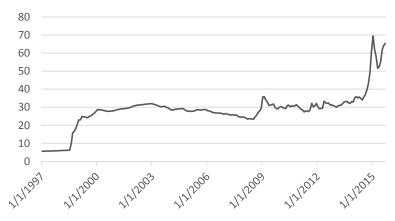Fin 412 Currency Report

The Unambiguously Confusing Story of the Ruble

Ruble depreciation Expected

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RUB/USD Exchange Rate

Russian Ruble vs. US Dollar (RUB/USD)	
Quote on Oct 23, 2015	61.81
52 Week High – Low	70.8867

Median Forecast	
1 year	71.67
3 year	81.12
5 year	85.51

Continued High Russian Inflation
Steep rise in Russian inflation to 16% due to sanctions and aggressive expansionary monetary Policy

Narrowing Interest Rate Differential
Expecting Russian rates cut to fight recessionary pressure and US rates hike given good economic data

Negative Russian GDP growth
Expecting -1.5% to 2.5% growth due to high inflation and debt, low confidence and capital investments within 2 years

Declining Russian Trade Balance
Significant decline in Russia trade balance due to sanctions, Chinese economic slowdown and declining oil prices

Stable Russian Foreign Reserves
Decreasing CBR intervention in path to free float, FX reserves staying constant around USD 340B

Brief Overview

We have seen the Russian Ruble depreciate by about 2.6% since the beginning of the year, a heavy improvement considering the almost 50% depreciation since October 2014. Historical 1-yr volatility stays above 20%, coming down from its 108% maximum at the beginning of January. The Ruble has seen a large devaluation since mid-2014, in part fueled by sanctions due to the Ukrainian crisis, structural issues with the Russian economy and the final abandonment of the Central Bank of Russia heavy intervention policy, which has held the exchange rate stable around 30 RUB/USD since the beginning of the millennium.

Despite continued trouble in the Ukraine, and an expectation of a first FED hike coming in 2016 (see table 2, and figure 3), we expect the Ruble to slightly calm down, and slowly depreciate over the next 3-5 years.

Inflation expected to ease

Triggered by economic and financial sanctions in response to Russia's invasion of Crimea in early 2014, Russia has seen a steep rise in inflation, rising from 8% to 16% over the past year. However, in accordance with the CBR and despite aggressive expansionary monetary policy over the past months, we expect inflation to level down to about 5% by 2018, as the lagging effects of the current recession will kick in. Meanwhile, in the US, inflation is still close to 0, indicating that the FED is hesitant to sharply hike in the near future (see figure 1).
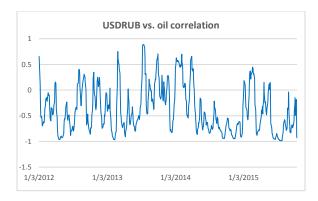
Interest rate differential expected to narrow

With the Russian yield curve currently inverted, markets are pricing in economic distress in the near future. On the other hand, the US curve is still relatively flat with the 3-month/30-yr spread below 3% (see figure 4). The current 3-month US/Russia differential is 10.39%, while the 20-yr differential lies at only 7.4%. An expected first 25 bps hike in June of 2016 after strong US economic data as well as a continued cut in the Russian benchmark rate in an attempt to fight recessionary pressures lead us to predict a

narrowing of the differential over the next few year.

An important factor to consider: oil

The Ruble is traditionally considered one of the strongest commodity currencies, due to its heavy economic reliance on oil and its peripherals as well as natural gas. Since the beginning of the year, the Ruble has developed a significantly negative correlation with crude oil, currently ranging between -0.7 to -0.8. The commodity has dropped over 50% since last summer, fueled by an extreme excess supply, in part caused by the OPEC countries. However, the recent resolution of the Iran conflict and its long-awaited entrance to the global oil market, as well an expected reduction in supply due to lagging effects from lower investments by extracting companies and refineries, lead to an expected rebound in oil prices over the next few years, reaching a level of $68/barrel by the end of 2018.

GDP growth: stable in the US, negative in Russia

In the US, record-low rates have had their fair share in spurring economic growth, with real GDP YoY growing 2.5% or higher since Q3 2014 (see figure 2). We forecast a slightly lower, but stable growth of 2%, in accordance with the FED, over the near term. In the meantime, the CBR's expansionary monetary policy has yet to show relief on real GDP growth, as inflationary pressures erode all potential upside. Hence, our forecast is in line with the consensus estimate and the CBR, and we see a further decline of Russian real GDP of between 1.5% and 2.5% in 2016.

This is partly due to high inflation, as well as deep structural inefficiencies that lead to low consumer and business confidence as well as unusually high leverage, personal debt and dangerously low capital investment levels (see figure 8). However, over the medium term, we see monetary policy effects kicking in, and GDP growing 1% in 2017 and up to 2% in 2018.

External sector – Trade Balance

The US trade balance remains largely negative and has decreased from USD -41.8B in July 2015 to USD -48.8B in August, due to 6.2% slowdown in exports after both China and Europe have faced continuous economic issues. Russia's trade balance, on the other hand, is still positive at USD 8.7B in August 2015, but has seen a steep decline since the beginning of the year, when it was around USD 15.5B. Due to economic sanctions, a global slowdown lead by China (Russia's biggest trade partner), as well as declining oil prices, Russian imports (-34.3%) and exports (-39.0%) have been declining significantly over the previous months. In the near future we expect the negative trend to continue for both the US and Russia, as China's growth continues to slow down, and Europe is fighting deflationary pressures.

External Sector – Foreign Reserves

In November 2014, the Russian Central Bank abolished its soft peg as well as automatic FX intervention programs. Up until that point, the Central Bank accumulated large amounts of Ruble reserves by selling up to $30B a month to maintain an exchange rate around 30 USD/RUB. Russia's FX reserves have therefore been historically high and volatile. Since late 2014, however, FX and gold reserves for Russia have stayed nearly constant at around USD 340B, indicating a strong reduction in the CBR intervention rate, and a slow path towards a free float (see figure 7). US Reserves have historically been robust as well, currently totaling USD 120B, but having dropped from its over USD 150B all-time high in mid-2012, indicating a controlled devaluation of the dollar against other G10

currencies after the crisis. Although we do not expect the CBR to undertake any major FX interventions over the next 2 years, controlled policies might be enacted if the Ruble devaluation becomes too severe.

Potential for Chinese contagion is limited

As China transitions from an export oriented economy to a more sustainable domestic consumption oriented economy, the slowdown in growth will have negative ripple effects across the world. Russia will be primarily impacted by the decline in commodities prices as China shifts away from manufacturing, demanding less of the basic resources and minerals. Additionally, Russia exports 14% of its oil to China and falling demand could pull prices down even further. By contrast, China is the US third largest export partner accounting for just 5.3% of total exports, causing a slowdown in demand to have a more limited effect on the US economy. The correlation between the Chinese and US stock markets is low to nonexistent. In fact a meltdown in Chinese financial markets will have limited contagion effects because foreigners own just 1.5% of shares. Furthermore, Chinese financial markets don't accurately reflect the fundamentals of the economy and just 1 in 30 Chinese people own stocks, therefore a meltdown won't necessarily hurt the average Chinese consumer.

Additional factors to look out for

- Unemployment is low in both the US and Russia, and we do not expect this to dramatically change in the near term, or impact the exchange rate significantly (see figure 5).
- An intervention of Russia in both the Syrian and the Ukrainian crisis might spur new international sanctions.
- Even though we expect Russia to slightly rebound, keep an eye out for credit re-valuations of Russia's Ba1 status. We do not expect this to have any major impacts in the near term.
- Presidential Elections in the United States in late 2016 should not produce

any turmoil in international markets and have virtually no impact on the USD/RUB exchange rate

Economic Forecasts

Table 1: Economic Forecasts

		2016	2017	2018	LT
US	GDP Growth	2.30%	2.20%	2.00%	2.00%
	Inflation	1.40%	1.70%	1.90%	2.00%
	Unemployment	4.80%	4.80%	4.80%	4.90%
Russia	GDP Growth	-0.75%	0.50%	2.50%	N/A
	Inflation	6.00%	4.00%	3.50%	N/A

Table 1 above shows forecasts for selected economic variables that will most likely affect the exchange rate in the near future. Consistent with our analysis, we expect Russia to recover over the next five years, while the US remains strong, on both an inflation and a GDP growth level basis.

Table 2: FED hike probabilities

Hike in	Probability of 25 bps hike
Oct	0%
Nov	16%
Dec	31%
Jan	44%
Feb	56%
Mar	72%
Apr	82%
May	96%

Table 2 above shows the currently priced-in probabilities of a first 25 bps FED rate hike until May 2016. The probabilities are implicitly calculated from Fed Funds futures contracts and show that the FED is expected to first hike in June of next year, in line with our expectations, and on track to give the USD another boost.

Exchange Rate Forecasts: APPP takes the lead

Date	APPP	RPPP	UH	UIRP	Oil
1 (2016)	75.15	204.73	73.02	**71.67**	53.64
3 (2018)	**81.12**	220.99	86.56	82.02	50.93
5 (2020)	**85.51**	232.95	99.44	89.91	N/A

Since all of our models showed regressive R^2 of around 5% as well as negative slopes, we decided to resort to qualitative factors to identify the most competent model in predicting the future USDRUB exchange rate. Due to successful back testing and the generally good predictive capabilities of the UIRP method over the past 8

years, shown by its high statistical accuracy compared to other models, we use the UIRP prediction for the 1-yr time horizon.

Over longer maturities, however, the APPP tends to show a good approximation for the general trend of the exchange rate, due to the underlying factors of the model. Since the APPP generally works better over longer horizons, and in environments characterized by high inflation (which has been the case in Russia over the past few years), we use the APPP prediction for both the 3 and the 5 year time horizon, which is in line with our predictions based on macro-factors that the Ruble will depreciate, but in a less extreme fashion.

Table 3: Regression Analysis

Coefficients	APPP	UIRP	UH	RPPP
R^2	0.091	0.047	0.011	0.020
Intercept	0.2498	-0.0048	-0.4451	0.7381
Slope	0.0881	-0.0052	1.7767	0.0406

We dismissed the oil prediction due to the high variability of the correlation between the exchange rate and the commodity. Even though the correlation has been highly negative over the past few months, it has changed dramatically over the past, which makes it a bad framework to estimate future exchange rates longer than 6 months.

Note: In general, all predictive models lack accuracy due to the fact that the CBR heavily intervened in currency markets until November 2014, thereby limiting the validity of past data to be used to predict future exchange rate trends, as the currency pair is getting closer and closer to a free float regime.

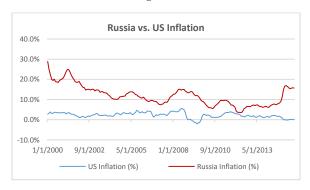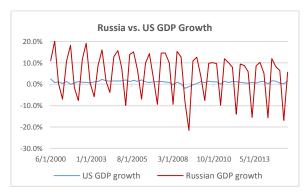# Appendix A – Graphical Analysis

Figure 1

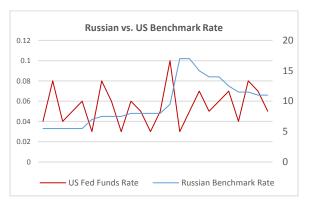### Russia vs. US Inflation
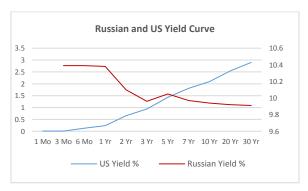

US Inflation (%) — Russia Inflation (%)

Figure 5

Russia vs. US Unemployment Rate

US Unemployment (%) — Russian Unemployment (%)

Figure 2

Russia vs. US GDP Growth

US GDP growth — Russian GDP growth

Figure 6

Russian vs. US Budget Surplus/Deficit

US Def/Sur % of GDP — Rus Def/Sur im % of GDP
US Def/Sur in USD Bil — Rus Def/Sur in USD Bil

Figure 3

Russian vs. US Benchmark Rate

US Fed Funds Rate — Russian Benchmark Rate

Figure 7

Russian FX & Gold Reserves

Figure 4

Russian and US Yield Curve

US Yield % — Russian Yield %

Figure 8

Construction works
Fixed capital investment
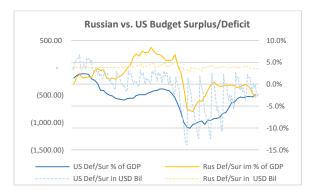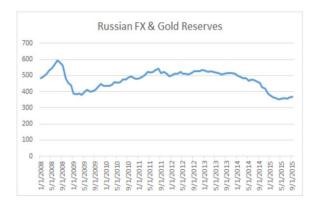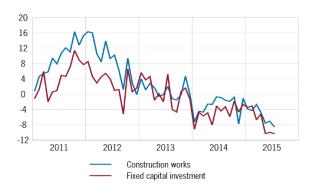
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Appendix B: Forecasting USDRUB exchange rate

Oil

The oil sector accounted for 16% of Russian GDP, 52% of federal budget revenue and over 70% of total exports. Consequently, we anticipated a significant relationship between the price of oil and the USDRUB exchange rate. After conducting a correlation analysis, the average monthly correlation over the past 1 year is -54%, over the past 3 years is -38% and over the past 5 years is -42%. Therefore the exchange rate is negatively correlated with the price of oil. Oil is currently trading at $46.29 and we expect it to appreciate by 26% through 2016 to $58 and by 49% through 2018 to $69. Given the former correlations and forecasted appreciation we foresee the USDRUB exchange rate, which is currently trading at 62.12, to change by -14% in 2016 to 53.64 and by -18% in 2018 to 50.93. Overall, we anticipate the Russian Ruble to appreciate relative to the US Dollar.

APPP

Our APPP and RPPP analysis required data on historical USD and RUB inflation rates along with actual USDRUB exchange rates. Using Bloomberg, we were able to obtain the United States Consumer Price Index from July 1993 to September 2015. From the CPIs, we were able to calculate monthly inflation in the United States using the formula $\pi US = \frac{CPI2 - CPI1}{CPI1}$. Using Bloomberg, we were also able to obtain actual ex-post monthly inflation rates of the Russian Ruble and ex-post actual USDRUB exchanges rates from July 1993 to September 2015.

For our Absolute Purchasing Power Parity (APPP) historical analysis we established July 2003 as a base month meaning we assumed the actual USDRUB exchange rate would be equal to the expected APPP exchange rate at that point in time. We used July 2003 as our base month because the USDRUB exchange rate from January 2000 to February 2006 remained relatively constant, hovering between 28 and 32 USDRUB. Thus, we believed it would be best to extrapolate our APPP estimates from the middle of this time period when USDRUB exchange rates were relatively less volatile.

We estimated APPP exchange rates using the formula $(1 + s) = \frac{1 + \pi RUB}{1 + \pi USD}$. The exchange rate in July 2003 was USDRUB 30.2591, thus the APPP estimate for August 2003 would be $S(Aug\ 2003) = USDRUB\ 30.2591 * \left(\frac{1 + \pi RUB(aug)}{1 + \pi USD(aug)}\right)$. Using our USD and RUB inflation data we were able to make APPP estimates of spot prices through September 2015. For every month before July 2003, we calculated the APPP exchange rate using the formula $S(t - 1) = \frac{St}{\left(\frac{1 + \pi RUB}{1 + \pi USD}\right)}$. For example the APPP exchange rate in June of 2003 would be given by the formula $S(June\ 2003) = \frac{USDRUB\ 30.2591}{\left(\frac{1 + \pi RUB(june)}{1 + \pi USD(june)}\right)}$. Using this method we were able to make APPP estimates from August 1993 to June 2003. We then created a graph that compared our APPP exchange estimates to the actual spot USDRUB rates from August 1993 to September 2015 (see figure 9). From these graphs we were able to use regression analysis to show the relationship between our APPP spot rate estimations and the actual ex-post spot rates (see table 3).

RPPP

We generated our RPPP estimations using the formula $StRPPP = K * StAPPP$. K is a constant that we established in August 1993. K is defined as $\frac{StActual}{StAPPP}$. Using this equation we established K as $\frac{.9925}{.36432} = 2.72$. We held this K constant from August 1993 to September 2015 to generate our RPPP USDRUB estimations. We then created a graph that compared our RPPP exchange estimates to the actual spot USDRUB rates from August 1993 to September 2015 (see figure 11). From these graphs we were able to use regression analysis to show the relationship between the RPPP spot price estimations and the actual ex-post spot rate (see table 3).

UH

The Unbiasness Hypothesis (UH) predicts that the future spot rate is a good and unbiased predictor of the future spot exchange rate [$E(S_{t+k}) = F_{t, t+k}$]. In order to test if UH is a valid theory pertaining to the USDRUB, data was gathered from Bloomberg for back testing. The spot rates of the USDRUB since 2010 was plotted against forward rates (see figure 12). The one, three, and five year forward data was used. After the information was gathered from Bloomberg, the spot was matched with the accompanying forward rates that matured within the same month. The graph below shows this. After the forward premium (or discount) was calculated along with the monthly change in the spot exchange rate. Both sets of data were run through a Regression model. The result showed that the R^2 calculated is 0.0111 which is fairly low and providing more evidence of the fact that the UH is not an accurate predictor of future spot exchange rates.

UIRP

The UIRP states that high interest rate currencies tend to depreciate to move back to an equilibrium state after high rates attract foreign capital. To analyze our predictions based on the Uncovered Interest Rate Parity Model, we calculated expected appreciation/depreciation rates using the following formula:

$$S_{(t+1, USDRUB)} = (i^{US} - i^{RU})/(1+i^{RU})$$

We used historical data for both 1 year, 3 year and 5 year Russian and US government bonds, as reliable LIBOR data was difficult to obtain for Russia. Using a time lag, we calculated the expected exchange rate based on the UIRP (which generally predicted a depreciation of the RUB due to higher interest rates in Russia) and compared it with the actual appreciation over the following month to assess the model's predictive capabilities (see figure 10). We found a close relationship, however, like our other models, a regression showed a low R^2 as well as a negative slope.
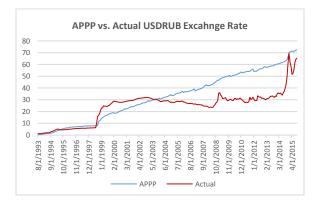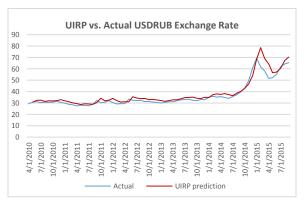
Figure 9

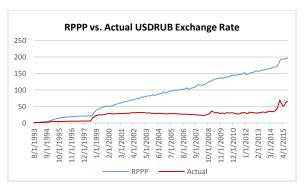APPP vs. Actual USDRUB Excahnge Rate

Figure 10

UIRP vs. Actual USDRUB Exchange Rate

Figure 11

RPPP vs. Actual USDRUB Exchange Rate

Figure 12

UH vs. Actual USDRUB Exchange Rate

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