

# Analyzing Support and Resistance Line of a Stock Value with Rooted Tree

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**Abstract**—Support and Resistance Line is a very important thing in doing technical analysis of a stock value. Support Line or floor line is a line that will bounce the stock value from bottom, so the price won't go down too deep. Otherwise, the Resistance Line is a line that will hold the stock value from top, so the price won't rise too high. There are many ways to analyze support and resistance line. The most common way is by using graphical representation of a line to predict the support or resistance level in certain curve area. Using graphical analysis is a handy tool, especially when traders want to predict the current trend, but graphical analysis is not a good tool for daily/weekly traders, since the information given is not too accurate (with only a graphical representation of the line). If we want more precise result, we must analyze the stock by its numerical value (since analyzing by the curve is affected by other external factors such as the software, or even the lining process). This paper will explain the idea of using a rooted tree to analyze support and resistance line of a stock by using its numerical value.

**Index Terms**—Rooted Tree, Stock Analysis, Support and Resistance.

## I. INTRODUCTION

Support and resistance represent key junctures where the forces of supply and demand meet. In the financial markets, prices are driven by excessive supply (down) and demand (up). Supply is synonymous with bearish, bears and selling. Demand is synonymous with bullish, bulls and buying. These terms are used interchangeably throughout this and other papers. As demand increases, prices advance and as supply increases, prices decline. When supply and demand are equal, prices move sideways as bulls and bears slug it out for control.

Support is the price level at which demand is thought to be strong enough to prevent the price from declining further. The logic of support is quite simple. As the price declines, the market will begin increase the demand for the declining stock (because the stock is getting cheaper). When the price reaches the support level, the power of demand is a lot stronger than the power of supply. This will prevent the price from falling below support and raise the stock price to its resistance level (as shown in Picture 1.1).



Picture 1.1 – Graphical representation of Level 1 Support

Support levels are usually below the current price, but it is not uncommon for a security to trade at or near support. Technical analysis is not an exact science and it is sometimes difficult to set exact support levels. In addition, price movements can be volatile and dip below support briefly. Sometimes it does not seem logical to consider a support level broken if the price closes 1/8 below the established support level. For this reason, some traders and investors establish support levels.

Resistance is the price level at which selling is thought to be strong enough to prevent the price from rising further. The logic of resistance is just like the logic of support. As the price rises, the market will begin increase the supply for the rising stock (since the price is getting higher, traders want to get profit by selling their stocks, this kind of profit is called capital gain). When the price reaches the resistance level, the power of supply is overwhelmed the power of demand. This will hold the price and make it declines to its support level (as shown in Picture 1.2).



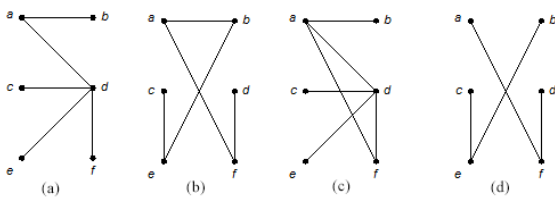
Picture 1.2 – Graphical Representation of Level 1 Resistance

Resistance levels are usually above the current price, but it is not uncommon for a security to trade at or near resistance. In addition, price movements can be volatile and rise above resistance briefly. Sometimes it does not seem logical to consider a resistance level broken if the price closes 1/8 above the established resistance level. For this reason, some traders and investors establish resistance levels.

## II. RELATED THEORIES

### A. Tree

Tree is an undirected connected graph that doesn't have circular vertex <sup>[1]</sup>. A Tree should have these two important properties, the first is connections between elements, and the second is having no circular vertex. From Picture 2.1, we know that (b) is not a tree because it has a circular vertex, and (d) is not a tree because it has no connection between its elements.



Picture 2.1 – Tree and not a tree <sup>[1]</sup>

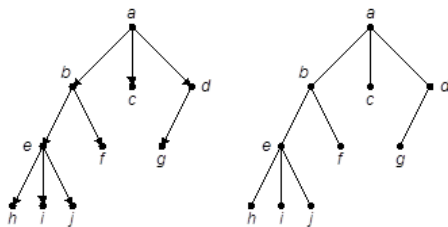
Let  $G = (V, E)$  is undirected graph and having  $n$  edges.

A tree will have following properties:

1. Each vertices in  $G$  have a singular path
2.  $G$  is connected and it has  $(n - 1)$  edges
3. If an edge is removed, graph will be separated into
4. two different components
5.  $G$  has no cycles and any two particular vertices can
6. be connected by using one simple path

### B. Rooted Tree

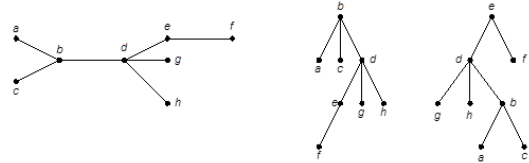
A tree is called a rooted tree if one vertex has been designated the root, in which case the edges have a natural orientation, towards or away from the root.



Picture 2.2 – Rooted tree <sup>[1]</sup>

The direction of rooted tree is always from top to bottom, so we don't have to give the direction to each connection between elements (as shown in Picture 2.2). Any kind of tree can be converted to rooted tree by selecting a node as a root. The rooted tree result that been

produced this way may vary depend to the root selection. For example, from Picture 2.3, the tree in left side of the picture can create the rooted tree in center side of the picture by selecting node  $b$  as the root. Also, the tree also can create the rooted tree in right side of the picture by selecting  $e$  as the root.

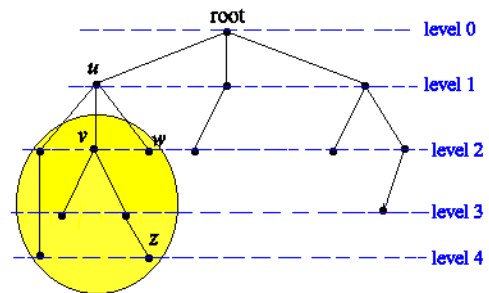


Picture 2.3 – Making a rooted tree <sup>[1]</sup>

There are several terminologies of rooted tree that important and used interchangeably throughout this and other papers. They are listed in Table 2.1 below:

Name	Example from Picture 2.4
Level	The level of $u$ is 1; the level of $z$ is 4.
Height	The height of this tree is 4.
Leaf	$w$ and $z$ are both leaf.
Child/Children	$v$ and $w$ are children of $u$ , $u$ is a child of the root.
Parent	$u$ is the parent of $v$ and $w$ , the root is the parent of $u$ .
Siblings	$v$ and $w$ are siblings.
Ancestors	$u$ and $v$ are ancestors of $z$ , $u$ is an ancestor of $w$ .
Descendant	$z$ is a descendant of $u$ and $v$ , $w$ is a descendant of $u$ .

Table 2.1 – Several rooted tree terminologies



Picture 2.4 – Rooted tree and its components

### C. Highs and Lows

One good method of determining support and resistance is by using Highs and Lows method since its simple and give quite accurate result <sup>[2]</sup>. By using this method, support can be established with the previous reaction *lows*. Resistance can be established by using the previous reaction *highs*.

For example, from Picture 2.5, support was established with the October low around 33. In December, the stock returned to support in the mid-thirties and formed a low around 34. Finally, in February the stock again returned to the support scene and formed a low around 33 1/2.



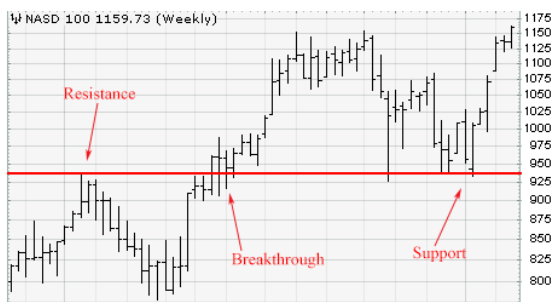
Picture 2.5 – HAL Candle Sticks

After each bounce off support, the stock traded all the way up to resistance. Resistance was first established by the September support break at 42.5. After a support level is broken, it can turn into a resistance level. From the October lows, the stock advanced to the new support-turned-resistance level around 42.5. When the stock failed to advance past 42.5, the resistance level was confirmed. The stock subsequently traded up to 42.5 two more times after that and failed to surpass resistance both times.

#### D. Support-Resistance Equal Line

Technical analysis method stipulates that support can turn into resistance and vice versa [2]. Once the price breaks below a support level, the broken support level can turn into resistance. The break of support signals that the forces of supply have overcome the forces of demand. Therefore, if the price returns to this level, there is likely to be an increase in supply, and hence resistance.

The other turn of the coin is resistance turning into support. As the price advances above resistance, it signals changes in supply and demand. The breakout above resistance proves that the forces of demand have overwhelmed the forces of supply. If the price returns to this level, there is likely to be an increase in demand and support will be found.



Picture 2.6 – NASDAQ 100 Candle Sticks

For example, from Picture 2.6, the stock broke resistance at 935 (shown in Picture) and traded just above this resistance level for over a month. The ability to remain above resistance established 935 as a new support level. The stock subsequently rose to 1150, but then fell back to test support at 935. After the second test of support at 935, this level is well established.

#### E. Support and Resistance Zone

The other way to find support and resistance line is by creating support and resistance zones. Each security has its own characteristics, and analysis should reflect the intricacies of the security. Sometimes, exact support and resistance levels are best, and, sometimes, zones work better. Generally, the tighter the range, the more exact the level. If the trading range spans less than 2 months and the price range are relatively tight, then more exact support and resistance levels are best suited. If a trading range spans many months and the price range is relatively large, then it is best to use support and resistance zones. These are only meant as general guidelines, and each trading range should be judged on its own merits.



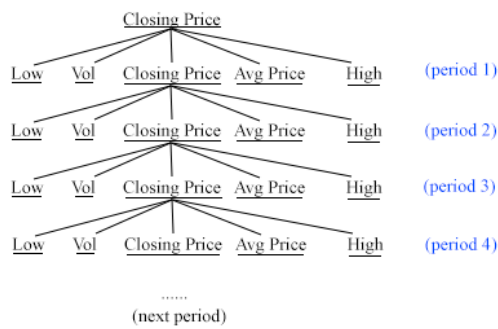
Picture 2.7 – HAL Candle Sticks

For example, in Picture 2.7, we can see that the November high of the trading range (33 to 44) extended more than 20% past the low, making the range quite large relative to the price. Because the September support break forms our first resistance level, we are ready to set up a resistance zone after the November high is formed, probably around early December. At this point though, we are still unsure if a large trading range will develop. The subsequent low in December, which was just higher than the October low, offers evidence that a trading range is forming, and we are ready to set the support zone. As long as the stock trades within the boundaries set by the support and resistance zone, we will consider the trading range to be valid. Support may be looked upon as an opportunity to buy, and resistance as an opportunity to sell.

### III. THE STOCK TREE IDEA

#### A. Model

The stock tree is formed by using 5-ary rooted tree concept. The root for this tree is the closing value of previous stock price range (the range may be vary depend on the analyzing period used). The children of the root will contain information about the trading condition of the current period. The first child is *Lowest Value*; the second child is *Transaction Volume*; the third is *Closing Value*; the forth is *Average Value*; the last is *Highest Value*. The third child (which contains the closing value) will act as a root for sub tree which contains information for the next trading period.



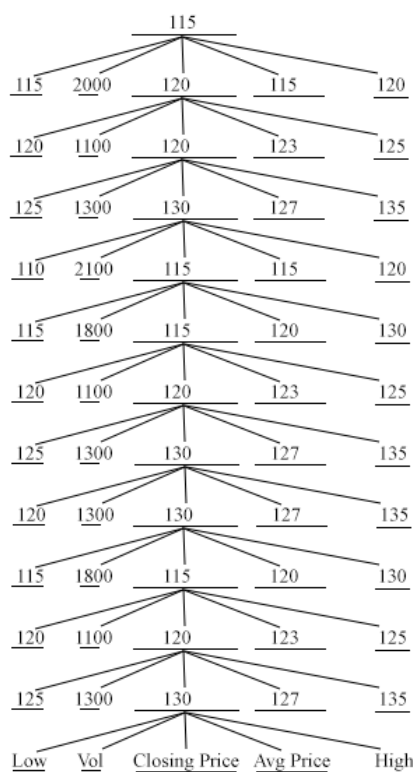
Picture 2.7 – Stock Tree Structure

The model is visualized in Picture 2.7, which tells us the structure of the stock tree.

### B. Determining the Best Support Line

The support line can be easily determined by using the stock tree by using its lows value. To find support line, firstly we must find the support value by using information that we have in our stock tree. Support value can be determined by selecting group of the most common lowest price in the tree, and pick one of them as the support value <sup>[2]</sup>. The volume, closing price, average price, and highest price play an important role as indicators that will help us selecting the right group.

Let's go with an example. Picture 2.8 contain stock tree of HSL that contain 11 levels. From that information, we know that this stock tree is based on 11 trading periods. Now look carefully at the lows value (the most left).



Picture 2.8 – 11 levels stock tree

From the stock tree in Picture 2.8, we can get the most common lows value is 110, 115 and 120. We must select one of them as the support value for the support line. First, let's analyze 110. The price only reach 110 at one time, so we can't make it as the best support value as this price only tested once per eight (the sum of 110, 115 and 120 in the tree). The second is 120. This price could be the best support value since it has been tested three times, with one break to 115. But, the volume at this price level doesn't rise so significant. So, we better analyzing the third value, 115. The price at level 115 is tested three times and always bounces the next price level up. The volume at this price level also rises so significant. At this case, price level at 115 is our best available support value.

The support line is formed by using the support value with zero gradient<sup>1</sup>. The support line will remain constant at the best support value until the price breaks it.

### C. Determining the Best Resistance Line

Just like the support line, the resistance line can be determined easily by using the stock tree by using its high value. Firstly, we must find the resistance value by using information that we have in our stock tree. Resistance value can be determined by selecting group of the most common highest price in the tree, and pick one of them as the resistance value <sup>[2]</sup>. Just like selecting group for the support value, the volume, closing price, average price, and highest price also play an important role as indicators that will help us selecting the right group in selecting resistance value.

Now, let's try some example. Let's go back at Picture 2.8 which contain 11 levels stock tree. Look carefully at the highs value (the most right).

From the stock tree in Picture 2.8, we know that the most common highs prices are 130 and 135. Determining the resistance value for this case is quite easy. Let's look at price level 135. The price couldn't break the resistance line created by this price level, so this price level create a very strong barrier that the price can't pass through. Is it the best resistance value? Before we answer that, let's look at the price level 130. This price level appears mostly in closing price values. Volume for this price level is also quite high, even the price is at the top of value. From this information, we can guess that this stock is in *bullish* trend. So, the best resistance value for the *bullish* trend is the highest (but must also quite strong) price available, which means the price level 135.

One thing to note, even this stock is in *bullish* trend, we still have to careful in selecting the resistance value as it has Support-Resistance Equal Line property. If we pick the wrong resistance value (which will be the resistance line), once the price break it, we will believe that it's become the support line, which it can be so dangerous. So it's important to choose the right resistance value.

<sup>1</sup> Zero gradient line equation:  $y(x) = c$ ;  $c = \text{constant}$ .

## V. CONCLUSION

Tree data structure has widely applications in daily activity because of its flexibility. Rooted tree, which is a tree that has one vertex been designated the root, in which case the edges have a natural orientation, towards or away from the root is one sample of tree that widely used in many other aspect, such as economics.

The stock tree is one application of rooted tree which has 5-ary property. The root for this type of tree is the closing value of a stock price range. The children of the root will contain information about the trading condition of the current level period. The first child contains the Lowest Value, called Lows; the second child contains the Transaction Volume, called Vols; the third contains the Closing Value; the forth contains Average Value, called Avg; the last contains the Highest Value, called Highs. The third child (which contains the closing value) will act as a root for sub tree which contains information for the next trading period (next level).

The best Support Line and the best Resistance Line can be determined easily by analyzing the lows and the highs information from the stock tree. The volume, closing price, average price, and highest price is used to help selecting the best Support Line or the best Resistance Line.

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