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NON-KEYNESIAN SAVINGS OF RUSSIANS[2]

The Russian recession of 2014-2015 began with a run on the ruble and a rise in the rate of inflation, the precise opposite of a Western-type deflationary slump combined with money hoarding. Does this mean that Russians need different micro-model to describe savings and consumption behavior?

This study shows that the workhorse log-linearized rational SDF formula with the CRRA utility function still provides a good explanation for the behavior of Russian consumers. It explains dollarization, domestic equity market avoidance, preference for real estate, and, most importantly, a wary attitude towards the ruble.

Expectations derived from past and interactive preferences lock the Russian economy in a state of steadfast distrust in the ruble as prone to inflation. At present, one should not expect a Keynesian-type deflationary cycle in Russia. The next recession is likely to be inflationary, requiring monetary tightening.

This reasoning is generalized for other emerging countries. A free-floating currency and inflation targeting do not ensure an easy path for countries with recent experiences of high inflation.

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Introduction

Russia is currently enduring its second recession since it returning to steady growth in 2000s. The ultimate causes for this recession are the Ukraine affair, Western sanctions, and the drop in the price of oil. At the outset of this cycle Russia displayed all the attributes of a modern developed national economy: an independent central bank, a free-floating currency, and official inflation targeting. Nonetheless, the economic cycle in Russia seems very different from that of other countries in the developed world.

The recent global financial crisis broadly supported the Keynesian explanation for the economic cycle in the developed world. The Keynesian explanation is as follows: some shock (i.e., the financial shock of 2007-2009) causes the private sector to cut back spending, which induces a higher level of demand for precautionary savings in the economy. This leads to the "paradox of thrift," namely, a glut of entities running financial surpluses. At the same time there is a lack of entities willing to run financial deficits. High demand for precautionary saving leads to relative appreciation of non-risky monetary assets, including cash. This leads to a deflationary recession. The remedy, of course, is budget expansion, clearing of the financial market via the interest rate channel, and possibly increasing the supply of cash (see Krugman [2012]; Eichengreen [2015])

The ongoing Russian recession seems very different. The Ukrainian affair provided the initial shock for the private sector in 2014 and 2015. But instead of cutting buck and increasing demand for monetary assets, Russians did the opposite. The private sector fled from the ruble, and frantically increased purchases of housing and consumer goods. This caused a burst of inflation and a collapse in exchange rates. The Bank of Russia had to react drastically hiking the key interest rate from 5.5% to 17%[3]. This effectively stopped the run on the ruble, but killed investment activity in the country and ignited a recession. In a sense the Russian recession of 2014-2015 is more similar to US "Volker shock" of 1981-1982, when the Federal Reserve moved its target rate up to 20% (see Eichengreen [2012]) than to the more common type of recession in the developed world.

Of course, there are other important explanations of the crisis in Russia, including the sudden stop induced by Western financial sanctions, uncertainty about government policy, and institutional weakness. There are exchange rate spillover effects, global factors like the price of oil, "taper tantrum," and the slowdown in emerging markets. But I believe the main mechanism behind the

[3] See: http://www.cbr.ru/Eng/DKP/print.aspx?file=standart_system/rates_table_14_e.htm&pid=dkp&sid=ITM_7116

inflation and interest rate hike was the response to the private sector's run on the ruble. Thus I believe that a description of private sector actions is necessary for a diagnosis of current macroeconomic conditions. This description will imply very different policy actions.

Understanding the behavior of economic agents has been the starting point for overall macroeconomic modeling since Lucas [1976] published his "critique." Clearly, economic actors have expectations that change over time in response to their recent experiences and changes in their information and beliefs. This in turn creates structural shifts in macroeconomic functioning. Lucas called this "adaptive forecasting," and argued that history matters. He stated that microeconomic analysis must provide a foundation on which "secondary" and dynamic macroeconomic theory can be constructed.

The key research question I wish to explore is how Russian economic agents form their consumption and saving decisions. Why did they run from their own currency in 2014-2015? Can this behavior be explained by the existing microeconomic framework using the "Euler equation" together with expectations derived from history?

One might think that Russia, and possibly other developing countries, needs a special economic theory distinct from that applied to the developed West. This idea seems plausible given the opposite behavior of macroeconomic variables in Russia's case. Recession in Russia leads to inflation rather than deflation, and increases in the interest rate by the central bank rather than easing of credit. These differing observations make it tempting to conclude that either Russian economic agents or Western economic agents are irrational. Why is it that the former run from domestic cash and the latter hoard it?

This inquiry shows that the rational expectation and Euler equation framework is sound, and remains relevant in the Russian case. The difference in agent reactions comes from settings of the micro-model, namely, different histories which further shape savings decisions. This exercise in this article will allow us to build a macroeconomic theory and predict future behavior of the economy, as well as form regulatory prescriptions.

Savings decisions are inversely related to consumption decisions. So another goal of this work is to explain the attitude of Russians towards all major asset classes, including dollar, housing, stock market and nominal ruble assets. Why is there dollarization in Russia? Why do Russians shun their domestic stock market and prefer real estate?

The poll conducted by WCIOM[4] at the end of 2014 shows how Russians view their savings options. The most powerful motive is precautionary saving, that is, the desire to smooth consumption (see Fig. 1). Rainy-day considerations, including job and health safety concerns, account for 70% of a total sum of 166% (up to 3 answers were allowed, so percentages do not add up to 100%). The most popular answer – "for buying housing" – is 33% of the total. This may be considered a precautionary motive, corresponding to the need for shelter. Saving for the sake of additional income – i.e., earning interest – is the least popular answer, comprising only 2% of total responses.

Clearly precaution is the main motive for saving, and this is likely related to the trauma of the 1990s. In the last months of the Perestroika years, there was widespread deficit and real fear of hunger. At that time, the West sent humanitarian aid to Russia in form of food and clothing. Badly implemented reforms, hyperinflation and "shock therapy" in 1992-1993 wrought havoc in the economy. In the '90s, average real disposable income in Russia was reduced almost by half, including a 47.5% drop in the single year 1992 alone. Real wages fell by approximately two-thirds (see Data section). Thus the 10 years from 1990 to 1999 were the ultimate "rainy days".

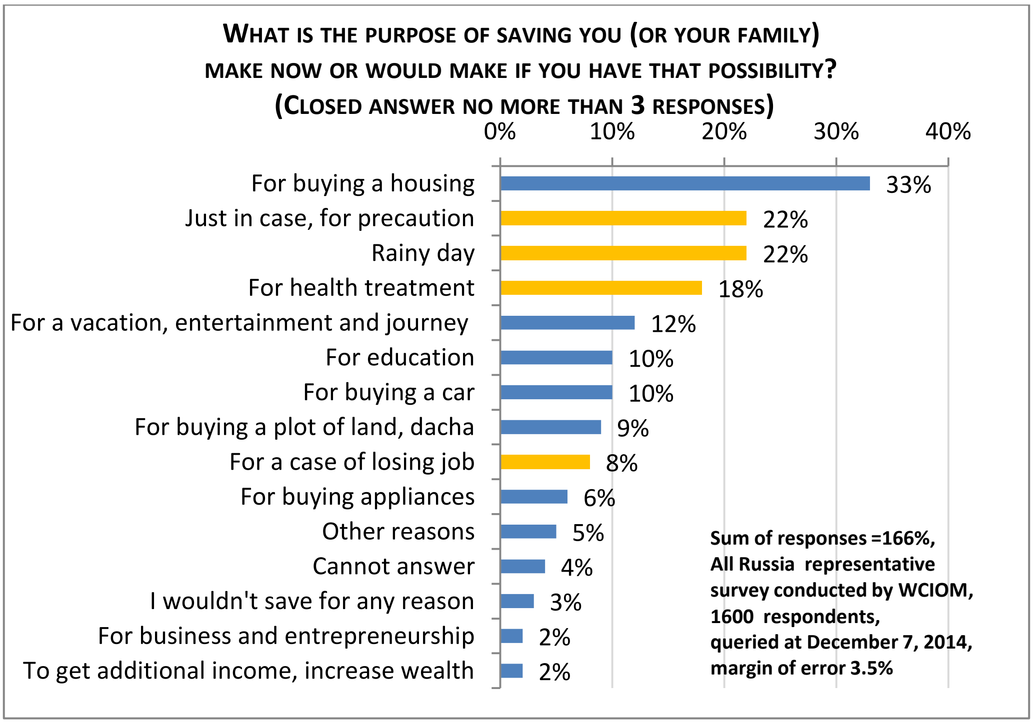

Fig. 1. Saving motives according to a survey in Russia conducted by WCIOM on Dec. 7, 2014

[4] Survey conducted by Russian Public Opinion Research Center (WCIOM) all over Russia, with a pool of 1600 individuals, and a margin of error lower than 3.5%. URL: http://wciom.ru/zh/print_q.php?s_id=996&q_id=68524&date=07.12.2014 (in Russian, accessed 15.06.2015)

The history of monetary policy in New Russia was also dismal. The population of the USSR had decent savings in accounts with the state bank (now Sberbank), or in the form of paper cash. Soviet savings were partially the result of the goods deficit. There were almost no other assets to preserve wealth. Holding foreign currency, including the dollar, was a criminal offense and harshly punished.[5]

In March of 1991, the government of the USSR froze the bank deposits of the general population, in a decision dubbed "Pavlov's reform," after then-prime minister Valentin Pavlov. Old banknotes were declared illegal and had to be exchanged for new bills, with drastic limits per person. On April 1, 1991, state-regulated retail prices were raised by 200-300%. Price levels in 1991 increased by 270%. At the beginning of 1992, deposits in the state bank were still frozen, but prices were finally liberalized by the so-called "Gaidar's reform," which resulted in an increase of prices over 1992 by a factor of 26. Soviet savings were gone.

Cash dollars became available to the public starting in the summer of 1992, when the exchange rate market was liberalized and it became legal to hold foreign currency. The Russian government allowed the privatization of state-owned apartments, which created a housing market in 1992-1993. Voucher privatization and an organized equity market appeared in September 1995.

Russia has now had a market economy for 23 years, and has a nearly twenty-year history of major asset returns. On this basis, I will examine 1) nominal ruble assets in form of fixed income claims (deposits and obligations), 2) domestic equities, 3) housing and 4) foreign currency (dollars, euros) in cash form or held in banks. The main goal of this paper is to describe the attitude to those assets of Russian economic agents using the Euler equation framework.

This work has a range of implications, from asset pricing issues to macroeconomic policy. The main result is an explanation of how Russian agents see their savings in rubles, dollars, equity and real estate. I also show why the ruble is risky and why there was a run on the domestic currency in 2014-2015. Interactive Nash-like preferences leave open the possibility of further runs on the ruble and continuing instability in the Russian currency. This also means that the business cycle in Russia is not, and likely will not be, Keynesian.

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[5] Article 88 of Criminal code of the Russian Soviet Federative Socialist Republic included punishment up to the death penalty for non-official foreign currency "speculation" (exchange).

Another finding is an explanation of why Russians don't buy their own equities – Russian equity market is too risky for consumers to hold, given the covariance with the consumption. Housing is considered by Russians as the best investment. The Euler equation is able to explain this result.

This paper contains a review of literature, a description of the model, a data description section, and a results section. A discussion section concludes the paper.

1. Literature review

The business cycle in emerging markets is different from that in the developed world. Copying best practices and institutional arrangements from the West cannot provide the desired macroeconomic outcome, explaining the "fear of floating" described by Calvo and Reinhart [2000]. There is even the question, posed by Eichengreen [2002], of whether inflation targeting and a free-floating currency is suitable regime for an emerging country. There is supporting empirical evidence from Sokolov et al. [2011] that non-industrialized countries are better off pursuing a currency peg. This paper finds that industrialized emerging nations pursuing a free-floating currency have lower output variability, but higher inflation.

There are several problems with the free-floating currency required by inflation targeting. These include high pass-through, the difficulty of forecasting inflation, liability dollarization, and lack of credibility in monetary and fiscal policy. Devereux et al. [2006] add to these list institutional weaknesses which create moral hazard problem.

The main problem obviously is high pass-through, which leads to high variability in inflation. If the central bank is strictly following an inflation targeting mandate, a drastic interest rate response may be required to fulfill its inflation targeting objective. This in turn leads to high output fluctuations. Thus an open emerging economy, susceptible to commodity or foreign financial shocks, may not be able to attain its inflation targets without compromising the stability of its real economy.

What is the source of the high pass-through problem? Eichengreen [2002] explains that history of inflation led to habitual "formal indexation." Another explanation is that liability dollarization results in producers passing costs on to their customers. But the main reason is the low credibility of inflation targeting in emerging markets. In case of a shock, the central bank may be willing to compromise its inflation target for the sake of financial stability or to emerge from the depths of a recession.

The goal of this work is to show the micro-mechanisms behind the pass-through and credibility problems. Expectations derived from past lead to individually rational decisions of buying foreign currency and consumption goods. A shock thus means extra demand for foreign currency and acceleration of demand for consumption goods. This in turn means a depreciation of the domestic exchange rate and a rise in prices.

Imagine some economic agent trusting in the credibility of a monetary regime. She knows, however, there are many other agents who don't, and that their purchases are going to increase inflation. It is rational for her to exchange her domestic cash for goods and/or for foreign currency. This effectively locks in societal distrust of the monetary authority. Such preference interaction creates the conditions for a currency run. And that explain the origins of high pass-through.

How do economic agents form their decisions? Attanasio and Weber [2010] gave a review of the vast literature on consumption and saving. Before the '50s there was only the "fundamental psychological law" of J. M. Keynes, which buttressed the idea of marginal propensities to consume and to save within ISLM- type models. Then empirical data started to accumulate and the literature became more micro-oriented.

Theories of savings and consumption decisions usually operate by assuming rational optimizing behavior over time (although behavioral economics represents a detour from this assumption). This assumption is the heart of stochastic finance models in asset pricing theory as well. Usually the Euler equation, which appeared for the first time in literature in Hall [1978], is used.

This approach is useful, as it created a vital bridge between economic variables and asset prices. A survey of stochastic finance and consumption (or intertemporal) asset pricing models (CCAPM) may be found in Lustig and Guvenen [2007]

Settings of the model start with the presumption that the consuming agent (under the usual assumption, the entire population) at time t is maximizing expected utility for next periods i over time horizon T-t, subject to its budget constraints and current information set. The end time T may be assumed to be infinite if one considers a "perpetual" consuming agent like a family or enterprise:

$$\mathrm{Max}\ E_t\left(\sum_{i=0}^{T-t} e^{-\rho i}\, U_{t+j}(C_{t+j})\right) \tag{1}$$

C is consumption, U is time additive utility, and $\rho \geq 0$ is the subjective instantaneous rate of time preference, which we further assume to be constant over time and which characterizes the impatience of the agent. In the Bellman equation an agent subject to available information set at the start of every each period t decides on whether to invest in some asset with net return R or to consume. The usual maximizing first order condition gives the so-called Euler's equation.

$$U'(C_t) = e^{-\rho} E_t(U'(C_{t+1}) * (1 + R_{t+1})) \quad (2)$$

Net asset return for a period is denoted as $R_{t+1} = X_{t+1}/P_t - 1$, where P_t is the price at the beginning of the period and X is the expected payoff. It is common to use the power utility function (also known as the iso-elastic utility function, the constant relative risk aversion function, or simply CRRA):

$$U(C) = (C^{1-\gamma)} - 1)/(1 - \gamma) \quad (3)$$

In this function, $\gamma > 0$ is the elasticity of marginal utility, which is also known as the coefficient of relative risk aversion. The bigger the risk aversion γ, the more risk averse is the agent. Plugging (3) in (2) and solving it gives the following standard stochastic discounting factor (SDF) formula[6]:

$$1 = E_t(m_{t+1} * (1 + R_{t+1})) \quad (4)$$

In this function m is known as the stochastic discounting factor, or pricing kernel, and is defined as:

$$m_{t+1} = e^{-\rho} (\frac{C_{t+1}}{C_t})^{-\gamma} \quad (5)$$

There is a simple and useful analytical derivation in *unconditional* form, described in Campbell et al. [1997 p. 294] . Below, I skip time indices for the sake of simplicity:

$$1 = E(m * (1 + R)) = E(m)E(1 + R) + Cov[m, R] \quad (6)$$

This allows the expression of an unconditional formula for the expected return of any asset. This form gives a clear definition of risk:

$$E(1 + R) = \frac{1 - Cov[m,R]}{E(m)} \quad (7)$$

In this form it is clear that the pricing kernel $m=e^{-\rho}(C_{i+1}/C_i)^{-\gamma}$ becomes high when consumption falls. If an asset tends co-vary positively with consumption, then it has negative covariance with marginal utility. Such an asset is risky. The higher the correlation, the greater the expected return for the asset

[6] There is another useful derivation of price of any asset as a function of pricing kernel and expected return: $P_t = E_t(m_{t+1} * (1 + X_{t+1}))$

has to be in order for the agent to hold that asset. If some asset tends to rise in the states of the world with low consumption then this asset deserves negative return.

An asset which preserves its value in times of decreased consumption is not risky. Cuthbertson and Nitzsche [2005, p. 303] wrote: “This is because they can be ‘cashed in’ at a time when they are most needed, namely when consumption is low, and, therefore, extra consumption yields high marginal utility.” Ilmanen [2011] shows that, indeed, historical returns of different asset classes in the US may be explained by their price behavior in “bad times” (major recessions). Thus the whole CCAPM framework seems broadly to offer a good description of reality.

A review of the empirical performance of CCAPM may be found in Guvenen and Lustig [2008] and it is clear that the model does not quite fit historical data. A number of “puzzles” exist which a researcher trying to apply the model (as this paper does) must address. Mehra and Prescott [1985] were the first to discover the Equity Risk Premium (ERP) puzzle. The excess return of equities over T-bills (i.e., the ERP) in the US historically runs close to 5%. This is too high to be justified by using a reasonable estimate of risk aversion. Even if one is willing to accept this huge aversion coefficient, then according to Weil [1989] he or she is going to encounter another puzzle – an excessively low risk free-rate. This was dubbed the “risk-free puzzle.”

Nada [2013] provides one of the recent reexaminations of literature on the equity premium puzzle. She correctly points to the widely understood dilemma of historical versus expected returns and “ex-post” and the expected “ex-ante” risk. Expectations within the pricing kernel are not observable and may be different from their historical realization. Her conclusion is that the “puzzle is yet to be solved.”

Those puzzles arise in tests using data from developed countries. The problem is that the historical volatility of consumption is too small. For example, the standard deviation of yearly consumption in the US is close to 2% (see results section, Table 1). There are, broadly speaking, two ways to solve puzzles – habit formation models and the “rare disasters” approach.

Habit formation models present the utility function as a fraction or as a difference of consumption with some level which is called “habit”. As an example, the SDF with the CRRA utility function becomes the function $e^{-\rho}[(C_{t+1}-H_{t+1})/(C_t-H_t)]^{-\gamma}$, where H is “habit”. Another variant of habit models is the ratio $e^{-\rho}\ [(C_{t+1}/H_{t+1})/(C_t/H_t)]^{-\gamma}$. This approach to utility effectively “leverages” the volatility of marginal utility and helps to reduce the magnitude of the ERP puzzle.

Habit can be endogenous and exogenous in the consumption model. Endogenous habit is usually determined as some customary level of consumption, based, for example, on average levels from the recent past. Another variant is the agent's expected income. This idea correlates to the permanent income hypothesis. The interesting feature of such an approach is that it creates variables for risk aversion depending on income levels. This may possibly shed some light on cyclical behavior in the economy. An exogenous source of habit may be some reference level of consumption, for example, of some neighbor. This type of model is known as "keeping up with the Joneses."

A more interesting solution to the puzzle is the "rare disasters approach," initially proposed by Rietz [1988]. Rietz introduced low-probability, not-in-the-sample, depression-like events in the usual income generating process, and showed it is possible to have a high ERP and a low risk-free rate simultaneously with low risk aversion. He achieved this result with a drop in economic output owing to an expected event with 1% probability of occurring. His work was dismissed and forgotten on the premise that it is unlikely for events to have disproportionate effects on equities but not on risk-free assets; see for example Campbell et al. [1997]. Weil [1989] maintained that Reitz's solution was "absurd."

Lately Barro [2005] revived this idea again, and proposed a model with two distinct and low-probability events. The first one is the same depression-like event, leading to a huge drop in consumption. Barro showed that many developed and developing countries had historically endured such events, which were much worse by magnitude than the US Great Depression.

To the other kind of low probability event he gave the unfortunate name "the end of the world." There are difficulties in how exactly to conceive of this "end," because it makes the whole infinite consumption optimization task within the Euler equation rather dubious. But Barro employs another definition, "default," meaning complete loss of equity and risk-free assets (the latter, of course, becomes no longer risk-free). One may think of such an event as a revolution, major economic catastrophe, or a war.

Introducing negative tail events allows for greater variation in marginal utility in the lower side. This helps to explain equity premium. At the same time the risk of complete loss in a default event keeps risk-free assets in positive territory.

Expected probabilities of tail events vary with the economic cycle. This explains the phenomenon of low interest rates during wars and depressions. Barro's model is also able to explain the huge volatility in equity prices, possibly solving Shiller's [1981, 2005] "volatility puzzle." Allowing for not-in-the-sample tail events in financial models has a long tradition, starting from the "peso problem" critique of Krasker [1980].

Rietz - Barro seems to be the best solution for the ERP puzzle at present, and is receiving some recognition (see Guvenen and Lustig [2008]). The rare disaster approach fits the history of modern Russia well. There is no need to imagine out-of-sample catastrophes; Russian history supplies its own wars, defaults, depressions and drastic variations of income.

In conclusion, the attempt to fit the Euler equation describing savings and consumption decisions to data is fraught with difficulties. But this approach remains the main workhorse in micro and asset pricing. The branch of literature on emerging country business cycles distinguishes the problem of high pass-through and connects it to insufficient credibility. Explanations of the source of this tenuous credibility are lacking.

This paper aims to show that the application of the Euler equation provides a different view. The high pass-through problem is related to historical experience, rationally framed expectations, and individual decisions. Social preference interaction locks the whole society in equilibrium of distrust in the local currency, which makes it prone to currency runs. This explains high pass-through.

2. Model

In this work I use the approach of log-linearization following Campbell et al. [1997, pp. 306-307]. It may be done under assumptions of joint conditional lognormality and homoscedasticity of consumption and asset returns. This linearizes the basic SDF equation (7) and allows for simple algebraic calculations with the moments. In the model I assume that ex-post realized history characterizes expectations, which fits the theory of adaptive expectations.

$$\mathrm{E}\left[\mathrm{r}_{\mathrm{i,t+1}} - \mathrm{r}_{\mathrm{f,t+1}}\right] + \frac{\sigma_{\mathrm{i}}^2}{2} = \gamma\sigma_{\mathrm{ic}} \tag{8}$$

This specification uses continuously compounded returns. $E\left[r_{i,t+1} - r_{f,t+1}\right]$ in (8) is the asset risk premium over a risk-free asset, which is described below. The term $\sigma_i^2/2$ is Jensen's inequality correction, where σ_i^2 is expected variance of asset return. The risk-free asset $r_{f,t+1}$ has zero correlation with consumption, and it is usually proxied by short-term government bills. This risk-free asset is also known as the "zero-beta asset."

The choice of model is dictated by four considerations. First, such a model is analytically tractable and still provides clear assessments. Secondly, the main idea of this modeling is to measure attitudes toward four major assets – that is, to evaluate the sign and the magnitude of required premiums $E\left[r_{i,t+1} - r_{f,t+1}\right]$, which also represent risk assessments based on the historical behavior of the assets. Thirdly, most models in finance are built on relative valuation, like in (8). In Summers' [1985] famous definition, finance is "ketchup economics" that usually explains the value of a financial asset by the value of another financial asset. In this formulation, though, it allows the elimination of the time preference parameter and yields a simple tractable formula. Fourthly, the available annual data of non-durable consumption for Russia (see next section) is very short. It is not possible to operate within GMM or other econometric frameworks with instrumental variables.

3. Data

All the data presented here are available by request and presented in the form of graphs. In asset pricing literature, standard practice is to define consumption in its nondurable form, which includes nondurable (perishable) goods and services, as well as consumption from durables. A rational agent trying to smooth consumption may take advantage of durable goods as they retain value. So durables may be considered as an investment asset and thus should not be included in the consumption variable.

The Russian State Statistics Service (RSSS) provides a yearly balance[7] of income and spending for the whole population. The data does not allow isolation of all forms of non-durable consumption. The resulting data still include some durables like cars, refrigerators, and other appliances. But I believe my measure is reasonably close to the definition used in the literature. It is hard to account for all forms of durables in spending, not to mention semi-durables, and this problem persists even for those countries with good national statistics (see Attanasio and Weber [2010])

The path of aggregate nondurable consumption in Russia (see Fig. 2) is calculated by following procedure: RSSS's series of real disposable income per capita changes for the year are chained together to form a real index. This index is then scaled to nominal disposable income per capita per month of year 2014 to make it comparable to the most recent price level data. Then it is multiplied

[7] The bulk of income and spending data is available at http://www.gks.ru/free_doc/new_site/population/urov/urov_17g.xls (in Russian, accessed June, 2015). These data were expanded from various sources of RSSS for early 2015* and for 2014.

by the ratio of non-durables to disposable income, which is calculated from the spending structure of Russians for the respective year (presented in Fig. 3 in the appendix).

This measure of nondurable consumption is better than salary or disposable income data. For example, in 1991 Russians experienced noticeable nominal wage increase, and real disposable income grew by 20.9%. But Russians couldn't spend all of this income because of the widespread deficit of goods and Pavlov's reform (described in the introduction). Non-durable consumption actually fell 4.2% in 1991. The rest of the income was forcibly "saved" in the form of cash and deposits, and then vanished during the hyperinflation of 1992. Another example is the crisis year of 2009, when real disposable income in Russia grew by 3.2%. This was achieved by huge fiscal stimulus, including an increase in pensions and in government workers' salaries. At the same time, real non-durable consumption fell that year by 4.8%.

Interestingly, non-durable consumption in Russia in this sample (1990-2014) shows a growth rate very close to the long-term US sample (1927-2014) discussed above. It is 2.08%, versus 2.02% in the US (in continuously compounded measure). But standard deviations of these two series differ by a factor of 5.9 – 12.9% versus 2.2%. This difference has powerful implications in savings decisions and asset pricing. Special explanations like habit formation and rare catastrophe are not necessary to justify very high risk aversion given such huge variance in consumption levels.

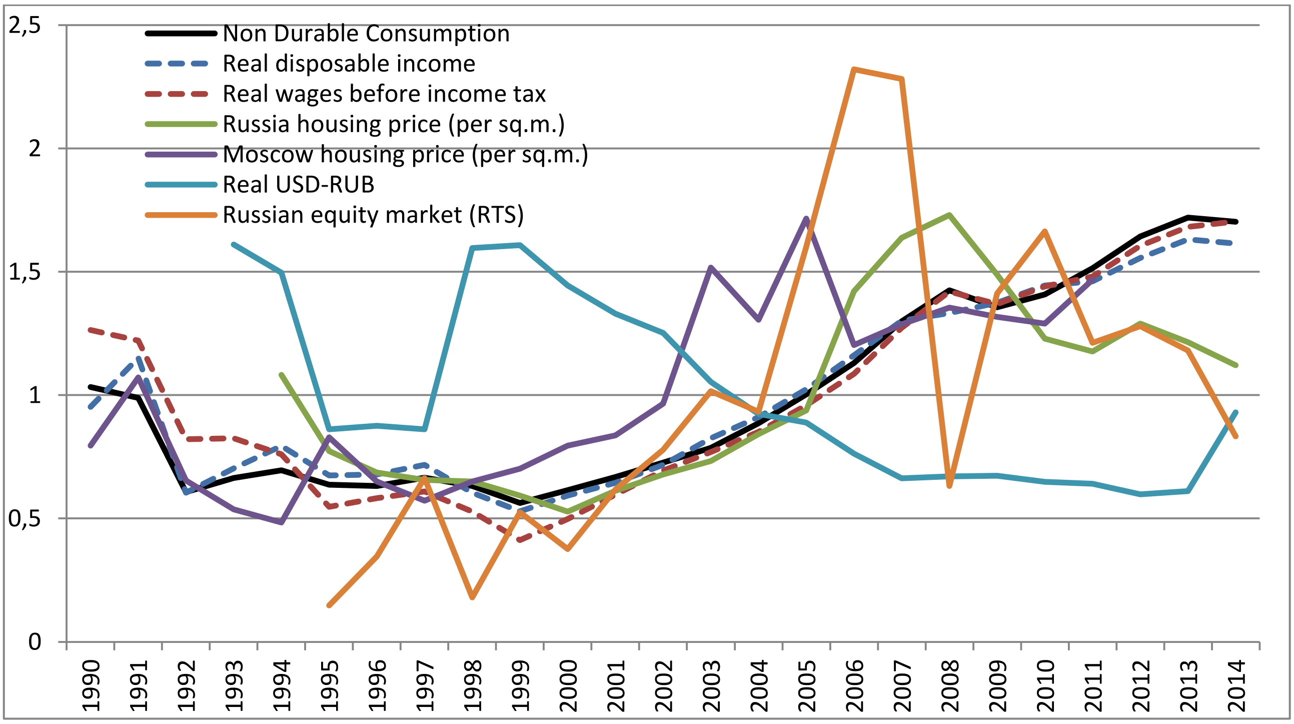

Fig. 2. Yearly data of real disposable income per capita, real wages per capita and real asset prices in Russia. All series are divided by its respective mean. This allows to show all the data on the same scale.

The major assets available to Russians are housing, equities, and nominal ruble assets such as deposits. The last is not shown on the chart and is discussed below. The series are calculated by taking nominal values at the end of the year and deflating them by the CPI index.

The data also include the United States Dollar (USD) as an asset as it is regarded to be a major saving asset in the still-dollarized Russian economy. USD became officially available to ordinary Russians during the liberalization in the summer of 1992 and it began trading on the recently-founded Moscow Interbank Currency Exchange (now the Moscow exchange). The series of USD is simply the real effective exchange rate of the nominal dollar at the year end, calculated by CPI. It can be thought of as the purchasing power in Russia of a USD paper bill under the mattress.

Privatization of state property started in 1993, which opened both the housing and equity markets. Official data for housing prices for Russia is available for 1995 onwards, and has been expanded for earlier years from private sources. Organized trading in Russian equities began in September of 1995 with the foundation of Russian Trading System (RTS). I use dollar RTS index multiplied by the ruble exchange rate and deflated by CPI.

It is hard to define nominal ruble assets in Russia because of the lack of available data. Holding paper cash is not rational in high inflation (the geometric average of which was 58% annually in 1990-2014, thanks to the hyperinflation of 1992-1994) and the average is 11% for 2000-2014. It was possible to hold deposits in banks or to buy fixed-income securities in Russia. But there have been periods of widespread bank failures and there was even a government default in 1998. Government deposit insurance was introduced only after 2004. There was certainly no asset in the Russian Federation even close to being risk-free.

Thus nominal Russian fixed income assets are modeled as the difference between inflation of the current and previous year expressed in instantaneous (natural log) changes. This represents inflation surprise for the consumer in the economy if she forms expectations on inflation by the last year's figure. This can be thought of as a nominal contract made at the end of the year for the next year. Such a contract compensates for the last year's inflation and gives some required real return. At the end of the next year the change in inflation is the real gain or loss.

The most tenuous point is to define a risk-free asset in Russia. The setup of the model includes a premium, or difference between risky and risk-free asset. It is usual to approximate risk-free assets by government inflation-protected securities[8] or by short-term high quality bonds. Certainly there was no such asset in Russia until August 2015, when the Russian Treasury issued its first inflation-linked bonds.

Even if one could have perfectly foreseen the downfall of the economy before the collapse of the USSR, there was no reliable way to preserve wealth. Foreign assets were not available by the summer of 1992. The only remedy was accumulation of durable and semi-durable goods including packaged food, canned goods, and the like. In a developed country this may look silly. But it is perfectly rational in a volatile and inflationary emerging economy, or in a country facing the threat of a major war or social unrest. Obviously physical goods have a constant expected return of zero, $r_{f,t+1} = 0$ (assuming no storage and degradation costs). It is clear that $cov[m, R] = 0$. This assumption is used in the model for Russia as the best possible assumption.

In order to calibrate the risk-aversion coefficient I use United States annual data for the period 1927-2014. Consumption is taken in nondurable form and derived from Federal Reserve Economic Data of St. Louis[9]. I take real personal consumption expenditures (PCE) in 2009 dollars divided by the total population for the US and multiplied by the share of PCE in nondurable goods and services, which I derive from nominal values. Yearly returns of the US stock market and Treasury bills are taken from the Kenneth French data library[10], in which the risk-free rate is 3-month Treasury bills, and return on equity is calculated as the capitalization of the weighted index of the CRSP universe. Conversion to real returns is done via the PCE deflator.

4. Results

Plugging the moments (see Table 1) of US data into (8) allows to find a risk aversion coefficient γ = 21.74, which is too high to be plausible and replicates Mehra and Prescott's [1985] equity risk premium puzzle. They stated in their paper that a plausible coefficient has to be below 10. The Literature on asset prices usually assumes a realistic relative aversion coefficient to be in the vicinity of 3.

[8] We did not use them for the US. Treasury inflation linked securities (TIPS) were introduced in 1997 and using it would dramatically reduce the sample of data.
[9] URL: https://research.stlouisfed.org/fred2, symbols for the data are PCNDA, PCDGA, PCESVA, PCECA, A08180USA173NNBR, DPCERX1A020NBEA (accessed 5.5.2015)
[10] URL: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html (accessed 5.5.2015)

Table 1. Moments, correlation[11] and covariance with consumption for the US, 1927-2014. Returns are calculated for continuously compounded rates.

	Mean	Standard deviation	Correlation with consumption (t-stat)	Covariance with consumption
Non-durable consumption growth	0.02022	0.02193	1.0000 (n/a)	0.00048
US equity returns	0.06734	0.19755	0.6048 (0.0108)	0.00262
Treasury bill returns	0.00711	0.03783	-0.2557 (0.0074)	-0.00021
Equity minus bill return	0.06023	0.20069	0.6437 (0.0273)	0.00283

Despite the fact that consumption has a strong correlation (0.6048) with equities in Table 1, the covariance is low because consumption itself is not volatile, with a standard deviation of 2.193%. This makes covariance with consumption low, and requires a high γ for (8) to hold. I use calibrated value of risk aversion coefficient $\gamma = 21.74$ in calculations further below, as well as several other plausible values.

Table 2. Moments, correlation and covariance with consumption for major asset classes in Russia, 1990-2014. Returns are calculated for continuously compounded rates. Housing, equity data start from 1995, USD data start from 1992.

	Mean	Standard deviation	Correlation with consumption (t-stat)	Covariance with consumption
Non-durable consumption growth	0.02082	0.12931	1.00000 (n/a)	0.01602
Zero-beta asset (basket of goods)	0.00000	0.00000	0.00000 (0.0021)	0.00000
Russian Equities (RTS index)	0.09105	0.63752	0.51494 (0.3409)	0.02186
Housing (RSSS data)	0.01590	0.17031	0.71122 (0.2788)	0.00566
Nominal RUB (inflation surprise)	-0.00320	0.61755	0.67886 (0.4214)	0.05307
Nominal USD asset (REER)	0.02826	0.82513	-0.76237 (0.4845)	-0.07795

Plugging moments into Formula (8) from Table 2 and assuming zero constant return for risk-free assets gives the required premiums, presented in Table 3. The calculations are performed with several values of parameter γ, including the value calibrated on the US data (last row).

[11] Correlation and covariance with equities is calculated with a one-year lag for consumption changes, which is standard for such calculations. It is related to the forward-looking nature of financial markets.

Table 3. Required Premiums for major asset classes in Russia calibrated by data from 1990 to 2014. Housing, equity data start from 1995, USD data start from 1992.

Risk aversion γ	Required equity risk premium	Required housing risk premium	Required risk premium for nominal ruble	Required risk premium for nominal USD
3	6.5%	1.7%	15.9%	-23.4%
5	10.9%	2.8%	26.5%	-39.0%
10	21.8%	5.6%	53.1%	-78.0%
21.36	46.7%	12.1%	113.3%	-166.5%

Required premiums in Table 3 represent the degree of risk for asset classes for a Russian consumer at the end of 2014 if she forms her savings decisions based on that history.

5. Discussions

The results in Table 3 evaluate all major investment assets for Russians as if they formed their investment decisions on the past history within the log-linear model. Being agnostic regarding the equity risk premium puzzle, I use several values for risk aversion γ. The lowest value of $\gamma= 3$ is used by Barro [2005]. The highest value of $\gamma= 21.36$ is calibrated by the US data, but this represents the equity risk premium puzzle. One of the intermediate values, $\gamma= 10$, was called the "maximum plausible" value by Mehra and Prescott [1985].

The highest premium of all assets is for the ruble (or nominal asset). It is an astonishingly high 15.9%, even at the relatively low value $\gamma=3$ (see Table 3). This result arises from the covariance with consumption, 0.05307, which is the highest among all assets (see Table 2). This figure is explained by the hyperinflation of 1991-1992, which was combined with the huge drop in consumption in the same period (-45.9% in year 1992). If the years of hyperinflation are excluded and the analysis begun from 1994, the required nominal asset premium comes out to -1.0% at $\gamma=3$ and -7.1% at $\gamma=21.36$.

The results can be interpreted as follows: the high premium required on the nominal ruble asset represents high risk. A consumer making decisions on the basis of the whole sample history would want to hold a given asset if it promises very high return. Even if the consumer does not expect a recurrence of hyperinflation, this still calls for a wary attitude towards the ruble. Indeed, all major recessions in Russia concurred with acceleration in the rate of inflation (1998-1999, 2008-2009, and 2014-2015).

It is obvious from Fig. 2 that the only asset with negative covariance to consumption is USD. It has a high value when consumption is low, and vice-versa. Historically this asset has proved to have hedging properties – it acts as insurance against "bad times." Within USD here I include all "hard currency" assets, including dollar banknotes, euros, and even equities of developed countries. High reliance on the dollar as a vehicle for savings is widespread in emerging countries, including Russia. Yeyati [2006] calculated that in the early 2000's, the share of dollar deposits was 44% in emerging countries, excluding countries where dollar deposits were prohibited. Fridman and Verbetsky [2001] documented evidence that the share of dollars in the total amount of cash circulating in the Russian economy peaked around 80% at the end of 1990s.

The Euler equation can explain the dollarization phenomena in Russia. The negative correlation of dollars to consumption also implies a negative *required* premium. A consumer may be willing to tolerate an expected decline in the value of the USD asset because of its usefulness for hedging. It is clear that cash dollars, including those "under mattresses," lose value with dollar inflation and thus have a negative expected return. But a consumer in Russia may be willing to accept this because of her distrust in banks and the whole financial system. From the model it is clear why she may prefer holding depreciating dollars and abstain from holding rubles with high real expected return. The key is the covariance with consumption.

The WCIOM survey[12] shows that 9% of Russians said that the best investment is to hold *paper* dollars and euros (not in the bank). Additionally, 16% see gold and jewelry (a USD-like asset) as the best investment. Yeyati [2006] posited that the dollar exchange rate in emerging countries is the major value anchor for domestic currencies. More than half (52%) of Russians surveyed by WCIOM said they monitored exchange rates. If terms of trade or financial conditions lead to domestic currency depreciation, then the population will become more anxious about the future value of the local currency. This means there will be more demand for foreign currency as a hedging instrument, mainly the dollar. This creates the conditions for a vicious cycle of further exchange rate depreciation.

Another alternative for saving during times of economic shock is buying physical goods, especially imports, durables, and semi-durables. Such activity was evident during the last two crises in Russia, in 2008-2009 and 2014-2015. There were episodes of short-term consumption booms concurring with currency depreciation (see appendix for car sales data in Russia). The opposite side is falling

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[12] Representative survey conducted by WCIOM July, 25-26 of 2015. 1600 respondents in 130 localities of 46 regions in the Russian Federation. Margin of error is less than 3.5%. URL http://wciom.ru/index.php?id=236&uid=115345 (accessed 17.11.15).

demand for domestic money, and thus inflationary pressure. This explains why the monetary authority in emerging countries usually tightens credit during recessions.

Yeyati [2006] found that the more dollarized an economy is, the higher the pass-though effect of exchange rates into inflation will be. This correlation-not-causation finding can be explained easily by a microeconomic analysis. More-dollarized economies are those which have had bad monetary experiences recently. The damage done to circulation of money during hyperinflation inevitably leads to declines in the economy and the wellbeing of the population. If economic agents form their expectations on past history (myopic preference formation), then they acquire a wary attitude towards their domestic currency. The worse their experience, the greater is their urge to run from the currency during shock into safer assets, like the dollar and consumption goods. This leads to a higher pass-though effect and locks in patterns of currency runs for the long term.

Another mechanism of currency run is social preference interaction. Suppose there is some rational agent who does believe in government policy and does not expect any future "monetary mistakes." But she knows there are many other anxious citizens who have formed their expectations over the course of a difficult history. If a shock hits, she knows that they will dump domestic money, creating extra demand for foreign currency and causing a rise in price levels. In this case, it makes sense for her to run from the currency first. Thus negative expectations become a self-fulfilling prophecy. This way inflation occurs, even if there were no objective conditions for it (an example of the "sun-spot problem," of course).

The mechanism of a currency run described here is essentially the same as in Diamond and Dybvig's [1983] model of a bank run. There are two possible equilibria within the game approach summarized in Fig. 3. If there are enough economic agents willing to run from the domestic currency, then it is rational to run from it in favor of other currencies. This means there will be inflation, high pass-through and pro-cyclical monetary policy. This is the case that obtains for an emerging country.

The opposite will hold if there are many agents willing to hoard cash in order to smooth consumption: after a shock, it still makes sense to hoard money. This means there will be increased demand for money and deflation, and low (or even negative!) pass-through. Then the central bank will need to counteract both by lowering interest rates and easing credit.

Personal strategy	Public will hoard domestic nominal assets	Public will run on domestic currency
Nominal assets (money) hoarding	Keynesian recession. Extra demand for domestic currency. Deficiency of spending. Deflationary spiral. Central bank lowers interest rate, supports credit, discourages savings	No equilibrium
Dump domestic currency	No equilibrium	Extra demand for foreign currency, imports and durables. No deficiency in spending. Increase of inflation, and currency depreciation. Central bank counteracts by increasing interest rate, starting recession.

Fig. 3 Game equilibria for personal saving allocation during shock and different macro outcomes.

The only remedy for a monetary authority facing a run on the domestic currency is to arrest it by choking domestic credit off. This of course depresses investment and endangers banks, possibly accelerating the plunge of the economy due to the financial accelerator (see Bernanke et al. [1996]). Clearly the flow of business cycle in the emerging market is very different from that observed in developed world.

There are two remaining assets of interest - housing and equities. The Euler equation is able to explain the attitude of consumers to both. WCIOM showed that 48% of Russians respondents said that housing was the best investment of all. In our sample, housing has the lowest covariance (0.00566) with consumption relative to other assets. That is why housing in Russia may be seen as the investment asset closest to being risk-free. Thus housing has the lowest positive required premium. In the sense of consumption CAPM, housing for a Russian consumer is the closest to being a “zero-beta asset,” i.e., an asset that keeps its value regardless of the state of the world.

Equities are too risky for Russians. With γ=21.36, calibrated by the US stock market data, the Required Equity Risk Premium (RERP) for the Russian market is too high, at 46.7%[13]. Even at the lowest risk aversion value, γ=3, it is 15.7%. This may be seen as partial evidence for Rietz [1988] and Barro's [2005] explanation of the equity risk premium puzzle. Russian history, with its very volatile consumption levels, does not require a high risk aversion value to explain high RERP. But

[13] Reminder: in this paper continuously compounded rates are used everywhere, traditional premium is ln(1+46,7%) = 38.3%

in reality there is another problem - the value is, in fact, too high. That is a researcher trying to explore the equity risk premium puzzle with Russian data may need to use very low risk aversion coefficient. An excessively high RERP explains why Russians almost never buy they own stocks, and the fact that free-float is dominated by foreign investors. WCIOM didn't specifically ask Russians about equities. But they seem to fall within the catch-all item, "other," which drew only 2% of all responses.

Attanasio and Weber [2010, p. 68] wrote the following. *"Euler equations are remarkably useful because they let researchers estimate important preference parameters in a relatively robust way, allowing for, but without the need to explicitly model, important phenomena such as labor supply, housing, durables and so on. However, to conduct a useful policy debate it is necessary to be able to say something about the level of consumption"*.

Nonetheless, there are important implications from this exercise. Firstly, it explains why the Russian business cycle is so different from that observed in the developed world. It is clearly non-Keynesian, and it means that traditional income-smoothing fiscal and monetary channels do not work here. The prediction can be made that the next economic shock in Russia is likely to be inflationary rather than deflationary. The case for Russian consumers may be generalized to many other emerging countries which also have free mobility of capital and a free-floating exchange regime. Textbooks usually assume that this combination allows the country to pursue its own monetary policy (within the "impossible trinity"). Thus, it is possible to implement inflation targeting. But historical traumas do not necessarily make this an easy path. Such an economy still remains inflation-prone.

6. Conclusion

The business cycle in an emerging country is very different from that in the developed world. The main problem is a high pass-through of exchange rate depreciation to CPI. Monetary authorities in an emerging country often pursue pro-cyclical policies, typically raising interest rates during recessions in order to fight inflation. The literature on emerging markets usually tries to explain high pass-through effect by a lack of credibility, explained in turn by political constraints, institutional and financial weakness, and other factors.

Additionally, I was able to show why free-float in the Russian equity market is dominated by foreign investors. High historical covariance with consumption means that Russian equities are too risky for Russians themselves. But this is not the case for the US investor. I calculated the Russian country risk premium required by the US investor. I also demonstrated why many Russians see housing as the safest investment.

In this work I show that the mechanism behind high pass-through is primarily related to the way the private sector forms its savings decisions. Recent historical experience in turn plays a large role in forming these decisions. I modeled this on Russian data within a simple log liberalized stochastic form of the Euler equation.

A country which has lived through high inflation usually becomes dollarized. If an economic shock subsequently occurs, citizens in this country dump the domestic currency and buy dollars, euros, and consumption goods, especially durables. This creates another bout of inflation requiring tightening of monetary policy, which deepens the recession. The acceleration of inflation during a shock means that domestic money becomes a risky asset. Appreciations in dollars or euros make these currencies a hedging asset. Societal preference interaction locks the country in a Nash-like equilibrium, in which self-supporting and persistent preferences are formed.

This is an example of non-ergodicity in the macro economy which is caused by societal preference interaction, as described by Horst [2008]. It is also an illustration of Lucas' idea of the importance of microeconomic foundations.

This mechanism supports dollarization and forces the country's population to monitor the dollar exchange rate as the anchor of the value of domestic currency. The recognition that sudden exchange rate depreciation may ignite another currency run explains the "fear of floating" described by Calvo and Reinhart [2000].

The business cycle in emerging markets is very different from textbook accounts of the experience in the developed world. This may explain a lot of buzz in emerging countries about how the "Washington Consensus" prescribes capital mobility and free-floating. Inflation targeting is not just working as expected in many emerging countries, as exemplified by the Russian and Brazilian experiences.

Another problem is that economists researching emerging markets as well as policymakers may be indoctrinated by the standard textbook description of business cycles. They may misinterpret the chain of events and prescribe the wrong medicine for economic ills.

Appendix

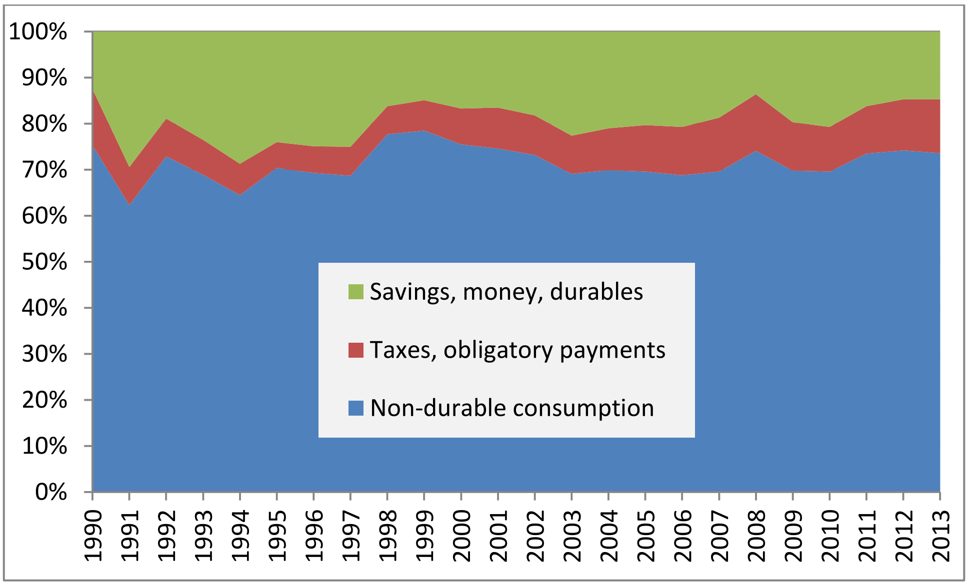

Fig.4. Distribution of personal income in Russia for the last 24 years. Non-durable consumption in this data still includes some durables like cars, refrigerators, and other appliances.

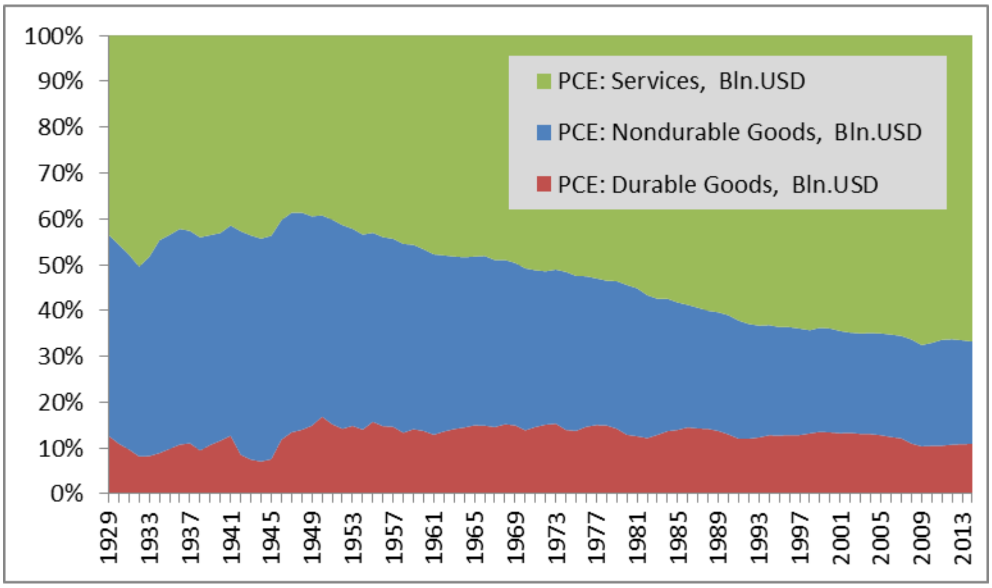

Fig. 5. Personal consumption expenditure breakdown for the US. Source: Federal Reserve Economic Data, St Louis FED. Symbols for data: PCDGA, PCESVA, PCECA

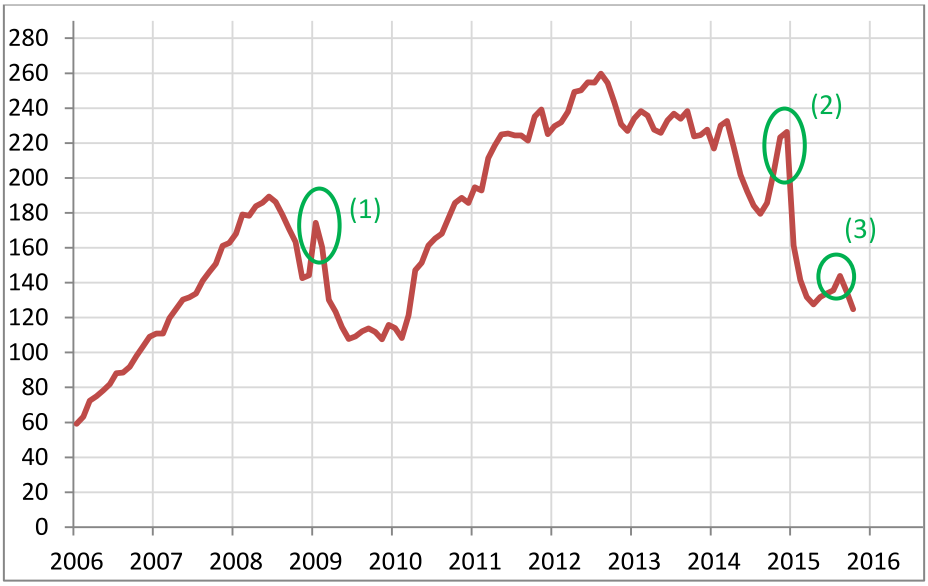

Fig. 6. Light car sales in Russia, thousands per month: typical durable goods. Data of Association of European Business, corrected for seasonality and trading days, X-13Arima-SEATS. (1) and (2) are the local aberrations of consumption during RUB exchange rate drop.

References

Attanasio, O.P., Weber, G., 2010. Consumption and Saving: Models of Intertemporal Allocation and Their Implications for Public Policy (Working Paper No. 15756). National Bureau of Economic Research.

Barro, R.J., 2005. Rare Events and the Equity Premium (Working Paper No. 11310). National Bureau of Economic Research.

Bernanke, B., Gertler, M., Gilchrist, S., 1996. The Financial Accelerator and the Flight to Quality. Rev. Econ. Stat. 78, 1–15. doi:10.2307/2109844

Calvo, G.A., Reinhart, C.M., 2000. Fear of Floating (Working Paper No. 7993). National Bureau of Economic Research.

Campbell, J.Y., Lo, A.W., MacKinlay, A.C., Lo, A.Y., 1997. The Econometrics of Financial Markets. Princeton University Press, Princeton, N.J.

Cuthbertson, K., Nitzsche, D., 2005. Quantitative Financial Economics: Stocks, Bonds and Foreign Exchange. John Wiley & Sons.

Devereux, M.B., Lane, P.R., Xu, J., 2006. Exchange Rates and Monetary Policy in Emerging Market Economies. Econ. J. 116, 478–506.

Diamond, D.W., Dybvig, P.H., 1983. Bank Runs, Deposit Insurance, and Liquidity. J. Polit. Econ. 91, 401–419.

Eichengreen, B., 2015. Hall of Mirrors: The Great Depression, The Great Recession, and the Uses-and Misuses-of History, 1st ed. Oxford University Press, New York, NY.

Eichengreen, B., 2012. Exorbitant Privilege: The Rise and Fall of the Dollar and the Future of the International Monetary System, Reprint edition. ed. Oxford University Press, Oxford; New York.

Eichengreen, B., 2002. Can emerging markets float? Should they inflation target? Banco Cent. Bras. Work. Pap. Ser. 36.

Fridman, A., Verbetsky, A., 2001. Currency Substitution in Russia (EERC Working Paper Series No. 01-05e). EERC Research Network, Russia and CIS.

Guvenen, F., Lustig, H., 2008. consumption-based asset pricing models (empirical performance), in: Durlauf, S.N., Blume, L.E. (Eds.), The New Palgrave Dictionary of Economics. Nature Publishing Group, Basingstoke, pp. 157–161.

Hall, R.E., 1978. Stochastic Implications of the Life Cycle-Permanent Income Hypothesis: Theory and Evidence. J. Polit. Econ. 86, 971–87.

Horst, U., 2008. ergodicity and nonergodicity in economics, in: Durlauf, S.N., Blume, L.E. (Eds.), The New Palgrave Dictionary of Economics. Nature Publishing Group, Basingstoke, pp. 30–33.

Ilmanen, A., 2011. Expected Returns: An Investor's Guide to Harvesting Market Rewards, 1 ed. ed. Wiley, N.Y.

Krasker, W.S., 1980. The “peso problem”in testing the efficiency of forward exchange markets. J. Monet. Econ. 6, 269–276.

Krugman, P., 2012. End This Depression Now!, 1 edition. ed. W. W. Norton & Company, New York.

Lucas, R.E., 1976. Econometric policy evaluation: A critique, in: Carnegie-Rochester Conference Series on Public Policy. Elsevier, pp. 19–46.

Lustig, H.N., Guvenen, F., 2007. Consumption Based Asset Pricing Models: Theory (SSRN Scholarly Paper No. ID 968061). Social Science Research Network, Rochester, NY.

Mehra, R., Prescott, E.C., 1985. The equity premium: A puzzle. J. Monet. Econ. 15, 145–161.

Nada, S., 2013. Equity Premium Puzzle: Not solved yet. Bus. Adm. 48.

Rietz, T.A., 1988. The equity risk premium a solution. J. Monet. Econ. 22, 117–131. doi:10.1016/0304-3932(88)90172-9

Shiller, R., 1981. Do Stock Prices Move Too Much to be Justified by Subsequent Changes in Dividends? Am. Econ. Rev. 71, 421–36.

Shiller, R.J., 2005. Irrational exuberance. Princeton University Press, Princeton, N.J.

Sokolov, V., Lee, B.-J., Mark, N.C., 2011. Linkages Between Exchange Rate Policy and Macroeconomic Performance. Pac. Econ. Rev. 16, 395–420. doi:10.1111/j.1468-0106.2011.00556.x

Summers, L.H., 1985. On Economics and Finance. J. Finance 40, 633. doi:10.2307/2327785

Weil, P., 1989. The equity premium puzzle and the risk-free rate puzzle. J. Monet. Econ. 24, 401–421.

Yeyati, E.L., 2006. Financial dollarization: evaluating the consequences. Econ. Policy 21, 62–118. doi:10.1111/j.1468-0327.2006.00154.x

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