DUKASCOPY
Swiss Forex Bank & Marketplace

QUARTERLY REPORT

Q4, 2013

AGGREGATE TECHNICAL INDICATOR

FUNDAMENTAL ANALYSIS

TECHNICAL ANALYSIS

ECONOMIC RESEARCH

TRADE PATTERN

IDEAS

COMMUNITY FORECASTS

EXPERT COMMENTARY

"Short and medium term technicals give a rather clear indication that USD/JPY is under pressure. At the moment it is testing the uptrend support and the 200-day SMA, but we don't see it holding up."

Tomas Urniežius
economist at Dukascopy Bank SA

Dear traders,

We have just entered the last quarter of this year, but we have already run into events that are sure to keep the investors on their toes for a prolonged period of time. Even if these questions, namely, the U.S. government shutdown and the upcoming deadline to raise the debt ceiling, are to be resolved in the nearest future, they are sure to leave a notable trace in the financial markets. This will again highlight the importance of the political factors, which have been increasingly significant as of late, and not only in North America, but throughout the world. And even though the foreign exchange market seems to be slow to react for now, as the volatility remains fairly low at the moment, the rising Treasury yields as a result of the increasing possibility of a default and the postponement of the QE3 tapering are already changing the way how the currencies behave.

In the meantime, Dukascopy Bank SA seeks to broaden the opportunity horizon for its clients and has already received a Securities Dealer License during the last quarter. It will allow us to extend the scope of financial instruments being offered through the contracts for difference and enable you to take advantage of the latest developments in the world economy.

As for this particular issue of the Quarterly Report, in addition to our traditional sections, we have also included a section which sums up the view of our FX Community members on the major tendencies in Forex; you may already know it as Community Forecasts. We would like to use this opportunity to express our gratitude for their participation and welcome all of you to take part in our periodic releases.

Kind regards,

Alexander Suhobokov, CFA, FRM

Head of Research

Dukascopy Bank SA

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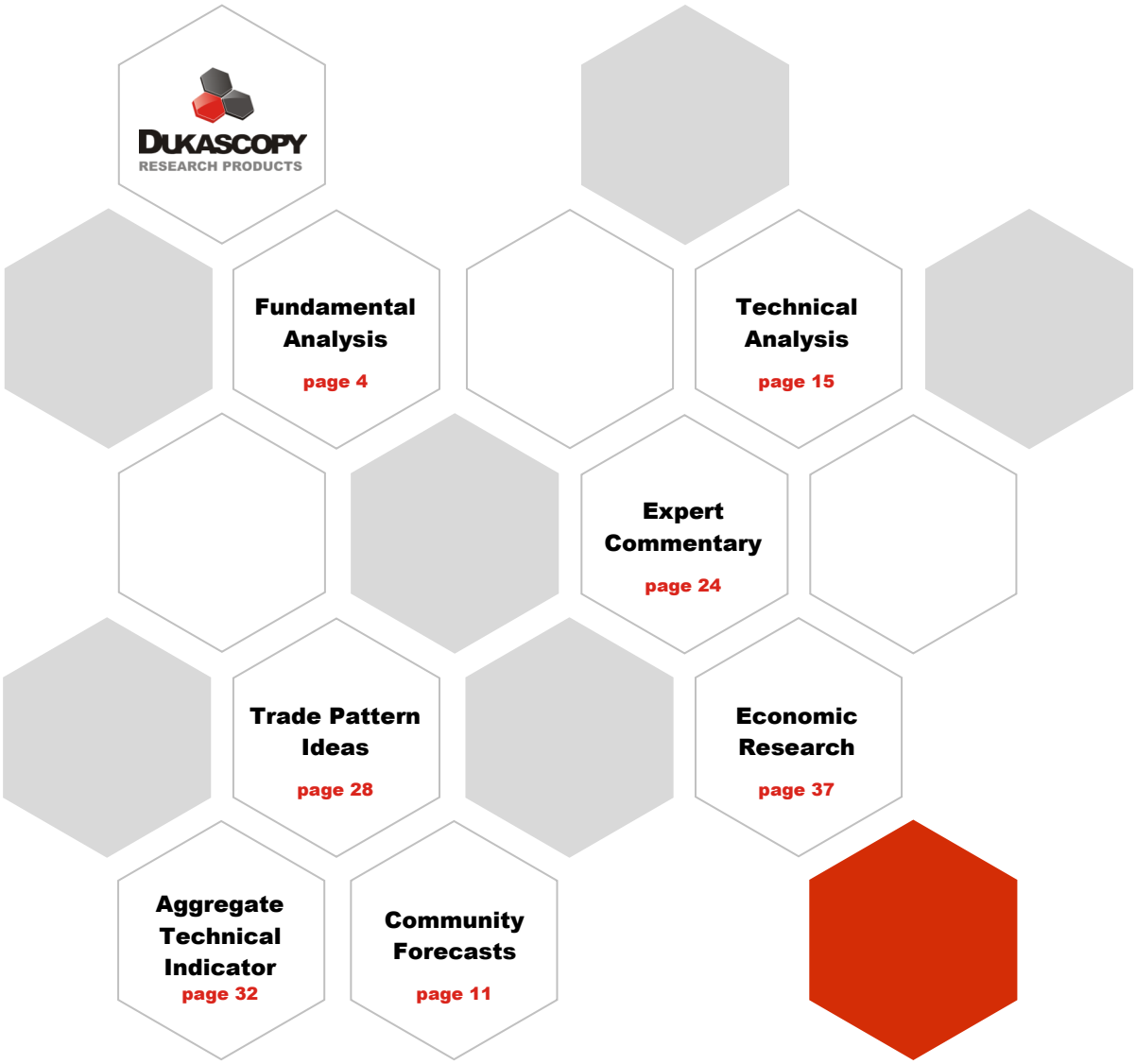
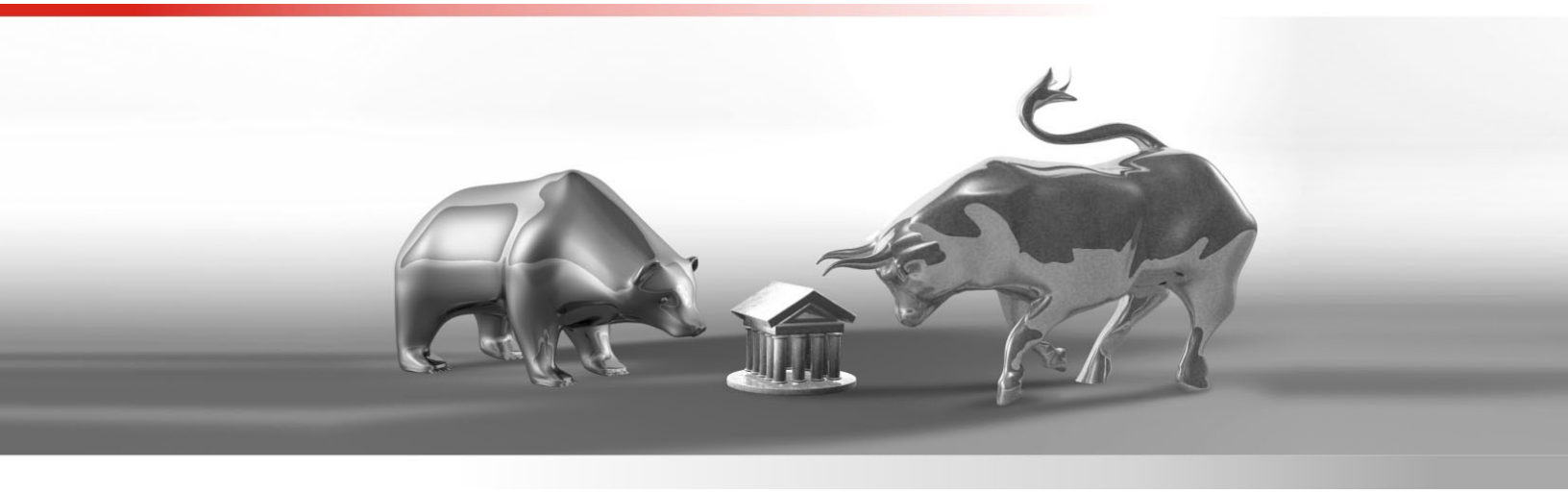




Fundamental Overview

Eurozone

The Eurozone economy has emerged from its longest-ever recession. After 18 straight months of contraction the 17-nation economy has finally moved back to growth; however, a resolution to region's twin banking and fiscal crises remains a distant prospect and it is too early to speak about a sustained recovery. The combined gross domestic product of the area that has Euro in circulation expanded 0.3% in the second quarter, up from a 0.3% contraction in the first quarter, with its two biggest countries both revealing surprising strength. This is also moderately better than the 0.2% expansion anticipated by market participants, mostly due to the solid performance of Germany and France, which expanded by 0.7% and 0.5%, respectively. Among other countries, Portugal boasted a rapid rise of 1.1%, while Spain, Italy and the Netherlands all shrank, with their GDP contracting 0.1%, 0.2% and 0.2%, respectively. However, upbeat data masks the mixed economic fortunes among all Eurozone countries, as several big economies are still experiencing a severe contraction. Soon after the report, European Commission Vice-President Olli Rehn pointed out that the overall economy is gradually gaining momentum, however, there is no room for complacency.

"The return to modest rates of economic growth in the Eurozone as a whole won't address the deep-seated economic and fiscal problems of the peripheral countries."
- Analysts from Capital Economics

Soon after the GDP report a bunch of optimistic fundamental data cemented the view that the economy is building up the steam. Activity in services sector expanded for the first time in 19 months, while the overall business activity grew at the fastest pace in 26 months. Moreover, manufacturing PMI in August hit its highest level since June 2011, as the sector expanded across the majority of European countries, including struggling to grow Spain and Italy. Furthermore, retail sales across the region rose for the first time in more than two years.

Improved outlook

Not only the aforementioned data but also other figures forced Mario Draghi to improve the economic outlook. The European Central Bank now predicts the bloc's economy to shrink only by 0.4% in 2013, compared with a 0.6% contraction predicted in June. Draghi also pointed out that "output is expected to recover at a slow pace, in particular owing to a gradual improvement in domestic demand supported by the accommodative monetary policy stance". During the last ECB gathering in Paris, policymakers decided to refrain from any additional stimulus measure. The European Central Bank's refinancing rate, which lenders have to pay when they borrow funds from the central bank, was left unchanged at a record-low of 0.5%, while the deposit rate still stands at zero. There have been no adjustments to ECB's monetary policy since May 2, when the bank trimmed its rate by 0.25%. Additionally, Mario Draghi affirmed once again that consumer prices will stay comfortably below 2% target level both this year and next one.

Germany to lead Europe out of crisis

The latest data also reaffirmed Germany's position as the powerhouse behind the whole region, as even though the Europe's largest economy narrowly avoided the recession, its second quarter growth helped to pull the Euro zone out of recession. In late August, market sentiment was pushed higher by the massive growth of German economy, as the seasonally-adjusted gross domestic product expanded by 0.7%, in line with the flash reading released a week earlier, and up from the previous quarter's growth of 0.1%. In annual terms, the economic output advanced 0.9%, compared with an unimpressive downwardly revised 1.6% contraction in the prior quarter. In addition to that, sentiment among German businesses improved for the third straight month in July, signalling the economy is on the track for a sustained upswing after last year's sluggish performance. The German Bundesbank also pointed out that German expansion should normalize and stabilize during the rest of the year, expecting a 0.3% growth for this year and acceleration of up to 1.5% in the next one.

Taking into account Angela Merkel's popularity in Germany, it was not a surprise that her conservative union CDU/CSU won the nation's parliamentary elections, gaining the highest percentage of votes since reunification of Germany in 1990, slightly missing an absolute majority. Christian Democratic Union together with its ally Christian Social Union won 41.5% of the votes. Meanwhile, the opposition left-wing Social Democratic Party received 25.7% of votes. The main disappointment, however, came from Merkel's preferred coalition partner – the Free Democratic Party that received only 4.8%. Election results may be interpreted as supportive news for the single currency.

Remaining concerns

It might seem that the European crisis is over and the economy will continue gathering momentum. However, there are still several major concerns that pose significant risks for the economy. Even though the unemployment is not rising any further, it is abnormally high, with 12.1% people being unemployed. Moreover, Europe's third largest economy, Italy, is still the only G7 world-leading economy that is expected to contract in 2013. While central Europe is starting to stabilize, peripheral countries are still struggling to grow. In September, European Commission President Jose Manuel Barroso stressed the need to create a closer political union to overcome the ongoing crisis. Though the European Parliament has voted in favour of centralized oversight for the European banking sector, other elements of the plan are harder to implement due to opposition from some governments. Nonetheless, it seems that the worst for Europe is over, and the economy is likely to stabilize, supported by improvement in the global economy, structural reforms and ECB's readiness to act if necessary. Eventually, the widely anticipated amelioration will shed its light upon Europe.

USA

During the last quarter markets were dominated by two themes. The first issue was whether the Federal Reserve should begin tapering its stimulus programme or not, while the second crucial question, which can lead to a default and have a devastating effect on the fourth quarter growth, was the government shutdown. After twelve weeks of Obama's second term as the President of United States, he gave a promising speech about the world's largest economy. "We cannot rebuild this economy on the same pile of sand," said Mr. Obama. "We must build our house upon a rock. We must lay a new foundation for growth and prosperity – a foundation that will move us from an era of borrow and spend to one where we save and invest; where we consume less at home and send more exports abroad." However, the latest data are reinforcing a view the U.S. is developing, albeit the recovery is fragile and risks for future expansion are high.

Obama's pledge

Four years ago Obama pledged to rebalance the economy by increasing the share of exports and investment, while consumption, housing and imports should decrease. For the first two years, the goal looked achievable; however, later the process of rebalancing stalled. In July the trade gap soared 13.3%, as Americans increased consumption. A 1.6% hike in imports is pointing at a pickup in domestic demand, but exports plunged 0.6% and the difference between these two indicators is constantly growing. Therefore, Obama's goal to double exports until 2015 already looks like a pipe dream. The same story can be seen in savings and income figures. In August, personal income jumped 0.4%, the fastest growth since February, pushing consumer spending higher and providing a more optimistic view for the economy. Personal savings, however, inched up 4.6% in August, from 4.5% a month earlier. At the same time, the share of national income has stabilized at around 59% of GDP, a level which is 3% lower than before the recession. The worst thing is that the private investment is fluctuating below the long-run share of country's output. One of the most important pillars of a balanced economy is investment, both public and private. However, it seems that both Democrats and Republicans are not overly concerned about this issue.

"We cannot rebuild this economy on the same pile of sand. We must build our house upon a rock."
- U.S. President Barack Obama

QE or not QE?

In contrast, the Federal Reserve is trying to rivet market's eyes on the labour market, which is showing some signs of improvement. Bernanke has pledged to wind down its monthly bond purchases as soon as the unemployment rate nears 7%, and will start raising rates when jobless rate hits 6.5%. The problem, however, is that the key rate is falling faster than expected, as more people have stopped looking for work and are dropping out of the work force instead. The economy has lost 347,000 jobs during the last two months, while the labour participation rate fell to 63.2% from 63.5%, hitting its lowest point since 1970. Hence, the Fed should focus more on the economy's ability to create jobs,

rather than the unemployment rate, which masks the true situation in the labour market. The latest report from the ADP Research Institute showed the economy created less than expected jobs, indicating labour market is struggling to build up steam. There were only 166,000 new working places, after a 159,000 gain a month earlier; however, the figure is significantly lower from the consensus estimate of 180,000. In case the tendency persists in the coming months, it is unlikely Bernanke will consider tapering its stimulus program, as faster progress in hiring and strong growth in wage is vital to sustain improvement in consumer spending, which is the biggest part of the economy. “The job market appears to have softened in recent months. Fiscal austerity has begun to take a toll on job creation. The run-up in interest rates may also be doing some damage to jobs in the financial services industry,” said Mark Zandi, chief economist at Moody's Analytics.

While the majority of analysts expected Bernanke to announce the widely-anticipated tapering during September’s FOMC meeting, markets were disappointed by his decision. Nothing. This is what Ben S. Bernanke decided to do, solidifying the standing as the most activist Fed Chairman in history. By a 9-to-1 vote, the policy-setting FOMC yesterday opted out from reducing $85 billion of monthly asset purchases, catapulting stocks to record highs and triggering the biggest rally in Treasuries in two years as investors repositioned for a more accommodative central bank. Meanwhile, Fed’s official Eric Rosenberg said the QE should not be withdrawn until 2016. Until markets have a clear date when the Fed could possibly begin tapering its QE, the growing uncertainty is likely to have a collateral impact of the whole economy.

Gloomier outlook

During the last meeting Bernanke also unveiled the Fed’s growth forecast, predicting the economy will expand only 2.0% this year, down from 2.3% expected earlier, while the downgrade for 2014 was even sharper. In addition to that, a shutdown could cut Q4 growth by as much as 1.4% depending on its length. Moody's currently estimates a 3% growth rate for the fourth quarter without a closure, however, in case of a three-to-four week shutdown it would be reduced up to 1.6%. A two-week shutdown starting October 1 could cut the GDP by 0.3%. The momentum would be partially lost when workers are furloughed subtracts from economic output. Growing tensions between the White House and Congress would have an even bigger impact on the economy, as companies and households hold off on spending. Even though Barack Obama was upbeat in his 2009 speech, the latest figures are economic development are bolstering the case the world’s largest economy is still on a shaky foundation.

Asia & Pacific

During the last five years the Asian economies have been feasting on the cash that flowed in as investors all over the world, leery of low yields in the West, poured money into the Asian region. Amidst the high capital inflows, governments have not spent too much time to lower hurdles to investment, reduce the dominance of state-owned businesses or cut back on red tape. However, many analysts now believe that the continued flow of cheap cash is moving to an end and structural reforms are needed in order not to lose the momentum the economy has gained in recent years. Even despite high risks for Asian growth, analysts do not see any currency collapses or even balance of payments crises. "As long as money is cheap, there is less pressing need for structural reforms," said Frederic Neumann, co-head of Asian economics at HSBC. Japanese, Chinese, Australian and New Zealand's authorities are making all efforts necessary to stimulate their economies; however, these economies are likely to experience some volatility given that the Federal Reserve is considering tapering of its stimulus program. Nevertheless, Asian economies are currently better positioned than they were during the financial crisis that shook the whole region between 1997 and 1998.

"Current conditions highlight the need for the region to exercise vigilance to safeguard financial stability."
- ADB Chief Economist Changyong Rhee

Chinese growth unsustainable

After growing speculation that China is developing rapidly enough to become the world's largest economy by 2016, the latest figures are indicating not-so-bright prospects, suggesting only stabilization after a long period of slowdown. Following a series of disappointing data a couple of brokers downgraded their growth forecast for the next year. Hence, Barclays now expects an expansion of just 7.4% in 2014, down from 7.8% tipped in April. Moreover, they stressed the government would also downgrade its own 2014 GDP target to 7%, down from the current level of 7.5% during its meeting next March. After a period of mixed data, the latest reports showed the industrial output hit a 17-month high, while the retail sales expanded at their fastest rate so far this year in August, supporting the case the economy is finally stabilizing after a deceleration for more than two years.

Abenomics spreading through the country

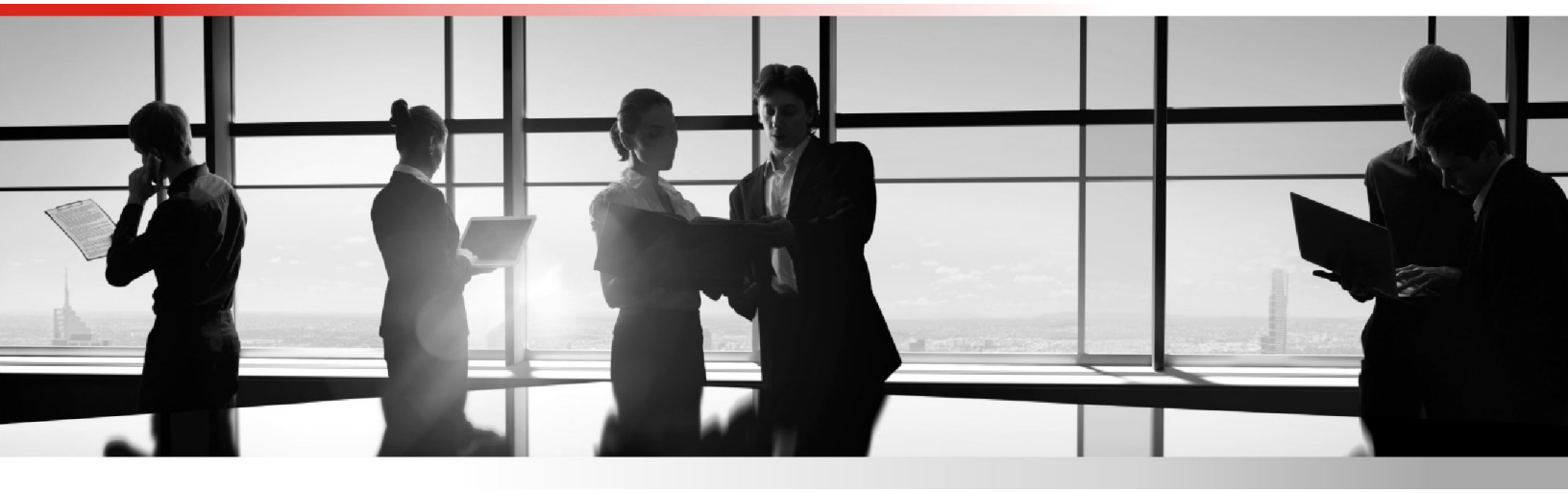
Another country from the list of top three world's largest economies is Japan, which is performing rather well, due to the nation's Prime Minister and central bank's Governor, who are constantly assuring markets in their decisiveness to boost growth and reach the inflation target as planned as well as implement structural reforms to assure the long-term prosperity. During the last policy meeting, Japanese policymakers declared the economy is recovering, as the Bank of Japan stayed put on its monetary stimulus, offering a more optimistic assessment of the world's third largest economy. The central bank once again affirmed its commitment to pump 60-70 trillion yen into the economy each year

in an effort to achieve 2% inflation target within two years. A moderate recovery is underway, as the economy is benefiting from higher exports and a pickup in investment in fixed assets by businesses on the back of higher profits. In the beginning of October Prime Minister Shinzo Abe decided to raise the consumption tax from 5% to 8% in April as it was planned earlier. This decision sweeps aside concerns the hike might put brakes on the economy's nascent economic amelioration. Even as Abe's decisions contradict each other to some extent and may weigh on economic growth, the government has already signalled it is ready to start fiscal consolidation and committed to curb the debt back to a more sustainable path. "Japan's economy is recovering moderately. Overseas economies as a whole are generally heading toward a pick-up, although a lacklustre performance is partly seen," according to the Bank of Japan. Improvement in manufacturing, stronger demand for Japanese goods, weaker Yen and inflation rate at five-year high are all cementing views Abenomics are successfully spreading through the economy.

RBNZ to pull the trigger

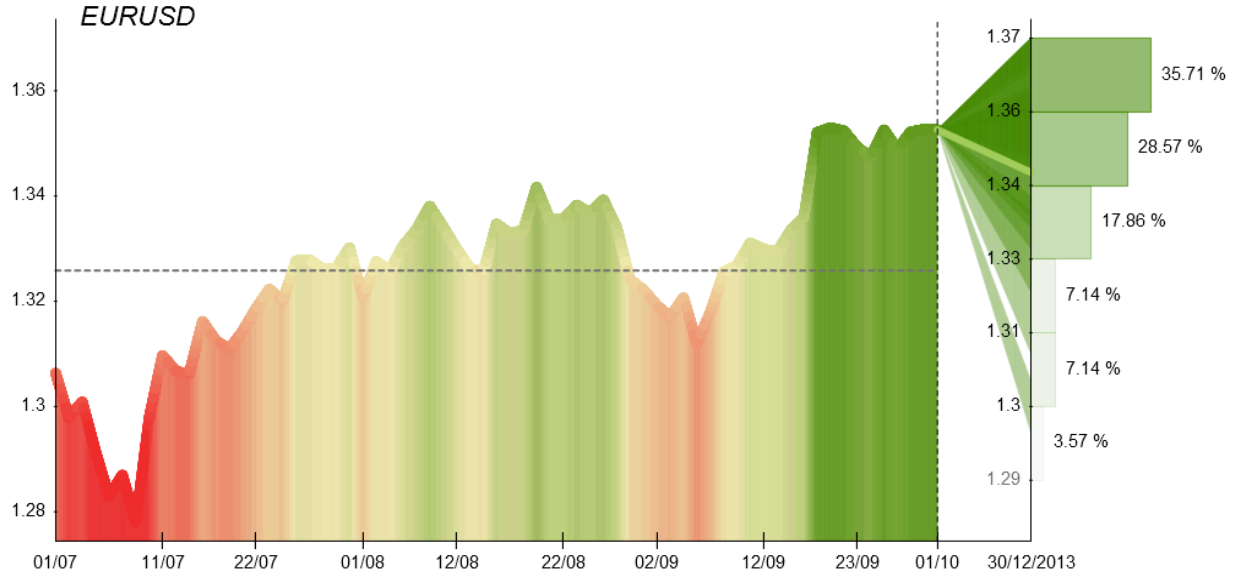
Regarding other Asian economies, Australia and New Zealand in particular, the countries are experiencing some difficulties and struggle to grow; however, taking into account the latest economic and political shifts, they are likely to build up steam in the foreseeable future. In September, the Reserve Bank of New Zealand made no adjustments to its monetary policy, leaving the key rate at 2.5%, and pointed at a possible tightening in policy next year, sending the domestic currency significantly higher. The RBNZ Governor Graeme Wheeler said that additional stimulus may be needed to curb the inflation which is expected to hover around 2% in 2014 in case housing pressure spill into consumer prices. The Official Cash Rate has been held at a half-century low of 2.5% since March 2011, when policymakers cut the refinancing rate after the Canterbury earthquake struck. New Zealand's economy is likely to accelerate to 3% by the September quarter, and gain momentum further by the middle of the next year, reaching 3.5%. At the same time, Australian economy is expected to benefit from the new government, with Tony Abbott as the new Prime Minister already pledging to introduce structural reforms. Furthermore, resource-rich economy is likely to accelerate on the back of strong global demand for commodities and depreciation of the Aussie.

All things considered, Asian economies are still developing at a significantly faster pace than other developed economies, however they are facing high risks, which may weigh on future performance. The Asian Development Bank has downgraded its growth forecast for Asian developed countries, noting the growth will slow to 6.0% this year, following 6.1% posted the last year, due to slowing momentum in China and instability in regional financial markets. However, in 2014 growth will pick up to 6.2%. "While economic activity (in developing Asia) will edge back up in 2014 current conditions highlight the need for the region to exercise vigilance to safeguard financial stability in the short term while accelerating structural reforms to sustain economic growth in the longer term," says ADB Chief Economist Changyong Rhee.



Community Forecasts

EUR/USD



Rapid growth, almost eight-month high, and 4.3% gain during the quarter. That describes the most traded currency pair during the July-September period. Major spikes were registered on July 10 and September 18, surging 350 and 160 pips respectively after FOMC meetings. Furthermore, during the whole quarter the pair was moving in boundaries of a rising wedge pattern, formed on June 19 and lasting until now. However, there was a false breakout on October 3, another sign of strong bullish sentiment.

Despite the pair's bullishness in recent months, Dukascopy Community Members are considering the pair as over-bought, suggesting EUR/USD will go lower by the rest of the year. The consensus forecast for December 31 stays at 1.3445, still significantly higher than the last quarter's medium price of 1.325. Furthermore, 60% of respondents are bearish on the pair, and, according to "AdamFx42", the pair is facing a strong resistance around 1.37, hence the movement above this level is highly unlikely. It seems, the pair is highly dependent on fundamental news from the United States and Europe, rather than driven by technicals. Hence, Draghi's decision to cut rates, or Bernanke's comments on a possible tapering of the stimulus programme, may push the pair in any direction.

Mag

"Bullish channel with price under 1,28586 and 1,43715 higher price with a soil very clear in 1,28226 reached and drilled on 7 occasions that tells me an upward trend. Real time this hypothesis EUR/USD is worth 1,35083."

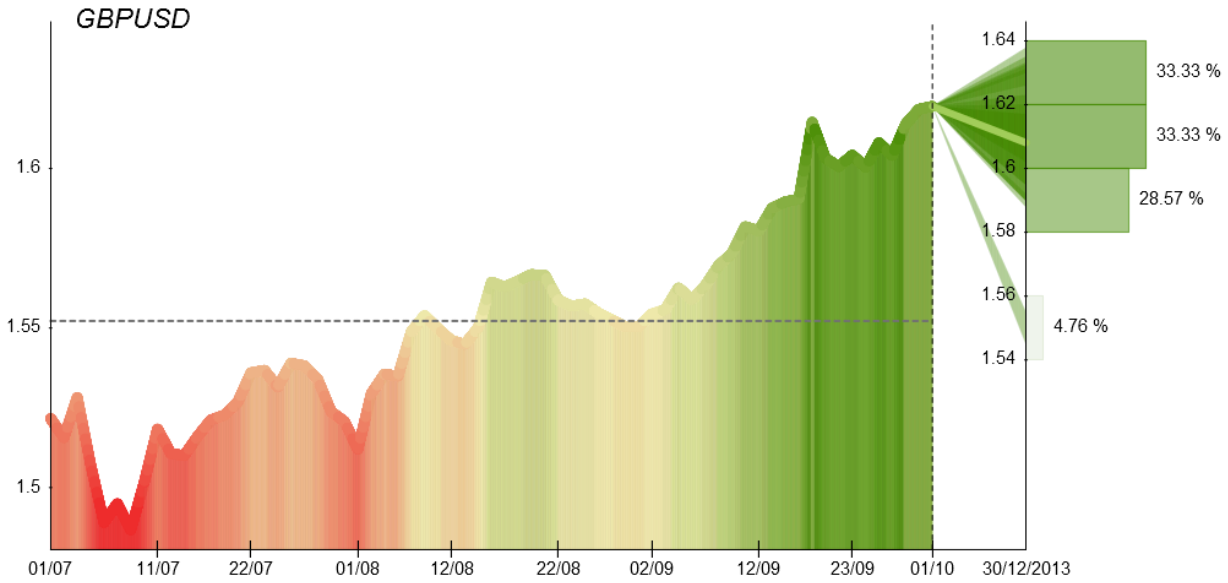
GreyEmin

"The EU is not in as good condition as last price action looks. I expect range trading in 1.375-1.345 band until stronger currency effect starts influence in economy or in case of stronger Dollar through global market."

Bullish: 40% votes

Bearish: 60% votes

GBP/USD



During the third quarter, GBP/USD currency pair has gained 9.8%, as it started the quarter at 1.52081 and closed at 1.61868 on September 30. The pair lost 930 pips in the June to July sell-off where it reached its 2013 low, but the pair started appreciating strongly right after that. The pair reached its three-month high on September 18 when it touched 1.6163, while it dipped to its low of 1.4813 on 7 September. The couple touched its 38.2% retracement on July 7, while the key Fibonacci retracement of 61.8% was reached on July 25. At the moment of writing the GBP/USD was trading close to its extended Fibonacci retracement (161.8%) which is close to the couple's 2013 high of 1.638.

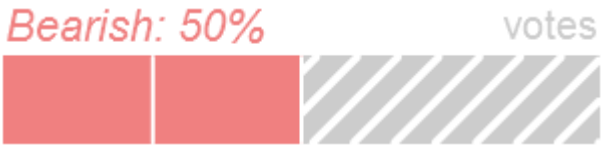
According to our Community members, the Pound is likely to slightly weaken against the Dollar, as the average closing price for December 31 is predicted to be at 1.61136. However, traders' sentiment is rather neutral, since equal amount of them are bullish and bearish. 60% of traders used technical indicators when forecasting, the majority of which also emphasized that the pair is overbought, therefore a pullback could be expected soon. As far as fundamentals are concerned, Bruce referred to steady monetary policy in the U.K, while Juandata expressed his concerns over the European economy.

geula4x

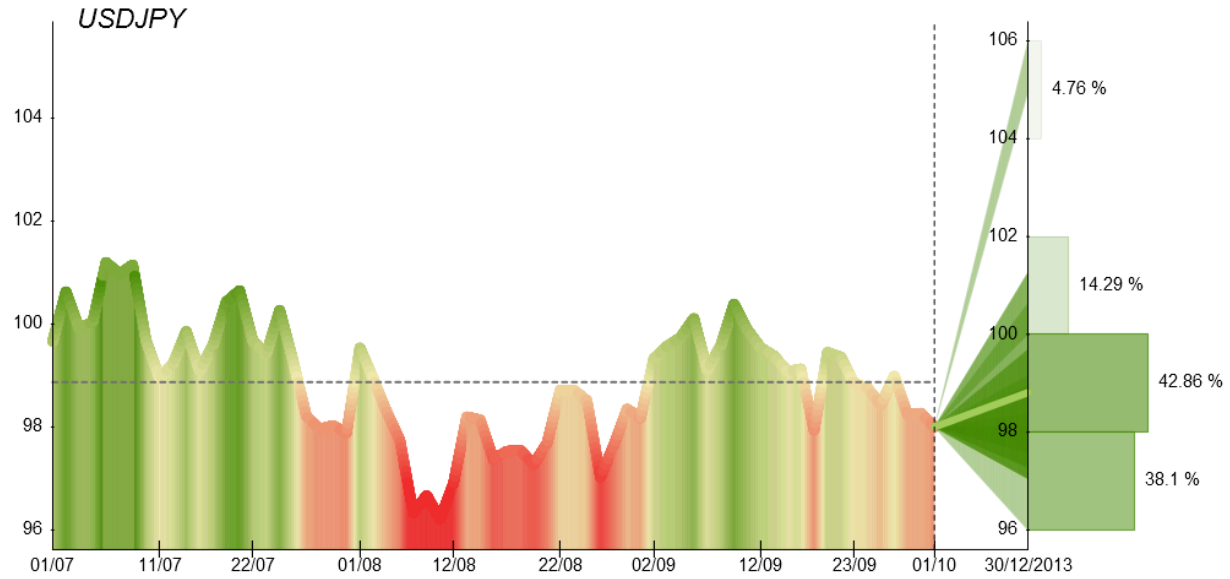
"GBP/USD is on bullish monthly momentum. April and August candles' closes around 1.5500 have established this area as support. Resistance lays around 1.6750."

Maksim_Chelnokov

"On the date December 31 for this pair I expect the level of 1.53-1.52, for the same reasons that I expect fall of the EUR/USD - QE3 will be tapered until the New Year."



USD/JPY

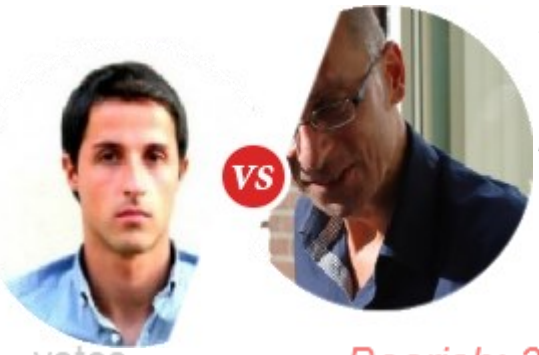


Throughout the third quarter, USD/JPY was extremely volatile, reaching the highest level of 101.53 on July 7 and falling to the lowest point of 95.810 a month later. Overall, the U.S. Dollar lost as much as 2.3% versus the Yen during July-August period. Since September 2012 the pair has been moving in triangle pattern. On September 9 2013 bulls made an attempt to penetrate the upper trend line; however, later the pair moved back within pattern's boundaries. Currently, USD/JPY changing hands around 97, suggesting the downside breakout of triangle pattern, meaning prices will go lower.

During the last quarter of 2013, the pair is expected to enjoy a bullish trend, reaching the 98.66 level by December 31, according to Community members, who cited the Fed decision on tapering of QE as a major driver for the pair. GreyEmin expects the pair to "retest resistance near the 101.5 level and this year's high close to 103.5, with a possibility to create a new high." In contrast, given the current uncertainty over the U.S. budget deadlock and possible default of the world's biggest economy, risk-aversion might spur more demand for the Japanese Yen. Bruce argued that the pair will break the triangle pattern and will likely to consolidate in the 92-104 zone.

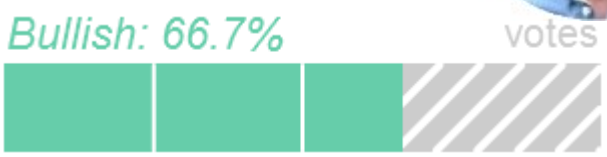
Marius24

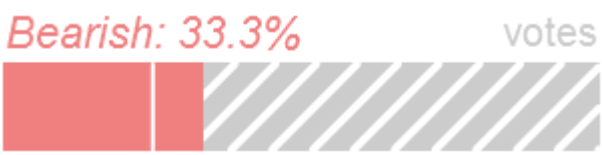
"Over three months USD/JPY is likely to go higher helped of course by the next move of Federal Reserve (possible in December) to reduce the pace of 85bn dollars per month in bond buying plan."



AdamFX42

"This pair's incapability to break 100 will probably lead to a lot of profit-taking throughout the end of the year, and this way create a bearish sentiment in the market."





Technical Overview

EUR/USD

Daily Chart

100-day SMA 200-day SMA

2013 Q3 Summary

After bouncing from the 2013 low in the beginning of the quarter, it took 2 months for the pair to recover the losses that occurred in the last few weeks of the second quarter. Peak of this recovery was reached on 20th of August, which was followed by the sell off to the 50% retracement of the mentioned June-July fall. Together with the 100 and 200-day SMAs, it provided a bullish impetus for the pair which pushed it 460 pip higher to reach the quarterly high at 1.357. It is worth pointing out that further appreciation at that point was most likely prevented by the September pivot (R2), which is located at 1.356 as well. In the last few weeks of the quarter the pair was somewhat capped by the August high at 1.345 and the 6 month high/September pivot (R2).

2013 Q4 Outlook

In the short to medium term, we do not expect that the pair will advance above the 2013 high at 1.371. We have to agree with the short term technicals, which point at further bullishness of the pair, but medium and long term technicals, the RSI and the Stochastic indicators especially, give clear signals that the pair is overbought. In addition to this, the 2013 high should have significant psychological effect on the traders as well. It was the highest level the pair had reached since the November of 2011. Despite that, we expect that the pair will stay in the uptrend channel and reach it's support somewhere in the middle of November (around 1.350). After that we should pay close attention to the August high at 1.345. If it fails to provide a strong enough impetus for the pair and drive it higher, we should look in to 100 and 200-day SMAs. At that point, they should be somewhere around 1.330-35 and 1.315-20 respectively. If that would not stop the pair trailing lower, we should look in to major level at 1.300 and 2013 low at 1.274. In case the pair advances above the 2013 high at any point, we should see increased volatility in the market and main interim targets to be located at major resistance at 1.40 and October, 2011, high at 1.424.

GBP/USD

Daily Chart

100-day SMA 200-day SMA

2013 Q3 Summary

In the beginning of the quarter the pair continued to depreciate after peaking above the 200-day SMA in the second week of June. Bearish impetus received by the pair then pushed it to 1.481—the lowest level in 2013 (prior low was at 1.483, and was reached on March). Setbacks in the recovery can be seen when the pair reached 38.2% and 61.8% retracements of the mentioned June-July sell off and approached 1.575, the highest level since January. All of these levels and moves put the pair in a rather neat uptrend channel. Last few weeks of the quarter passed with bulls trying to push the pair above major psychological level of 1.60. It seems that they have succeeded to do so which puts the 2013 high at 1.638 on the map.

2013 Q4 Outlook

It seems that the market has topped for now and we should expect some significant bearishness in the nearest future. 20-day SMA, which at the moment is located somewhere between 1.60 and 1.61, should cause some small rebound, but we expect that the pair will be strongly bearish in the short to medium term. We do see the uptrend boundaries seen in the chart holding up after that. At this point the main support would be with the 55-day SMA, which at the moment is at 1.575. Dip below it could easily provoke losses down to 1.55 (major support and 100-day SMA) and 1.54 (200-day SMA) areas. In case any of these support levels would uplift the pressure on the pair and cause it to inch up higher, which seems very unlikely due to the clear neutrality of medium and long term technicals, first of all, we should look in to 1st of October high at 1.626. The 2013 high at 1.638 could be reached, in the best case, no earlier than by the end of October. If it is breached, we could expect that the pair will go further, but should struggle with the August 2011 high at 1.661 and the 2011 high at 1.675.

USD/JPY

Daily Chart

100-day SMA 200-day SMA

2013 Q3 Summary

The pair has been appreciating for the most of 2013. It rather noticeably lost all of this bullishness in the May-June period, when it depreciated by 100 pips in less than 4 weeks. Pair's bulls proved to be persistent and drove the pair above 100 JPY once more in the beginning of the quarter, however, they did not manage to keep it there as it plunged to 96 JPY shortly after. We can see that most of the support after that came from the 200-day SMA. It was not pushing the pair higher, but did not allow it to fall, either. However, at the end of August it gave a push for the bulls to try to consolidate the pair above the 100 JPY once more, again unsuccessfully. For the last few weeks of the quarter it has been slowly trailing lower, and at the moment is trading in the vicinity of the 200-day SMA.

2013 Q4 Outlook

Short and medium term technicals give a rather clear indication that the pair is under pressure. At the moment it is testing the uptrend support and the 200-day SMA, but we don't see it holding up. We expect that the pair will continue depreciating at least till the August low at 95.80. It should hold the initial test, but it should not cause a reversal and drive the pair higher. Some bullishness could be expected around 95 JPY as well. It or the June low at 93.79 should give a strong enough impetus for the pair to start appreciating once again. 100 and 200-day SMAs would be the first main resistances we would be facing. 20-day SMA, which is located around 98 JPY, could weight on the pair as well, but should not be perceived as major resistance. Downtrend resistance, which connects July and September highs, should be perceived with caution as well. Main medium to long term target is at 100 JPY (major level). Only if the pair advances above it we could start looking on to September high at 100.61, July high at 101.52 and 2013 high at 103.74. Any of these could cause significant bearishness, but the latter one could switch the pair back in to full pledged depreciation.

USD/CHF

Daily Chart

100-day SMA 200-day SMA

2013 Q3 Summary

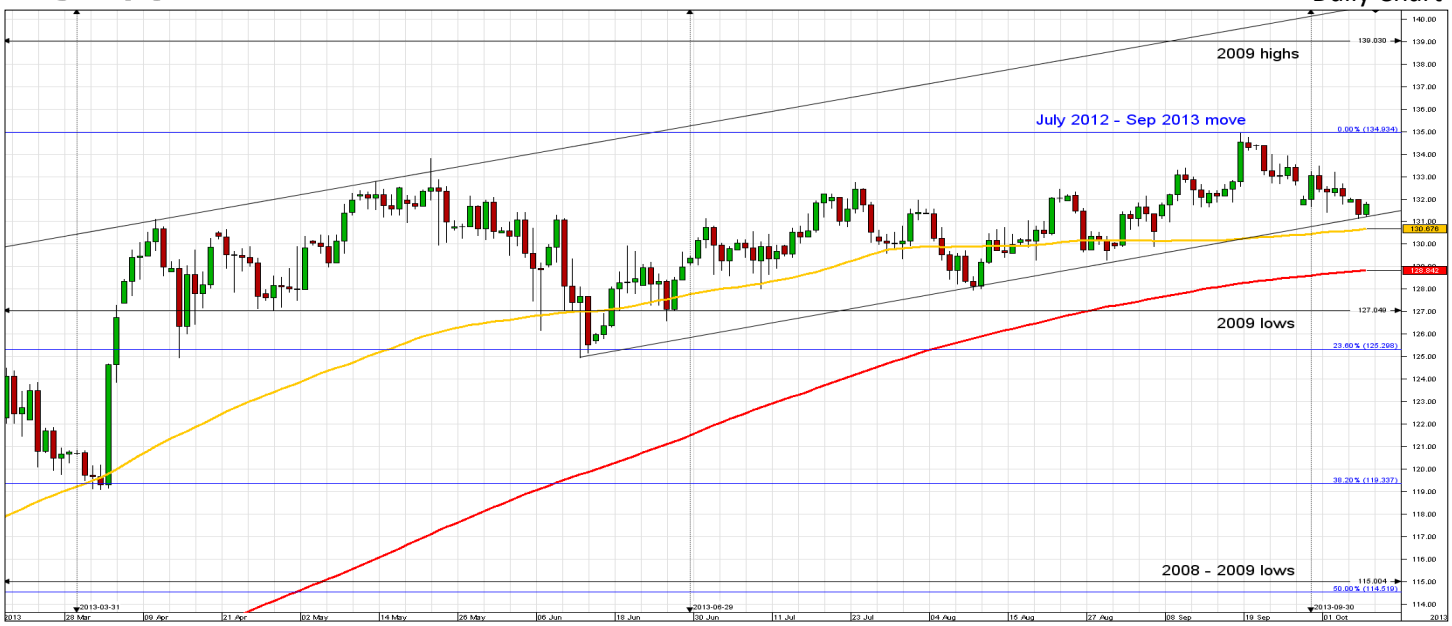
The pair started the quarter with an attempt to recover from the 0.913, which was reached in the middle of June. At that point, it was the second lowest level for the pair in 2013. The lowest level (0.902) was reached in the first of January. However, it failed to consolidate above the 0.97 and was brutally driven down—it returned in the vicinity of 92 cents in the course of 5 weeks. Few attempts to recover these losses followed, but it seems that 100 and 200-day SMAs were enough to keep the pair depressed. In that period, the mentioned June low (0.913) provided support for the pair, but, as we can see, it was breached just a few weeks ago. It was expected that 91 cent mark will provide the necessary psychological support, but just a few days ago the pair already dipped below the January, 2013, low of 0.902.

2013 Q3 Outlook

At the moment, the pair is testing February low and the downtrend support (connects April and June lows). It ought to hold the initial test as 90 cents should be causing some bullishness as well. Short and medium term technicals, however, give a clear bearish outlook on the pair. In order to uplift most of it, the pair should advance above the 20-day SMA and August low at 0.910/15. After that, we could start looking into the 55-day SMA, which at the moment is located just slightly above the 92 cents. Significant failure should be caused by the 100 or 200-day SMAs. Any of these could push the pair back below the downtrend resistance (connects July and September highs). In case the bears prevail and the pair continues to depreciate we should expect that the whole 89 to 90 cents area will be highly volatile. However, downtrend support line should work as a good guideline. It is worth pointing out that both the downtrend support and resistance intersect at 0.885. Here, the pair could start moving along any of them. October 2011 low at 0.856 should serve as a good interim target, but we don't think it could be reached till the end of the year.

EUR/JPY

Daily Chart



100-day SMA 200-day SMA

2013 Q3 Summary

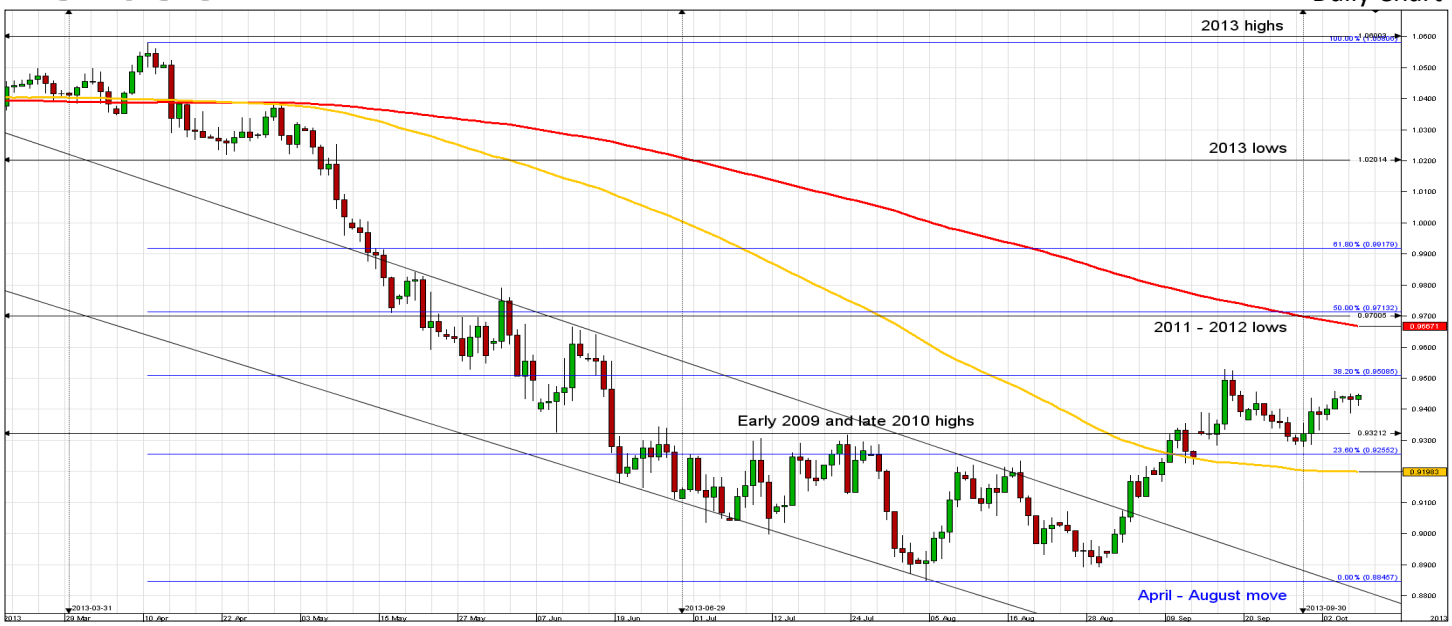
Two quarters ago it seemed as if the currency pair was trading within the rising wedge pattern, meaning there were considerable downside risks present at the time. However, in reality it would be an error to expect the support area between the 2009 lows and 23.6% Fibonacci retracement level (from the July 2012 – May 2013 rally) to let the price to descend. Instead we believed the exchange rate would be contained by 134 from above and 127 from below. This turned out to be the case in the end, although EUR/JPY's bullish run in the second part of the last quarter slightly exceeded the assumed upper boundary, reaching the highest level since the end of 2009.

2013 Q4 Outlook

Another noteworthy point during the third quarter of 2013 was a breach of the rising trend-line, an event that could have potentially invalidated the bullish outlook on the pair. Nevertheless, the price did not reach the 200-day SMA, it was underpinned by yet another rising line, which is safeguarding the positive bias with respect to EUR/JPY at the moment and is likely to continue guiding the rate higher despite the recent pair's propensity to decline. Accordingly, there is a good chance that, until the end of the current year, EUR/JPY could attempt to challenge the peaks charted back in 2009, while trading above the bullish line initiated in mid-June. Still, the resistance at 135 must be overcome first, a task that does not promise to be easy, but is nonetheless achievable given the present context in the market.

AUD/USD

Daily Chart



100-day SMA 200-day SMA

2013 Q3 Summary

While there were good reasons to suspect that AUD/USD would carry on being led downwards by the two trend-lines, and it did for the most part of Q3, September was marked with an advancement that ignored all the major resistances that were supposed to prevent extensive appreciation of the Australian Dollar and return it back on the path that is directed South. Neither the down-trend resistance line at 0.9070 nor the area between the early 2009 and 2010 highs and 100-day SMA, also including the 23.6% Fibonacci retracement (of the April – August move), was able to attract enough selling pressure in order to stop the surge.

2013 Q4 Outlook

It must be noted that the sentiment of SWFX market participants towards the Australian Dollar remains extremely bullish, as it currently is the most popular currency among the major ones, being contested only by the U.S. Dollar, but the Aussie is still preserving a significant advantage over the Greenback in terms of frequency with which they are purchased throughout their crosses. The percentage is consistently above a mark of 70% for the former, but with the latter it has recently entered high sixties. Regarding our view on AUD/USD, we would join the majority of traders and agree that there is potential for the pair to add to already substantial gains, but only in the short to medium term. We are inclined to think the up-move should not cross 0.97, taking into account the fact this resistance level is formed by the 200-day SMA, 2011-2012 lows and 50% retracement level, but stop there and transform into a decline.

USD/CAD

Daily Chart

100-day SMA 200-day SMA

2013 Q3 Summary

The situation on USD/CAD has not been subject to drastic changes over the past three months, since none of the major levels have been violated throughout this period. The currency pair has been contained by the tough resistance at 1.06 from above and by the formidable support at 1.03 from below. However, during the last month of the third quarter the U.S. Dollar nursed broad losses that entailed a breach of the 100-day moving average. Subsequently, the pair has even launched an assault on the 200-day SMA that was reinforced by the major up-trend which has been in force since September of 2012 and was close to cancelling the bullish outlook. In the end, the support area weathered the strong selling pressure, but at the same time did not goad the investors into massive buying; the rebound remains shallow.

2013 Q4 Outlook

Although the current recovery does appear to be weak at the moment, it is easier to imagine appreciation of the U.S. Dollar with respect to its Canadian counterpart than any other course of events. Once USD/CAD mounts over the 100-day SMA that now acts as the resistance, it will enter a more than 200-pip wide area that is largely free from any major obstacles. When the price covers this distance, however, it will face the resistance that has effortlessly negated previous two attempts to advance beyond it. Accordingly, USD/CAD is likely to swing between 1.06 and the mentioned earlier rising trend-line, thus forming an ascending triangle. The pair is more likely to break out of it as soon as the next year, especially considering that the upper boundary of this pattern will be immediately followed by the 2010 highs at 1.07.

NZD/USD

Daily Chart

100-day SMA 200-day SMA

2013 Q3 Summary

Our assumptions regarding NZD/USD three months ago did not prove to be true. Even though we acknowledged the durability of the support at 0.77, which is mainly created by the rising support line that has been in place since the beginning of 2010, we did not expect the surge fomented by it to pierce through the 100-day SMA first and then penetrate a dense resistance area between 0.82 and 0.81, reckoning in that it consists of 2008 highs, 2012 Q4 lows, 2013 Q1 lows and the 200-day SMA. Nevertheless, the rate disregarded all of these levels and maintained a bullish trajectory, opening thereby the road towards the April high at 0.8676.

2013 Q4 Outlook

The most recent price action exposed 0.8676, making it the most likely target for NZD/USD during the next three months, since now the pair has a strong backing represented by 0.82 and 0.81. Near the April high the major bullish move is supposed to have run its course and let the bears to take control of further developments. Of course, we cannot rule out a possibility of the New Zealand Dollar rising in value beyond 0.8676, but then the price will run into another supply area around 0.8850 – the highest levels of July in 2011. From there on the pair is expected to start descending back towards the bullish line at 0.78, but this is likely to be a relevant topic in the next issue of the quarterly report rather than the current one.

Expert Commentary

U.S. Dollar

Peter Kinsella
Senior FX Strategist
Commerzbank
UK

I expect the U.S. Dollar to trade rather weakly, in particular against its major counterparts; namely, the Euro and Sterling.

To my mind, the main drivers for the greenback will be with regard to economic developments, especially Labor market data and home purchases / refinancings. Moreover, it will also be important to look at equity flows going into the U.S., which have disappointed so far this year.

Our forecast for the EUR/USD pair for the end of this year is 1.35 , while USD/JPY we see trading at 102.

> ***We are looking for a decline in the EUR/USD currency pair to the 1.28 area by the end of this year.***
>
> ***- Michael Sneyd, FX Strategist at BNP Paribas***

Euro

Michael Sneyd
FX Strategist
BNP Paribas
UK

We are looking for a decline in the EUR/USD currency pair to the 1.28 area by the end of this year, and we could see a further slide to 1.26. We think that over a longer term horizon EUR/USD could continue to decline down to 1.25 by the end of next year. Versus the Sterling we expect that Euro could remain supported, and the main reason for this is that, in our opinion, the Sterling is looking slightly overbought at these levels following the strong data that we have had out of the U.K. recently. We expect that if we do get a slight pullback in the U.K.'s data, we could see the Euro gaining some support and EUR/GBP trading around 0.85.

During the last quarter of this year we are expecting the main drivers for the EUR/USD pair to be more on the Dollar side of the equation. In the Eurozone we are looking for the ECB to keep dovish stance. Also, we think that at the meeting in the last quarter we could see the ECB putting more weight on the strength of the Euro, as the 17-nation currency has been very strong lately. We suspect that they might try to comment on this in order to cause the Euro to weaken somewhat. In terms of EUR/USD, we think that the shared currency will be weakening against the backdrop where data in the U.S. remains reasonable, and thus we going to see a big dislocation in growth differentials between the Euro and the U.S., which is likely to be causing the EUR/USD to decline.

Australian Dollar

Andrew Salter
Currency Strategist
ANZ
Australia

Over the next few months our general view is the crosses should evolve in line with the general 'reversification' trend that is in play in FX markets. The Australian Dollar will be weak against the core currencies – the U.S. Dollar, Japanese Yen, Sterling and Euro. Against emerging market and other commodity currencies, it should be less weak, and possibly strong in some cases.

The big drivers in the Aussie's move towards fair value from above parity will be commodity prices and the interest rate differential. The Aussie should be driven down during the quarter with commodity prices decreasing, and interest rates moving down in Australia and up in the U.S.

Our forecast for December 2013 is for the AUD/USD to be at 0.88.

> ***The big drivers in the Aussie's move towards fair value from above parity will be commodity prices and the interest rate differential.***
> ***- Andrew Salter, Currency Strategist at ANZ***

Swiss Franc

Jonathan Webb
Head of FX Strategy
Jefferies Bache
UK

We expect that at some point the EUR/CHF pair will go higher; however, at the moment the pair seems to be very stable around the 1.23 level. Therefore, we do not believe that it is going to move very much in the short term. With regards to USD/CHF, we suspect that EUR/USD will go down, which consequently will push USD/CHF higher as well.

What we need to see is a continued recovery in the Eurozone or at least less pressure in the periphery countries along with successful navigation of the U.S. budget and debt ceiling negotiations. In that respect, once those are in place, we probably will see a weaker Swiss Franc.

In my opinion, USD/CHF will not move far from the current levels. I expect the 0.93 level by the end of this year.

Japanese Yen

Kumiko Gervaise
FX Market Analyst
Gaitame.com Research Institute
Japan

On October 1, Prime Minister Shinzo Abe announced his decision to raise sales-tax to 8% from 5% in April 2014. Mr. Abe will develop economic package to ease up the negative effect against Japan's economy by rising tax until the beginning of December. In addition, Haruhiko Kuroda, Governor of Bank of Japan, said that he will add monetary easing policy in case the situation requires it after the sales-tax hike. These means all policies in Japan put pressure on the Japanese Yen. Though the decision about cutting corporate tax is procrastinated until the beginning of December, I see the trend of the Yen's depreciation is continuing as long as the expectation against "Abenomics" is kept or new risk (like Libya's problem) does not arise.

Especially, USD/JPY seems to be the main driver of "Yen's depreciation". Currently the hottest topic in financial markets is "When does the tapering start?". Thus, in effect the U.S. Dollar is leading the currency market. I guess the movement of USD/JPY is the most understandable. I think the long term trend of the Dollar's appreciation will continue because the Fed is already looking for the right timing to taper (well ahead of other countries). And USD/JPY will be increasing because of the gap in central banks' attitudes.

> *It means all policies in Japan put pressure on the Japanese Yen.*
> *- Kumiko Gervaise, FX Market Analyst at Gaitame.com*

However, the timing of tapering's start is unclear. There is a possibility that it is determined during next year. If the possibility of starting to taper retreats due to disappointing economic figures or any other significant issue, USD/JPY may lose the clear direction.

The improvement in US economic figures drives the expectation for earlier tapering. Stronger expectation would lead to further increase in USD/JPY. USD/JPY would aim to reach successive targets (100.61YEN in 11th Sep, 101.53YEN in 8th July, 103.73YEN in 22th May). However, I underline there is a possibility USD/JPY may lose direction in case tapering is put off next year.

In Europe, the data shows that economies are not in bad condition, supporting the Euro. Although, there are some risks like German coalition and unsettled government in Italy, I think the Yen is weaker than the Euro as long as these risks are not serious. However, currently I see the U.S. Dollar is the market driver. Thus, EUR/JPY is not expected to drift significantly from the direction indicated by USD/JPY and EUR/USD. EUR/JPY's trend will be moderate.

Trade Pattern Ideas

EUR/GBP

Weekly Chart

200-week SMA

EUR/GBP

Channel Down

Short term stochastic indicator, which is constructed to predict major turning point, sends SELL signal suggesting that the pair is up for a sell-off which might be caused by the 200-day SMA.

The pair has been in a clear downtrend since the end of 2008, but only the trades since June 2010 can be characterized in a Channel Down pattern at hand. At the moment it is hovering just slightly below the 200-week SMA at 0.8478. Long term technicals on aggregate point at appreciation of the pair suggesting that it might not be willing to leave the vicinity of the pattern's resistance just yet. In addition to this, significant share of traders (61%) are already long on the pair. Long traders could focus on the 20-week SMA at 0.8529, monthly R2 at 0.8586, monthly R3 at 0.8651, Bollinger band/pattern's resistance at 0.8705, July high at 0.8770, 2013 high at 0.8816, August, 2012, high at 0.8921, major resistance at 0.9000, 2011 high at 0.9084 and March, 2010, and, November, 2009, highs at 0.9152/51.

Short term stochastic indicator, which is constructed to predict major turning point, sends SELL signal suggesting that the pair is up for a sell-off which might be caused by the 200-day SMA. In support for this comes the fact that 69% of all pending orders are in favour of bears. Short traders could focus on the monthly PP/55-week SMA at 0.8406/04, Bollinger band/September low at 0.8353/33, 100-week low/monthly S1 at 0.8304/290, monthly S2 at 0.8226, monthly S3/2013 low at 0.8110/086, major support at 0.8000, November, 2012, low at 0.7961 and 2012 low at 0.7758.

AUD/CHF

Weekly Chart

200-week SMA

AUD/CHF

Rectangle

Daily, though less relevant, and weekly technicals on aggregate point at further depreciation of the pair, which could give additional support for the bears.

The pair has been trading within the boundaries of a 3200 pip wide Rectangle pattern since the end of October 2007. At the moment it is on its move from pattern's resistance to the pattern's support and is trading somewhat in the middle between them at 0.8606. Current market sentiment is mildly bullish with 61% of traders holding long positions on the pair. In addition to this, almost every three out of four pending orders are set in favour of bulls as well. Al in all, we could see the pair being pulled back to the 200-week SMA. Long traders could focus on the monthly R1 at 0.8665, monthly R2 at 0.8887, major resistance/Bollinger band/monthly R3 at 0.9000/62, 55-week SMA at 0.9268, 100 and 200 -week SMAs at 0.9408/51, 2013 high/parity condition at 0.9978/1.000 and 2012 high at 1.0349.

Daily, though less relevant, and weekly technicals on aggregate point at further depreciation of the pair, which could give additional support for the bears. Short traders could focus on the monthly PP at 0.8490, monthly S1 at 0.8268, Bollinger band/2013 low at 0.8199/76, monthly S2 at 0.8093, monthly S3 at 0.7871, major support at 0.7500, 2011 at 0.7149 and 2008 low at 0.6939.

USD/SGD

Weekly Chart

200-week SMA

USD/SGD

Double Bottom

Together with the recent bounce from the 200-week SMA and current market sentiment, which is mildly (60%) bearish, this suggests we could expect some bearishness in the nearest future.

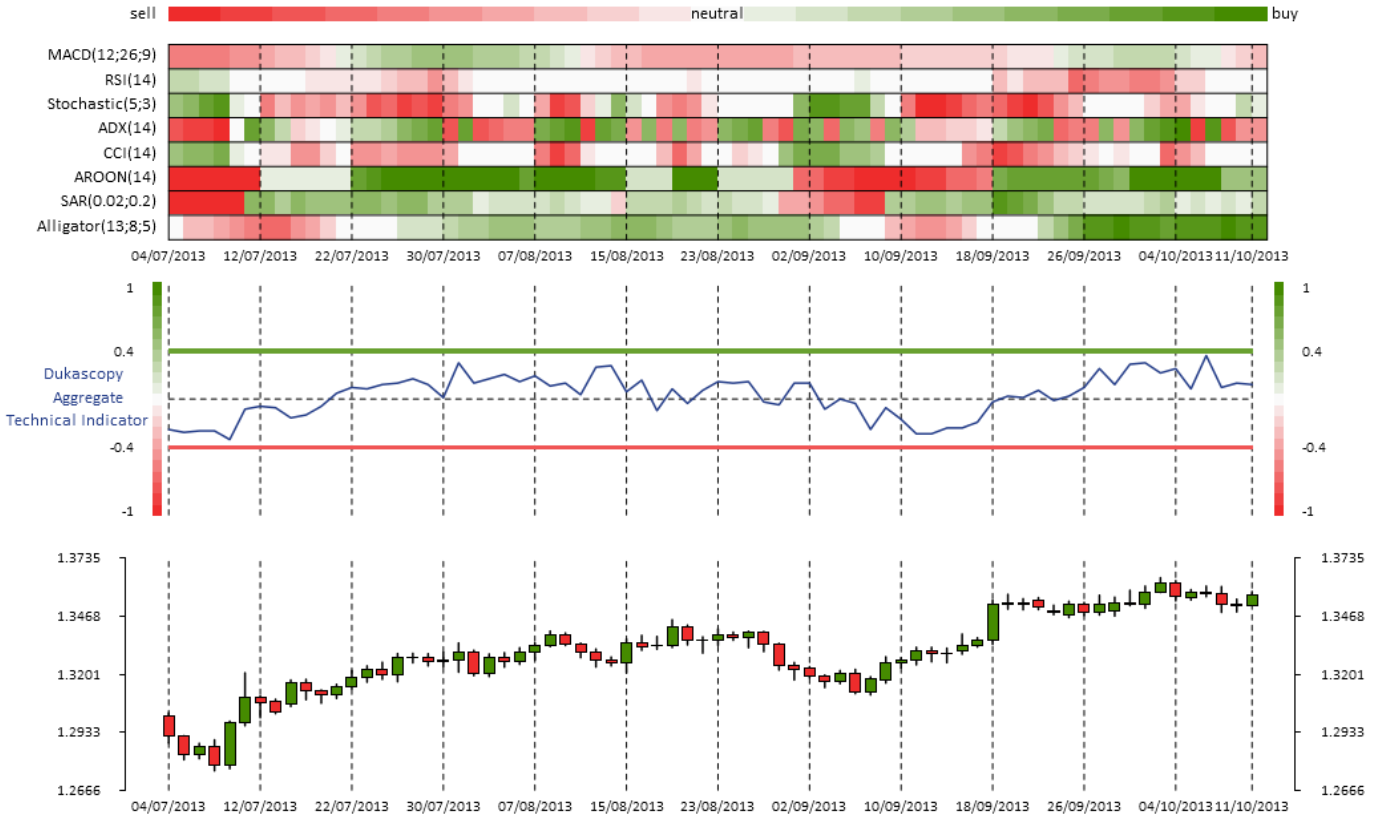
The pattern started on the first full week of March 2009; pattern's resistance (neck line) is at 1.3201; currently the pair is trading at 1.2557. The overwhelming majority of pending orders (72%) are set to go long on the pair, indicating the presence of strong support area. Long traders could focus on the monthly PP/20-week SMA at 1.2599/639, monthly R1/200-week SMA/Bollinger band/2013 high at 1.2775/865, monthly R2 at 1.2995, monthly R3/2011 high at 1.3171/201.

Daily horizon technicals send an almost unanimous SELL signal for the past week or so. Together with the recent bounce from the 200-week SMA and current market sentiment, which is mildly (60%) bearish, this suggests we could expect some bearishness in the nearest future. Short traders could focus on the 55-week SMA/Bollinger band at 1.2448/32, monthly S1 at 1.2379, May low at 1.2269, monthly S2 at 1.2203, 2012 low at 1.2153, major support/2011 low/monthly S3 at 1.2000/1.1984.

Aggregate Technical Indicator

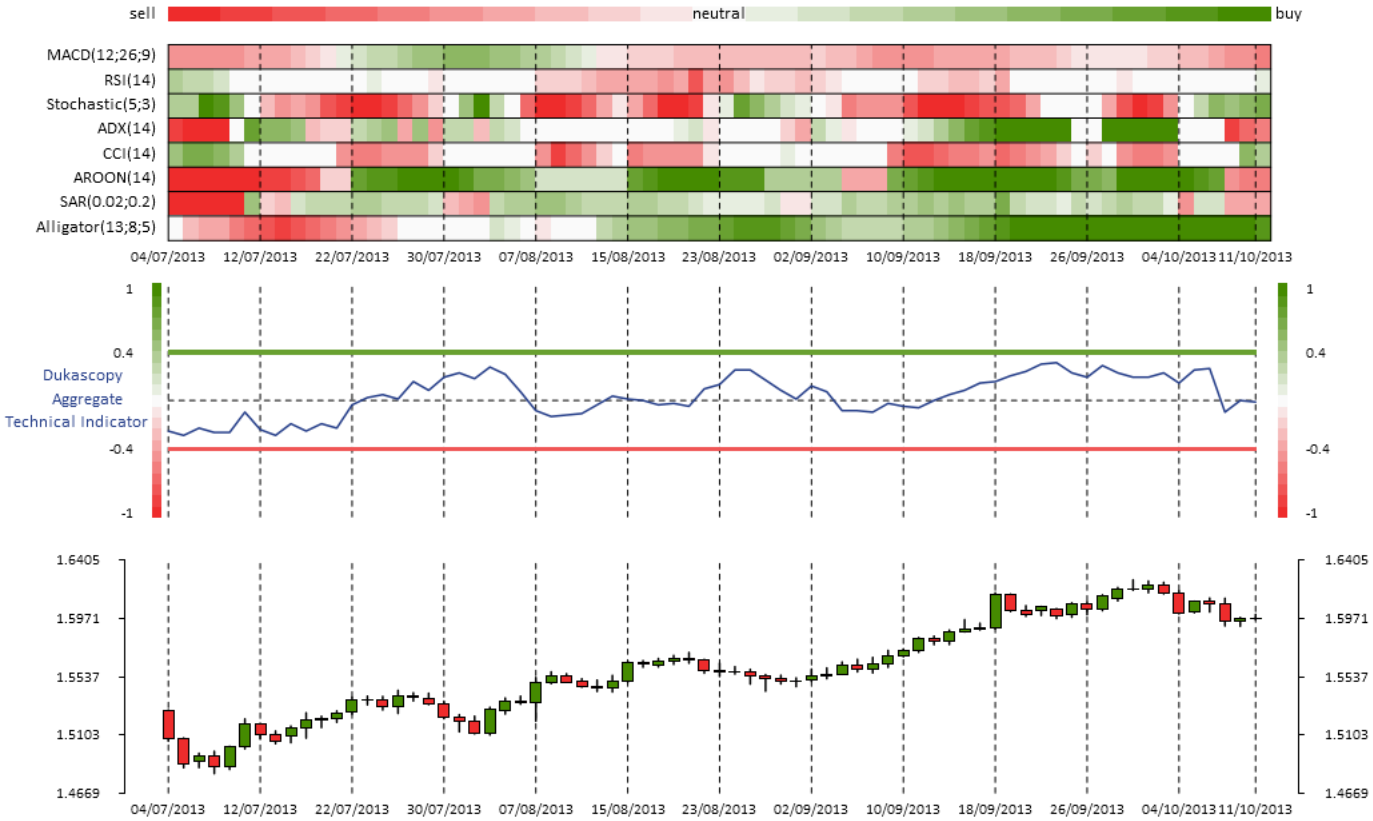
EUR/USD

Daily chart



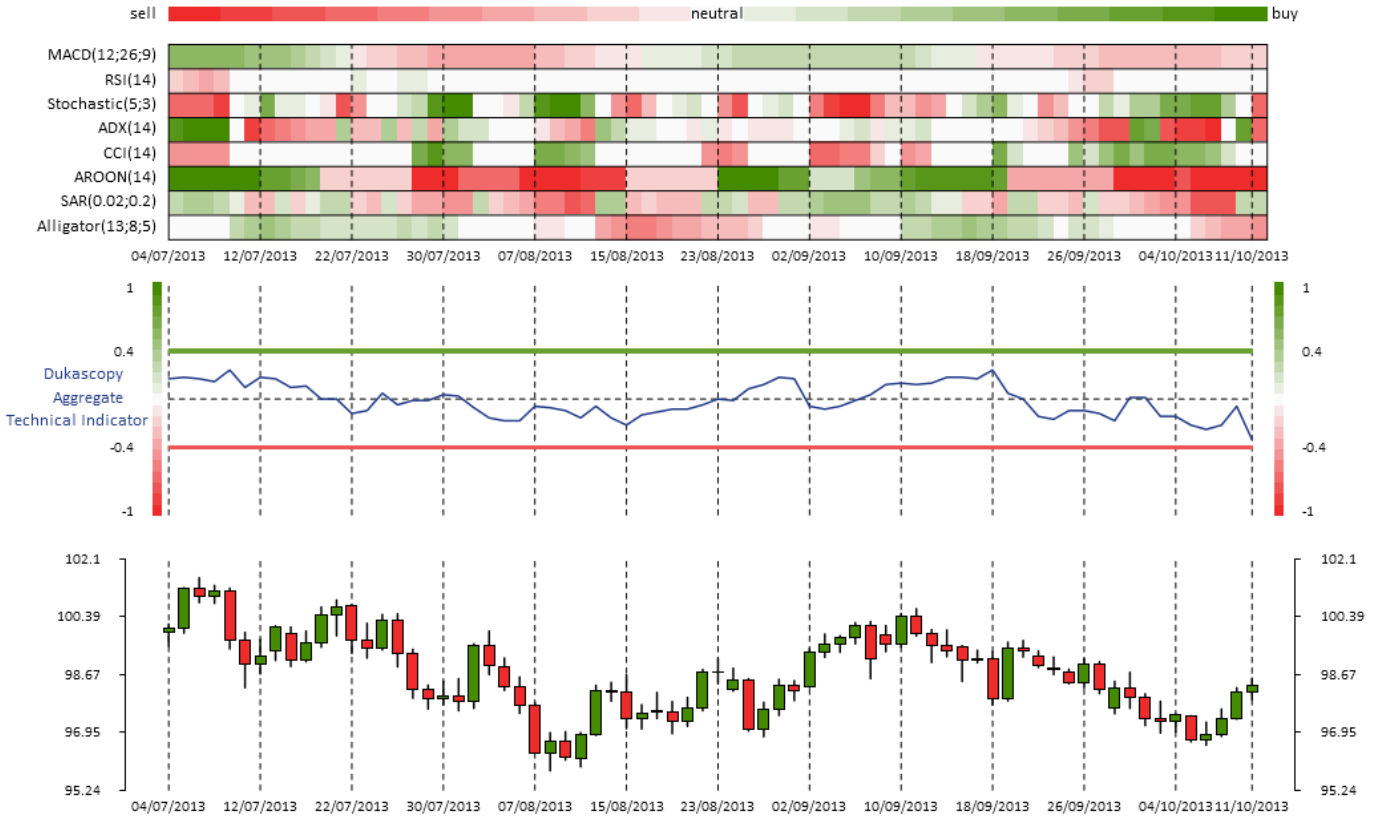
GBP/USD

Daily chart



USD/JPY

Daily chart

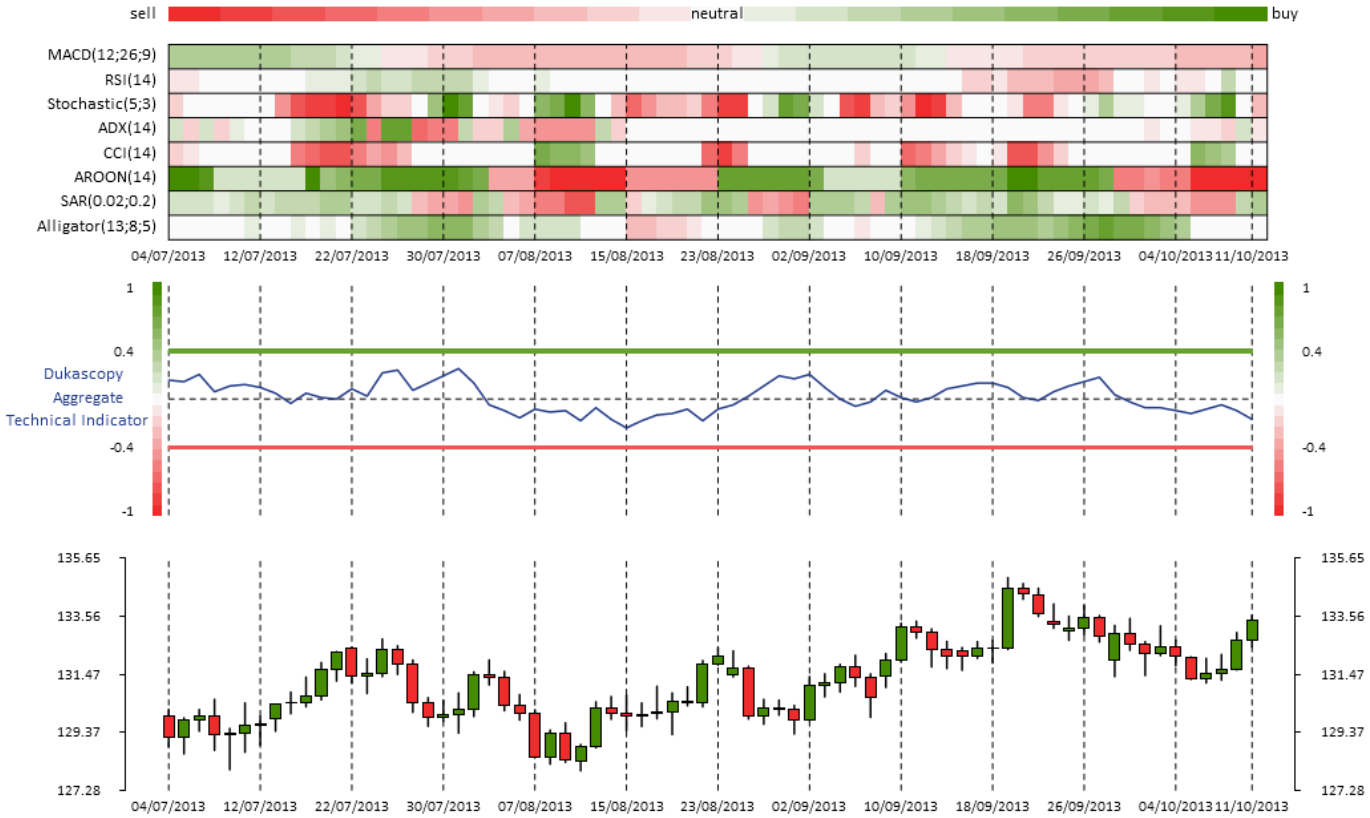


USD/CHF

Daily chart

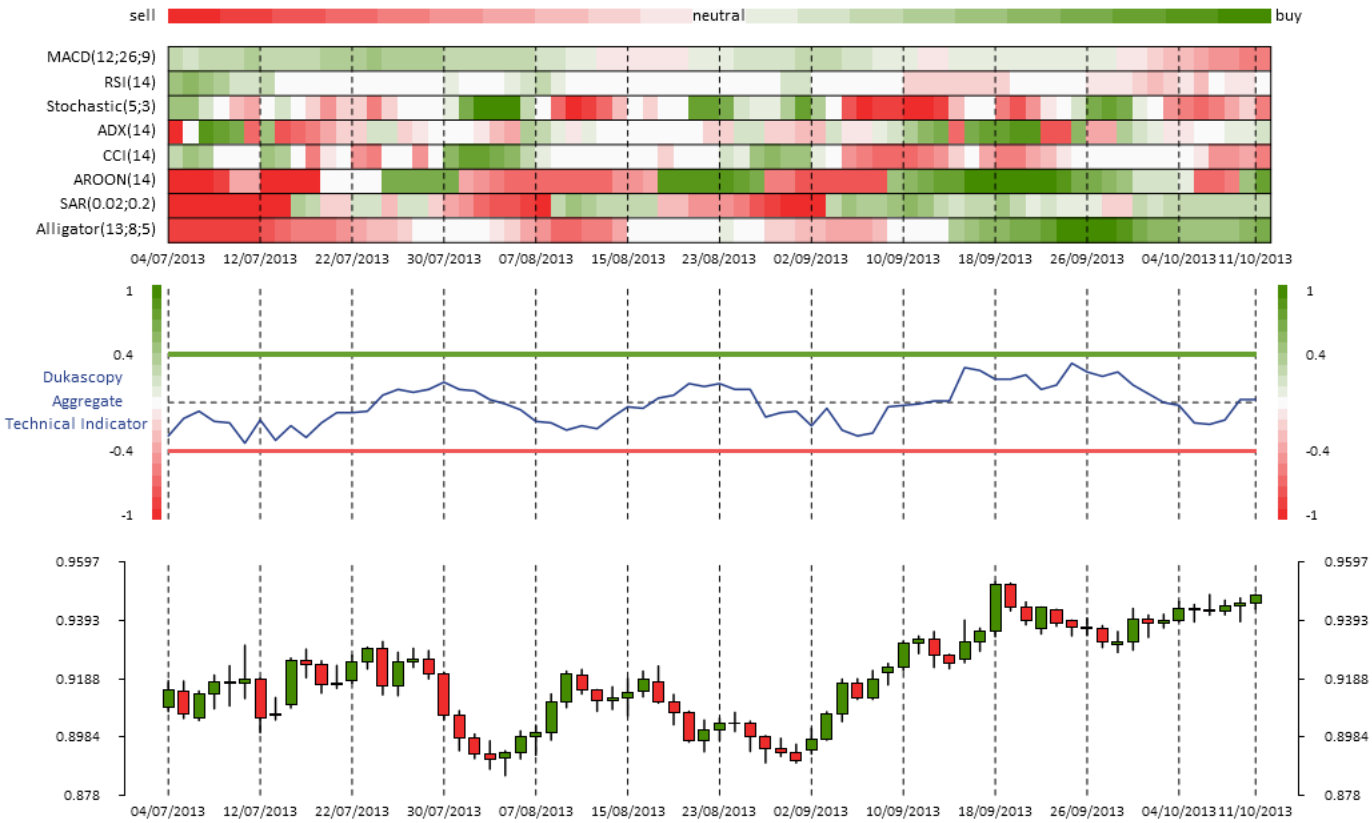
EUR/JPY

Daily chart



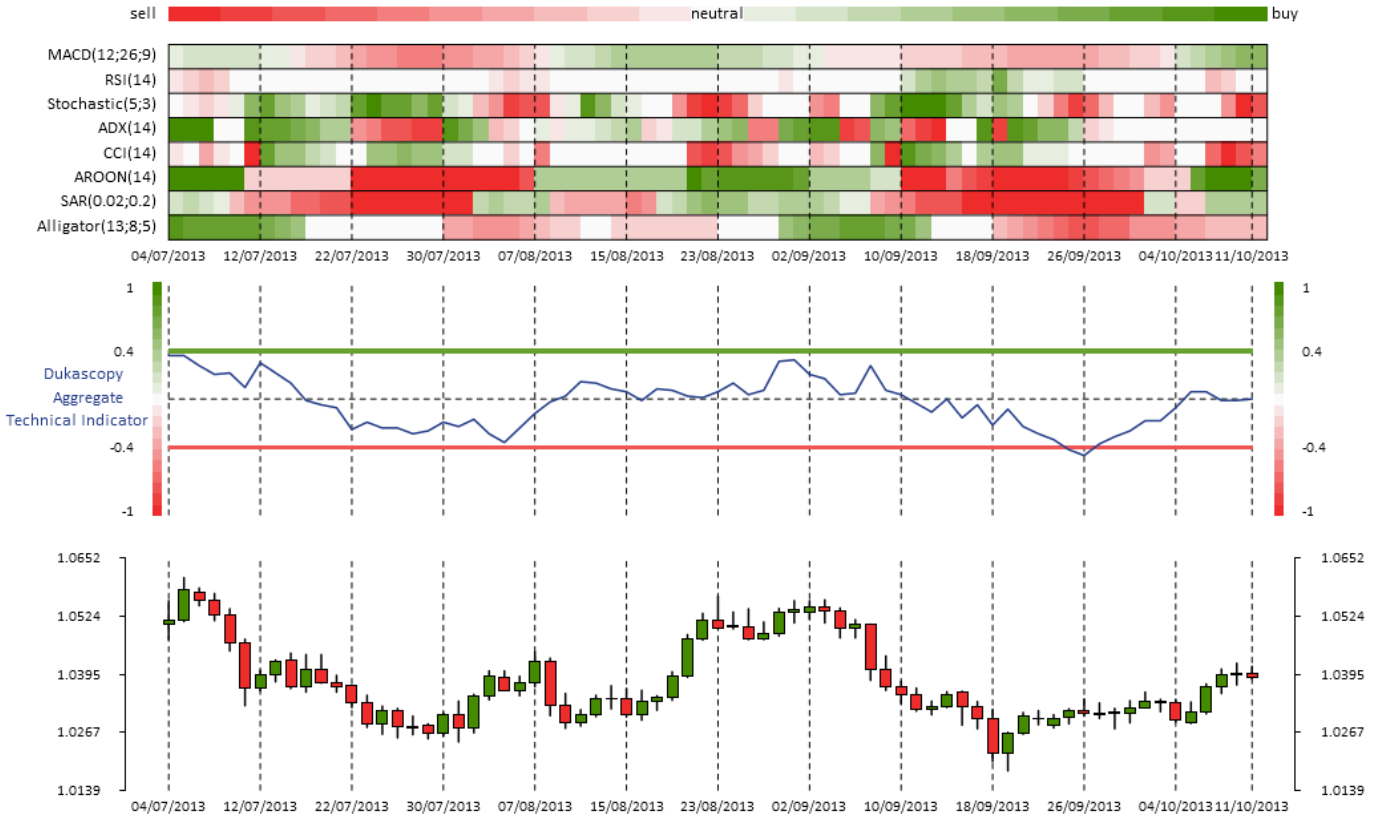
AUD/USD

Daily chart



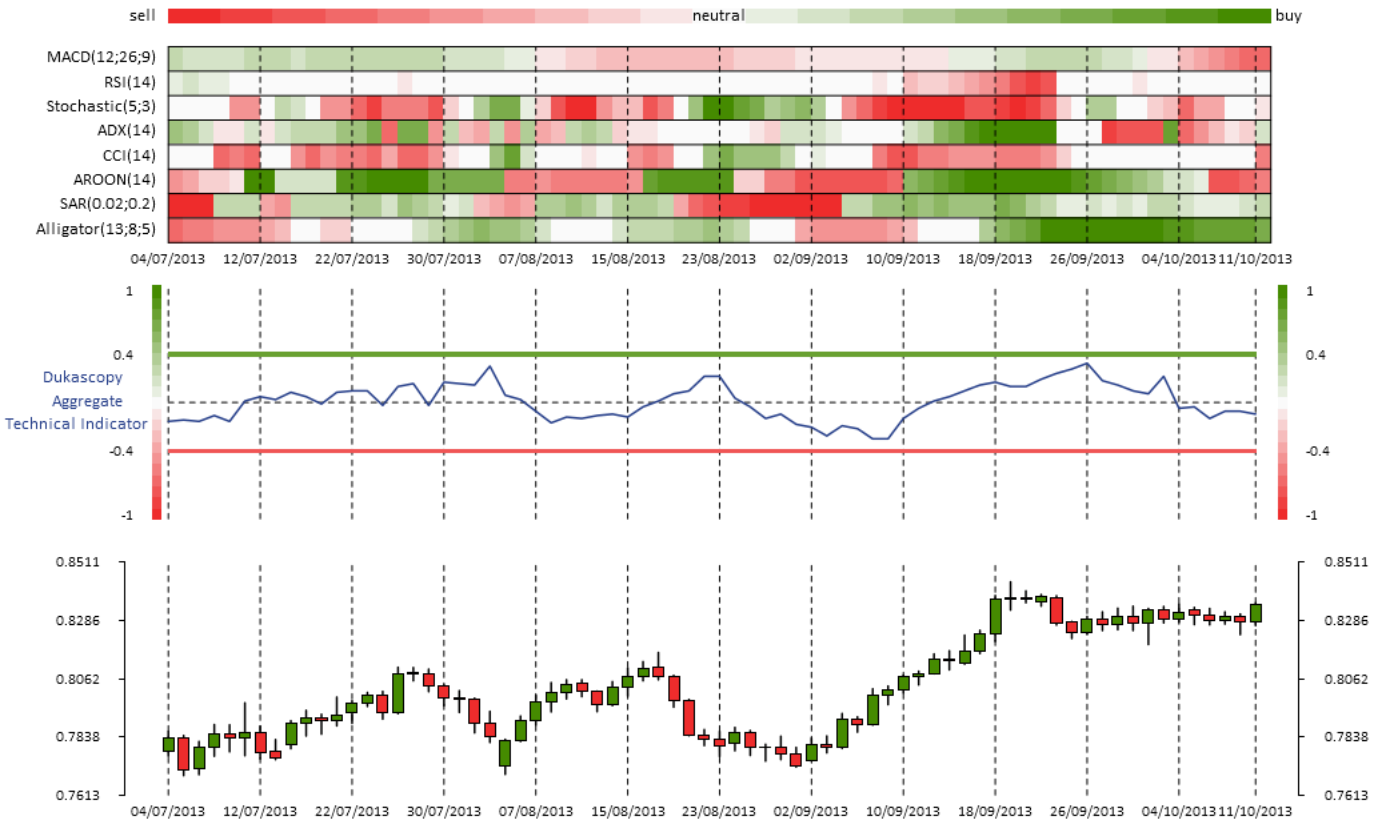
USD/CAD

Daily chart



NZD/USD

Daily chart



Economic Research

Rescaled Range Analysis

Rescaled range analysis, or RRA, is one of the many techniques used to examine and forecast the movements of economic indicators and financial assets. In contrast to various other methods, RRA can be applied to all kinds of data series regardless of their statistical properties. It can be viewed as a major advantage, as in most cases financial data does not meet the strict requirements of forecasting models.

In this research we examine the implications of RRA and the ways how to use the information it gives in practice.

In finance, *RRA* is used to study mean reversion and mean aversion in the process of price development. It is more commonly applied to stock market, but methodologically there are no restrictions against employing it for investigating exchange rates. Therefore we use *RRA* to try and classify the behaviour of two major currency pairs – EUR/USD and USD/JPY, - and two crosses – EUR/CHF and GBP/JPY. The datasets are formed from ten minute, one hour and one day candles up to August 2013.

Methodology

The main purpose of rescaled range analysis of a process is to estimate its Hurst exponent – a measure of the so called long-term memory. The notion of the Hurst exponent comes from an idea about dependence between certain characteristics of the process and a time span over which they are observed.

$$\mathbb{E}[\boldsymbol{R}(\tau)/\boldsymbol{S}(\tau)] = (\boldsymbol{C}\cdot\tau)^{\boldsymbol{H}}, \tau \to \infty,$$

where $\mathbb{E}$ is the probabilistic average, C is a constant, and

$$R(\tau) = \max_{1\le t\le\tau} X(t,\tau) - \min_{1\le t\le\tau} X(t,\tau),$$

$$S(\tau) = \sqrt{\frac{1}{\tau}\sum_{t=1}^{\tau}\left(\xi(t)-\bar{\xi}_\tau\right)^2}$$

$$X(t,\tau) = \sum_{i=1}^{t}\left(\xi(i)-\bar{\xi}_\tau\right) = \sum_{i=1}^{t}\xi(i) - \frac{t}{\tau}\sum_{t=1}^{\tau}\xi(t),$$

$$\bar{\xi}_\tau = \frac{1}{\tau}\sum_{t=1}^{\tau}\xi(t)$$

Parameter *S(τ)* is a common standard deviation, while *X(t,τ)* is a deviation from the mean, accumulated over time *t≤τ*. *X(t,τ)* can also be viewed as the deviation of the cumulative values of the process over *t* time periods from an average value for this number of periods. *R(τ)* is therefore described as a degree of deviation of cumulative values from their mean over time span *τ*. The quotient *R(τ)/S(τ)* is merely a normalization of *R(τ),* aimed, among other things, at producing a dimensionless quantity.

Taking the logarithm of the above formula yields the following result:

$$\log_2 \mathbb{E}[R(\tau)/S(\tau)] = H\cdot\log_2\tau + \log_2 C, \qquad \tau \to \infty$$

As in practice we can only deal with finite time spans a method has to be devised to approximate the value of *H.* One such method is the rescaled range analysis that is based on the idea of a simple linear regression.

A simple linear regression is a method for expressing the relationship between dependent variable *y* and independent variable *x* as a linear equation:

$$y = a \cdot x + c$$

The aim of the linear regression analysis is to estimate the unknown parameters *a* and *c*. One of the indicators of quality of the regression equation is R^2. It measures how well the equation explains the behaviour of the dependent variable. It ranges from 0 to 1.

In case of *RRA, y* and *x* are $log_2(R(\tau)/S(\tau))$ and $log_2\tau$, but the Hurst exponent plays the role of the unknown coefficient *a*.

To be able to perform the linear regression analysis, we need a set of values for both $log_2(R(\tau)/S(\tau))$ and $log_2\tau$. In *RRA* this is achieved by taking a set of values the process have taken over some period of time and consecutively dividing it into subsets as shown in Figure 1. The regression is then built using the values $(R/S)_i$, t_i, $i = 1,\ldots,n$.

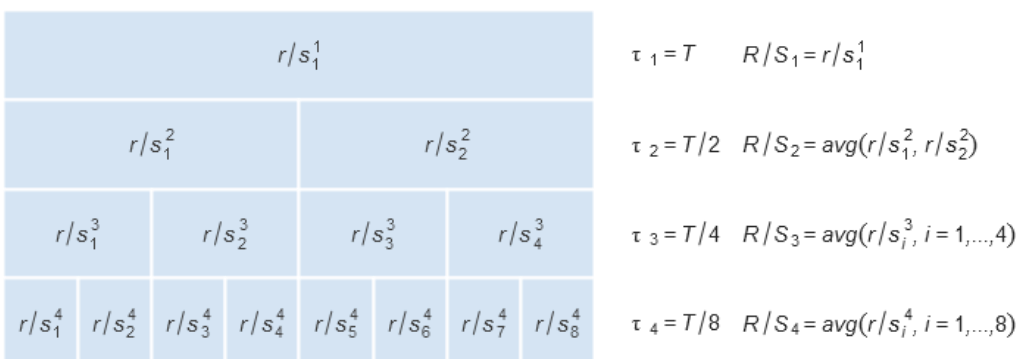


Figure 1: Dividing data into subsets for RRA

The last step of the rescaled range analysis is categorizing the process by the obtained value of *H*. As suggested by Figure 2, processes with *H* greater than 0.5 tend to follow long-term trends. That is, if the price was increasing during the analysed period, it is likely to increase during the future period of the same length. In contrast, processes with the Hurst exponent less than 0.5 are considered to be anti-persistent. A price on such an instrument tends to move back to some long-term mean, and the period of its growth is likely to be followed by the period of decline.

The Hurst exponent of 0.5 is believed to indicate a random process that has no distinct behavioural patterns. The observations in such a process are independent.

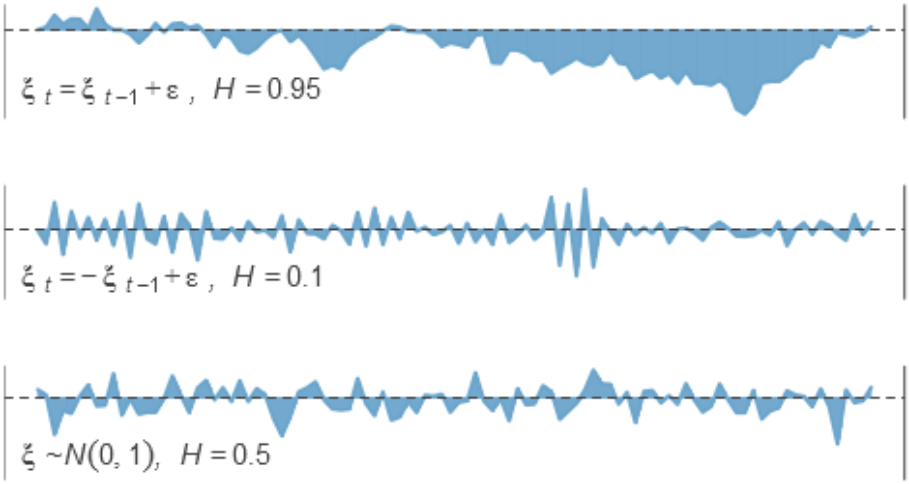


Figure 2: Mean-averting, mean-reverting and random processes. Their Hurst exponents

Despite the fact that *RRA* is most commonly used in its original form, some studies show that it tends to overestimate the value of the Hurst exponent and classify random processes as persistent ones. To see if such inaccuracy really takes place, we employ a modification to *RRA* that is said to fix the issue. The modification consist of defining a new variable, $log_2 H_t$, and using it instead of $log_2(R/S)(t)$ in regression analysis.

$$F(t) = \begin{cases} \dfrac{t-0.5}{t} \cdot \dfrac{\Gamma\left(\frac{t-1}{2}\right)}{\sqrt{\pi}\Gamma\left(\frac{t}{2}\right)} \displaystyle\sum_{i=1}^{t-1} \sqrt{\frac{t-i}{i}}, & t \leq 340 \\ \dfrac{t-0.5}{t} \cdot \dfrac{1}{\sqrt{t\frac{\pi}{2}}} \displaystyle\sum_{i=1}^{t-1} \sqrt{\frac{t-i}{i}}, & t > 340 \end{cases}, \quad \Gamma(t) = (t-1)!$$

To see if the theoretical classification corresponds to the actual behaviour of the exchange rates, we check what trends they followed during the examined periods. We determine the direction of trends by constructing the least-squares trend lines, and the strength of trends by calculating the values of ADX indicator.

Results

1. Modified *RRA* gives more accurate results for random processes.

The modification of *RRA* was originally developed to improve the estimation of the Hurst exponent for random processes. Therefore we test the methods on randomly generated normal distributions of different lengths.

Figure 3 shows that, while classical *RRA* on average overestimates the Hurst exponent, its modified version produces a slight underestimation. Such tendencies can also bias the results if the long-term memory of the process is not manifested strongly enough to overpower them. Therefore it might be useful to carry out a more complex analysis if the estimated Hurst exponent is in the range of 0.4-0.6.

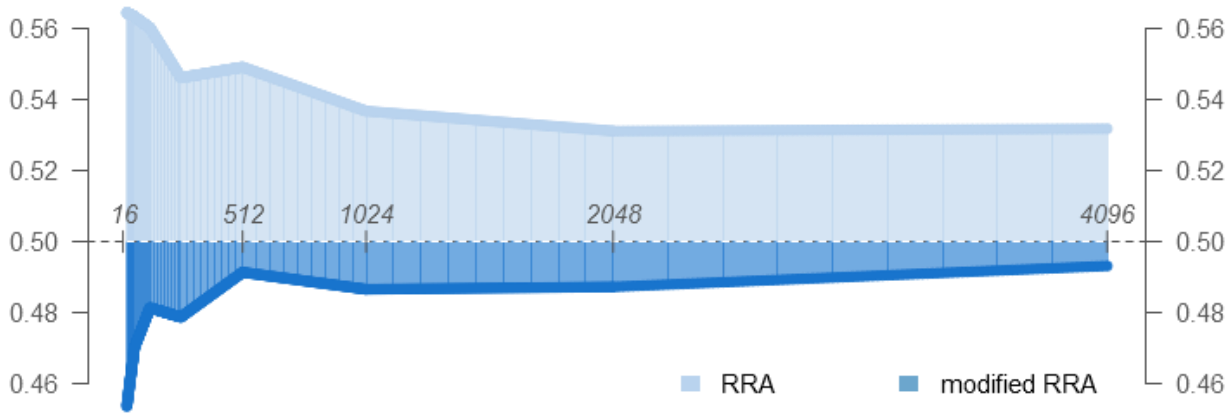


Figure 3: The relationship between the estimated values of the Hurst exponent of a random process and the number or data points

On average, however, the modified *RRA* proves to be more precise as it gives a smaller root-mean-square error than its classical counterpart – *0.107* against *0.132*.

It seems that the analysis of larger sets provides a more accurate estimate of the Hurst exponent. However, processing large amounts of data is time consuming. Moreover, it requires a long exchange rate history, which might not always be available. Therefore, as the results do not seem to differ dramatically for the sets with more than a thousand elements, for future analysis we set the maximal length of datasets to be *1024*.

To have a benchmark for future results we calculate the Hurst exponents for simulated data with known structure. The results are shown in Table 1. Here ε denotes a random component.

$\xi_t =$	$\xi_{t-1}+\varepsilon$	$-\xi_{t-1}+\varepsilon$	$0.6\,\xi_{t-1}+\varepsilon$	$-0.6\,\xi_{t-1}+\varepsilon$	$0.1\,\xi_{t-1}+\varepsilon$	$-0.1\,\xi_{t-1}+\varepsilon$	$\xi_{t-2}+\varepsilon$
RRA	1.02	0.06	0.63	0.45	0.49	0.57	0.85
m. RRA	0.96	0.01	0.57	0.39	0.44	0.52	0.79

Table 1: Autoregressive processes and their estimated Hurst exponents

2. RRA classifies all examined exchange rates as strongly trending.

We have performed both classical and modified *RRA* on *500* sets consisting of *1024* close prices. Table 2 summarises the results by providing some basic descriptive statistics.

	10-minute					1-hour					1-day				
	CI_-	avg	CI_+	st.dev.	R^2	CI_-	avg	CI_+	st.dev.	R^2	CI_-	avg	CI_+	st.dev.	R^2
EUR/USD	1.03	1.03	1.04	0.01	0.999	1.01	1.01	1.01	0.01	0.999	0.93	0.94	0.94	0.03	0.99
	0.98	0.98	0.98	0.01	0.999	0.96	0.96	0.96	0.01	0.998	0.88	0.88	0.89	0.03	0.991
USD/JPY	1.03	1.03	1.03	0.01	0.999	1	1	1	0.01	0.999	1.02	1.02	1.02	0.01	0.998
	0.98	0.98	0.98	0.01	0.997	0.95	0.95	0.95	0.01	0.998	0.97	0.97	0.97	0.01	0.997
GBP/JPY	1.01	1.01	1.01	0.01	0.998	0.96	0.97	0.97	0.03	0.995	0.99	0.99	0.99	0.02	0.999
	0.96	0.96	0.96	0.01	0.996	0.91	0.92	0.92	0.03	0.996	0.94	0.94	0.94	0.02	0.998
EUR/CHF	1.01	1.01	1.01	0.02	0.999	0.98	0.98	0.98	0.01	0.999	1.02	1.02	1.02	0.01	0.998
	0.96	0.96	0.96	0.02	0.998	0.93	0.93	0.93	0.01	0.999	0.97	0.97	0.97	0.01	0.997

Table 2: Statistical parameters for the results of RRA. "avg" denotes the average value of H, "st.dev." – the standard deviation of the value, but "CI_-" and "CI_+" are the lower and the upper bounds of the 95% confidence intervals

All the estimated values of the Hurst exponent are greater than *0.9*, which indicates that the examined currency pairs have a tendency to follow long-term trends. It is also important that the regressions used in estimation have exceptionally high R-squared values. It suggests that the prices tend to evolve with an even speed and in general have relatively minor fluctuations along the trend line.

According to the benchmark values discussed before, such high results reflect a strong direct relationship between neighboring prices. That, of course, is not a new result. It is a common practice to model the prices of financial instruments as so-called autoregressive processes, in which every new value linearly depends on the previous one.

However, crosses are sometimes referred to as range-bound currency pairs, so it is somewhat surprising that *RRA* does not classify them as mean-reverting. We have additionally examined these pairs with weekly prices, thus covering a broader timeframe, but received the same results. That is why it seems necessary to study the real behaviour of the exchange rates within the chosen periods and see if it fits the *RRA* classification.

To do that we look at *25* sets of *1024* close prices and calculate an average *ADX(14,9)* for each set. We then check if the high values of the Hurst exponent correspond to the high values of ADX. We also use only the modified version of *RRA* from this moment henceforth, as it proved to be more accurate for high values of the Hurst exponent.

	10-minute			1-hour			1-day		
	ADX	corr	%	ADX	corr	%	ADX	corr	%
EUR/USD	31.44	0.19	66.59	34.45	0.25	72.15	34.83	0.85	72.37
USD/JPY	32.41	-0.11	67.54	33.46	-0.55	66.68	35.63	0.21	71.91
GBP/JPY	33.3	-0.01	66.85	31.59	-0.44	58.81	33.9	0.14	72.83
EUR/CHF	31.95	0.46	69.13	35.49	0.61	74.72	35.02	0.91	76.9

Table 3: Comparison of the results of RRA and values of ADX. "corr" denotes correlation between Hurst exponent and ADX, "%" – percentage of cases, in which the values of ADX were above 25

All the observed average values of ADX range from *30* to *35*, indicating moderately strong trends. This matches the values of the Hurst exponent that remain above *0.9* throughout the whole examined period. In addition, the individual values of ADX rise above *25* in over *60%* cases, which also supports the implications of *RRA* results.

On the downside, there seems to be no clear picture of correlation between the values of ADX and the Hurst exponent. The coefficients vary in both significance and signs. One possible reason for such ambiguity is that the values of the Hurst exponent change within a range that is too narrow to allow for clear linear dependence. It can also mean that ADX defines the strength of a trend in terms that are not considered by *RRA*.

We also check if the high value of the Hurst exponent guaranties that the direction and the strength of an existing trend will last during a period in future, as the theory suggests.

Fairly good and frequency-dependent results are observed here. Ten-minute exchange rates with high values of the Hurst exponent appear to be unreliable in pursuing a clear linear trend, but they seem to preserve general strength of directed movement in over *60%* of cases. Daily candles, on the other hand, keep both linearity and strength most of the time. There is, however, only one pair – GBP/JPY, - that offers consistent results regarding correlation between current value of the Hurst exponent and the future level of ADX.

Even though rescaled range analysis of exchange rates does provide some insight into their behaviour, it does not offer much new information and in general goes in line with well-known financial assumptions. Therefore it seems more interesting to use *RRA* on currency pair returns that are often believed to be purely random.

	10-minute			1-hour			1-day		
	corr	% direction	% ADX	corr	% direction	% ADX	corr	% direction	% ADX
EUR/USD	0.72	40	100	-0.2	52	48	-0.34	84	100
USD/JPY	-0.18	36	88	-0.59	68	64	0.51	72	100
GBP/JPY	0.84	36	84	0.53	72	16	0.61	40	88
EUR/CHF	-0.55	4	60	0.84	16	32	0.38	76	60

Table 4: The relationship between current value of the Hurst exponent and future behaviour of the exchange rates. "corr" denotes correlation between Hurst exponent and future ADX, "% direction" is percentage of cases, in which the direction of the current trend coincides with the direction of the future movement, but "% ADX" – in which both current and future ADX are above 25.

3. RRA shows a direct relationship between time-separated returns.

To examine logarithmic returns, we used the same type of analysis we carried out for close prices. Namely, we averaged the resultant values of the Hurst exponent after applying the modified *RRA* to *500* sets of *1024* returns. The results varied from *0.44* to *0.52* for all currency pairs and all frequencies, indicating the randomness of the process. However, the results for logarithmic returns, calculated over multiple exchange rate values, showed a completely different picture.

We define an *n*-period logarithmic return as

$$\ln \frac{rate(t+n)}{rate(n)}$$

and use the same method for calculating average values of the Hurst exponent.

It appeared that the values of the Hurst exponent for *n*-period returns increase with an increasing *n*. That is, the multiperiod returns are not independent and tend to follow moderately strong trends.

It also appears that the Hurst exponent in this case is frequency-dependent.

For EUR/USD and USD/JPY lower frequencies seem to bring the values down, while for GBP/JPY the situation is the opposite. In addition, Figure 4 shows that on higher frequencies GBP/JPY and EUR/CHF have lower values of the Hurst exponent than EUR/USD and USD/JPY. It might indicate that there is, after all, a difference in the behaviour of major currency pairs and crosses.

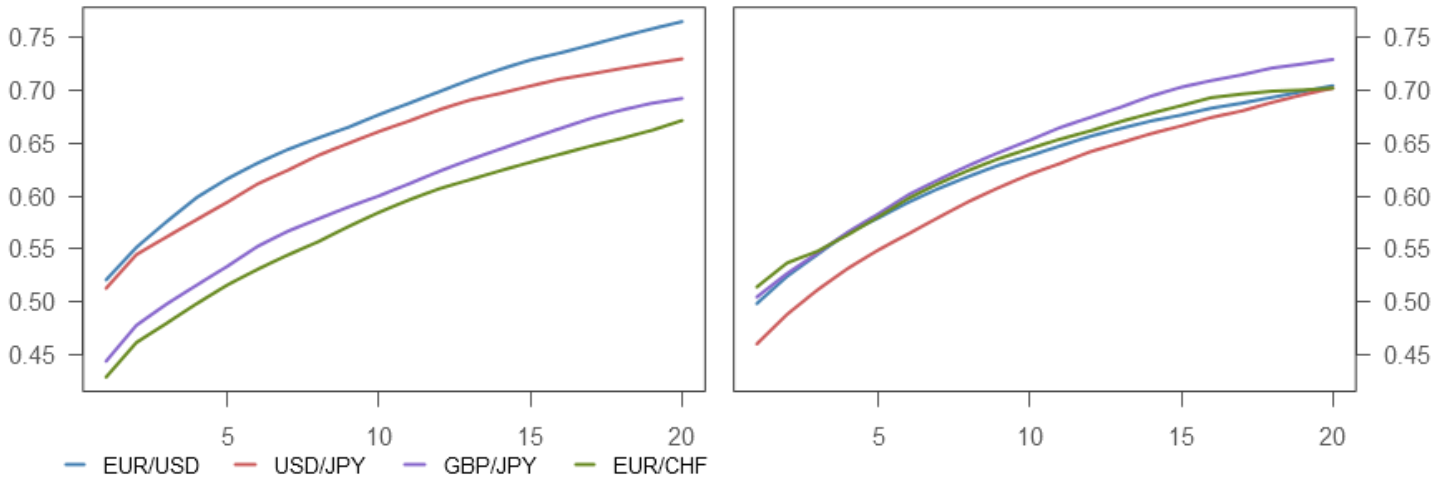


Figure 4: The relationship between the number of periods n and the Hurst exponent of the multiperiod returns by currency pair: a) one period equals one hour; b) one period equals one day

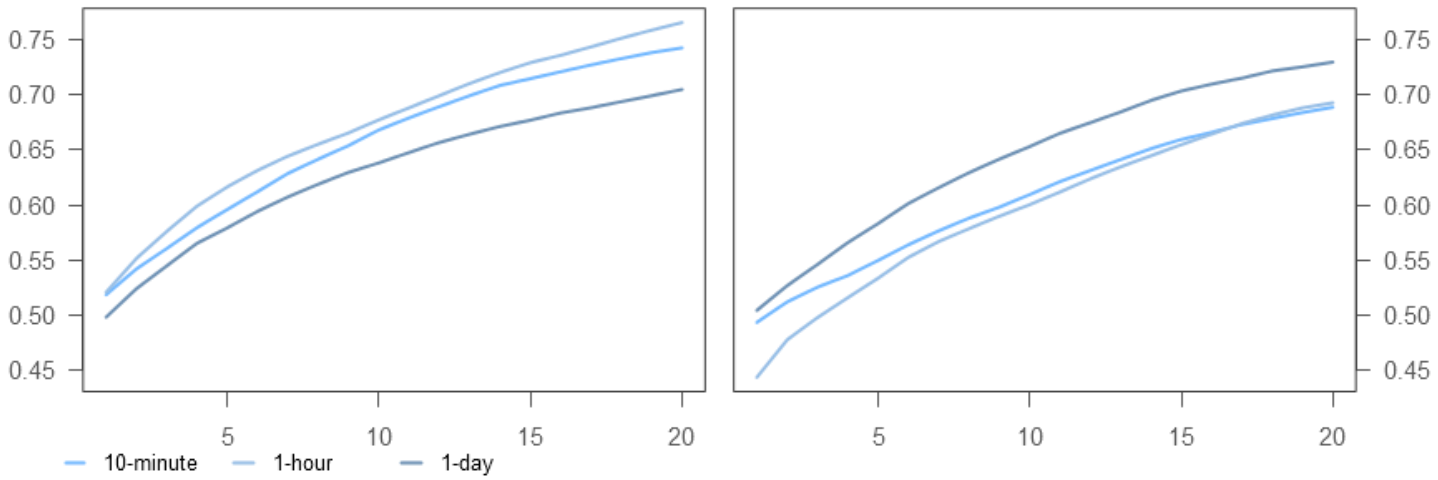


Figure 5: The relationship between the number of periods n and the Hurst exponent of the multiperiod returns by frequency: a) EUR/USD; b) GBP/JPY

Studies show, however, that the Hurst exponent can differ from *0.5* due to some exterior factors not connected to the long-memory effect. The method to check for such a possibility is to repeat *RRA* for scrambled data – a set in which the observations change places and are no longer consequent. If the resultant values of the Hurst exponent are close to the ones obtained from the original sets, the process is random. But if the new values range around *0.5*, the initial assumptions about the long-memory in the data are true.

We have carried out this additional test for the multiperiod logarithmic returns. All the obtained values varied from *0.4* to *0.57*, and there seemed to be no relationship between the Hurst exponent and frequency or the number of periods. This proves that the high values of the Hurst exponent for the multiperiod returns are not coincident and reflect the true nature of the process.

Conclusions

We studied two methods of estimating the Hurst exponent – the measure of long-term memory in a process. We saw that classical rescaled range analysis, which is one of the most commonly used means for estimating the parameter, and its modified version both have their own flaws. **Classical *RRA* proved to overestimate the Hurst exponent, while the modified method, on the contrary, produced underestimated values. However, modified *RRA* gave a lesser error of estimation, and thus seemed to be more accurate.**

All examined exchange rate had high values of the Hurst exponent, indicating a tendency to follow persistent trends. In most cases these high values were supported by relatively high ADX. We also saw that against the background of the high values of the Hurst exponent the existing trends most often preserve their direction and strength for some period in future. **However, the analysis of the exchange rates did not give any values of the Hurst exponent equal to or less than *0.5*, while there were plenty of cases of the small values of ADX. Therefore it is hard to make assumptions about a relationship between the results of *RRA* and more popular measures of describing trends.**

RRA provided some new insight into the behaviour of currency pair returns. **It appeared that there is a direct relationship between multiperiod logarithmic returns, and that it strengthens with increasing periods.** Results show that the sets of ten- and more period returns have a Hurst exponent high enough to classify them as persistent. This denies the pure randomness of the development of currency pair returns and suggests that there might be fairly efficient methods for modeling the returns and thus forecasting future moves.

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