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USAGE OF RELATIVE STRENGTH INDEX ON LESS ACTIVELY TRADED CURRENCY PAIRS

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Annotation. Foreign Exchange market is open for all users who want to create foreign currencies based investments portfolio. Brokers of this market offer everything what investors need, i.e. worldwide accessibility, friendly trading platforms, big leverages and analysis tools. Can foreign currencies based portfolio be profitable? Can currencies be suitable to use common methods of analysis on them? The article tries to find the answer for these questions. Rising accessibility to Foreign Exchange market's instruments allow us create portfolios of currencies of almost any other countries of the world. The paper presents and discusses the data received using American analyst Welles Wilder's Relative Strength Index in spot trades of Australian dollar versus New Zealand dollar pair.

Keywords: FOREX, Technical analysis, Relative Strength Index.

INTRODUCTION

New investing instruments refill financial markets time after time. The same situation happens with methods of analysis – they refill with new tools and new modifications. All this activity has one aim - people try to make profit or save their capital. Various approaches and theories are developed to evaluate risks, future value, future profit or loss. Despite lot of existing approaches, non-stop activity in financial markets needs new ones. Only in last decade, our world got acquainted very closely with a new monetary instrument – "Quantitative Easing" (QE), a new impacting factor – "verbal intervention" and a new type of virtual assets – "cryptocurrency". All these financial novelties do an impact to financial markets including the currency market. H. Ugai (2007) described QE as a way to reduce the value of national currency. Bank of Japan was first who used this monetary instrument to keep Japanese yen's value lower than other major currencies. Other novelty – "verbal intervention" can significantly affect daily foreign exchange rate returns. Girardin and others (2008) noticed that speeches of the officials significantly affect currency rate. And we all saw the transformation of world of money from regular currencies to "cryptocurrencies". Hileman and Rauchs (2017) estimated millions of active crypto wallets and billions in market cap. All such events enforce to refuel our knowing of analysis and interpretation.

Fundamental and technical analyses are the main ways to make decisions for investing in financial markets. If fundamental analysis has most famous analyst and investor Warren Buffet, technical also has very famous Welles Wilder. In 1978 Welles Wilder invented Relative Strength Index (RSI). It became very popular and widely used among technical analysts. Originally this index was created for predictions in stock market. But the methodology of RSI calculation let us use it in other financial trading places such as Foreign Exchange market (FOREX). FOREX is the biggest market of financial products with 4—5 trillion US dollars daily turnover (Triennial Central Bank Survey, 2016). FOREX brokers have about 60 million internet and mobile visitors per month (Bartkus, 2017, p. 12). One of the attributes of this market is high volatility of prices. This article presents the results of trading the Australian dollar versus New Zealand dollar (AUD/NZD) currency pair with various interpretations of RSI. In earlier research on EUR/USD pair, results showed that most common classical RSI setup was the worst on accuracy and return ratios (Bartkus, 2018, p. 7). One of suggestions for this phenomenon could be behavior of traders in financial market. Anderson and Li (2015) related it to big popularity and widely using of original combination. In other words, one trading strategy can't be efficient for all traders. Otherwise, all of them can make profit as much as they want and this thought is far away from reality. So, increasing or decreasing number of the same strategy users can change results of trades. According Bank of International Settlements report (2016) most popular world's currencies are US dollar and euro. The USD is the absolute leader in currency trading. Together with euro and all the other currencies, it has been chosen by 88% of all trades. Euro was next, with 31%, and Japanese yen was the third one. AUD and NZD were chosen for this research to avoid big mass of currency traders. AUD participated in 7% and NZD in 2% of all trades in 2016. Therefore, alongside with the classical W.

Wilder's (1978) RSI setup, this research will show return on bigger range of different setups. The main aim of research is finding the best RSI modification for trading and investing in FOREX market. Alongside with the result, paper seeks and discuses fundamental reasons which influence changing price of AUD/NZD currency. These reasons can distort the accuracy of RSI signals. Therefore, the understandable connection between them could help to create better investing strategy in future.

RESULTS OF USING RSI

The technical analysis is based on the past data. It is a method for the analysis and forecast of future prices, future trading volumes and tendencies in financial markets. A technical analyst investigates the market without worrying about the fundamental factors (Kirkpatrik, 2013, p. 4). Technical analysis tools are the indicators that can be divided into 4 groups: trend indicators; moment indicators; volume indicators; others. Relative Strength Index belongs to moment indicators group. These indicators can determine the situation in financial market. In the situation when buyers dominate the market, prices always increase. Eventually the enthusiasm of buyers declines and they stop buying. This moment is called the "overbought market". Moreover, this moment signals about the possibility of price decrease. Vice versa, in the situation when sellers dominate the market, prices always decrease. Eventually the enthusiasm of sellers fades and they stop selling. Therefore, this moment is called the "oversold" market and it signals about the possibility of increase of price (see Figure 1).

Figure 1. **RSI signals of "overbought" and "oversold" markets**

The original RSI was developed by W. Wilder in 1978 for trading stocks in The New York Stock Exchange. Since that, the index has become widely used and now, every trading platform has integrated it inside theirs charts. W. Wilder has mentioned the necessity of having to keep up to enormous amount of data. New technologies solved it - now users can calculate RSI very fast and observe its data from every personal computer or mobile phone. The original index calculation splits into two formulas. First of all, the Relative Strength has to be calculated:

$$RS = AUP / ADP \quad (1)$$

Where, RS − Relative Strength;
AUP − average gain of UP periods during the specified time frame;
ADP − average gain of DOWN periods during the specified time frame.

W. Wilder recommends use 14 days periods. According to him, on day 15 and more, the price changes in unpredictable way for RSI. Till that, the oscillator's indication goes ahead of price line and that's very important for trader who wants to forecast the price of securities. According earlier research of EUR/USD pair, the classical 14 days calculation showed worst result with 47% of accuracy per all trades (Bartkus, 2018, p. 7). In the same time the best accuracy was obtained of using 10 days periods (68%) and 18 days periods (62%). These results motivate to use bigger range of periods in RS formula on AUD/NZD too. The RS data from the 1st formula has to be used in RSI calculation:

$$RSI = 100 – (100 / (1 + RS)) \quad (2)$$

The calculated RSI value always fluctuates between 0 and 100 (see Figure 1). If RSI goes above 70, Wilder suggests calling this momentum the "overbought" market. It is mean that desires of the securities buyers are satisfied and their enthusiasm starts to fade. Therefore, it is the moment of the so-called "Bear Market". Thus, in the FOREX market, a trader can make a "short" (sell) order for earning the profit of currency's depreciation. Market becomes the "Oversold" when the RSI drops under 30. This moment is the sign that the securities prices will be reversed and the so-called "Bull Market" will begin. At the moment of the indication, a trader can make a "long" (buy) order and hope for profit of currency's value gain. Le Beau and Lucas (1991) applied the indicator in futures market. They suggest using RSI with 75 as the "overbought" and 25 as the "oversold" markets for better results. Taran-Morosan (2011) reduced the highest level of RSI to 67.5 and increased the lowest level to 32.5 in his research. He asserts that the investment results of the US stock market are better than using the classic RSI. Already mentioned Anderson & Li (2015) also proved it with investigation of US dollar and Swiss franc pair during 10 years from 1998 till 2009. The researchers tested lots of oversold/overbought market variations and discovered that 40/60 is better than 30/70 in profitability ratio. Even more, 35/65 modification is the most profitable for this specific currencies pair. These results motivate to use different interpretations of overbought and oversold markets in research of AUD/NZD pair.

What are the results of using RSI in different types of financial markets and different places of the world? Bhargavi and others (2017) have applied the indicator for Indian Stock Exchange and concluded that it is very effective tool for creating portfolio. They had made this conclusion with using of strictly Wilder's RSI modification. Also researches mentioned that using RSI with fundamental analysis gives even better results. Meanwhile, Halilbegovic and others (2018) doubt about usefulness of this index. Authors assert that RSI has reliability of 13% which is way under the limit of even the most risk-loving investors. Halilbegovic tested indicator on tree stocks in US market which were biggest and most famous companies in the world – IBM, Apple and Amazon. These stocks are very popular among investors and big popularity works against RSI according to Anderson and Li (2015). Wider examination was made by Chong, Ng & Liew (2014). They examined US, Italy, Germany, Canada and Japan stock markets with three modification of RSI. Together with 14 days period, researches have used 7 and 21 day periods in calculation formula. Results with 7 days RSI were unprofitable in all markets. 14 days RSI gained profit on US and Germany stock markets and 21 day RSI showed positive result in Italy and Canada. However, none of the modifications can be useful for Japanese stocks. The reason could be the monetary policy of Central Bank of Japan. This country is one of the firsts who used QE and it links us to thoughts that strong monetary instruments could distort signals of technical analysis. Spanish stock market was examined by Rosillo and others (2013) for 23 years period from 1986 till 2009. The original RSI combined with MACD (Moving Average Divergence Convergence) indicator were used in their research. RSI was applied for buying Spanish stocks. MACD indicates the trend changes and it was used for selling already bought stocks. They concluded that most of the companies where RSI showed best results have big market capitalization in comparison to the rest. Results on London Stock Exchange market were profitable in total but highlighted some difference between RSI buy and sell signals accuracy and profitability. During 60 years, "long" transactions generated 10 day return of 0.779% or an annual return of 22.44%. Meanwhile, "short" transactions showed negative result with -0.127% per 10 days period or -3.36% annually (Mills, 1997, p. 321-322).

Is RSI suitable for investing in currencies in FOREX market? Coakley and others (2016) concluded that RSI was robustly profitable and can achieve annualized return up to 30% after the examination of 22 currency pairs during 20 years period. However, slightly different RSI's modification from its originality was used there. Oversold market was kept when index value fell below 40 and overbought market was kept when index value reached 60. Another currency trade's accuracy data was acquired by Kiiski (2009) in analysis of 10 currency pairs. The amount of positive trades with RSI fluctuates between 55% and 68% on different currency pairs. In this research, the best result was obtained on less popular pair – US dollar versus Canadian dollar. So, it could be another proof that increasing or decreasing number of the same strategy on same financial instruments could influence investment's results. It was also partly confirmed by Neely and others (2007). They had made a conclusion that FOREX market adapts to indicators of technical analysis and profitability results can't be the same over the all time.

So far, we have some lack of results from using RSI in stock exchange market and FOREX with applying of weekly periods instead of daily. The accuracy and profability were better on weekly RSI then

daily RSI in early research on EUR/USD (Bartkus, 2018, p. 9). Also, all researchers didn't point direct fundamental factors which distort accuracy of the results. Beaupain and others (2010) pointed and achieved evidence that high volatility in financial markets makes usage of RSI more risky. However, fundamental reasons of such volatility weren't mentioned. This research tried to get answers on these problems with the less actively traded currency pair AUD/NZD and few modification of RSI.

THE RESULTS OF RSI ON AUD/NZD PAIR

The FOREX's less popular currency pair AUD/NZD was chosen for this investigation. The data of this pair's price was collected from 01.01.2008 till 30.06.2018. Virtual trades have been made with the help of several modifications of RSI signals. Instead of using classical number of periods in oscillator's calculation, here scenarios with 6, 8, 10, 12, 14, 16, 18, 20 and 22 periods on daily (D) and weekly (W) price charts were chosen. Full conditions and rules for opening or closing trades are described in Table 1.

Table 1

Main conditions for opening and closing the trading order

	Entering LONG position	**Exiting LONG position**	**Entering SHORT position**	**Exiting SHORT position**	**Position's amount**
1st approach to market	RSI<30	RSI>70	RSI>70	RSI<30	1000NZ$
2nd approach to market	RSI<20	RSI>80	RSI>80	RSI<20	1000NZ$

The long position is a transaction in financial markets when traders buy securities for hoping that the price will rise. Virtual long orders of 1000NZ$ were opened when RSI was under 30 and closed when RSI was above 70 in 1st approach. Long orders were opened when RSI was under 20 and closed when RSI was above 80 in 2nd approach. The short position is a transaction in financial markets when traders sell securities for hoping that the price will fall in the future. Virtual 1000NZ$ short orders were opened when RSI was above 70 and closed when it was under 30 in 1st approach and from 80 to 20 in 2nd. All obtained data from trades was used for revealing results on accuracy, total profitability and profitability for individual period of time. Positive trades were divided by total trades and multiplied by 100 for calculation of accuracy.

Nine daily (D) and five weekly (W) scenarios were simulated in 1st approach of this work (Table 2). The biggest number of trades have captured on 6 periods daily (D6) and weekly (W6) scenarios.

Table 2

1st approach (30/70) results obtained with daily and weekly RSI trading scenarios

Scenario	**Trades**	**Accuracy, %**	**Total return, NZ$**	**Profitable trades**		**Unprofitable trades**	
				5%-10%	***10%-20%***	***5%-10%***	***10%-20%***
D6	84	51.19	-333	0	0	6	0
D8	66	59.09	77	0	0	4	0
D10	45	60.00	144	0	0	1	0
D12	36	52.78	64	0	0	1	0
D14	24	70.83	149	1	0	0	1
D16	20	65.00	92	2	0	1	1
D18	14	71.43	211	1	0	0	1
D20	8	75.00	185	5	0	0	1
D22	6	83.33	54	3	0	0	1
W6	17	70.59	2	0	0	0	1
W8	13	92.31	370	3	1	0	1
W10	11	90.91	427	5	1	0	1
W12	4	75.00	123	1	1	0	1
W14	4	75.00	256	1	2	1	0

The best positive AUD/NZD daily trades accuracy reached in the D22 (83.33%) and this result was better than the best result obtained on EUR/USD (68.42%) in earlier research (Bartkus, 2018, p. 6). All five

weekly trades had more than 70% of accuracy and the best was W8 scenario (92.31%). This number is 12% better than the best accuracy of weekly results on EUR/USD (80%). There were noticed that the best accuracy don't guarantee the best profit of invested 1000NZ$. Although almost all scenarios were profitable, the biggest return had D18 with 71.43% of accuracy and W10 with 90.91% of accuracy. In the same time, EUR/USD research has shown more poor results – 2 of 7 daily scenarios and 3 of s6 weekly scenarios were profitable. Worth to mention that only weekly EUR/USD trades gained significant profit. So, these data could be the proof that RSI works better on unpopular currencies pairs than popular ones. Even more, if we compare only the classical Wilders RSI modification, EUR/USD had 47.37% of accuracy and loss of 305€. Meanwhile, AUD/NZD had 70.83% of accuracy and profit of 149NZ$.

The most promising scenarios D14, D16, D18, D20, D22, W8, W10, W12, W14 have suffered at least 1 trade which brought losses between 100NZ$ - 200NZ$. In all situations, it happened in time lap during 01.01.2013 and 01.06.2014. This period needs to analyze closely for finding the reasons what work against RSI. The first reason – the decisions of Reserve Bank of Australia (RBA) on interest rate (Reserve Bank of Australia, 2018). It was reduced 4 times in year 2012 and 2 times in 2013 by total of 1.75%. The Reserve Bank of New Zealand (RBN) didn't change interest rate in the same period of time (Reserve Bank of New Zealand, 2018). And this means less of profit for investors in AUD. The second reason is decreasing of price of iron ore by 33%. Iron ores and concentrates are the largest export from Australia with share of 16% per year (Australian Trade and Investment Commission, 2018). This means smaller demand for AUD from business which uses this metal, i.e. steel manufacturing and constructions. Meanwhile, New Zealand's top export is production from milk and it lived with slightly rising prices on the markets (Nasdaq, 2018). Australia had very similar situation in 2008 and 2009. The country reduced its interest rate 6 times. The price of iron ore sharply felt down also. But New Zealand has done the same monetary decisions on interest rate and milk prices have followed iron ore. All this affected good RSI results on AUD/NZD pair.

Table 3

2st approach (20/80) results obtained with daily and weekly RSI trading scenarios

Scenario	Trades	Accuracy, %	Total return, NZ$	Profitable trades		Unprofitable trades	
				5%-10%	*10%-30%*	*5%-10%*	*10%-30%*
D6	32	56.25	2	1	0	3	0
D8	19	68.42	133	2	0	2	1
D10	16	75.00	325	3	0	0	1
D12	6	83.33	92	3	0	0	1
D14	4	100.00	407	2	1	0	0
D16	2	100.00	495	0	2	0	0
D18	1	100.00	236	0	1	0	0
D20	1	100.00	270	0	1	0	0
W6	10	90.00	400	9	0	0	1
W8	4	75.00	370	1	2	1	0
W10	1	100.00	146	0	1	0	0

Firstly, all scenarios of 20/80 approach had less trades than 30/70 because of RSI's insensitivity. The insensitivity has made both negative and positive impact on investments. With this setup, D22, W12 and W14 had no opportunities to make any trade during the period of investigation. That's negative side. Positive side is the accuracy which is better than 1st approach's. Even more, few scenarios had incredible precision of 100%. The classical Wilder's RSI (D14) was one of the best investments with 100% on precision and 407NZ$ on total return.

Despite decent profitability, D6, D8, D10, D12, W6 suffered from losses obtained by the same reason as it happened in the 1st approach and in the same time lap. So, the following of information about interest rates and prices of commodities is still important for better result of using these RSI setups. Other RSI setups forecasted AUD/NZD movements perfectly in all situations which happened on the financial markets.

Another conclusion made from tables 2 and 3 is less RSI sensitivity shows better result on accuracy and return. 1st approach's two weekly scenarios (W8 and W10) gained return twice as big as the best daily one (D18). 2nd approach has lost its sensitivity by setting higher levels of opening the orders and this worked

better than 1st one. The 9 of 11 2nd approach tradings gained bigger return if we compare periodically similar RSI scenarios. For example, classical D14 earned 149NZ$ on 30/70 conditions and 407NZ$ on 20/80. Only W10 was obviously weaker in insensitive conditions with 146NZ$ against 427NZ$.

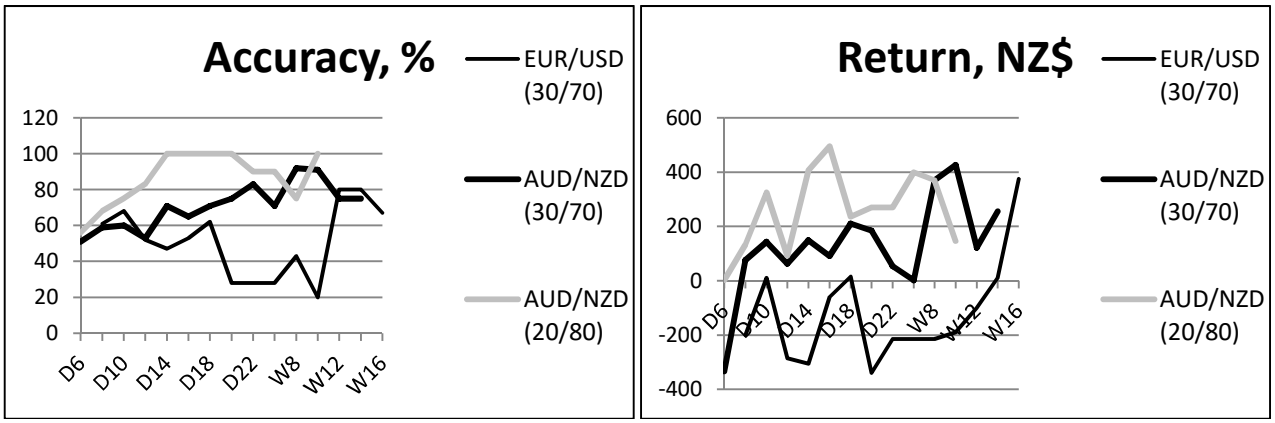

Figure 1. **RSI results on accuracy (%) and return (NZ$)**

The accuracy and return curve of EUR/USD are below the curves of less popular AUD/NZD (see Figure 1). This partly confirms the previously mentioned thoughts of Anderson and Li (2015) that often used strategies which don't work on most popular financial instruments. Volatility of AUD/NZD is less than EUR/USD. So, Beaupain and others (2010) were correct when concluded that usage of RSI in high volatility markets is more risky. Hence, we can't be sure that positive results obtained in this research will be positive in future. Growing in popularity of AUD/NZD, changing amount of RSI users and rising volatility in the FOREX market could change previous results. Neely and others (2007) came up to the almost the same conclusion - FOREX market adapts to indicators of technical analysis and profitability results can't be the same over the all time. In future, other different popularity currencies could be research to prove article's results. Especially, pairs mixed with popular (USD) and unpopular (NZD) currencies. Alongside with other pairs, other technical analysis ways (MACD, Parabolic SAR) need to be tested.

CONCLUSIONS

1. The technical analysis and RSI can be used for investing in AUD/NZD pair. However, some deviations from classical RSI setup are needed for better achievement. The better results were achieved in less sensitive 2nd approach (20/80) than classical (30/70). Despite classical D14 scenario gained positive return of 149NZ$, here were 12 better scenarios and some of them had twice bigger profit.
2. Almost all RSI modifications have suffered big losses during the period when Reserve Bank of Australia reduced interest rate 6 times in two years which were hard for ore iron prices (-30%) too. AU$ started down trend which lasted from 01.01.2013 till 01.06.2014. Only five scenarios from twenty five (D14, D16, D18, D20 and W10) had correct RSI signals during this period. Hence, blindly trusting in technical analysis has lots of risk.
3. The more popular among the traders and investors EUR/USD pair is more risky in case of using widely known investing strategies. The small amount of AUD and NZD users influenced better accuracy of trades and gained bigger return. However, growing popularity of AUD/NZD, changing amount of RSI users and rising volatility in the FOREX market could change previous results and older investing strategies don't guarantee the same results in future.

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