrans et al., 2014), debt management (Shim et al., 2009; Gaspart, 1997; Porter & Garman, 1992), savings (Sacks et al., 2012; Skinner, 2007); investment performance (Chu et al., 2017); consumption (Cifuentes et al., 2016) and wealth or debt-to-savings ratio (Greninger et al., 1996) as measures of FWB. However, several studies (Ng & Diener, 2014; Diener et al., 2013; Cummins, 2000) argue that such objective indicators as income will understate the true state of an individual's FWB especially when it is insufficient. Therefore, it is possible that two people with the same objective financial situation have different levels of FWB, otherwise, the difference will never be observed if FWB is simply assumed from the objective situation (Warmath, 2021). Besides, FWB has implications for an individual's overall FWB (Moghaddam,2008). That is, it is a multidimensional construct that transcends just the individual's financial condition. It could comprise their health condition (Huh & Shin,2014; Lee et al., 2015), job (Netemeyer et

[1] Money illusion is a term used to describe a condition when nominal money wage/income is rising but real wage is falling because the percentage rise in aggregate price level (inflation) is above that of wage rise.

al., 1996), and even relationships (Walen & Lachman, 2000). This means that although FWB could be examined objectively an individual's assessment of his/her financial state cannot be completely undermined when looking at their FWB.

The second group suggests that FWB (FWB) is a subjective construct (Xue et al. 2020; Gerrans & Heaney, 2019; Bobe & Cooper 2020; Iyer & Muncy, 2016). It assesses the emotional outcomes of an individual's perceived ability to sustain the current and anticipated future living standards (Brüggen et al., 2017; OECD, 2020). A study by the CFPB (2015) posits four considerations people use in assessing their level of FWB. Two of which are bothered by their current financial situation: *I am in control of how I manage my money*; and *I am able to enjoy life because of how I manage my money* while the two others centres on their future financial expectation: *I could handle an unexpected expense* and *I am on track to meet my financial goals*. The views of the Organization for Economic Co-operation and Development (OECD), in collaboration with the International Network on Financial Education (OECD/INFE) differ slightly from that of CFPB (2015) by adding a financial stress question to the FWB construct thus: "I am concerned that my money won't last" (OECD, 2020). Riitsalu and Murakas (2019) focused current money management stress and expected future financial security, each measured with 5 and 4 questions respectively. Whereas the questions relate to those under the CFPB (2015) and OECD (2020) their degrees of responses differs. Vlaev and Elliott (2014) placed a high premium on the ability to control and manage debt as the main measure for FWB.

This suggests that FWB as a subjective construct is more of a dynamic stochastic process rather than a static issue since it is based on individual changing circumstances rather than the present realities of their financial situation. Consequently, most empirical studies seem to align more with the subjective approach relative to the objective view (Singh & Malik, 2022). Moreover, being a subjective construct, it implies that FWB is entirely personal and corresponds to the individual's emotional and cognitive evaluation of the financial condition. Besides, people with different socio-demographic and economic features might have different views about their FWB status (Kapur, 2005). Therefore, people may experience different levels of FWB regardless of their objective financial condition (Brüggen et al., 2017).

Given this background, it becomes relatively difficult to ascertain the standard general level of national FWB status since perception differs among individuals and across regions. In other words, while it is possible to quantify an individual's or group of individuals' FWB, examining this condition across the entire region or country might be difficult. This study, therefore, argues that while the subjective approach seems preferable, certain uniform indicators that cut across the sample group are still necessary, thereby rendering credence to the objective assessment of FWB. This is because of the lack of consensus in the questions asked among studies that followed the subjective approach. Therefore, the position we took in this study is that FWB can be quantified either subjectively, objectively or a combination of the two depending on the parameters available to the researcher and the bases of measurement. Hence, we follow a pseudo-objective approach (randomized objective indicators) and focus on developing a more inclusive measure of FWB using five major constructs as schematized in figure 1 above: (i) Asset capital, (ii) Physical capital, (iii) Human capital, (iv) Social capital, and (v) Environmental capital. Asset capital represents the difference between an individual's total assets and liabilities, physical capital is the excess of income from employment over expenditure, human capital represents educational attainments, social capital is the household's social empowerment while environmental capital comprises of expenditures on social amenities as illustrated in figure 1.

2.2 Building the Hypotheses based on Literature

Apart from the measurement issue about FWB, most recent empirical studies (Lusardi & Messy, 2023; Sharma & Roshan, 2021; Xue et al., 2019; 2020; Brüggen et al., 2017; Liao et al., 2017) focused on the role of financial literacy in determining FWB. Yet, the literature has not sufficiently explored empirical

evidence on the transmission effect of financial literacy and a composite approach to measuring FWB.

This study, therefore, hypothesizes that although financial literacy is an important determinant of FWB, it can only transmit to better FWB through other financial and economic aggregates. Jappelli & Padula (2013) observed that although savings and investment are important financial indicators for FWB, their impacts are conflicting. This conflicting impacts draws from two unique hypotheses in the literature yet to be empirically proven. First is that higher savings is associated with a falling consumption expenditure in the current period which is capable of improving the FWB of the individual in the long-run (Markowitz & Bowerman, 2012). However, higher savings do not translate to a better FWB if it is not adequately diversified to profitable investments. Therefore, one's level of financial literacy determines the extent to which their savings could translate to profitable investment opportunities (Lusardi, 2008). The second hypothesis suggests that low savings are associated with higher consumption expenditure in the current period which translates to higher satisfaction (Stutzer and Frey, 2010) thereby jeopardizing future FWB. These divergent views amplify the need not to only examine the asymmetric impact of savings on FWB but to also assess whether financial literacy translates to better FWB through savings and/or investment as a transmission channel.

Xue et al. (2020) examined the role of consumption and financial literacy on the FWB among elderly Australians. Their findings were consistent with that of Stutzer and Frey (2010) that higher investment, consumption, and better financial literacy promote FWB. They assert that the accumulation of savings translates to profitable investment that keeps the flow of income high even at old age/retirement when the labour income is zero. This means that rising income can lead to higher levels of financial satisfaction (Skinner, 2007). This study, therefore, aims to fill this research gap by examining how households' income, savings asymmetry and the interaction of financial literacy with savings/investment drives FWB overtime.

Gerrans and Heaney, (2019), Blanchflower and Oswald, (2004) and Louis and Zhao (2002) found that higher educational attainment is positively associated with the level of one's FWB. As people's educational level rises, their levels of financial literacy also improve which ultimately raises their level of FWB (Xue et al., 2019; Lusardi & Mitchell 2007; Lusardi 2008). The idea behind this is that as people attain higher educational level, they will not only earn higher income but will also be financially aware or knowledgeable to make profitable financial decisions that can improve their financial condition. Hence, people with higher educational attainment are more financially literate. Other socio-demographic determinants of FWB include the nature of work (Degutis and Urbonavicius, 2013), marriage (Malone et al., 2010; Alesina et al., 2004) and health condition of the person (Dolan et al., 2008). These were found to have a positive relationship with FWB. However, the challenge with these indicators is that they are often subjective and cannot represent the aggregate in a macro-based research.

3. The Theoretical Framework

In addition to empirical evidence, economic theories propose that FWB/income tends to peak at the middle age of people's life when labour income is highest, low at the early and later stages of life when labour income is low and/or zero due to lack of jobs and retirement (Degutis and Urbonavicius, 2013). As a result, this study employs the life-cycle income theory to examine the relationship between FWB, savings and investment and financial literacy.

The theory, as developed by Ando and Modigliani (1963), describes people's consumption pattern (and by extension, their FWB) over the course of their lifetime. That is, people spread their expenditure and maintain a relatively constant level of consumption throughout their lifetime. During the early stage of life when income is low, people borrow or liquidate assets while at the later stage of life when labour income is zero due to retirement, they dis-save to stay on an established welfare level. However, during the peak/middle stage of life when income is very high due to increasing labour income and accumulation of assets, they still maintain though a relatively higher expenditure and ultimately a higher level of FWB, but they also increase savings for the later periods of their life. Therefore, the model is stated thus:

$$C_t = \alpha_t + \beta_0 y_t + \beta_1 y_{t-1} + \beta_2 y_{t-2} + \beta_3 y_{t-3} + \ldots + \beta_n y_{t-n} + \mu_t \quad \ldots\ldots(1)$$

Consumption is a function of assets in the current period (α_t) and lifetime income levels. However, since future income cannot be easily ascertained, we use previous income levels as proxies. Where:

c_t = national current level of consumption in South Africa.
α_t = Assets level/base in the country in the current period.
y_{t-i} = Income of households throughout their lifetime.
β_i = marginal propensities to consume.

Model (1) as a distributed lag model is not free from the problems of multicollinearity and autocorrelation, hence, we apply the Koyck (1954) transformation. Following Koyck (1954) assumption that the impact of the lagged variable on the dependent variable reduces as the lag length increases, we express the relationship thus:

$$\beta_i = \beta_0 \lambda^k \qquad i, k, = 1, 2, 3, 4, \ldots$$
$$\text{Where } 0 < \lambda < 1 \ \ldots\ldots (2)$$

Substituting (2) into (1) yields:

$$C_t = \alpha_t + \beta_0 y_t + \beta_0 \lambda Y_{t-1} + \beta_0 \lambda^2 Y_{t-2} + \beta_0 \lambda^3 Y_{t-3} + \ldots + \beta_n \lambda^n Y_{t-n} + \mu_t \quad \ldots\ldots (3)$$

Taking the first lag of equation (3) and multiply the outcome by λ for k = 0, 1, 2, …. we have:

$$\lambda C_{t-1} = \lambda \alpha_{t-1} + \beta_0 \lambda Y_{t-1} + \beta_0 \lambda^2 Y_{t-2} + \beta_0 \lambda^3 Y_{t-3} + \beta_3 \lambda^4 Y_{t-4} + \ldots + \beta_n \lambda^{n+1} Y_{t-n-1} + \lambda \mu_{t-1} \quad \ldots\ldots(4)$$

Therefore, if we subtract equation (4) from equation (3) and rearrange the result, we obtain the transformed consumption model as follows:

$$C_t = (1-\lambda)\Delta\alpha_t + \beta_0 Y_t + \lambda C_{t-1} + \varepsilon_t \quad \ldots\ldots (5)$$

Where: $\varepsilon_t = \mu_t - \lambda \mu_{t-1}$. Moreover, household income is either consumed or saved thus:

$$Y_t = C_t + S_t \quad \ldots\ldots (6)$$

Where Y is the household disposable income; C is household consumption expenditure while S is total household savings. Since a proportion of the savings is used for investment purpose, the savings equation is therefore defined thus:

$$S_t = s_t + \sigma s_t \quad \ldots\ldots(7)$$

Where s_t is retained savings and σs_t is the part of savings which is diversified for investment purposes. Hence, $\sigma s_t = Inv_t$. by substituting equations (7) and (5) into (6), rearranging and dividing through by $(1-\lambda)$, yields equation (8) which represents the FWB model thus:

$$FWB_t = \Delta\alpha_t + \delta_1 FWB_{t-1} + \delta_2 c_{t-1} + \delta_3 s_t + \delta_4 Inv_t + \varepsilon_t \quad . (8)$$

Note that $\Delta\alpha_t$ the constant term measures the households' stock of wealth/change in assets base $FWB_t = \frac{1}{1-\lambda} y_t$, which measures the elasticity/multiplier effect of wealth transmitted to improve one's FWB; let $\delta_1 = \frac{\beta_1}{1-\lambda}$ such that $\beta_1 y_{t-1} = \frac{\beta_1}{1-\lambda} FWB_{t-1}$, $\delta_2 = \frac{\lambda}{1-\lambda}$; $\delta_3 = \frac{1}{1-\lambda}$ and $\delta_4 = \frac{\sigma}{1-\lambda}$ which measures the marginal efficiency of capital/multiplier effect of investment to FWB. The prior expectation are thus: $\frac{\partial FWN_t}{\partial FWN_{t-1}} > 0$; $\frac{\partial FWN_t}{\partial S_t} > 0$; and $\frac{\partial FWN_t}{\partial Inv_{t-1}} > 0$

3.1 Model Specification

Based on the models above, we specify the equation thus:

$$FWB_t = f(FWB_{t-1}, HDI_t, Sav_t, FLit_t, Inv_{t-1}) \quad \ldots\ldots (9)$$

Its econometric representation is presented as follows:

$$FWB_t = \partial_1 + \phi_1 FWB_{t-1} + \phi_2 HDI_t + \phi_3 sav_t + \phi_4 Flit_t + \phi_5 Inv_{t-1} + \mu_t \quad \ldots\ldots (10)$$

Where FWB= index of FWB, ∂_1 = the average change in assets, Inv = investment, Sav= Savings rate, Flit= Financial literacy, HDI= Households' disposable income in South Africa (Gerrans and Heaney, 2019; West et al., 2021) and μ_t is the error term.

3.2 Data Measurement, Sources and Scope

The study used secondary annual time series data for South Africa spanning from 1980 to 2023. It comprises five data namely, the FWB index, household disposable income (HDI), savings (Sav), Investment (Inv) and financial literacy (FLit). The index of FWB is calibrated using five unique components namely, physical capital (income from employment less expenditure), asset capital (households' assets owned less liabilities), social capital (households' level of social empowerment, proxy with social

contribution)[2], environmental capital (total households' expenditure on housing, water, electricity, gas, etc.) and human capital (educational attainment of households). The data were sourced from the South African Reserve Bank (SARB) and the World Bank statistical bulletin and their sources and measurements are presented in Table 1.

Table 1: Data Description, Sources and Expected Sign

Data	Variable	Measurement	Sources	Extd Sign
FWB	Financial Wellbeing	Index generated using the Principal Component Analysis (PCA). The components include five indicators of physical capital, assets capital, social capital, environmental capital and human capital.	South Africa Reserve Bank (SARB)	NA
DI	Household disposable income	Household disposable income at constant price	SARB	Positive
Sav	Household Savings	Household Savings as % of disposable income	SARB	Positive
Flit	Financial literacy	The ratio of households' disposable income at current price to secondary education	World Bank development Indicator (WDI)	Positive
Inv	Investment	The growth rate of gross fixed capital formation	WDI	Positive

Source: Authors' Compilation

3.3 Methodology

Two unique methodologies were employed to investigate the objectives of this study. They are the principal component analyses and the nonlinear autoregressive distributed lag techniques.

3.3.1 Principal Component Analysis (PCA)

The PCA technique is used to generate an index of FWB using five components as itemized in Table 1. This technique is preferred over other techniques, such as the variance equal weight approach because it circumvents the problem of possible co-movement between indicators. The PCA technique makes use of the following formula:

$$FWB_t = (W^0 S_t) * C_t * (W^0 S_t)^T \ldots\ldots\ldots\ldots\ldots\ldots (11)$$

Where $W = (w_1, \ldots, w_s)$ is the vector of the sub-index weights, s = $(s_1, \ldots, s_s)$ the vector of sub-indexes, and $(W^0 S_t)$ the Hadamard-product of the vector sub-index weight and the vector of sub-indexes in time t. $(W^0 S_t)^T$ is the transpose of this matrix. C_t is the matrix of time varying cross-correlation coefficient between sub-indexes *i and j*. The index is then normalized by putting it in a scale of between zero and one (0, 1). That is, in order to avoid aggregation distortion which may arise if the means of the indicators are different, the index is transformed into a common scale of zero mean and standard deviation of one (Sere-Ejembi et al. 2014) thus:

$$FWB\ Index_t = \frac{x_t - min x_t}{Max(x_t) - Min(x_t)} \ldots\ldots\ldots\ldots\ldots\ldots (12)$$

Where: x_t is the individual observations while $min(x)_t$ and $max(x)_t$ are the minimum and maximum values respectively.

3.3.2 The Nonlinear Autoregressive Distributed Lag Model (NARDL)

As a dynamic model, an autoregressive distributed lag (ARDL) model is employed to examine the objective of the study. This is specified thus:

$$\Delta FWB_t = \delta_i (FWB_{t-1} - \lambda_i' X_t) + \sum_{j=1}^{p-1} \alpha_{ij} \Delta FWB_{t-j} + \sum_{j=1}^{q-1} \beta_{ij}' \Delta X_{t-j} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots (13)$$

Note: FWB_t is the index of financial well-being (refer to Table 1); X is a vector of all the explanatory variables as itemized under Table 1. $\delta_i = -(1 - \sum_{j=1}^{p-1} \alpha_{ij})$, speed of adjustment to the long run steady state (ie. $\delta_i < 0$)

λ_i' = vector of long-run relationships

ECT = $(FWB_{t-1} - \lambda_i' X_t)$, the error correction term, and.

α_{ij}, β_{ij}' are the short-run dynamic coefficients

p *and* q_i are lag length on dependent and independent variables, respectively while ε_t =Error term.

[2] Note that whereas this might seem to be a contradiction, Abrar-ul-Haq et al. (2018) argued that the alternative usefulness of the social contributions gives some level of confidence to households to feel secured about their finances. Hence, it can represent their level of social empowerment which is entirely subjective (Narayan-Parker 2005) especially when it is viewed from its supply side rather than from the demand side hypothesis.

Also recall, that one of the objectives of this study is to ascertain whether the savings behavior of households has an asymmetric effect on their FWB in the long-run and short-run. According to the theory, savings increase from early to the middle stages of people's life and fall at the later periods of their life. This suggests the need for an asymmetric relationship of savings with FWB. Hence, with rising income, a savings glut would result due to high savings thereby stagnating aggregate demand/growth and ultimately reducing FWB. This means that an increase in savings (Sav^{+}) has the tendency to worsen FWB especially if it was not invested and vice versa. These hypotheses will be tested in this study. Therefore, the assumption of savings asymmetric effect led to the specification of a nonlinear ARDL. If the long-run coefficient guarantees a co-integrating relationship, model (13) becomes:

$$\Delta FWB_t = \varphi_0 + \delta_1 ECT_t + \sum_{i=1}^{p} \beta_i \Delta FWB_{t-1} + \sum_{j=0}^{q_1} \phi_j \Delta HDI_t + \sum_{j=0}^{q_2} (\alpha_j^{+} \Delta Sv_t^{+}) + \sum_{j=0}^{q_3} (\alpha_j^{-} \Delta Sv_t^{-}) + \sum_{j=0}^{q_4} \pi_t \Delta Flit_t + \sum_{j=0}^{q_5} \rho_t \Delta Inv_t + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots (14)$$

The error correction version of the NARDL is used to verify if the model is dynamically stable or explosive. However, this is after the condition of co-integration among the long run parameters (λ_i''s) in equation (13) is fulfilled, otherwise only a short run ARDL will be necessary. Therefore, equation (14) is the error correction and the asymmetric form of equation (13) with emphasis on the asymmetric effect of savings based on theory. The error correction term (ECT) which captures the speed of adjustment to long-run equilibrium in the event of short run disturbance. The coefficient of the ECT (δ_i) is expected to be significant and negative to guarantee a long-run equilibrium in the presence of contemporaneous short-run disequilibrium (Pesaran, Shin and Smith, 2001). Moreover, the Wald test was used to verify the joint asymmetric impact of savings on FWB in both short and long run. The null and alternative hypothesis for the short run is stated thus: $H_0, SR: \sum_{j=0}^{q_1} \alpha_j^{+} = \sum_{j=0}^{q_i} \alpha_j^{-}$ this is tested against the alternative hypothesis thus: $H_1, SR: \sum_{j=0}^{q_1} \alpha_j^{+} \neq \sum_{j=0}^{q_i} \alpha_j^{-}$.

Likewise, the null hypothesis in the long-run is stated thus: $H_0, LR: -(\varphi_i^{+} / \beta_i) = -(\varphi_i^{-} / \beta_i)$ which is tested against the alternative hypothesis thus: $H_1, LR: -(\varphi_i^{+} / \beta_i) \neq -(\varphi_i^{-} / \beta_i)$. Note that φ_i is the individual positive and negative coefficients of the long run variables of savings whereas their elasticity of impact is captured by their ratio to the lag of the dependent variable as $-(\varphi_i^{+} / \beta_i)$ and $-(\varphi_i^{-} / \beta_i)$ respectively.

The interactive model of equation (15) captures the transmission effect of financial literacy to higher FWB thus:

$$\Delta FWN_t = \delta_1 + \phi_0 ECT_t + \sum_{i=1}^{p} \beta_i \Delta FWN_{t-1} + \sum_{k=0}^{q_2} \varphi_k \Delta X_{t-k} + \sum_{j=0}^{q_{1t}} (\alpha_j^{+} \Delta Sav_t^{+}) + \sum_{j=0}^{q_i} (\alpha_j^{-} \Delta Sav_t^{-}) + \sum_{j=0}^{q_{1t}} \pi_j (\Delta FLit * Sav_{t-i}) + \sum_{j=0}^{q_i} \rho_j (\Delta FLit * Inv_{t-i}) + \varepsilon_t$$

….(15)

The variables remain as defined above, however, the interaction between financial literacy, savings and investment is used to capture the second objective of a transmission effect. Different diagnostic tests, such as autocorrelation, normality, heteroskedasticity and the cumulative sum of recursive residuals (CUSUM) on the error term is used to ascertain the efficiency and the reliability of the parameter estimates.

4. Results and Discussion

The analyses began with the presentation and discussion of the preliminary tests such as the descriptive statistics and the unit root tests to ascertain the unique properties of the variables. Table 2 presents the common descriptive statistics of five-time series variables for a sample period of forty-four years.

Table 2: The Descriptive Statistics

	FWB	HDI	SAV	FINLIT	INV
Mean	0.412	10.326	1.064	0.306	2.949
Median	0.304	10.516	0.950	0.199	2.982
Max	1.000	18.379	6.5000	0.936	31.542
Mini.	0.060	-2.143	-2.900	0.023	-24.561
Std. Dev.	0.283	3.957	2.323	0.268	11.104
Skewnes	0.580	-0.353	0.359	0.852	-0.114
Kurtosis	2.088	3.743	2.424	2.470	3.482
JB	3.990	1.927	1.556	5.849	0.521
Prob.	0.136	0.382	0.459	0.054	0.771
Sum	18.113	454.34	46.800	13.449	129.77

Sum Sq. Dev.	3.455	673.39	232.08	3.082	5301.7
Obs.	44	44	44	44	44

Source: Estimation

The result reveals that all variables reported positive mean and median values but with moderately low standard deviation values for almost all the variables in the model. This suggests that the level of risks or uncertainties associated with the variables are relatively low. Consequently, volatilities in the variable is not strong enough to provoke an economic downturn.

The positive skewness of FWB, SAV and FINLIT reveals that majority of their observations lies on the right side of the mean, hence, they are positively skewed. The reverse is true for household disposable income and investment as they reported negative skewness. The kurtosis value indicates a high peak for household income and investment. This is because their kurtosis values were both more than three (3), hence, the series palytokurtic. On the other hand, FWB index, savings and financial literacy (FINLIT) revealed a Laptokurtic peak with kurtosis value less than 3. Finally, the result reveals that all the series reported a normally distributed values because the probability values of their Jarque-Bera statistics are more than 5 per cent. Hence, the justification to apply normal distribution option in model estimation. Meanwhile, results of the PCA (See appendix) reveal that the index of FWB is more susceptible to economic variables components 2 and 3. This implies that FWB in South Africa depends more on economic indicators rather than socio-demographic factors.

The tests for stationarity were conducted using the Augmented Dickey-Fuller (ADF) and the Philips-Perrion (PP) unit root tests. These were necessary to accommodate the uniqueness of each other and augment for their weaknesses. Results of the unit root test are presented in Table 3 below and it shows that the variables are a combination of I(1) and I(0) data sets.

Table 3 Unit Root Test

Variables			ADF Unit Root Test	PP Unit Root Test
	Cons	Trend	Condition	Condition
Financial Well-being (FWB)	Yes	Yes	I(1)***	I(1)***
Households' income (HDI)	Yes	Yes	I(1)***	I(1)***
Savings (Sav)	Yes	No	I(0)*	I(0)*
Financial Literacy (FINLIT)	Yes	No	I(1)***	I(1)***
Investment (INV)	Yes	Yes	I(0)***	I(0)***
*** significant at 1%; ** significant at 5%; * significant at 10%				

Source: Estimation

To be more precise, results of the unit root test from the augmented Dickey-Fuller test reveals that savings and investment were stationary at level I(0) while FWB index, households' disposable income (HDI) and financial literacy became stationary after their first difference [I(1)]. Results from the Philips Perron unit root test also reported a consistent conclusion. No variable is stationary at the second difference [I(2)]. These results imply that the conditions to employ the nonlinear ARDL approach are fulfilled (Pesaran et al., 2001).

In addition, the Pesaran et al. (2001) bounds test used to check for cointegration among the variables in the long run reveals that the variables have long run relationship. Here, the calculated F-statistics based on the nonlinear ARDL estimate is compared with its critical bound value. Therefore, since the F-statistics (4.4492) is greater than the critical value of the upper bound I(1) at 5% significance level, which stood at 4.01 (Table 4), we reject the null hypothesis of no long-run relationship and accept the alternative hypothesis. Hence, the justification for reporting the cointegrating form of the model in Table 5.

Table 4: Result of the cointegration Test: Null Hypothesis: No long-run relationships exist

Test Statistics	Value	Significance	Lower Bound	Upper Bound
F-statistics	4.4492	10%	2.45	3.52
K	4	5%	2.86	4.01
		1%	3.74	5.06

Source: Estimation

4.2 Presentation and Discussion of the Main Results

The analysis here is based on results from the nonlinear ARDL equations (14) and (15) after all necessary tests were reported. The models were used to examine the determinants of FWB with focus on the asymmetric effect of savings as well as investigate the interactive effect of financial literacy with savings and investment on FWB respectively. The analyses were reported in two stances. The first stance reported results based on equation (14) which

examined the determinants of FWB with focus on the asymmetric impact of savings. The second stance investigates whether financial literacy is the transmission channel through which savings and investment could drive FWB.

The results of the first stance as presented under Table 5 reveal that households' disposable income (HDI), positive changes in savings (SAV+), negative changes in savings (SAV -), and investment (INV) were among the variables that determines the level of households' FWB in South Africa. The result reported a consistent result both during the short run and long run. That is, households' income, SAV+ and SAV - all drives the FWB of households in South Africa in the short run and long run. To be more precise, the result reveals that a one percent increase in HDI is on average and ceteris paribus associated with about 0.0002 percent increase in FWB during the short run and long-run at 1% significance level. This finding is consistent with that of Earl et al. (2015) who also found that during the short run, low income is associated with low FWB while higher income is likewise associated with higher FWB. This assertion is also supported by the life cycle income hypothesis which asserts that during the early stage of one's life, labour income is low and people deplete assets base to maintain a given level of FWB. This explains why the asset base in the economy, proxy with the constant term is negatively and significantly associated with FWB during the long-run. Hence, households' FWB in South Africa is a function of asset depletion and the available income.

Table 5: Nonlinear ARDL Co-integrating & Long Run Form

Dependent Variable: FWB Selected Model: ARDL(1, 0, 0, 0, 1)				
Short Run Coefficients				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(HDI)	0.000002	0.000000	4.405943	0.0001
D(SAV+)	-0.015298	0.006204	-2.465871	0.0186
D(SAV -)	-0.028951	0.006337	-4.568526	0.0001
D(INV)	-0.000348	0.000779	-0.446960	0.6576
ECT(-1)	-0.739827	0.156879	-4.715917	0.0000
Adjusted R^2	0.972061			
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
HDI	0.000000	0.000000	10.798386	0.0000
SAV+	-0.020678	0.008383	-2.466528	0.0185
SAV -	-0.039132	0.006002	-6.519496	0.0000
INV	-0.002579	0.001251	-2.061874	0.0465
Intercept	-0.072097	0.033567	-2.147850	0.0385
Short run asymmetric Wald test: F-stat. = 6.0805, P-value = 0.0186				
Long run asymmetric Wald test: F-stat. = 3.7507 , P-value = 0.0607				
Diagnostic Tests				
Tests		Obs R-squared		Prob.
Serial correlation (Breusch-Godfrey test)		3.4337		0.1796
Heteroskedasticity (Breusch-Pagan-Godfrey)		7.0553		0.3158
Test of Normality (Histogram)		0.7261		0.6955
Functional form (Ramsey-Reset test)		0.0193		0.8902

Source: Estimation

Again, there is evidence of a negative relationship of SAV+ with FWB both during the short run and long run. That is, a unit increase in savings (SAV+) is on average and ceteris paribus associated with about 0.0153 and 0.0207 units decreases in FWB of households in South Africa during the short run and long run respectively both at 5% significance level. Xue et al. (2020) observed that increase in savings promotes future FWB, hence, current FWB is always compromised in a bid to save more now to achieve higher satisfaction in the long-run.

The short-run Wald test (6.0805) is significant at 5% whereas the long run Wald test (3.7507) is not significant. This is an evidence that we should reject the null hypothesis in the short run but reject it in the long run. This implies that the short-run effect of savings on FWB is asymmetrical but symmetric in the long-run. Furthermore, although an increase in savings (SAV+) still dampens FWB significantly during the long run, the result reveals that decreases in savings (SAV -) significantly raised it by 0.0290 and 0.0391 during the short run and long run respectively[3]. This result suggests that the extra fund households receive from cutting down their savings is diversified or used for investment in order to raise their current level of FWB. However, the long run effect of such investment detracts from FWB since investment in the long run significantly reduces FWB. Hence, households' investment decision is not profitable.

The negative significant impact of investment during the long run further reveals that households in South Africa are not financially

[3] Recall that negative coefficients reported for SAV - suggests that positive impact is ultimately implied as two negative values translated to a positive effect (Somoye et al., 2022).

literate, consequently, their investment decisions are not profitable to impact positively on their level of FWB. Hence, the need to further examine the role an improved financial literacy could play in raising the level of FWB. This is the focus of the analysis in Table 6 below. Finally, the result as presented under Table 5 reveals that the model is non-oscillatory convergent model. This is because the speed of adjustment to long-run equilibrium stood as -0.7398 and it is significant at 1%. This means that short-run disequilibrium can be corrected at a convergent speed of 73.98% per annum. Hence, it will take the system about one year and four months to completely correct any short-run disequilibrium

Table 6: ARDL Co-Integrating and Long Run Form

Dependent Variable: FWB Selected Model: ARDL(2, 1, 0, 3)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(FWB(-1))	-0.393591	0.151916	-2.590843	0.0145
D(HDI)	-0.000001	8.52E-11	-1.110506	0.2753
D(SAV*FLIT)	-0.027471	0.028676	-0.957996	0.3455
D(INV*FLIT)	0.007373	0.003738	1.972425	0.0475
D(INV*FLIT(-1))	-0.006280	0.003688	-1.702509	0.0987
D(INV*FLIT(-2))	-0.013326	0.004897	-2.721392	0.0106
ECT(-1)	-0.270391	0.142458	-1.898044	0.0370
Adjusted R^2	0.977285			
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
HDI	0.000002	0.000000	2.980918	0.0056
SAV*FLIT	-0.101599	0.098129	-1.035362	0.3085
INV*FLIT	0.085195	0.049429	1.723582	0.0447
Intercept	0.257292	0.056883	4.523207	0.0001
Short run Joint Wald Coefficient test: F-statistics = 1.6555, P-value = 0.1959				
Diagnostic Tests				
Tests	Obs R-squared		Probability	
Serial correlation (Breusch-Godfrey test)	1.1447		0.5642	
Heteroskedasticity (Breusch-Pagan-Godfrey)	11.6636		0.2329	
Normality (Histogram)	0.2283		0.8921	

Source: Estimation

Furthermore, a robustness model based on equation (15) was estimated to see whether financial literacy improves the impact of savings and investment on FWB. Given the negative long run significant impact of investment and Savings^{+} on FWB, this study argues that that is because most households in South Africa are not financially literate. Consequently, their investment or savings decisions are likely to be wrong which ultimately reduce their FWB. The study tries to circumvent this by using financial literacy as investment or savings transmission channel to better FWB in an interactive model. The results, as presented in Table 6, reveal that the interactive model does improve the impact of investment and savings on households' FWB in South Africa. A percentage increase in the contemporaneous level of INV*FLIT is on average and ceteris paribus associated with 0.73 percentage increase in FWB at 5% significance level during the short-run. Conversely, a negative significant impact of INV*FLIT was found in the short run at the second lag with not significant impact at its first lag. These ambiguous results necessitated conducting a Wald coefficient test for the short-run variables to ascertain their joint significance. The result reveals that we cannot reject the null hypothesis (1.6555; P-value 0.1969) of no significant impact of the joint lags of INV*FLIT on FWB. Hence, we conclude that there is no short-run significant impact of the interactive effect of investment with financial literacy on FWB. This suggests that the role of investment on FWB is a long-run phenomenon.

The long-run significant impact of INV*FLIT accentuates to the fact that investment and FWB has a long-run positive relationship. A percentage increase in INV*FLIT is on average and ceteris paribus associated with 8.52 percentage increase in FWB during the long run at 5% significance level. Hence, financial literacy can only improve the impact of investment on FWB in the long run. This is consistent with the findings of Mudzingiri (2019) that one's financial behavior or investment decisions will continue to improve their financial condition only when their levels of financial literacy improve consistently. This explains why households' income and assets base (Intercept) significantly impact on FWB positively during the long run. This implies that it takes time before the positive effects of better financial literacy on investment translates to better FWB. Hence, this study concludes that financial literacy is the transmission channel through which households' investment decisions could improve their FWB.

The result further reveals that previous level of FWB is negatively related with its current level. That is, a unit increase in FWB in the previous periods will significantly reduce current FWB by 0.3936 units. Hence, wrong financial decisions are leverages on current impact thereby creating a vicious cycle of poverty. This suggests a quick policy response as households' FWB in South Africa deteriorates overtime.

Table 7: Result of the cointegration Test (Bounds Test): H_0: No long-run relationships exist

Test Stat.	Value	Significance	Lower Bound	Upper Bound
F-statistics	7.7134	10%	2.72	3.77
K	3	5%	3.23	4.35
		1%	4.29	5.61

Source: Estimation

Again, the co-integrating test is used to examine if the variables have a long-run relationship. A long-run relationship among the variables means that the estimation of an error correction version of the NARDL is necessary. Pesaran et al., (1999) bound testing co-integrating table is compared with the calculated F-statistics of the Pesaran et al. (1999) bound testing as indicated in Table 7. Co-integration exists if the calculated F-statistics is greater than the upper bound of the Pesaran table at 5 per cent significance level with *k* degree of freedom; otherwise, there is no co-integration among the variables. Results from the test as presented in Table 7 reveals that since the calculated F-Statistics for model 2 at 7.7134 is greater than the upper bound values at 4 degrees of freedom. Therefore, we reject the null hypothesis and accept the alternative, hence the variables have a long-run relationship.

Different diagnostic tests were carried out to explain the models' efficiency and reliability test. They include the serial correlation test, the heteroskedasticity test and the Jarque-Bera normality test. Furthermore, since the probability values of the Portmanteau autocorrelation test, Breusch/Pagan heteroskedasticity test, Ramsey specific test and the Jarque-Bera test of normality were all greater than 5 percent in the three models, we conclude that they are free from autocorrelation, heteroskedasticity problems, the models were correctly specified and the residuals were normally distributed.

5.1 Conclusion and Policy Implication

This study examined the role of savings or savings spread and investment on FWB of households in South Africa. Previous studies have been silent on this nexus as they place more emphasis on demographic and socio-economic factors that drive FWB. The study then argues that the ultimate representation of how well an individual is, financially has a lot of bearing with their financial decisions, whether wrong or right. Hence, emphasis was placed on high financial literacy as a precursor to better FWB in this study. The interest in financial literacy is propelled by the negligence of previous studies to examine how it transmits savings or investment to better FWB and in how FWB can be measured.

Results from the nonlinear ARDL of the impact of savings, investment and households' income on FWB reveal some ambiguous conclusions. While the asymmetric effect of savings ((SAV+) and (SAV -)) emits significant negative and positive effects respectively on FWB both during the short run and long run, investment had a negative significant impact in the long run. The policy implication of this is that households in South Africa dis-saves (reduces savings) to maintain an established FWB state. This assertion is consistent with that of Xue et al. (2020). Hence, higher savings are associated with poor growth which can reduce FWB whereas low savings are consistent with better FWB (Xue et al., 2020). This assertion is more valid during the short run but can be violated in the long run especially when it interacts with financial literacy as a transmission channel. The transmission effect of financial literacy with investment on FWB was positively significant. Hence, households' FWB was improved when savings and investment interact with financial literacy. This implies that the extent to which an individual diversifies idle funds to profitable investment opportunities thereby improving their levels of FWB is a function of how financially literate they are. Again, the positive impact of investment interaction with financial literacy on FWB during the long run implies that it is a long run phenomenon, therefore policies should be geared towards ensuring steady returns to investment. This conclusion is consistent with that of Ali et al. (2015). Moreover, the fact that households' wealth-base (intercept) still emits negative impact on FWB is an indication that households in South Africa are liquidating assets to improve future FWB. This implies that most households in South Africa are still at their early stages of career and financial journey when labour income is low. Hence, current FWB is maintained through liquidating inherited assets, transfer earnings, gifts and dis-savings.

Finally, based on the findings, conclusions, policy implications and the limitations[4] of this study, we therefore recommend that households should diversify their idle funds towards short term investment plans with better returns and become more financially literate to improve both current and future FWB. On the other hand, the study also recommends government intervention through unemployment allowances, social security benefits and the creation of public goods for better FWB in the country.

APPENDIX

Table 1A: Principal Component Analysis for FWB Index

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	3.04376	2.1628	0.6088	0.6088
Comp2	.880966	.140225	0.1762	0.7849
Comp3	.740741	.487289	0.1481	0.9331
Comp4	.253451	.172373	0.0507	0.9838
Comp5	.081078	.	0.0162	1.0000

Source: Estimation

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[4] The study could not measure or account for the subjective aspect of FWB empirically, hence, the focus of the study is mainly on objective measurements of FWB. Moreover, the role of institutional quality in FWB is not addressed in this study. Future studies should examine this.

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