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PARSIMONY AND LIQUIDITY RATIO EFFECTS ON CAPITAL MARKETS: EVIDENCE FROM SOUTH AFRICA

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Abstract

From a sample period of 30 years, the study shows that a parsimonious model helps explain the effect of the liquidity ratio on equities and bonds in South Africa. Guided by the combined theoretical model of liquidity preference theory and endogenous money approach, multivariate econometrics modeling is applied in this study. Findings show that as market participants improve their ability to pay off their short-term debts, as measured by liquidity ratio, they tend to decrease raising capital in the equity market and increase borrowing from the bond market. These findings are consistent with the parsimonious model in both the equity and bond markets. Further, the results indicate that the liquidity ratio is inversely associated with the equity index and positively associated with the bond index. All findings are obtained from a long-run horizon in the South African capital markets. Motivated by the financial stability developments in the private and public sectors, the findings contribute to capital formation by financial markets into the mainstream economy. The relationship between liquidity ratio and capital markets can serve as a guide to monitoring the strength of financial leverage and financial stability.

Keywords: Liquidity Ratio, Capital Markets, Parsimony, South Africa

JEL Classifications: A10, C50, G00

1. Introduction

The global financial system has enabled loanable funds to be channeled from ultimate lenders to borrowers at a price (Gelos *et al*. 2011). The capital markets are the mainstream platform for these funds. The South African financial system has appreciated the global markets and has become an active participant for more than three decades. The need for capital in these periods was because of its robust mining industries, and gold was one of the leading natural resources produced (O'Connor *et al*. 2015). Thus, a large share of economic growth was based on gold production. After the 1994 democratic dispensation, most industries were privatized, with some key sectors partially owned by the state. Today the country comprises many private companies, businesses, and state-owned enterprises (SOEs).

The financial system of South Africa has been an essential vehicle for many companies listed on the Johannesburg securities exchange (JSE). The exchange provides a one-stop shop marketplace for equities and bonds. The JSE has been a critical marketplace in which the financialization of the South African economy unfolded. Due to its role, global investors gained

trust in investing in this market (Chen *et al.* 2021). The JSE developed into one of the world's most highly liquid securities exchanges. The financial market has been a key driver in mobilizing domestic and international loanable funds. Government and its SOEs are vital in the equity and bond market (Gelos *et al.* 2011), whereas large corporations and medium-sized firms have also been active players. Moreover, small firms and individuals have access to investment products such as exchange-traded funds.

Against this background in South Africa, this study investigates if liquidity ratios can be priced in by the capital markets as it is essential to assess if the liquidity ratio plays a vital role in the capital markets. In the study process, we aim to find a model with explanatory power. Studies of parsimony continue emphasizing its importance. They postulate that solutions to empirical results can be obtained in the simplest form if the modeling does violate the data (Burnham and Anderson, 2002). This process enables the production of easily understood models and results that can be easily communicated. Hence, the study reviews some updated literature and provides new empirical findings.

The contribution of this study can enable the global community and policymakers to obtain knowledge about how the liquidity ratio affects the capital market of South Africa since an effectively functioning financial market is highly desirable for the South African economy. With the inclusion of control variables, we find a negative relation between the JSE All Share Index and the liquidity ratio. As the liquid assets to short-term liabilities ratio increases, the JSE All Share Index decreases. We also report a positive relationship between long-term government bonds and the liquidity ratio. As the liquid assets to short-term liabilities ratio increases, so is the long-term government bond yields. The degree to which the financial market participants can raise capital from the global financial markets space can be assessed by the estimations obtainable from this study. When liquidity ratios are high, market participants can finance their economic activities using their liquid assets (Baum *et al.* 2008). However, they acquire the ability to borrow less or more from the financial markets. At the same time, they can gain trust from creditors and investors, considering that they will not default on their debt. A low liquidity ratio in the economy can mean that the market participants resemble some form of financial instability (Kim *et al.* 1998). This instability is detrimental to the country's overall creditworthiness and investor worthiness (Beaver, 1966).

The remaining paper is organized as follows. Section 2 reviews the literature on the developments of liquid assets to short-term liabilities ratio and the capital markets. Section 3 elaborates on the methodology used for the study. Section 4 presents the findings of the empirical association between liquidity ratio and equity and bond indices. Section 5 concludes the findings.

2. Literature review

The study follows the theoretical model of Boulding (1944) and Kregel (1988). The model combines the Keynesian liquidity preference theory of asset prices and the endogenous money model (Wray, 1991). Post-Keynesian scholars appreciated the endogenous approach to money, which postulates that money supply is a function of money demand. They also articulated that Keynesian liquidity preference theory could not determine interest rates if money demand is met by an increasing money supply. Considering this, endogenous money scholars adopted a markup rate for an increasing money supply. This approach implies that banks can offer credit at various interest rates and explains how liquidity preference theory and endogenous money differ. Endogenous money scholars cannot abandon the liquidity preference theory. Keynes asserted that interest rates were a reward for not hoarding money. According to Kregel (1988), demand and supply for money determined interest rates, which is also called the marginal efficiency of money. The return of assets is called the marginal efficiency of investment and capital. Equation (1), Boulding's identity, shows the reconciled liquidity preference and endogenous money theories. The identity enables the inclusion of many assets.

$$P_a = R_m \, M \, R_a \, A \tag{1}$$

where P_a is a vector representing demand prices for n assets, R_m is a scalar representing an inverse of liquidity preference, M is the money supply, R_a is a matrix of the preference ratio for each of the n assets, and A is a vector of inverses of quantities of the n types of assets. Equation (1) states that decreasing liquidity preferences increases all asset prices. In other words, when liquidity preference (R_m) decreases, asset ratios (R_a) increase due to budget constraints. Equation (1) further justifies that increasing demand for money will not be met by increasing money supply if ultimate lenders in financial markets consider liquidity ratios as an important factor. Liquidity preference plays an active role in determining interest rates in the financial markets. If liquidity preference decrease, ultimate borrowers issue equity or debt securities to purchase capital (Wray, 1991).

The development of financial ratios can be traced back to the elements of Euclid's Book V, written in 300 B.C. (Horrigan, 1968). Financial ratio analysis started when demand for credit by private firms increased. Ratios became a common tool for financial statement analysis in the 1900s (Lough, 1917). The importance of analyzing credit came from the ability of the firm to repay its debts. These developments had their genesis in the United States of America. The financial sector became an essential segment of the economy by connecting ultimate borrowers with ultimate lenders (Foulke, 1961). In the 1800s, comparing current assets to current liabilities was a common practice that became an essential tool in credit analysis (Bierman, 1960). This method is called the current ratio and necessitated the development of the liquidity ratio as a tool in the second half of the 1900s. Wall (1919) advocated for more financial ratios as the private sector issuance of commercial papers increased. As ratio analysis became the norm in the financial sector, various organizations started collecting financial ratio data (Foulke, 1961). Collecting average financial ratios in the economy was then called "scientific ratio analysis" (Justin, 1924). Hence, these data became available to analysts in the financial markets as industry average ratio series.

Gibson (1987) found that firms that were not successful had low financial ratios. Since 1946, ratio analysis has started being used to examine economic activity. Hickman (1958) argued that ratios provided information about the probability of the firms defaulting on their debt. Saulnier *et al.* (1958) further asserted these findings, showing that firms with poor financial ratios and net worth were more likely to default on their loans. In recent years, empirical studies of financial ratios on economic activity have been conducted, but the mainstream literature has failed to incorporate these developments (Shim and Shin, 2021). The aggregate financial ratios can serve as simple analytical tools for assessing the financial stability of firms in the future (Curto and Serrasqueiro, 2022). Since the 1990s, the liquidity ratio has emerged as the most important financial ratio of firms and contributes to the focus of this study (Chen *et al*. 1981). Firms holding large amounts of liquid assets can finance their future business and investment opportunities. A high liquidity ratio gains the borrower's trust (Chen *et al*. 2021). Maintaining a high liquidity ratio can enable firms to borrow from the financial markets at low costs. The equity and bond markets offer lower borrowing costs than formal banks (Schwert, 2019). Firms with low liquid assets have low savings for future economic activities, leading them to borrow funds in the financial markets. When firms increase their stock of liquid assets, it enables them to increase or reduce their borrowing. It depends on a firm decision to lower its liabilities or not. Also, the stock of liquid assets can be easily converted into cash during financial stress (Schwarz, 2017). This is important as investors would like to be paid back if they decide to sell their securities.

According to Goyenko and Ukhov (2009), the illiquidity of stocks and bonds caused security market frictions in the long run. In these events, investors adjusted their portfolios. Illiquidity signals investors to flight to liquidity and quality, and an illiquid equity market channels funds to the bond market, while an illiquid bond market channels funds to the equity market. If the domestic equity and bond markets are illiquid, there is a capital flight to other global markets. Lee (2011) found that pricing of liquidity risk in the financial markets occurs independently from market risk. This renders the liquidity ratio an exogenous variable, which is calculated and arrived at independently. Its effect in the capital markets is also independently distributed. Multinational corporations and large firms find it easy to raise capital in the financial markets because of the economics of scale (Alfaro *et al*. 2010). The securities markets also add to their ease of obtaining

capital, translating into their future profitable prospects. In countries with low savings rates, the foreign and direct capital influx often leads to market concentrations (Forte and Moura, 2013). This creates a capital structure and formation extensively sourced externally than domestically. These financialization dynamics have been the reality of the South African corporate sector and its financial markets. The banking sector in this country is also a key player in facilitating government and private sector investment deals.

Profitable business opportunities and the desire to expand make companies go to the loan window of the securities exchange (Schwert, 2019). When the government and private sectors' assets are liquid enough, they can service and pay off debts. The securities market is where market participants make high levels of debt. These debts far exceed the loans taken at formal banks. The financing of private companies and the government by global investors is what we proceed to coin as the financialization of the economy (Huang *et al*. 2022). We examine to what extent the market participants' liquidity ratio position affects the South African capital markets. It is expected that a security market is made to facilitate loanable funds that should positively affect the economy. Current studies are yet to empirically examine the impact of financing the economy using foreign or domestic capital on long-run economic growth. However, we first investigate financial strength, that is, the ability to pay off debts in the process of economic activities. This ability to service debt is what ensures the sustainability of the securities markets and, in turn, the economic growth prospect of the economy in the long run. A low liquidity ratio means a firm cannot pay off its short-term debts using its current liquid assets (Lagos *et al*. 2017). The liquidity ratio is a good measure of sentiments in the loanable fund markets. It is also a good measure of the sustainability of financialization in a country that lacks domestic capital and exhibits low domestic savings.

3. Data and methodology

The liquidity ratio of financial market participants directly affects the ability to issue equity and bond securities (Hickman, 1958). Market participants with a high liquidity ratio have higher incentives not to borrow from the capital markets. They can use their liquid assets to finance economic activity and amortize their debts. Those with a low liquidity ratio find it difficult to obtain capital in the financial markets and fully amortize their debts (Gibson, 1987).

These earlier theories found that the aggregate liquidity ratio as a variable is endogenous in modeling its effects on the financial markets (Saulnier *et al.* 1958). This finding set out a necessary and sufficient condition to test the relationship utilizing the linear multivariate regression model. The liquidity ratio has gained importance in the literature as the most important financial ratio (Chen *et al.* 1981). In recent years, the liquidity ratio has become one of the leading indicators of financial leverage and financial stability in capital markets (Curto and Serrasqueiro, 2022).

In this context, this study investigated the role of liquidity ratio on capital markets. The variables of interest for this study, along with the descriptive statistics, are captured in Table 1. The main variables of interest are *ALSI, BONDS,* and *LIQUID,* which are JSE All Share Index, long-term government bond yields, and liquid assets to short-term liabilities ratio. Other indicators are included as control variables. The data is obtained from the Federal Reserve Economic Data (FRED), World Bank, Johannesburg Securities Exchange (JSE), and World Uncertainty Index databases. As the statistical description of the variables captured in Table 1 shows, the sample period is 30 years, from 1991 to 2020.

The selection of the control variables is guided by theory, and our pairwise correlation coefficients are captured in Table 2. These variables are strong linked with the equity market, bonds market, and liquidity ratio. Some empirical works by various scholars have provided good insights. For instance, Huybens and Smith (1999) demonstrated that economic activity, trading in equities, and bank lending are positively correlated. They also found that inflation negatively correlates with economic activity and the equity market. Thus, inflation plays a crucial role in allocating financial resources.

Table 1. Variables and descriptive statistics

Variable	Description	Obs.	Mean	Std. Dev.	Min.	Max.
ALSI	JSE All Share Index	30	46.587	37.255	6.628	108.757
BONDS	Long-Term Government Bond Yields (%)	30	11.002	3.083	7.722	16.344
LIQUID	Liquid Assets to Short Term Liabilities Ratio	30	45.87	1.957	42.943	49.58
INFLA	Inflation Rate	30	6.458	3.232	-0.692	15.335
EXRATE	South African Rand to U.S. Dollar Spot Exchange Rate	30	8.057	3.776	2.762	16.449
UNCERT	World Uncertainty Index for South Africa	30	0.375	0.357	0.013	1.343
OPTIONS	Put/Call Open Interest Ratio	30	92.536	20.084	63.48	125.77
MSLY	M3 Money Supply (% change)	30	11.51	5.686	3.5	23.3

Source: Author's own computations

Table 2. Pairwise correlations

Variable	ALSI	BONDS	LIQUID	INFLA	EXRATE	UNCERT	OPTIONS	MSLY
ALSI	1							
BONDS	-0.710***	1						
LIQUID	-0.732***	0.827***	1					
INFLA	-0.412*	0.615***	0.373*	1				
EXRATE	0.888***	-0.642***	-0.660***	-0.466**	1			
UNCERT	0.842***	-0.535**	-0.577**	-0.173	0.735***	1		
OPTIONS	0.612***	-0.848***	-0.770***	-0.515**	0.661***	0.375*	1	
MSLY	-0.485**	0.174	0.268	0.144	-0.397*	-0.415*	-0.027	1

Note: *, **, and **** denote statistical significance at the 5%, 1%, and 0.1% levels.

Source: Author's own computations

Regarding the exchange rate, Gadanecz *et al.* (2013) investigated the relevance and implications of it in the financial markets and economic activity. They found that the exchange rate assists in smoothing output volatility in emerging markets and help reduce currency market vulnerabilities. As shown in Table 2, correlations report a highly significant and strong positive correlation between the exchange rate and the equity market and a negative correlation with the bond market. This shows how the exchange rate is important for all participants in the capital markets.

Another variable is the uncertainty. According to Segal *et al.* (2015), uncertainty could be good or bad. Good uncertainty is associated with increases in economic activities and variables such as investments, consumption, and government spending. They also showed that good uncertainty is positively correlated with financial developments and that bad uncertainty is negatively correlated with equity market prices.

The investor sentiments in financial markets can be measured by the put/call open interest ratio, which measures the mood in the capital markets involving equities and bonds. This sentiment is significantly correlated with our variables of interest: equities, bonds, and liquidity.

Monetary policymakers use money supply synonymously with the key interest rate, usually referred to as the repo rate in South Africa. The central bank influences the financial markets by creating conditions where it becomes attractive for market participants to buy or sell stocks (Sieroń, 2019). In broader terminology, market response to increase or reduce money supply can be called expansionary or contractionary monetary policy (Abel *et al.* 2011). An increase in money supply is a decrease in the key interest rate, which leads to a decrease in the equity index. Investors in equities are attracted by an increasing or high-interest rate that the market can price in and offer. Also, government debt increase is accompanied by a rise in long-

term interest rates (Claeys *et al.* 2012). In this study, we show a significant and negative correlation between money supply and equities.

This study uses a linear ordinary least squares model (Angrist and Pischke, 2009). Based on recommendations by Boulding (1944) and Kregel (1988), we utilize two regression equations: the equity market regression in Equation (2) and the bond market equation in Equation (3). These two equations capture the relationship between the liquidity ratio (*LIQUID*) and JSE All Share Index (*ALSI*) and the long-term government bond yields (*BONDS*) in the long run. Given this specification, we estimate the partial effect of each independent variable on the dependent variables (Yu *et al.* 2015). In the estimation process, we transform the *ALSI* and *BONDS* variables into logarithms to interpret the statistic in percentiles. Thus, we divide the capital market regressions into two parts. The first part is an equity market regression, and the second is a bond market regression.

$$Log(ALSI) = \alpha + \phi X + \beta(LIQUID) + \varepsilon \quad (2)$$

$$Log(BONDS) = \alpha + \phi X + \beta(LIQUID) + \varepsilon \quad (3)$$

where α is the constant, X is a set that contains the control variables, α is the coefficients vector of the control variables contained in X, β is the coefficient of liquidity ratio, and ε is an error term (Hausman, 2019).

We estimate the partial effect of the independent variables on the dependent variable, holding all other variables constant. The error term captures unobserved variables. We want to obtain the best results from the data and the model we use. Therefore, the primary variables, which are the variables of interest, are adequately justified by the theory (Sarr, 2002). What is needed from estimation is a model that can offer results with precision. Adding covariates that can explain the effects between variables of interest more precisely provides valuable estimations (Silver, 2012).

Our goal for parsimony leads to the inclusion of five regression equations for each market. We select the most parsimonious of these five models as the lead model. A lower score of the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC) reveals the most parsimonious model. Theorists define a parsimonious model as using a few variables to produce estimations with statistical reliability (Deutsch, 2012). In the process, the models should be unbiased and consistent (Almalik *et al*. 2021).

To achieve parsimony, we test for it using the information criterion models, namely AIC and BIC. The AIC can be specified as "*AIC = −2 ln(L) + 2(k)*", where *ln(L)* is the log-likelihood that is maximized, and *k* is the number of estimated parameters. The BIC can be specified as "*BIC = −2 ln(L) + k ln(N)*", with *N* as the size of the sample (Wang and Liu, 2006). The first part of both equations measures the fit negatively. These parts are not desired to be high as it worsens the fit. The second part in both equations measures the complexity positively. The model with the smallest information criterion is the most parsimonious.

4. Findings

In this section, we present the results that analyze the effects of the liquidity ratio on the JSE All Share Index and long-term government bond yields. Table 3 summarizes the empirical results for liquidity ratio and the JSE All Share Index. Model 1 is the bivariate regression model, which includes only liquidity ratio as an explanatory variable. We conduct multivariate regressions after the first model. The inflation rate and exchange rate enter Model 2, while we add uncertainty into Model 3. Model 4, in addition to these variables, includes the put/call open interest ratio, and Model 5 includes the money supply. Our findings show a statistically significant and negative effect of liquidity ratio on the JSE All Share Index. The significance remains at the 1% level from Models 1-3.

After including additional controls, the significance of the liquidity ratio is at the 5% level in Model 4, while no statistically significant result is documented in Model 5. In Model 3, all

explanatory variables are significant at 1%. An increase in the ability of market participants to pay off their short-term obligations reduces their raising of capital in the equity market. In other words, the company can use its current liquid assets to finance its current liabilities without borrowing from the capital markets. We can focus on Model 3 to justify our findings. In the sample period, a percentage increase in liquidity ratio decreases the JSE All Share Index by an estimated 20.1 percent. A percentage increase in the inflation rate decreases the JSE All Share Index by an estimated 6.4 percent. A percentage increase in the exchange rate increases the JSE All Share Index by an estimated 7.4 percent. A percentage increase in the uncertainty index increases the JSE All Share Index by an estimated 79 percent. The coefficient of determination (R^2) in the model tells us that the set of explanatory variables causes a variation in the JSE All Share Index by an estimated 88 percent.

Table 3. Regression of the liquidity ratio and JSE All Share Index, 1991-2020

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
LIQUID	-0.390*** (0.042)	-0.201*** (0.038)	-0.173*** (0.036)	-0.130* (0.061)	-0.124 (0.066)
INFLA		-0.044 (0.023)	-0.064** (0.022)	-0.058* (0.022)	-0.057* (0.022)
EXRATE		0.128*** (0.023)	0.074** (0.024)	0.060* (0.027)	0.056 (0.029)
UNCERT			0.790** (0.217)	0.909*** (0.242)	0.903*** (0.235)
OPTIONS				0.007 (0.006)	0.008 (0.007)
MSLY					-0.005 (0.011)
Constant	21.369*** (1.898)	11.914*** (1.773)	10.933*** (1.647)	8.352* (3.218)	8.070* (3.441)
R-squared	0.647	0.844	0.880	0.882	0.878
N	30	30	30	30	30

Note: *, **, and **** denote statistical significance at the 5%, 1%, and 0.1% levels.
Source: Author's own computations

Table 4 provides a summary of the empirical results for liquidity ratio and the JSE All Share Index. In the case of liquidity ratio, the results for Models 1-3 are significant at the 1% level, and Models 4-5 are significant at the 5% level. The inflation rate is highly significant in the long-term government bond market and positively correlated in every model. Unlike in the equity market, uncertainty is negatively correlated and significant in Models 4-5 at the 5% level. Good sentiments in the capital markets switch investments from the bond market to alternative markets by an estimated 0.7 percent, as indicated in Models 4-5. We found that money supply has no effect on the long-term bonds market and is not significant.

All explanatory variables are significant in Model 4. A percentage increase in the long-term bond index, inflation rate, and exchange rate is associated with an increase in the liquidity ratio by 4.8%, 2.6%, and 2.5%. The coefficient of determination (R^2) in the model tells us that the set of explanatory variables causes a variation in the long-term government bond yields by an estimated 75.8 percent.

Table 5 shows that model that can effectively explain our findings is Model 3 since model selection involves selecting the model with the lowest value of the information criteria. In this case, both AIC and BIC select Model 3 and preserve it as the most parsimonious when studying the effects of liquidity ratio on the equity market. In Table 6, both the AIC and BIC select Model 1 as the most parsimonious.

Table 4. Regression of the liquidity ratio and long-term government bonds, 1991-2020

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
LIQUID	0.113***	0.096***	0.092***	0.048*	0.047*
	(0.009)	(0.011)	(0.012)	(0.017)	(0.019)
INFLA		0.028***	0.032***	0.026***	0.026***
		(0.006)	(0.007)	(0.006)	(0.006)
EXRATE		0.001	0.010	0.025*	0.025
		(0.009)	(0.012)	(0.012)	(0.013)
UNCERT			-0.137	-0.257*	-0.257*
			(0.094)	(0.098)	(0.100)
OPTIONS				-0.007***	-0.007**
				(0.002)	(0.002)
MSLY					0.000
					(0.004)
Constant	-2.826***	-2.245***	-2.074**	0.526	0.551
	(0.391)	(0.542)	(0.559)	(0.917)	(1.021)
R-squared	0.666	0.752	0.758	0.838	0.831
N	30	30	30	30	30

Note: *, **, and **** denote statistical significance at the 5%, 1%, and 0.1% levels.

Source: Author's own computations

Table 5. Akaike's Information Criterion and Bayesian Information Criterion - Equity

Model	N	ll(null)	ll(model)	d.f.	AIC	BIC
Model 1	30	-40.251	-24.126	2	52.252	55.054
Model 2	30	-40.251	-10.744	4	29.488	35.092
Model 3	30	-40.251	-6.269	5	22.539	29.545
Model 4	30	-40.251	-5.376	6	22.751	31.158
Model 5	30	-40.251	-5.265	7	24.530	34.338

Source: Author's own computations

Table 6. Akaike's Information Criterion and Bayesian Information Criterion - Bonds

Model	N	ll (null)	ll(model)	d.f.	AIC	BIC
Model 1	30	-2.655	14.337	2	-24.674	-21.872
Model 2	30	-2.655	19.899	4	-31.797	-26.192
Model 3	30	-2.655	20.830	5	-31.661	-24.655
Model 4	30	-2.655	27.468	6	-42.937	-34.530
Model 5	30	-2.655	27.476	7	-40.952	-31.144

Source: Author's own computations

5. Conclusion

This study empirically estimated the effect of liquidity ratio on the JSE All Share Index and long-term government bonds. The results showed that the liquidity ratio is negatively associated with the JSE All Share Index and positively associated with long-term government bond yields. Choosing the most parsimonious model enabled explanatory estimation power from control variables. The strong link between liquidity ratio and capital markets serves to stimulate further research in the field of financialization.

The limitation of the study is that alternative financial ratio that endogenously affects capital markets was averaged into macro-level data in South Africa. The financial markets literature failed to include average financial ratios in empirical modeling. Future studies can investigate averaging alternative financial ratios, build the framework, and expand the modeling.

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