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The Three-Point Revolution: A Profound Impact on NBA Game Strategy

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Abstract:

This analysis explores the significant influence of the three-point revolution on NBA strategies and player development, analyzing data spanning from the 2007-2008 to the 2022-2023 seasons. Using multivariate linear regression analysis, the study highlights a strong correlation between three-point shooting accuracy and team success, showcasing the critical role of three-point proficiency in contemporary basketball strategies. The findings further delve into how these strategic shifts have reshaped defensive approaches, team compositions, and training practices. The research underscores an increasing reliance on analytical methods to craft strategies and adapt tactically to the growing effectiveness of three-point shooting. This study not only emphasizes the transformation in gameplay but also points to the broader tactical adaptations that teams have made in response to the enhanced value of three-point shooting within the league. Additionally, the study provides insights into how the shift toward three-point shooting has influenced viewing experiences and fan engagement, transforming not just the tactics but also the broader appeal of the game.

Keywords: NBA; Three-Point Revolution; Basketball Analytics; Linear Regression Analysis.

1. Introduction

The beginning of the three-point revolution can be traced back to the mid-to-late 2000s, when a number of teams began to recognize the potential of the three-point shot to improve offensive efficiency. Indeed, if a player was shooting 35 percent from three in a given zone (1.05 points per possession), shooting threes was more efficient than shooting 50 percent from two in that zone (1.00 points per possession)[1]. However, it was not until the Golden State Warriors won the NBA Finals three times between the 2014-2015 and 2018-2019 seasons, with their victories attributed to an abundance of three-point shots, that three-point based offensive tactics became widely recognized and imitated. The Warriors' success is not only reflected in their victories, but also in the way they outscore their opponents with a high volume and efficiency of three-point attempts. In fact, the number of three-point attempts set an all-time high: the 78,742 three-pointers completed in the 2018-2019 season (i.e., the last season before the New Crown outbreak, which consisted of 82 games) set a new NBA record, and was 11.5 times the number of three-pointers made in the first three-point season[2].

Prior to the introduction of the three-point line, most scoring came from under-the-basket shots or layups. To increase the spectacle of the game and to compete with the NBA, the ABA introduced the three-point shot and the dunk.In 1976, the NBA acquired the ABA, but the three-point line was not officially introduced until the 1979-1980 season. Since then, three-point lines have been added to NBA courts and the concept of the three-point shot has been officially introduced. Chris Ford completed the NBA's first three-point field goal.

While it was expected that the addition of the three-point shot would make the splitting method more interesting, the change was not immediate. Initially, the NBA averaged just 2.8 three-point attempts per game, but that number gradually increased over time. Especially from the 2014-2015 season, the emergence of Steph Curry marked the dawn of the small-ball era. He sparked a three-point boom with his quick shot speed, unpredictable movement and amazing three-point percentage. As he succeeded in establishing the Warriors dynasty, more and more teams began to adopt this efficient way of scoring and devised layouts that used the three-point shot as a tactical finisher. In short, the three-point shot not only changed the way of scoring, but also profoundly affected the tactical layout of teams and the development of players' skills.

The purpose of this paper is to explore how the three-point revolution has affected NBA game strategies, including changes to offensive and defensive strategies and their impact on team performance and style of play. By analyzing data and case studies from the past few seasons, this paper

will provide a comprehensive account of the role of the three-point shot in modern basketball tactics.

2. Methodology

This article uses the linear regression method to deeply understand the impact of the three-point shot revolution on NBA game strategy. Through Python's web crawler technology, "request" and "BeautifulSoup", NBA team data over the past ten years is crawled from the Internet, including basic and advanced data. "BeautifulSoup" is a library that creates a parse tree for the parsed page and extracts data through html. It receives data from html, xml and other markup languages. "BeautifulSoup" allows us to extract special context from web pages, remove html Label and save information[3]. Since the 2023-2024 season was completely over when the data was obtained, the data used in this article are from the 2007-2008 season to the 2022-2023 season. The data sources are all from basketball-reference.com.

Furthermore, a multiple linear regression model was established using the statsmodels library, and the management of regression analysis methods was used to find out how the dependent variable or dependent variables are predicted using the independent variables or independent variables. Regression analysis analyzes two or more variables, which explains the relationship between these variables[4]. In this article, we use linear regression to analyze the impact of three-point shot attempts and shooting percentage on game results. Apply statistical analysis, examine parameters and verify model robustness using cross-validation and model diagnostic techniques. This includes residual and normality tests, Durbin-Watson tests for autocorrelation, and condition number analysis of multicollinearity. All these steps ensure the reliability and accuracy of the model results. Finally, data visualization is performed through the seaborn library.

3. Results

3.1 Three-point attempts and makes

This study explores the impact of three-point shooting strategy on NBA team winning percentage and its evolution over time. Using multiple regression analysis and data visualization techniques, this study analyzed the team's three-point shot attempts and shooting percentage (3PA and 3PM), offensive efficiency (ORtg) and defensive efficiency (DRtg) and winning rate (Win_Rate) over multiple seasons. correlation between.

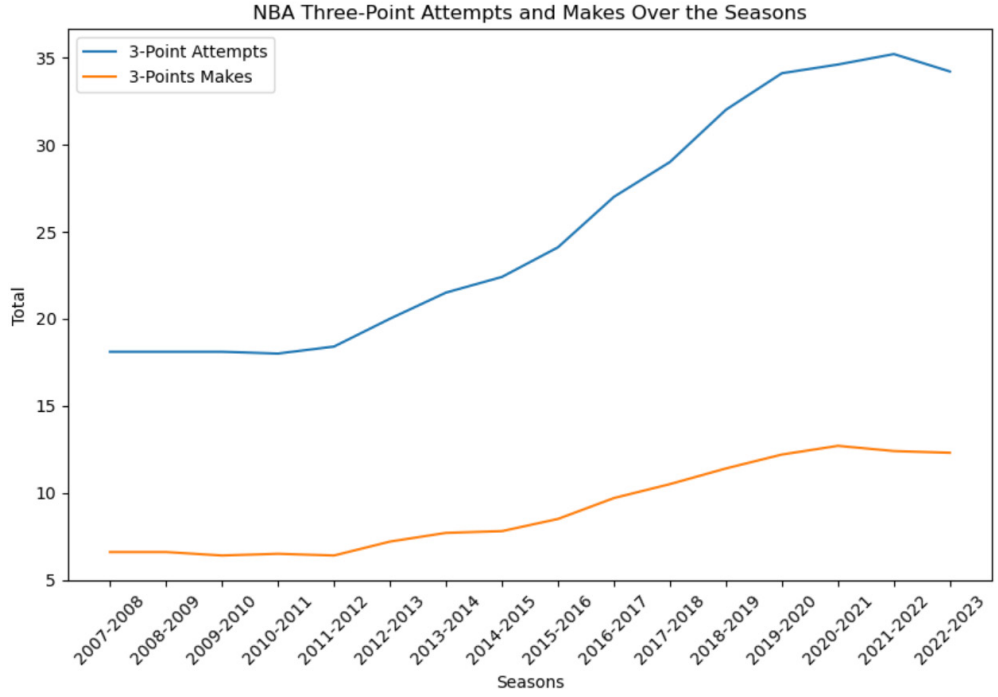

Figure 1 NBA Three-Point Attempts and Makes Over the Seasons

It can be observed from Figure 1 that since the 2015 season, the number of three-pointer attempts has increased significantly and reached a peak in the 2021 season. This trend was partially influenced by the Golden State Warriors' championship run in 2014, when the Stephen Curry-led team demonstrated the success of the three-point shooting strategy, prompting other teams to imitate the style and adopt tactics and tactics more suited to the three-point shot. Lineups, such as the elevator gate tactics and small ball lineups that were well-known at the time.

Although rule changes resulted in certain tactics being banned, the impact of these tactics on subsequent strategy was profound. In addition, the rise of statistical analysis has also contributed to the development of three-point shooting strategies.

3.2 Offensive and Defensive Rating

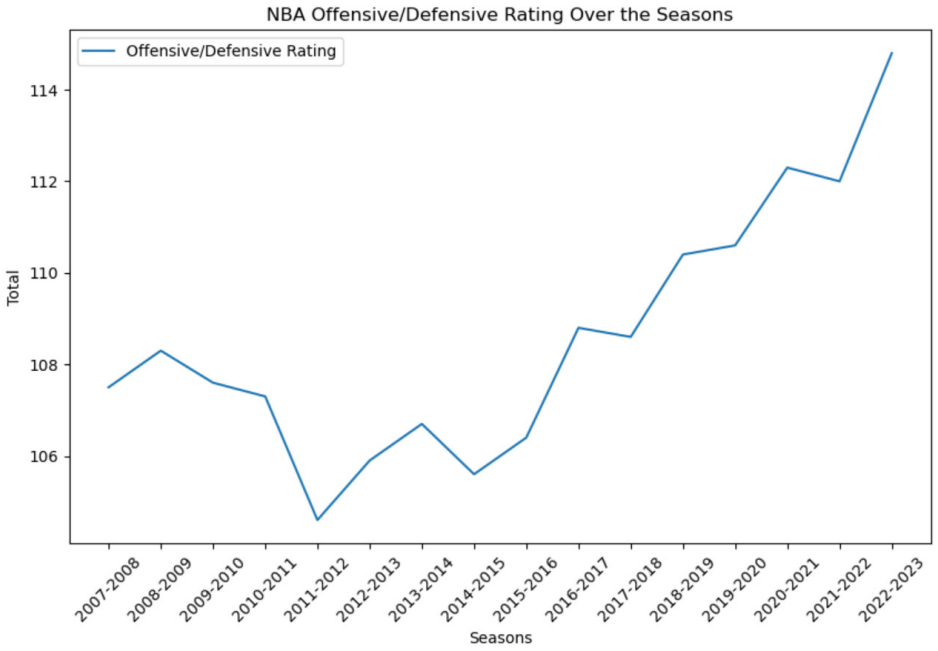

Figure 2 NBA Offensive/Defensive Rating Over the Seasons

As shown in Figure 2, from the 2007-2008 season to the 2022-2023 season, the offensive and defensive efficiency of NBA teams have shown significant changes. By analyzing relevant data, this study shows that as players gradually increase the number of three-pointers they take, their efficiency shows a steady improvement in both offense and defense. Although efficiency fluctuates during certain seasons, the overall trend is significantly upward. This ongoing trend not only reveals a gradual evolution of the league's tactics, but also reflects a fundamental change in the style of play. An increase in three-point attempts was one of the key factors driving these changes. This tactical adjustment shows that the team gradually realizes that using the high efficiency of three-pointers can gain a greater competitive advantage in the game, which in turn affects the overall adjustment of their tactical layout and game strategy.

Over time, we have seen a gradual improvement in offensive efficiency, which is related to the team's increasing emphasis on three-pointers in their offensive strategy. Accordingly, the increase in defensive efficiency may indicate that teams are constantly adjusting and strengthening their defensive tactics in response to more efficient offensive strategies. In addition, this trend may also reflect the improvement of player skills and the overall level of competition in the league. These findings provide an insight into the evolution of NBA game strategy and highlight the importance of statistical analysis in evaluating game strategy and decision-making. In particular, they reveal the potential impact of three-point shooting tactics on a team's overall performance, further confirming our initial conclusion that the effective use of three-point shooting tactics is crucial to modern basketball. The three-point shot is very efficient. If players can hit mid-range shots with 1.5 times the accuracy of three-pointers, then the efficiency of the two shooting methods will be equal[5]. To put it simply, mid-range shots require a higher hit rate (1.5 times) than three-pointers in order to achieve the same efficiency as three-pointers. This is why players are more willing to shoot three-pointers instead of using mid-range jumpers as a scoring method.

Throughout the history of the NBA, the changes in tactics and finishing methods can be said to be very drastic. Whether it is the golden era of Magic and Bird, the Bulls dynasty started by Michael Jordan, or the rise of the four major centers, the mid-range and the basket have always been the most commonly used and adept offensive methods of the top NBA superstars. Tactically, others were more responsible for opening up space for the team's superstar to play in isolation, and to catch the ball when the superstar was double-teamed. Therefore, pick-and-roll and superstar isolation became the more popular tactics at the time. In the era of super centers (1993-1995), in order to create more space for the team's big men, the role of

full-time three-point shooters was further demonstrated, and the tactic of pop-up three-pointers after the pick-and-roll began to appear in the league. By 2004, the NBA published the No Hand Check rule, which gave the outside shooters led by the four shooting guards more room to perform. The outside ball handlers also began to win major NBA honors, such as MVP and scoring champion. In the 2006 season, the Suns led by Steve Nash adopted the run-and-gun tactic for the first time, which is to use mid-range shooting and fast running to defeat the opponent and complete the offense before the opponent's defense is in place. However, this novelty did not help the Suns win the championship, but instead exposed the biggest problem with small ball tactics-defense. But the run-and-gun tactic also laid the foundation for the Warriors to usher in the small ball era. At least people saw the feasibility of this tactic. Until the 2014 season, most teams in the league still chose attacking the basket as the team's main offensive method, but the Golden State Warriors showed the world a different style of play. The team has adopted a dynamic offensive style of play. Most of the Warriors' tactics require players to run without the ball, pick and roll, and pass and cut, such as Loop, Tsunami Split and Curl Punch Split. Players no longer stand still and watch the team's superstars rely on their strong personal abilities to break through the opponent's inside line. Instead, they constantly change positions, disrupt the opponent's defense, and create opportunities for outside shots. The Warriors successfully won the championship in the 2014-2015 season by relying on a higher frequency of three-point shots and scoring in sports games. They proved the value of efficient three-pointers and inspired the entire league to pay attention to three-point shooting tactics. More and more teams are beginning to imitate the Warriors' tactical concepts, increasing the number of three-pointers in games, and strengthening the development of three-pointers in player training.

3.3 Regression analysis

OLS Regression Results

Dep. Variable:	Win_Rate	R-squared:	0.333
Model:	OLS	Adj. R-squared:	0.331
Method:	Least Squares	F-statistic:	163.5
Date:	Sun, 14 Apr 2024	Prob (F-statistic):	1.20e-30
Time:	23:04:26	Log-Likelihood:	231.86
No. Observations:	330	AIC:	-459.7
Df Residuals:	328	BIC:	-452.1
Df Model:	1		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
const	-1.2812	0.139	-9.188	0.000	-1.555	-1.007
3P%	4.9840	0.390	12.785	0.000	4.217	5.751

Omnibus:	5.220	Durbin-Watson:	0.971
Prob(Omnibus):	0.074	Jarque-Bera (JB):	3.364
Skew:	-0.028	Prob(JB):	0.186
Kurtosis:	2.508	Cond. No.	66.4

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.

Figure 3 OLS Regression Results

Through the regression model developed, the analysis showed that the model had an R-squared value of 0.333, indicating that the variables included in the model explained 33.3% of the variation in the team's winning percentage. This result points to the fact that there are other factors not included in addition to those considered in the model that may affect the winning percentage. In particular, the coefficient on three-point field goal percentage (3P%) reaches 4.9840, indicating that for every 1% increase in three-point field goal percentage, a team's winning percentage is expected to increase by approximately 4.9840 percentage points. The statistical significance of this coefficient is very high, with a p-value of almost 0, well below the conventional significance level of 0.05, thus strongly suggesting a positive correlation between three-point field goal percentage and team winning percentage.

The t-statistic for 3P% in the model is 12.785, which is well above the commonly considered statistically significant threshold ($|t|>2$), which further confirms the significant correlation between three-point field goal percentage and winning percentage. In addition, the F-statistic of

163.5 corresponds to a p-value (Prob (F-statistic)) of almost 0, indicating that at least one of the predictor variables in the model is statistically significant and that the overall model is fit.The Durbin-Watson statistic of 0.971 is close to 2, suggesting that there is no autocorrelation between the residuals, which is an important characteristic of a competent regression model. The Jarque-Bera test has a p-value of 0.186, indicating that the residual distribution is close to normal.

Based on the data in Figure 3, the scatterplot clearly demonstrates the relationship between three-point field goal percentage (3P%) and NBA team winning percentage (Win Rate). The regression line shows a positive correlation between the two, implying that the higher the 3-point percentage, the higher the team's Win Rate accordingly. The blue area in the graph indicates the confidence interval of the regression line, demonstrating the level of precision or uncertainty in the prediction.

Figure 4 Relationship Between 3P% and Win Rate

Figure 4 shows the results after visualizing the data for Figure 3. As shown in the figure, there is a positive correlation between three-point field goal percentage and winning percentage. The best-fit line further reveals this trend, while the blue shaded area represents the confidence interval of the fitted line, and the wide dispersion of its data points points out that there are other factors contributing to the uncertainty, which may be due to some off-court factors or variables that were not accounted for. Despite these uncertainties, the overall trend clearly shows a positive correlation between three-point field goal percentage and winning percentage. In conclusion, three-point shooting continues to be one of the keys to improving a team's winning percentage. This suggests that increasing three-point shooting percentage is an effective way to increase a team's winning percentage, but winning percentage is not swayed by three-point shooting percentage alone. Therefore, we included two other variables that

may affect winning percentage - team offensive efficiency and defensive efficiency.

OLS Regression Results

Dep. Variable:	Win_Rate	R-squared:	0.931
Model:	OLS	Adj. R-squared:	0.930
Method:	Least Squares	F-statistic:	1460.
Date:	Sun, 14 Apr 2024	Prob (F-statistic):	1.49e-188
Time:	23:04:34	Log-Likelihood:	605.60
No. Observations:	330	AIC:	-1203.
Df Residuals:	326	BIC:	-1188.
Df Model:	3		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
const	0.4313	0.079	5.494	0.000	0.277	0.586
3P%	0.3848	0.160	2.409	0.017	0.071	0.699
DRtg	-0.0295	0.001	-47.664	0.000	-0.031	-0.028
ORtg	0.0288	0.001	43.163	0.000	0.028	0.030

Omnibus:	1.739	Durbin-Watson:	1.894
Prob(Omnibus):	0.419	Jarque-Bera (JB):	1.472
Skew:	-0.141	Prob(JB):	0.479
Kurtosis:	3.165	Cond. No.	1.19e+04

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.
[2] The condition number is large, 1.19e+04. This might indicate that there are
strong multicollinearity or other numerical problems.

Figure 5 OLS Regression Results

In the regression model with the addition of the team's offensive and defensive efficiency values, which is Figure 5, the adjusted R-squared value is 0.930, indicating that the variables in the model are more accurately predicting winning percentage. The constant term (const) of the model is 0.4313, which means that the team's winning percentage is 43.13% when all other predictor variables are zero. Specifically, the coefficient on three-point shooting percentage (3P%) is 0.3848, which means that every 1% increase in three-point shooting percentage increases the team's winning percentage by 0.3848 percentage points. The coefficient for Defensive Efficiency is -0.0295, indicating that for every unit increase in defensive efficiency, the winning percentage decreases by 0.0295 percentage points. The coefficient for Offensive Efficiency is 0.0288, indicating that for every unit increase in Offensive Efficiency, Winning Percentage increases by 0.0288 percentage points.

This confirms that the league is indeed encouraging offense, and the benefits of a series of rule changes to the offense were mentioned earlier. And Figure 2 also reflects the fact that team offensive efficiency has been increasing since the birth of the three-point shot. But this creates a huge challenge for team defenses, because the three-point shot gives players more space, and defenses are no longer constricted to the interior; instead, defenders may need to pressure outside shooters more, because the three-point shot is so efficient. For example, the famous defensive tactic, the two-three defense, is also gradually being replaced by the three-two defense. This is because the two-three defense is easy for the offense to easily find openings. The center of gravity of the defense is also expanded from the original paint to the three-point line. The defense added more running distance, which is more physical exertion for the players, so the addition of the three-point shot gave the defense more pressure.

The regression results show that defensive efficiency (DRtg) is negatively correlated with winning percentage, which just shows the tendency that improvement in defensive quality may be overlooked as teams focus more on offense. Of course, this is also due to changes in the rules of modern basketball. Because the defense is already passive, and because modern basketball is very strict about blowouts, the defense is easily fouled by the offense. And in the offensive round, the three-point shot gives players more options. For example, pick and roll tactics. before, players can only use cut or backdoor cut because they don't have three-point ability, but now, players can choose to go to the three-point line to catch the ball and shoot. the introduction of the three in the key rule also makes it easier for the attacking side to cut into the inner line, so the requirement of modern basketball for the players is to be faster and more flexible. Since both teams theoreti-

cally have a similar number of offensive possessions, the natural way to get more points in a small number of possessions is to shoot a lot of three-pointers. The efficiency of three-pointers compared to two-pointers has also been mentioned, so for teams that can effectively curb their opponents' three-point shooting percentage, they will still have a competitive advantage.

4. Discussion and Analysis

As the pace of NBA games becomes faster and scoring generally improves, scoring records that were once out of reach are gradually being broken one by one by players born in the new era. Explosive statistics that might only appear once every few years in the past, such as scoring 60+ points, now happen almost every season. The team has also begun to look for players who can effectively implement three-point shooting tactics, which has also led to positional ambiguity. The team's big man's job is not only to protect the frame and the basket, but they often also appear on the three-point line to help teammates. Create three-point shot opportunities or take three-point shots yourself, rather than playing inside near the frame.

Over the past decade, the popularity and strategic status of the three-point shot in the NBA has increased significantly. This change is reflected in team scoring patterns, player training programs and game viewing. The regression analysis results of this study show that there is a significant positive correlation between the three-point shooting percentage (3P%) and the team's winning rate, which confirms the importance of three-point shooting efficiency to victory. For every 1% increase in three-point shooting percentage, the team's winning percentage increases by nearly 5 percentage points on average. This statistical significance not only highlights the direct impact of three-pointers on game outcomes but also hints at a broader strategic trend in which modern basketball focuses more on perimeter shooting than traditional inside scoring.

However, this shift in strategy does not come without costs. This study found that although the improvement of offensive efficiency (ORtg) is positively related to the winning rate, the defensive efficiency (DRtg) is negatively related to the winning rate, which means that stronger defense will actually reduce the winning rate. This may be because in a league that pays more and more attention to offense, even if the defense is good, without an efficient scoring machine, it is difficult for the team to guarantee victory. Additionally, high defensive efficiency may be associated with a slower pace of play, which may statistically manifest as a decrease in winning percentage.

Multicollinearity is another issue to be aware of, and the correlation between high defensive and offensive efficiency may distort the actual impact of three-point shooting efficiency on winning percentage. Future research should use methods such as ridge regression to reduce the impact of collinearity and consider more potential influencing factors, such as player injuries, key players' court time, and coaches' tactical arrangements.

In short, the revolutionary change of the three-pointer has not only reshaped the style of the NBA game, but also had a profound impact on team tactics, player skill development, and the viewing experience of the game. As this trend develops, teams and coaches may need to re-evaluate their understanding of game strategies to maximize the tactical advantages brought by the three-pointer.

5. Conclusion

By exploring how the three-point revolution has changed the NBA's game strategy and the development of players' skills, it is easy to see that the popularity of the three-point shot has not only improved the scoring efficiency of the game, but also changed the tactical layout of teams and the focus of players' training. Since the 2014-2015 season, the success of the Golden State Warriors by making a large number of three-pointers has inspired the entire league to pay attention to the three-point shot, making it a central element of the game. In addition, statistical modeling analysis revealed a significant positive correlation between three-point field goal percentage and team winning percentage, so improving the efficiency of three-point shooting has a high importance for winning.

The results of the multiple regression analysis also revealed that for every 1% increase in three-point field goal percentage, the team's winning percentage is expected to increase by approximately 5 percentage points. And defensive efficiency is negatively correlated with team winning percentage, which is consistent with the fact that the league is constantly changing the rules to encourage offense. It suggests that the key to winning is the team's offense, which is undoubtedly the most efficient at three-point shooting, which is why many teams and players are gradually adopting the three-point shot as a regular finisher.

In conclusion, the changes of the three-point revolution have not only accelerated the pace of play in the NBA, but also enhanced team tactics, player skill development, and game viewing. Along with this trend, teams and coaches may need to reevaluate their perceptions of game strategies to maximize the tactical advantages offered by the three-point shot. Future research could be directed toward exploring what factors cause players to make different shot choices or what factors impact three-point shooting

percentage, such as player salary, home/road distinction, time left in the game, etc.

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