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Exchange Rate Expectations

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Abstract

We investigate, here, the exchange rate expectations, which are broad models of exchange rate forecasting and efficiency, by looking at approaches, such as the static expectations, the extrapolative, the adaptive, the rational, the regressive, and some general specifications of the above expectations. At the end, orthogonality tests suggest that rejection of the unbiased forward rate hypothesis is caused by different variables (like "news", unexpected shocks, latent variables, forecast errors in money supplies, interest rate differentials, stock market risk premia, and various forms of conditional variance). Also, empirical tests of the above exchange rate expectations are taking place for four different exchange rates ($/€, $/£, C$/$, and ¥/$). Theoretical discussion and empirical evidence have emphasized the impact of "news" on exchange rates, which affect agents' expectations, too. Agents are using the exchange rate expectations effectively.

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1 Introduction

In economic theory, there are many specifications, which are used to represent the way that investors, foreign currency traders, and speculators form expectations. These specifications can be used as forecasting models of the exchange rate, too.

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There are empirical studies that have found evidence of deviation of the exchange rate from the spot market efficiency and it follows a variety of expectation formations. The most simple-minded assumption about expectations one can make is that of static or naïve expectations: Agents, it is assumed, expect the inflation rate next year to be the same as it was this year. Also, we assume, here, that the policymakers' objective is the maximization of the social welfare.

Further, adaptive expectations assumption merely extrapolates the concept of static expectations; it suggests that economic agents expect the inflation rate to be equal to the weighted average of the inflation rate in the past few periods. Economists used the assumptions of static and adaptive expectations until the concept of rational expectations was developed.[2] Other forms of expectations are the regressive ones and some general specifications models that can test alternative expectations. Also, an orthogonality test can be used to test the Unbiased Forward Rate Hypothesis (UFRH), which is necessary to confirm efficiency in the foreign exchange market[3] and to see if there is any effect of the equity markets risk premia on the exchange rates risk premia.

2 Theoretical Models of Exchange Rate Expectations

We start discussing theoretically one by one the five models of exchange rate expectations. They are the static expectations model, the extrapolative expectations, the adaptive expectations, the rational expectations, and the regressive expectations one. We use the assumptions and the mathematic formulation of each model, so they can become comprehensible to the readers.

2.1 Static Expectations

In economics, the concept of *static expectations* describes an assumption that economists make, about the way people form their predictions, regarding the future values of economic variables. Specifically, the static expectations assumption states that people expect the value of an economic variable next period to be equal to the current value of this variable.[4] Then, the simplest form of

[2] See, Kallianiotis [18] and [19]. Also, Moosa [29], http://books.google.com/books?id=Aj5u0-wQ54sC&pg=PA17&lpg=PA17&dq=Exchange+Rate+Expectations+(static,+extrapolative)&source=bl&ots=fudrzx9yK6&sig=9SRu77mgQBJ_KP3zeVN69dDy_y4&hl=en&sa=X&ei=kQViUP_UNafw0gHXjoCwBA&ved=0CD4Q6AEwBA#v=onepage&q=Exchange%20Rate%20Expectations%20(static%2C%20extrapolative)&f=false . Further, Marey [27] http://arno.unimaas.nl/show.cgi?fid=820

[3] See, Kallianiotis [15].

[4] The concept of static expectations has been widely used in the early economics literature, such as in the cobweb model of price determinations. In the cobweb model, the static expectations assumption states that sellers expect the price of a good next period to be the same as it is today and adjust their production accordingly. The early literature did not focus much on unexpected shocks. The concept of static expectations and its more advanced variation**,** the concept of adaptive

exchange rate expectations is *static expectations*, which means that expectations of the future spot rate are nothing more than the current spot rate. This process can be rationalized by the fact that the observed exchange rates appear to be stationary and investors see no particular reason why the next period's exchange rates would deviate from the current spot rate.

$$s^e_{t+1} = s_t \tag{1}$$

or

$$s^e_{t+1} - s_t = 0 \tag{2}$$

and its growth is,

$$\Delta s^e_{t+1} = 0 \tag{3}$$

where, s_t = the ln of the spot exchange rate (S_t), s^e_{t+1} = the ln of the expected spot exchange rate in period $t+1$, and Δs^e_{t+1} = the expected percentage change of the spot exchange rate.

Thus, the expected currency depreciation (fd^e) or appreciation (fp^e) is zero.[5] The main criticism of the concept of static expectations is that it assumes that people ignore the information about possible shifts in policy variables. In the case of monetary policy, if policymakers announce credibly that they will adopt an anti-inflationary stance, it would not be rational for economic agents to believe that the inflation rate will remain the same. Thus, the rational expectations assumption incorporates all possible information available, at the time the expectations are formulated, and not just the past values of the variable being forecasted, as is the case with static or adaptive expectations.

In modern economic theory, most models that incorporate uncertainty about the future assume rational expectations, not static expectations. Nevertheless, some economic variables and many financial variables follow a specific stochastic process, called martingale [a model of a fair game, where knowledge of past events will never help to predict future winnings; a sequence of

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expectations, play an important role in the monetary economics, the branch of economics that addresses the design and the impact of monetary policy. Because only unexpected inflation, or inflation rate in excess of the expected inflation rate, can increase the aggregate output of the economy, it is important for policymakers to know what inflation rate economic agents expect in the future. For economists, this means that they have to make an assumption about how economic agents form their predictions of future inflation, how they measure it, and if the monetary policy target rate will cover the expected inflation. See, Kallianiotis [14].

[5] Where, $fd^e \text{ or } fp^e = (s^e_{t+1} - s_t).\frac{12}{n}.100 \quad (as\ \%\ p.a.)$.

random variables (i.e., a stochastic process)], for which the best prediction of the future value is today's value. For these variables, static expectations turn out to be rational expectations.

2.2 Extrapolative Expectations

Extrapolative expectations are those that expect the future exchange rate will move according to a recent trend. The above static model [eq. (1)] can be modified, now, to the following one:

$$s^e_{t+1} = s_t + \alpha(s_t - s_{t-1}) \tag{4}$$

where, α = is a coefficient and $(s_t - s_{t-1})$ = the recent change in the exchange rate.

The rational is, here, that recent movements of exchange rates are nonstationary. It can be hypothesized that currency depreciation in the current period will generate an expectation of future depreciation; then, eq. (4) can be written as follows:

$$\Delta s^e_{t+1} = \alpha \Delta s_t \tag{5}$$

where, $\alpha > 0$ (expectations move the same direction).

These bandwagon expectations[6] are considered to be highly unstable since investors sell a currency that they expect to depreciate and vice versa. Speculative

[6] The *bandwagon effect* is a well-documented form of "groupthink" (ὁ κοσμικός ἄνθρωπος εἶναι μιμητικόν ὄν) in behavioral science and has many applications. The general rule is that conduct or beliefs spread among people, as fads and trends clearly do, with "the probability of any individual adopting it increasing with the proportion, which have already done so". As more people come to believe in something, others also "hop on the bandwagon" regardless of the underlying evidence. The tendency to follow the actions or beliefs of others can occur because individuals directly prefer to conform or because individuals derive information from others. In layman's term the bandwagon effect refers to people doing certain things because other people are doing them, regardless of their own beliefs, which they may ignore or override. For instance, once a product becomes popular, more people tend to "get on the bandwagon" and buy it, too. The bandwagon effect has wide implications, but is commonly seen in politics and consumer behavior. This effect is noticed and is followed very much by the youth and the people without personality (the ignorant ones); where, if young people see many of their friends buying a particular phone, they could become more interested in buying that (Apple products for example). When individuals make rational choices based on the information they receive from others, economists have proposed that information cascades can quickly form, in which people decide to ignore their personal information signals and follow the behavior of others. Cascades explain why behavior is fragile; people understand that they are based on very limited information. As a result, fads form easily, but are also easily dislodged. Such informational effects have been used to explain political

activities can be stabilizing, if the opposite direction is expected for the exchange rates (a depreciation of the currency is expected to be followed by an appreciation). Then, $\alpha < 0$ and eq. (5) becomes:

$$\Delta s_{t+1}^{e} = -\alpha \Delta s_t \tag{6}$$

or eq. (4) gives, in this case:

$$s_{t+1}^{e} = (1-\alpha) s_t + \alpha s_{t-1} \tag{7}$$

Equation (7) is called the distributed lag expectations model. The expectations of exchange rates are formed on the basis of current and lagged spot exchange rates. Here, longer lags are assumed to have no informational content.

2.3 Adaptive Expectations

In economics, *adaptive expectations* means that people form their expectations about what will happen in the future based on what has happened in the past. This approach has been used to model price behavior. For example, if inflation has been higher than expected in the past, people would revise expectations for the future. In adaptive expectations, the expected future spot rate is a weighted average of the current and lagged expected rate, as follows:

$$s_{t+1}^{e} = (1-\lambda) s_t + \lambda s_t^{e} \tag{8}$$

where, $0 < \lambda < 1$ and $s_t^{e} = E(s_t | I_{t-1}) = s_t - s_{t-1}$.

Equation (8) becomes:

$$s_{t+1}^{e} - s_t = \lambda (s_t^{e} - s_t) \tag{9}$$

or

$$\Delta s_{t+1}^{e} = \lambda (s_t^{e} - s_t) \tag{10}$$

Equation (10) states that expectations are revised on the basis of the expectations error $(s_t^{e} - s_t)$. This error adjustment is also called "partial adjustment". The magnitude of the revision depends on the coefficient λ.

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bandwagons. This is the behavior of masses (goyim), which unfortunately, are manipulated by the dark powers ("deep state") and satisfy their inhumane objective. See, Kallianiotis [13].

Once a forecasting error is made by agents, due to a stochastic shock, they will be unable to correctly forecast the price level again even if the price level experiences no further shocks since they only ever incorporate part of their errors. The backward nature of expectation formulation and the resultant systematic errors made by agents (see Cobweb model)[7] was unsatisfactory to economists such as Muth [30], who was pivotal in the development of an alternative model of how expectations are formed, called rational expectations. This has largely replaced adaptive expectations in macroeconomic theory since its assumption of optimality of expectations is consistent with economic theory.

2.4 Rational Expectations

Rational expectations is a hypothesis in economics,[8] which states that agents' predictions of the future value of economically relevant variables are not systematically wrong, in that all errors are random. Equivalently, this is to say that agents' expectations are equal to the true statistical expected values. The rational expectations assumption is used in many contemporary macroeconomic models, in game theory, and in other applications of rational choice theory. Since most macroeconomic models today study decisions over many periods, the expectations of workers, consumers, and firms about future economic conditions are an essential part of the model. How to model these expectations has long been controversial; it is well known that the macroeconomic predictions of the model may differ, depending on the assumptions made about expectations.[9]

To assume rational expectations is to assume that agents' expectations may be individually wrong, but are correct *on average*. In other words, although the future is not fully predictable, agents' expectations are assumed not to be systematically biased and use all relevant information in forming expectations of economic variables. Modeling expectations is crucial in all models, which study how a large number of individuals, firms, and organizations make choices under uncertainty. For example, negotiations between workers and firms will be influenced by the expected level of inflation,[10] and the value of a share of stock is dependent on the expected future income from that stock and by the federal funds rate. As such, an agent has rational expectations for the spot exchange rate k-periods from now, S_{t+k}, if the following condition holds:

[7] See, https://en.wikipedia.org/wiki/Cobweb_model

[8] See, Muth [30].

[9] See, Cobweb model, which explains why prices might be subject to periodic fluctuations in certain types of markets. It describes cyclical supply and demand in a market, where the amount produced must be chosen before prices are observed. Producers' expectations about prices are assumed to be based on observations of previous prices.

[10] And by the power of the labor unions, which has vanished, lately, due to globalization, deregulation, illegal migration, indebtedness, and then, by the pressure from the capital market (creditors).

$$E_t S_{t+k} = E(S_{t+k} | I_t) + \varepsilon_t \quad (11)$$

where, $E_t S_{t+k}$ = agent's subjective (personal) expectation formed in period t regarding the value of S in period $t+k$ with $(k > 0)$, I_t = the information set available to the agent[11] in period t, $E(S_{t+k} | I_t)$ = the objective "true" expectation

[11] This information I_t is incomplete and controlled by the "world planners" (dark powers) through the fake news. The true information is Π_t (πληροφορίαι) and $I_t \subset \Pi_t$. There are very few people that have full information (Π_t), they know the absolute TRUTH; but they cannot make it public because the media and all publications are in the hands of the "big liar" (the deceiver of the world). Unfortunately, this is almost impossible because the public is deliberately misinformed. There is no free speech anymore. We live in *the Age of Deception* (Davidson [5]) and our information is from the controlled media. The controlled and subjective mass media have contributed to these problems, the "big lies". John Swinton, the former Chief of Staff at the *New York Times* was asked to give a toast before the prestigious New York Press Club in 1953. He made this candid confession that there is no independent press. [It's worth noting that Swinton was called "The Dean of His Profession" by other newsmen, who admired him greatly]. He said, "There is no such thing, at this date of the world's history, in America, as an independent press. You know it and I know it. There is not one of you who dares to write your honest opinions, and if you did, you know beforehand that it would never appear in print. I am paid weekly for keeping my honest opinion out of the paper I am connected with. Others of you are paid similar salaries for similar things, and any of you who would be so foolish as to write honest opinions would be out on the streets looking for another job. If I allowed my honest opinions to appear in one issue of my paper, before twenty-four hours my occupation would be gone. The business of the journalists is to destroy the truth, to lie outright, to pervert, to vilify, to fawn at the feet of mammon, and to sell his country and his race for his daily bread. You know it and I know it, and what folly is this toasting an independent press? We are the tools and vassals of rich men [dark powers] behind the scenes. We are the jumping jacks, they pull the strings and we dance. Our talents, our possibilities and our lives are all the property of other men. We are intellectual prostitutes." (John Swinton, as "the former Chief of Staff at the *New York Times*", before the New York Press Club in 1953). Furthermore, the other side ("the rulers") said, "We are grateful to the Washington Post, the New York Times, Time Magazine and other great publications whose directors have attended our meetings and respected their promises of discretion for almost 40 years.....It would have been impossible for us to develop our plan for the world if we had been subjected to the lights of publicity during those years. But, the world is more sophisticated and prepared to march towards a world government. The super-national sovereignty of an intellectual elite and world bankers is surely preferable to the national auto-determination practiced in past centuries." (This frightful quote is from an extreme globalist, David Rockefeller).
See, http://www.goodreads.com/author/quotes/9951.David_Rockefeller . David Rockefeller passed away on March 20, 2017 at the age of 101 years old and the controlled media praised him as the greatest philanthropist of our times. See, https://www.nytimes.com/2017/03/20/business/david-rockefeller-dead-chase-manhattan-banker.html?_r=0 . See, also the other side, https://thefullertoninformer.com/the-death-of-one-of-the-most-evil-men-in-our-lifetime-david-rockefeller-enters-the-gates-of-hell-after-101-years/ We saw the subjectivity of the controlled media during the 2016 U.S. elections. They were and continue to be against Donald Trump because he is against globalization and were supporting Hilary Clinton, who is a puppet of the dark powers (the "deep state"). The dark powers are working since 1640 to control the uninformed masses (Goyim) and they succeeded as we see today. See, Kallianiotis [13]. Further, "Journalism

for S_{t+k} conditional on I_t, and ε_t = a forecasting error satisfying the condition $E(\varepsilon_t | I_t) = 0$.

It follows from eq. (11) that

$$E_t S_{t+k} = S_{t+k} \tag{12}$$

Further, rational expectations theories were developed in response to perceived flaws in theories based on adaptive expectations whereby, expectations of the future value of an economic variable are based on past values. For example, people would be assumed to predict inflation by looking at inflation last year and in previous years. Under adaptive expectations, if the economy suffers from constantly rising inflation rates (perhaps, due to expansionary monetary policy[12] or lack of government policies and competition or the latest imposition of monopolies), people would be assumed to always underestimate inflation. This may be regarded as unrealistic; surely, rational individuals would sooner or later realize the trend and take it into account in forming their expectations.[13]

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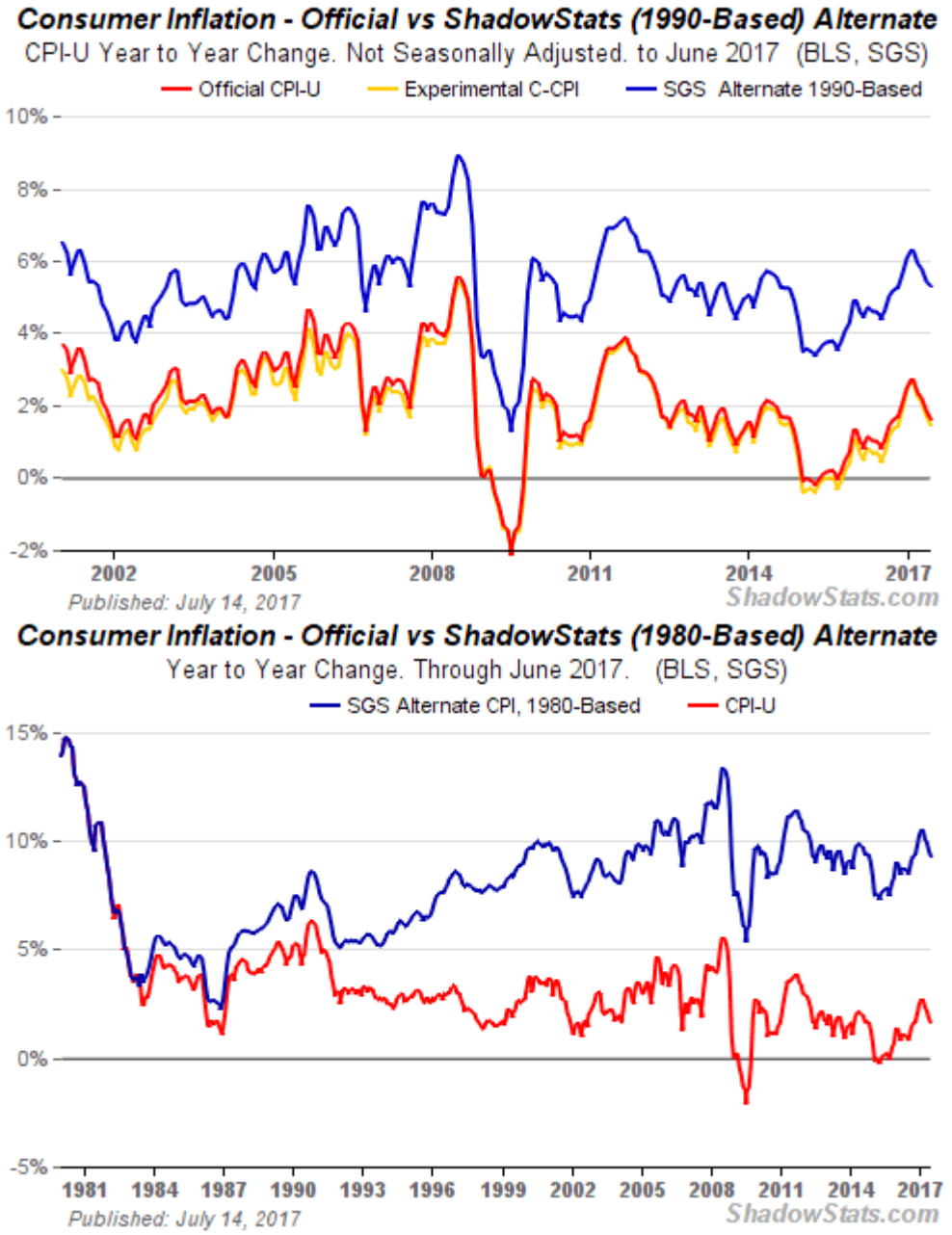
in America is dead". (Sean Hannity, *Fox* News, April 26, 2017). We are in big trouble and the situation becomes worse every day. Ὁ Θεός νά μᾶς λυπηθῇ καί νά μᾶς ἐλεήσῃ. Also, "The idea that markets work perfectly is no longer tenable," Richard Thaler said in a 2015 interview with the Newshour.

[12] See, Kallianiotis [14].

[13] Even though that the official inflation is downgraded by the authorities. The U.S. official inflation with July 2017 was ($\pi = 1.6\%$ p.a.) and the SGS give ($\pi = 9.8\%$ p.a.). This misinformation of the people is completely unethical, irrational, and anti-scientific. See, http://www.shadowstats.com/alternate_data/inflation-charts and their two Graphs bellow:

The hypothesis of rational expectations addresses the criticism on adaptive expectations by assuming that individuals take all available information into account in forming expectations. Though expectations may turn out incorrect, they will not deviate systematically from the expected values.



Source: http://www.shadowstats.com/alternate_data/inflation-charts

The rational expectations hypothesis has been used to support some radical conclusions about economic policymaking. An example is the Policy Ineffectiveness Proposition[14] developed by Thomas Sargent and Neil Wallace [33], [34]. If the Federal Reserve attempts to lower unemployment through expansionary monetary policy, economic agents will anticipate the effects of the change of policy and raise their expectations of future inflation accordingly (Phillips curve).[15] This, in turn, will counteract the expansionary effect of the increased money supply. All that the Fed can do is raise the inflation rate, not employment and they manipulate the way that we measure inflation. This is the reason that the QE (easy monetary policy) during the latest global economic crisis was completely ineffective. This is a distinctly New Classical outcome. During the 1970s rational expectations appeared to have made previous macroeconomic theory largely obsolete, which culminated with the Lucas [26] critique (arguing that it is naïve to try to predict the effects of a change in economic policy entirely on the basis of relationships observed in historical data, especially highly aggregated historical data). However, rational expectations theory has been widely adopted throughout modern macroeconomics, as a modeling assumption from the work of New Keynesians.

Furthermore, rational expectations theory is the basis for the efficient market hypothesis (efficient market theory). If a security's price does not reflect all the information about it, then there exists "unexploited profit opportunities": someone can buy (or sell) the security to make a profit; thus, driving the price toward equilibrium. This person has superior (insider) information or he is a financial market manipulator. In the strongest versions of these theories, where all profit opportunities have been exploited, all prices in financial markets are correct and reflect market fundamentals (such as future streams of profits and dividends). Each financial investment is as good as any other, while a security's price reflects all information about its intrinsic value.[16]

2.5 Regressive Expectations

Regressive expectations play a crucial role in the overshooting model of Dornbusch [7] and can be traced back to Keynes [23], who suggested that financial markets expect interest rates to regress to a "normal" level. Agents are characterized by regressive expectations if they expect the future spot rate (s_t) to move in the direction of some fundamental or long run equilibrium value ($\bar{s}_t$).

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[14] The *policy-ineffectiveness proposition (PIP*) is a new classical theory proposed in 1975 by Thomas J. Sargent and Neil Wallace based upon the theory of rational expectations, which posits that monetary policy cannot systematically manage the levels of output and employment in the economy.

[15] Phillips curve: $\pi_t = \pi_t^e - \beta(u_t - u_t^N) + \varepsilon_t$, where π_t = inflation rate and u_t = unemployment rate.

[16] For efficiency in the foreign exchange market, see Kallianiotis [12] and [15].

$$s^e_{t+1} = (1-\delta)\, s_t + \delta\, \bar{s}_t \tag{13}$$

where, δ = a constant ($0 < \delta < 1$) and $\bar{s}_t$ = the long run equilibrium exchange rate.

The expectations are assumed to be formed regressively since exchange rates in the long run regress toward the long run equilibrium exchange rate $\bar{s}_t$. Eq. (13) can be written as follows:

$$\Delta s^e_{t+1} = \delta(\bar{s}_t - s_t) \tag{14}$$

This equation [eq. (14)] says that if the spot rate is below the long run equilibrium rate, it is expected to climb and vice versa. Thus, the spot rate tends to converge to the long run equilibrium rate. This long run equilibrium rate does not have to be stationary and it is tied to PPP. Combining eq. (4), the extrapolative expectations, and eq. (14), the regressive expectations, we receive the following equation:

$$\Delta s^e_{t+1} = \alpha(s_t - s_{t-1}) + \delta(\bar{s}_t - s_t) \tag{15}$$

The first term of the above equation (extrapolative component) indicates a tendency for current spot rate depreciation or appreciation to lead to a further depreciation or appreciation in the near future (short-run), which captures the immediate market trend. This component can contribute to exchange rate overshooting and destabilization of the exchange rate. The second term of the equation (regressive component) recommends that the current spot rate will move towards its long run equilibrium value, due to changes in fundamentals; thus, it will be convergence and will stabilize at this new level.

3 General Specification of Alternative Expectations Models

The formation of different expectations (anticipations, hopes, and behaviors) depends on the available information and on the degree of knowledge of exchange rate determination. Assuming spot market efficiency, the five expectation formations that were described above can be viewed as a particular form of deviation from the random walk hypothesis [eq. (16)].

$$s^e_{t+1} - s_t = \varepsilon_{t+1} \tag{16}$$

The expectations equation can be written as follows:

$$s^e_{t+1} - s_t = x_t\,\zeta \tag{17}$$

where, x_t = an additional information set to eq. (16), the random walk.

Considering, now the realized (actual) value of the expected spot rate to estimate eq. (17), it can be written,

$$s_{t+1} - s_t = x_t\,\zeta + \varepsilon_{t+1} \tag{18}$$

where, s_{t+1}= the realized value of the spot rate next period, s_t = the ln of the spot exchange rate, ζ = a (k x 1) vector of unknown parameters, x_t= the (1 x k) row vector, and ε_{t+1}= the error term.

Based on eq. (18), alternative expectation models can be tested. A static expectation has an $x_t = 0$. In extrapolative expectations, we have $x_t = (s_t - s_{t-1})$. In adaptive expectations, it is $x_t = (s^e_t - s_t)$. In rational expectations $x_t = 0$, too. In regressive expectations, it is $x_t = (\bar{s}_t - s_t)$. And finally, the random walk, the $x_t = 0$. Other test that can be done are the unbiased forward rate hypothesis, where $x_t = (f_t - s_t)$; the uncovered interest parity with $x_t = (i_t - i^*_t)$; and the uncovered interest arbitrage, $x_t = [(i_t - i^*_t) + d]$, where, d = a risk-related deviation from perfect substitutability.

4 Orthogonality Tests

Many evidences confirm the hypothesis of the forward exchange market efficiency, but some recent studies have found this hypothesis to be quite weak.[17] To test whether additional information can be used to interpret the forecast error, researchers conduct a test called *orthogonality* test,[18] which is as follows:

$$s_{t+1} - f_t = x_t\,\psi + \varepsilon_{t+1} \tag{19}$$

where, s_{t+1}= the actual spot exchange rate next period, f_t = the forward rate, x_t = the (1 x k) row vector, ψ = a (k x 1) vector of unknown parameters, and ε_{t+1}= the error term.

[17] See, Kallianiotis [15].
[18] See, Sarno and Taylor [35].

The orthogonality test of f_t as an optimal predictor of s_{t+1} is designed to determine whether the forecast error is correlated to some subset of the current information set I_t, the row vector x_t, here. Consequently, testing the null hypothesis that $\psi = 0$ involves testing whether any elements of x_t are statistically significant. The rejection of the null hypothesis leads to different economic interpretations, depending on the elements that are included in the vector x_t.

(1) To explain the forecast error in eq. (19) many alternative hypotheses and approaches have been used (like, the "news", etc.). In this case, we can rewrite eq. (19) as follows:

$$s_{t+1} - f_t = \psi(V_{t+1} - V_{t+1}^e) + \psi^*(V_{t+1}^* - V_{t+1}^{*e}) + \varepsilon_{t+1} \tag{20}$$

where, $x_t = \{(V_{t+1} - V_{t+1}^e), (V_{t+1}^* - V_{t+1}^{*e})\}$, V_{t+1} *and* V_{t+1}^* = appropriate exogenous variables explaining the exchange rate (i.e., variables from the monetary approach).

(2) An alternative approach examining the issue of a risk premium is the inspection of serial correlation of the forecast error by taking x_t as a function of lagged forecast errors from both countries,

$$x_t = \{(s_{t+1-j} - f_{t-j}), (s_{t+1-j}^* - f_{t-j}^*)\} \tag{21}$$

Since the simple efficient market hypothesis (unbiasdness of the forward rate) implies that the $s_{t+1} - f_t$ is uncorrelated to x_t, the rejection of the null hypothesis that $\psi = 0$ implies the rejection of the efficient market hypothesis.

(3) Another method is to establish a relationship between exchange risk premia and the measure of risk (from some financial variables). Some researchers[19] relate the realized returns in the foreign exchange markets to the nominal interest rates in both countries, as follows:

$$s_{t+1} - s_t - (i_t - i_t^*) = \gamma_0 + \gamma_1 i_t + \gamma_2 i_t^* + \varepsilon_{t+1} \tag{22}$$

where, $[s_t - (i_t - i_t^*) = f_t]$ = the covered interest rate parity condition, $\gamma_1 < 0$, and $\gamma_2 > 0$.

[19] See, Giovannini and Jorion [11].

Other researchers[20] have linked the risk premia in foreign exchange markets to the risk premia in the stock markets (rp_m):

$$s_{t+1} - s_t - (i_t - i_t^*) = \beta_0 + \beta_1 (R^e_{m,t+1} - i_t) + \beta_2 (R^{*e}_{m,t+1} - i_t^*) + \varepsilon_{t+1} \tag{23}$$

where, $[(R^e_{m,t+1} - i_t) = rp^e_{m,t+1}]$= the expected market risk premium in the domestic equity market conditional on I_t, $[(R^{*e}_{m,t+1} - i_t^*) = rp^{*e}_{m,t+1}]$= the expected risk premium in the foreign stock market conditional on I_t, $\beta_1 > 0$, and $\beta_2 < 0$.

The confirmation of the above tests of hypothesis validates the argument for the existence of a risk premium in the foreign exchange markets.

5 Empirical Results

The data are monthly and are coming from *Economagic.com*, *Eurostat*, and *Bloomberg*. For the euro (€), the data are from 1999:01 to 2017:01 and for the other four currencies ($, £, C$, and ¥) from 1971:01 to 2017:01. Other data used, here, are T-Bill rates, money supplies, incomes, price levels, and stock market indexes. An empirical test of efficiency is a joint test of efficiency (full information) and the equilibrium (harmony) model. By "equilibrium," we mean an internal, external, eternal, and global balance that must exist in markets and societies because we (every individual) must be in balance and live in harmony with ourselves, the others, and the entire socio-economic environment;[21] otherwise, how can there be an equilibrium? Recent tests conducted by Kallianiotis [17] show that the evidence supporting the unbiased forward rate hypothesis is quite weak. He found that a non-consistent risk premium is present in several major foreign exchange markets ($/€, $/£, and ¥/$). The implication of these empirical findings is that one cannot use the forward rate directly as a measure for the future spot rate because there are many interventions in the foreign exchange market and many surprises (financial shocks) imposed by the "world planners".

5.1 Extrapolative Expectations

We run eq. (5) to determine α and the results appeared in Table 1a. The regressions give: for $/€, $\alpha = 0.194^{***} > 0$; for $/£, $\alpha = 0.342^{***} > 0$; for C$/$, $\alpha = 0.178^{***} > 0$; and for ¥/$ $\alpha = 0.328^{***} > 0$. Then, the expectations move the same direction, as in the past ($\Delta s_t \uparrow \Rightarrow \Delta s^e_{t+1} \uparrow$) for the four exchange rates.

[20] See, Chiang [3].
[21] See, Kallianiotis [13] and [16].

Table 1a: Extrapolative Expectations, Eq. (5)
$\Delta s^{e}_{t+1} = \alpha \Delta s_t$; if $\alpha > 0$ expectations move the same direction and if $\alpha < 0$ the opposite direction
$(s_t - s_{t-1} = \alpha(s_{t-1} - s_{t-2})$ and $(s_t - s_{t-1} = \alpha_0 + \alpha(s_{t-1} - s_{t-2})$

	α_0	α	R^2	SSR	F	$D-W$	N
\$/€	-	0.194***	0.038	0.136	-	2.023	215
		(0.067)					
\$/€	-0.001	0.194***	0.038	0.136	8.416	2.023	215
	(0.002)	(0.067)					
\$/£	-	0.342***	0.114	0.277	-	1.932	551
		(0.040)					
\$/£	-0.001	0.340***	0.116	0.277	71.796	1.932	551
	(0.001)	(0.040)					
C\$/\$	-	0.178***	0.031	0.129	-	2.004	551
		(0.042)					
C\$/\$	0.001	0.177***	0.031	0.129	17.768	2.004	551
	(0.001)	(0.042)					
¥/\$	-	0.328***	0.103	0.354	-	1.979	551
		(0.040)					
¥/\$	-0.001	0.325***	0.105	0.353	64.624	1.977	551
	(0.001)	(0.040)					

Note: R^2 = R-squared, SSR = sum of squared residuals, F = F-Statistic, $D-W$ = Durbin-Watson Statistic, N = number of observations, *** = significant at the 1% level, ** = significant at the 5% level, and * = significant at the 10% level.
Source: *Economagic.com*, *Bloomberg*, and *Eurostat*.

Running the same equation [eq. (5)] with constant term, we have the same results; the $\alpha_{0s} \cong 0$ (statistically insignificant) and the α_s very similar as in the previous regressions without constant term. Thus, the expectations move the same direction.

Now, we run eq. (7) and the results are shown in Table 1b. For \$/€, $\alpha = -0.197^{***}$; for \$/£, $\alpha = -0.340^{***}$; for C\$/\$, $\alpha = -0.179^{***}$; and for ¥/\$, $\alpha = -0.324^{***}$. The negative α_s tell us that the expectations move the opposite direction. Again, running the eq. (7) with constant terms give the same results as

before ($\alpha_s < 0$). Thus, the expectations move the opposite direction ($s_{t-2} \uparrow \Rightarrow s_t \downarrow$).

Table 1b: Extrapolative Expectations, Eq. (7)
$s_t = (1-\alpha)\, s_{t-1} + \alpha\, s_{t-2}$ and $s_t = \alpha_0 + (1-\alpha)\, s_{t-1} + \alpha\, s_{t-2}$; if $\alpha > 0$ expectations move the same direction and if $\alpha < 0$ the opposite direction

	α_0	$1-\alpha$	α	R^2	SSR	F	$D-W$	N
\$/€	-	1.190***	-0.197***	0.973	0.135	-	2.024	215
		(0.067)	(0.067)					
\$/€	0.003	1.187***	-0.203***	0.973	0.134	3,827.403	2.029	215
	(0.003)	(0.067)	(0.067)					
\$/£	-	1.338***	-0.340***	0.982	0.276	-	1.932	551
		(0.040)	(0.040)					
\$/£	0.007**	1.333***	-0.347***	0.982	0.274	15,121.86	1.936	551
	(0.003)	(0.040)	(0.040)					
C\$/\$	-	1.178***	-0.179***	0.988	0.129	-	2.004	551
		(0.042)	(0.042)					
C\$/\$	0.002*	1.172***	-0.181***	0.988	0.128	21,961.38	2.006	551
	(0.001)	(0.042)	(0.042)					
¥/\$	-	1.324***	-0.324***	0.996	0.352	-	1.977	551
		(0.040)	(0.040)					
¥/\$	0.025*	1.317***	-0.322***	0.996	0.350	74,561.27	1.977	551
	(0.013)	(0.040)	(0.040)					

Note: See, Table 1a.
Source: See, Table 1a.

5.2 Adaptive Expectations

The forecasting of the s_t^e is taking place with an $ARMA(1,1)$ process, which gives very good results and they are presented in Table 2a. By using the forecasting $\hat{s}_t^e$ from the $ARMA(1,1)$ equations, we run Eq. (8), which is shown in Table 2b. The results are: for \$/€, $\lambda = -0.185^{***}$; for \$/£, $\lambda = -0.384^{***}$; for C\$/\$, $\lambda = -0.173^{***}$; and for ¥/\$, $\lambda = -0.338^{***}$. The same regressions with a constant term α_0 give similar results as the equations without constant term. For \$/€, $\lambda = -0.197^{***}$ and

$1-\lambda = 1.178^{***} \cong [1-(-0.197) = 1.197]$; for \$/£, $\lambda = -0.395^{***}$ and $1-\lambda = 1.380^{***}$; for C\$/\$, $\lambda = -0.179^{***}$ and $1-\lambda = 1.169^{***}$; and for ¥/\$, $\lambda = -0.339^{***}$ and $1-\lambda = 1.333^{***}$. The coefficient $\lambda_s < 0$ (came out negative) that means the spot rates had been lower than they were expected and people revise their expectations downward for the future.

Table 2a: Forecasting of $\hat{s}_t^e$

$ARMA(1,1): \; s_t = \alpha_0 + \alpha_1 s_{t-1} + \alpha_2 \varepsilon_{t-1} + \varepsilon_t$

	α_0	α_1	α_2	R^2	SSR	F	$D-W$	N
\$/€	0.158	0.978^{***}	0.178^{***}	0.973	0.136	2,528.357	1.956	217
	(0.096)	(0.013)	(0.062)			RMSE = 0.025117		
\$/£	0.543^{***}	0.988^{***}	0.395^{***}	0.983	0.272	10,334.25	1.994	553
	(0.082)	(0.007)	(0.035)			RMSE = 0.022128		
C\$/\$	0.174^{**}	0.992^{***}	0.169^{***}	0.988	0.129	14,664.92	1.977	553
		(0.074)	(0.006) (0.023)			RMSE = 0.015269		
¥/\$	5.197^{***}	0.998^{***}	0.325^{***}	0.996	0.355	49,893.1	1.959	553
		(0.014)	(0.003) (0.035)			RMSE = 0.025324		

Note: See, Table 1a.
Source: See, Table 1a.

Lastly, by using the forecasting $\hat{s}_t^e$, we run eq. (10) and the results appeared in Table 2c. Now, all the $\hat{\lambda}_s > 0$ (are positive); the spot rates had been higher than expected and people revise their expectations upward for the future.

Table 2b: Adaptive Expectations, Eq. (8)
$s_t = (1-\lambda)\, s_{t-1} + \lambda\, s^e_{t-1}$ and $s_t = \alpha_0 + (1-\lambda)\, s_{t-1} + \lambda\, s^e_{t-1}$

	α_0	$1-\lambda$	λ	R^2	SSR	F	$D-W$	N
\$/€	-	1.176***	-0.185***	0.973	0.136	-	1.993	215
		(0.068)	(0.069)					
\$/€	0.003	1.178***	-0.197***	0.973	0.135	3,806.275	2.011	215
	(0.003)	(0.068)	(0.070)					
\$/£	-	1.381***	-0.384***	0.982	0.272	-	1.982	551
		(0.043)	(0.043)					
\$/£	0.008**	1.380***	-0.395***	0.982	0.270	15,364.17	1.999	551
	(0.003)	(0.043)	(0.043)					
C\$/\$	-	1.171***	-0.173***	0.988	0.129	-	1.990	551
		(0.043)	(0.043)					
C\$/\$	0.002**	1.169***	-0.179***	0.988	0.128	21,913.05	2.001	551
	(0.001)	(0.043)	(0.043)					
¥/\$	-	1.338***	-0.338***	0.996	0.354	-	1.994	551
		(0.043)	(0.043)					
¥/\$	0.027**	1.333***	-0.339***	0.996	0.351	74,425.66	2.000	551
	(0.013)	(0.043)	(0.043)					

Note: See, Table 1a.
Source: See, Table 1a.

5.3 Rational Expectations

Further, we test rational expectations equation, eq. (12), and it is shown in Table 3. To forecast the $\hat{s}^e_t$, we use the $ARMA(1,1)$ process, as we did in the previous eqs. (8) and (10). The results show: For \$/€, $\alpha_0 = 0.005^{**} \neq 0$ and $\alpha_1 = 0.969^{***} \cong 1$; then, $\hat{s}^e_t \neq s_t$ and the expectations are not rational. For \$/£, $\alpha_0 = 0.009^{**} \neq 0$ and $\alpha_1 = 0.986^{***} \cong 1$; thus, $\hat{s}^e_t \neq s_t$ and expectations are not rational for this exchange rate, too. Now, for C\$/\$, $\alpha_0 = 0.002 \cong 0$ and $\alpha_1 = 0.989^{***} \cong 1$; then, $\hat{s}^e_t = s_t$ and expectations for this exchange rate are rational. The same holds for ¥/\$, $\alpha_0 = 0.002 \cong 0$ and $\alpha_1 = 0.999^{***} \cong 1$; so, $\hat{s}^e_t = s_t$ and expectations are rational, here.

Table 2c: Adaptive Expectations, Eq. (10)

$$s_t - s_{t-1} = \lambda(s^e_{t-1} - s_{t-1})$$

	λ	R^2	SSR	F	$D-W$	N
\$/€	1.030*** (0.340)	0.041	0.136	-	1.958	216
\$/£	1.012*** (0.108)	0.136	0.270	-	2.011	552
C\$/\$	1.063*** (0.239)	0.034	0.129	-	2.002	552
¥/\$	1.065*** (0.131)	0.102	0.354	-	2.006	552

Note: See, Table 1a.
Source: See, Table 1a.

5.4 Regressive Expectations

We start estimating the long run equilibrium of the exchange rate, $\bar{s}_t$, by using the monetary approach and the results of these regressions appeared in Table 4a. Then, the regressive expectations, eq. (13), are tested and Table 4b gives the results. For \$/€, $\delta = -0.137$(insignificant), then the future spot rate (s_t) does not move to its long run equilibrium value ($\bar{s}_t$), so agents are not characterized by regressive expectations. For \$/£, $\delta = -0.162^{**}$, which shows that the future spot rate (s_t) moves to its long run equilibrium value ($\bar{s}_t$). For C\$/\$, $\delta = 0.142^{***}$, then the future spot rate (s_t) moves in the direction of some fundamental ($\bar{s}_t$). For ¥/\$, $\delta = -0.150^{**}$ that shows the future spot rate (s_t) moves to its long run equilibrium value (to some fundamentals $\bar{s}_t$). Thus, for the three exchange rates (\$/£, C\$/\$, and ¥/\$), agents are characterized by regressive expectations.

Table 3: Rational Expectations, Eq. (12)
$\hat{s}_t^e = \alpha_0 + \alpha_1 s_t + \varepsilon_t$; if $\alpha_0 \cong 0$ and $\alpha_1 \cong 1$

	α_0	α_1	R^2	SSR	F	$D-W$	N
\$/€	0.005**	0.969***	0.973	0.132	7,620.383	1.966	216
	(0.003)	(0.011)					
\$/£	0.009***	0.986***	0.983	0.267	31,063.4	2.010	552
	(0.003)	(0.006)					
C\$/\$	0.002	0.989***	0.988	0.127	44,107.47	1.985	552
	(0.001)	(0.005)					
¥/\$	0.002	0.999***	0.996	0.352	150,576.8	1.972	552
	(0.113)	(0.003)					

Note: See, Table 1a.
Source: See, Table 1a.

Now, we run eq. (14) with a constant and the results are presented in Table 4c. For \$/€, $\delta = -0.099$; for \$/£, $\delta = -0.063$; and for ¥/\$, $\delta = -0.075$ (insignificants), which shows that these three exchange rates do not change to reach their long run equilibria. For C\$/\$, $\delta = 0.143^{***}$, which tells us that this spot rate is below the long run equilibrium rate and it is expected to climb.

Then, eq. (15) gives the results (extrapolative and regressive components) that are shown in Table 4d. For \$/€, $\alpha = 0.283^{***}$ (extrapolative component) that shows the current spot rate will appreciate in the short run; $\delta = -0.046$(regressive component) reveals that the current spot rate will not move to a long run equilibrium value (fundamentals do not affect it).[22] For the other three exchange rates: (\$/£, $\alpha = 0.576^{***}$, $\delta = 0.373^{***}$), (C\$/\$, $\alpha = 0.370^{***}$, $\delta = 0.333^{***}$), and (¥/\$, $\alpha = 0.427^{***}$, $\delta = 0.197^{***}$), we see a tendency for the current spot rates to appreciate ($\alpha_s > 0$) in the near future (short-run). They might overshoot. Their second terms ($\delta_s > 0$) recommend that the current spot rates will move towards

[22] This is an indication of weak effects from fundamentals, due to globalization (outsourcing). The U.S. and Euro-zone have lost their manufacturing; it went to Asia. These two economies try to survive with the service sector (with falsehood), financial markets and services in general, which is impossible. The western economies are under collapse, after so many years of exploitation and control of their factors of production; especially, the factor labor (with minimum wages without health care and other benefits) and the factor land (with the enormous property taxes). *(sic).*

Table 4a: Forecasting the Long Run $\bar{s}_t$ by Using the Monetary Approach

$$s_t = \alpha_0 + \alpha_1(m_t - m_t^*) + \alpha_2(y_t - y_t^*) + \alpha_3(i_t - i_t^*) + \varepsilon_t$$

Variables	s_t (\$/€)	s_t (\$/£)	s_t (C\$/\$)	s_t (¥/\$)
c	-2.942***	1.349***	-1.027***	2.549***
	(0.703)	(0.249)	(0.068)	(0.800)
$m_t - m_t^*$	-0.766**	-0.386***	0.529***	-0.344**
	(0.345)	(0.089)	(0.026)	(0.142)
$y_t - y_t^*$	1.518***	-0.074	-0.024	0.445**
	(0.349)	(0.072)	(0.026)	(0.172)
$i_t - i_t^*$	0.013	-0.025***	0.003	0.028***
	(0.021)	(0.004)	(0.002)	(0.008)
ε_{t-1}	1.447***	1.161***	1.073***	1.392***
	(0.119)	(0.058)	(0.034)	(0.064)
ε_{t-2}	1.453***	1.075***	1.201***	1.593***
	(0.166)	(0.081)	(0.049)	(0.097)
ε_{t-3}	1.248***	1.058***	1.150***	1.564***
	(0.174)	(0.090)	(0.067)	(0.111)
ε_{t-4}	0.967***	0.875***	0.978***	1.379***
	(0.193)	(0.089)	(0.066)	(0.121)
ε_{t-5}	0.708***	0.630***	0.682***	0.897***
	(0.173)	(0.079)	(0.055)	(0.107)
ε_{t-6}	0.247**	0.299***	0.385***	0.407***
	(0.111)	(0.059)	(0.036)	(0.065)
R^2	0.966	0.939	0.981	0.964
SSR	0.063	0.154	0.133	0.188
F	243.255	463.964	2,134.515	658.732
$D-W$	1.902	1.835	1.770	1.824
N	96	312	428	258

Note: See, Table 1; m_t = ln of money supply, y_t = ln of income, i_t = short-term interest rate, and an asterisk (*) on a variable denotes the foreign variable.
Source: See, Table 1.

Table 4b: Regressive Expectations, Eq. (13)

$$s_t = \alpha_0 + (1-\delta)\, s_{t-1} + \delta\, \bar{s}_{t-1}$$

	α_0	$1-\delta$	δ	R^2	SSR	F	$D-W$	N
\$/€	0.003	1.118***	-0.137	0.970	0.025	1,522.552	1.429	96
	(0.003)	(0.086)	(0.093)					
\$/£	0.024***	1.113***	-0.162**	0.938	0.158	2,330.688	1.563	312
	(0.008)	(0.060)	(0.066)					
C\$/\$	0.001	0.857***	0.142***	0.983	0.120	12,153.48	1.481	428
	(0.002)	(0.047)	(0.049)					
¥/\$	0.142**	1.120***	-0.150**	0.967	0.172	3,728.325	1.597	258
	(0.060)	(0.062)	(0.067)					

Note: See, Table 1a.
Source: See, Table 1a.

Table 4c: Regressive Expectations, Eq. (14)

$$(s_t - s_{t-1}) = \alpha_0 + \delta(\bar{s}_{t-1} - s_{t-1})$$

	α_0	δ	R^2	SSR	F	$D-W$	N
\$/€	0.001	-0.099	0.014	0.057	1.382	1.413	96
	(0.003)	(0.084)					
\$/£	-0.001	-0.063	0.004	0.162	1.164	1.459	312
	(0.001	(0.058)					
C\$/\$	0.001	0.143***	0.023	0.120	10.148	1.481	428
	(0.001)	(0.045)					
¥/\$	0.001	-0.075	0.006	0.176	1.587	1.501	258
	(0.002)	(0.060)					

Note: See, Table 1a.
Source: See, Table 1a.

their long run equilibrium values (due to changes in their fundamentals). Thus, extrapolative and regressive expectations will take place.

Table 4d: Regressive Expectations, Eq. (15)
$(s_t - s_{t-1}) = \alpha_0 + \alpha(s_{t-1} - s_{t-2}) + \delta(\bar{s}_{t-1} - s_{t-1})$

	α_0	α	δ	R^2	SSR	F	$D-W$	N
\$/€	0.001	0.283**	-0.046	0.102	0.051	5.205	1.884	95
	(0.002)	(0.134)	(0.131)					
\$/£	-0.001	0.576***	0.373***	0.154	0.138	28.112	1.878	312
	(0.001	(0.078)	(0.080)					
C\$/\$	0.001	0.370***	0.333***	0.119	0.108	28.808	1.987	428
	(0.001)	(0.054)	(0.051)					
¥/\$	0.001	0.427***	0.197***	0.108	0.158	15.509	1.949	258
	(0.002)	(0.079)	(0.076)					

Note: See, Table 1a.
Source: See, Table 1a.

5.5 General Specifications of Expectations

Now, we test the random walk hypothesis, eq. (16) and its results are given in Table 5a. This is a test of static expectations, too. For \$/€ and \$/£ the random walk holds, but for C\$/\$ and ¥/\$ the constant terms are significant different than zero, which shows that the random walk does not hold for these two exchange rates. Then, we run eq. (18) by taking as $x_t = f_{t-1} - s_{t-1}$ (additional information), the unbiased forward rate hypothesis, which is shown in Table 5b. For the four exchange rates their ζ_s are positive and statistically significant at the 1% level. Thus, the forward discounts of last period give additional information to determine the future Δs_t^e (the unbiased forward rate hypothesis holds).

Table 5a: Random Walk, Eq. (16)
$s_t = \alpha_0 + \alpha_1 s_{t-1} + \varepsilon_t$; if $\alpha_0 \cong 0$ and $\alpha_1 \cong 1$

	α_0	α_1	R^2	SSR	F	$D-W$	N
\$/€	0.002	0.987***	0.972	0.141	7,341.461	1.592	216
	(0.003)	(0.012)					
\$/£	0.004	0.990***	0.980	0.311	26,832.25	1.313	552
	(0.003	(0.006)					
C\$/\$	0.002*	0.993***	0.987	0.133	42,744.67	1.640	552
	(0.001)	(0.005)					
¥/\$	0.027*	0.994***	0.996	0.391	135,023.5	1.354	552
	(0.014)	(0.003)					

Note: See, Table 1a.
Source: See, Table 1a.

Table 5b: The Unbiased Forward Rate Hypothesis, Eq. (18)
$(s_t - s_{t-1}) = \alpha_0 + \zeta(f_{t-1} - s_{t-1}) + \varepsilon_t$

	α_0	ζ	R^2	SSR	F	$D-W$	N
\$/€	-0.003	0.740***	0.208	0.074	36.405	1.657	141
	(0.002)	(0.123)					
\$/£	-0.002	1.098***	0.481	0.085	289.533	1.867	315
	(0.001	(0.065)					
C\$/\$	-0.001	0.842***	0.350	0.067	128.236	1.988	240
	(0.001)	(0.074)					
¥/\$	-0.001	1.073***	0.464	0.116	271.399	1.861	315
	(0.001)	(0.065)					

Note: See, Table 1a.
Source: See, Table 1a.

Table 6a: Forecasting the m_t^e by Using the Demand for Money, $m_t = \alpha_0 + \alpha_1 p_t + \alpha_2 y_t + \alpha_3 i_t + \varepsilon_t$

Variables	m_t (\$)	m_t^* (€)	m_t^* (£)	m_t^* (C\$)	m_t^* (¥)
c	-2.632***	-10.449***	-20.872***	-3.127***	14.005***
	(0.356)	(0.681)	(0.896)	(0.415)	(0.869)
p_t	1.082***	2.644***	2.946***	1.072***	-0.053
	(0.043)	(0.108)	(0.061)	(0.187)	(0.039)
y_t	0.602***	0.932***	1.722***	0.630***	-0.037
	(0.058)	(0.143)	(0.090)	(0.088)	(0.025)
i_t	-0.002***	-0.002	-0.005**	-0.010***	0.001
	(0.001)	(0.002)	(0.002)	(0.003)	(0.002)
m_{t-1}^*	-	-	-	-	0.999***
					(0.002)
ε_{t-1}	1.592***	1.091***	1.091***	1.222***	0.439***
	(0.039)	(0.092)	(0.062)	(0.041)	(0.058)
ε_{t-2}	2.206***	0.863***	1.225***	1.595***	0.323***
	(0.068)	(0.129)	(0.085)	(0.060)	(0.069)
ε_{t-3}	2.706***	0.639***	1.281***	1.676***	0.414***
	(0.099)	(0.137)	(0.104)	(0.078)	(0.073)
ε_{t-4}	2.861***	0.285***	1.202***	1.866***	0.193***
	(0.120)	(0.090)	(0.120)	(0.089)	(0.062)
ε_{t-5}	2.634***	-	1.134***	1.774***	-
	(0.130)		(0.123)	(0.096)	
ε_{t-6}	2.202***	-	1.127***	1.558***	-
	(0.121)		(0.111)	(0.083)	
R^2	0.999	0.998	0.999	0.998	0.999
SSR	0.061	0.008	0.042	0.304	0.001
F	246,278.7	10,035.19	43,609.81	20,135.65	137,703.1
$D-W$	1.553	2.111	1.816	1.759	1.966
N	552	132	312	428	258
$RMSE$	0.010489	0.00782	0.011715	0.029535	0.002135

Note: See, Table 1; m_t = ln of money supply, y_t = ln of income, i_t = short-term interest rate, and an asterisk (*) on a variable denotes the foreign variable.
Source: See, Table 1.

5.6 Orthogonality Tests

We start estimating a variable $V_t \equiv m_t$ and as forecasting of $V_{t+1}^e \equiv m_{t+1}^e$, we use the demand for money equation, which is reported in Table 6a. By using these regressions, we run eq. (20) and its results are in Table 6b. For \$/€, the domestic "news" ($\psi = -0.725^{*}$) have significant effect on ($s_t - f_{t-1}$); for \$/£, the "news" have no significant effect on ($s_t - f_{t-1}$); for the C\$/\$, the domestic and Canadian "news" ($\psi = 0.456^{***}, \psi^{*} = -0.329^{***}$) have significant effects on ($s_t - f_{t-1}$); and for the ¥/\$ exchange rate, only the Japanese "news" ($\psi^{*} = 1.570^{***}$) have significant effect on the ($s_t - f_{t-1}$).

Then, we run eq. (22) and the outcome is presented in Table 6c. The results show, here, that the nominal interest rates have significant effects on the $rp_t = s_t - s_{t-1} - (i_{t-1} - i_{t-1}^{*})$. The next equation is eq. (23) and its results are shown in Table 6d. It is revealed that the expected risk premia in the domestic equity markets have significant negative effect [$rp_m^e \uparrow \Rightarrow s_{t+1} - f_t \downarrow (\$\uparrow)$], except for ¥/\$ rate, which is insignificant and the expected risk premia in the foreign equity markets have significant positive effect on the covered interest rate parity [$rp_m^{*e} \uparrow \Rightarrow$

Table 6b: The Forward Exchange Market Efficiency, the "News", Eq. (20)

$$(s_t - f_{t-1}) = \alpha_0 + \psi(m_t - m_t^e) + \psi^{*}(m_t^{*} - m_t^{*e}) + \varepsilon_t$$

	α_0	ψ	ψ^{*}	R^2	SSR	F	$D-W$	N
\$/€	-0.007**	-0.725*	-0.523	0.271	0.004	3.347	2.440	21
	(0.003)	(0.353)	(0.426)					
\$/£	-0.002	-0.032	0.047	0.001	0.084	0.191	1.799	311
	(0.001	(0.089)	(0.082)					
C\$/\$	-0.001	0.456***	-0.329***	0.354	0.044	63.985	1.818	237
	(0.001)	(0.082)	(0.030)					
¥/\$	-0.001	0.088	1.570**	0.028	0.092	3.594	1.808	257
	(0.001)	(0.104)	(0.619)					

Note: See, Table 1a.
Source: See, Table 1a.

Table 6c: The Exchange Risk Premium and the Nominal Interest Rates, Eq. (22)

$$s_t - s_{t-1} - (i_{t-1} - i^*_{t-1}) = \gamma_0 + \gamma_1 i_{t-1} + \gamma_2 i^*_{t-1} + \varepsilon_{t+1}$$

	γ_0	γ_1	γ_2	R^2	SSR	F	$D-W$	N
\$/€	-0.001	-1.000***	1.000***	0.997	0.142	38,223.71	1.604	216
	(0.003)	(0.004)	(0.004)					
\$/£	-0.002	-1.002***	1.001***	0.999	0.284	1,983,280	1.325	495
	(0.002)	(0.001)	(0.001)					
C\$/\$	0.001	-0.999***	0.999***	0.999	0.133	2,831,623	1.643	550
	(0.001)	(0.001)	(0.001)					
¥/\$	-0.001	-0.999	0.994***	0.999	0.177	828,961.3	1.400	261
	(0.002)	(0.001)	(0.004)					

Note: See, Table 1a.
Source: See, Table 1a.

Table 6d: The Exchange Risk Premium and the Risk Premium in the Stock Market, Eq. (23)

$$s_t - s_{t-1} - (i_{t-1} - i^*_{t-1}) = \beta_0 + \beta_1 (R_{m_t} - i_t) + \beta_2 (R^*_{m_t} - i^*_t) + \varepsilon_{t+1}$$

	β_0	β_1	β_2	R^2	SSR	F	$D-W$	N
\$/€	-0.001	-1.000***	1.000***	0.997	0.142	38,223.71	1.604	216
	(0.003)	(0.004)	(0.004)					
\$/£	-0.002	-1.002***	1.001***	0.999	0.284	1,983,280	1.325	495
	(0.002)	(0.001)	(0.001)					
C\$/\$	0.001	-0.999***	0.999***	0.999	0.133	2,831,623	1.643	550
	(0.001)	(0.001)	(0.001)					
¥/\$	-0.001	-0.999	0.994***	0.999	0.177	828,961.3	1.400	261
	(0.002)	(0.001)	(0.004)					

Note: See, Table 1a.
Source: See, Table 1a.

deviation between the actual spot and the forward rate $(s_{t+1} - f_t) \uparrow$ (\$↓ and €↑, £↑, C\$↓, and ¥↓)]. Thus, the foreign rp_m^{*e} are some additional information to forecast the error of $(s_{t+1} - f_t)$.

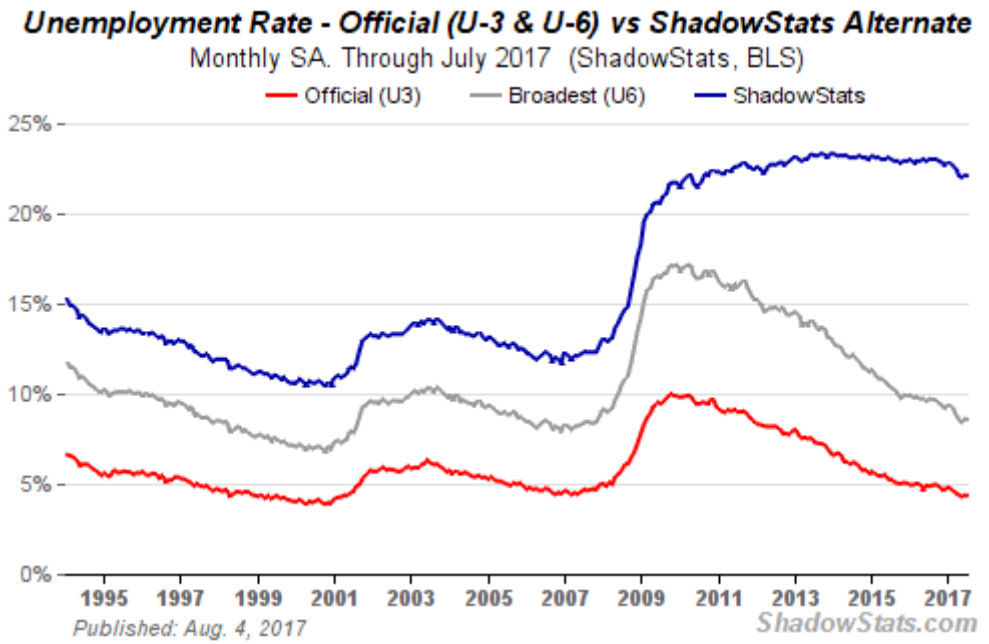
6 Policy Implications

Macroeconomic announcements play an important role in updating policymakers' and public's assessment of the U.S. economy; so expectations on movements of exchange rates are also affected by these "news".[23] The conduct of monetary policy changed substantially in the aftermath of the global financial crisis. Fed set the federal funds rate at near zero ($\bar{i}_{FF} = 0.25\%$), the zero lower bound (ZLB) and monetary policy statements about the path of interest rates became more explicitly linked to the anticipated evolution of inflation and unemployment,[24]

[23] Unfortunately, the media are completely controlled and their news are "fake". As we see lately, they have made up so much fake news about the bogus Russiagate conspiracy to force President Trump to avoid to make world peace with President Putin.

[24] The true unemployment rate with July 2017 is 22.1% (SGS) and not what the BLS is reporting as the official one of 4.3% (https://data.bls.gov/timeseries/LNS14000000).

The ShadowStats Alternate Unemployment Rate for July 2017 is 22.1%.



Source: http://www.shadowstats.com/alternate_data/unemployment-charts

known as forward guidance. The ZLB period (December 2008-December 2015)[25] was very different from the previous monetary policy regimes in terms of the nature of Fed policy communication and policy setting itself. It brought the introduction of unconventional quantitative easing to stimulate the economy. These new tools included quantitative easing (increasing the money supply by purchasing Treasuries and mortgage-backed securities) and the maturity-extension program (with the Fed shifting its balance sheet holdings of Treasuries to longer-term debt).[26]

For example, on April 3, 2015, an unemployment report illustrated a reaction to disappointing news (negative surprise). The statement reported that in March 2015, the economy added 126,000 jobs; sharply lower than the expected 245,000 jobs, a negative surprise of 119,000 jobs. This development led to an increase in Treasury note futures prices and a decline in their implied interest rates, as well as a depreciation of the U.S. dollar within a very tight time interval around the announcement. These price responses illustrate the reaction of interest and exchange rates to employment report surprises ("news").[27] The exchange rate should be insulated against the impact of shocks to expectations over future productivity. This is because, with sticky nominal goods prices, exchange rate movements affect relative prices, and in the models we analyze, efficient relative prices are independent of future productivity. The models, as formulated, make an assumption of complete markets. When market are incomplete, "news" shocks may generate wealth effects that alter current relative prices, even when all nominal prices are fully flexible. This makes the optimal policy response to news shocks less clear.

But it is still not self-evident that under a policy that ignores "news" shocks, the exchange rate will move in a manner consistent with efficient adjustment. Experience with floating exchange rates has shown us that expectations can lead to large and prolonged swings in exchange rates that do not correspond to any current changes in tastes or technology. Indeed, asset markets may be correctly pricing the effects of future changes in fundamentals, but the resulting allocations still are not efficient. Exchange rates cannot simultaneously

[25] See, https://fred.stlouisfed.org/series/FEDFUNDS

[26] Kallianiotis [14].

[27] Koch and Yung ([24], Chart 4, p. 4) give a chart, where they show the Dollar/Euro Futures sensitivity to U.S. News (macroeconomic surprises). First, high sensitivity for the $/€ Futures exists for the following "news". Housing: Existing-home sales, Initial jobless claims, Nonfarm payrolls, Real GDP growth: advance, Real GDP growth: second, Personal spending, Consumer confidence, and ISM manufacturing index. Then, less sensitivity exists for the $/€ Futures prices to the following macroeconomic surprises. Housing: housing permits, Housing: housing starts, Housing: new-home sales, Real GDP growth: final, Inflation: CPI, Inflation: PPI, Personal income, Retail sales, Consumer sentiment: preliminary, Consumer sentiment: final, Industrial production, Durable goods orders, and Factory orders.

achieve the asset market equilibrium that reflects "news" about the future relative values of currencies and the goods market equilibrium that reflects efficient relative prices. With the outsourcing after 1980s (loss of agriculture and manufacture), the surprises are only monetary shocks that cause overshooting (extrapolative components) to the exchange rates. Their long run equilibria (regressive components) have become weak.

Unfortunately, we sent all the jobs to China, India, and the other developing countries and we try to improve the economy with zero interest rates (ZLB), which does not work. It causes only new bubbles,[28] new crises, lasting recessions, and they (the policy makers) try to lie to people by changing the way that they measure unemployment, inflation, and growth. Then, people have lost their trusts for the policymakers and their expectations are based on the negative "news", which are many and affect the exchange rates and the other market prices. The zero deposits' rates have forced people to undertake, without their will, the high risk that the investment in financial markets generate. Individuals cannot trust the risky financial markets after the global financial crisis of 2007 and the enormous losses that they experienced. People have lost confidence to Fed[29] and

[28] The new financial bubble is very dangerous (DJIA form 6,547.05 on March 9, 2009 reached 23,434.19 on October 27, 2017). A growth of 16,887.14 point, 257.94% or 30.05% per annum and the bubble is growing. President Trump could face a total meltdown of the U.S. economy and then, a global financial and real crisis will take place, for which the financial manipulators are currently working. The U.S. Fed (Janet Yellen) is responsible for this forthcoming catastrophe by keeping the federal funds rate closed to zero since December 2008. On October 31, 2017, the effective federal funds rate was 1.16% and the target federal funds rate was (1.00%-1.25%). See, http://www.bankrate.com/rates/interest-rates/prime-rate.aspx?ec_id=m1032276&s_kwcid=AL!1325!10!391947733!4092256875&ef_id=WCTn_wAAACtXQgUz%3a20171010161045%3as . See also, https://fred.stlouisfed.org/series/FEDFUNDS. Our central banks and all the international institutions are in a serious disarray, as victims of globalization. Of course, the ultimate controller of the world is God!.. Even the "Nobel Economist Thaler Says He's Nervous About Stock Market", https://www.bloomberg.com/news/articles/2017-10-10/nobel-economist-thaler-says-he-s-nervous-about-stock-market

[29] "The Fed tells visitors its basement vault holds the world's biggest official gold stash and values it at $240 billion to $260 billion. But 'no one at all can be sure the gold is really there except Fed employees with access'… Other theorists suspect the gold beneath the New York Fed's headquarters at 33 Liberty St. may be gold-pated fakes." See, Katy Burne, "Fed Has 6,200 Tons of Gold in New York Basement-Or Does It?", *The Wall Street Journal*, August 11, 2017, pp. A1 and A7. Also, "Upon Strauss-Kahn raising his concerns with American government officials close to President Obama he was 'contacted' by 'rogue elements' within the Central Intelligence Agency (CIA) who provided him 'firm evidence' that all of the gold reported to be held by the US 'was gone'." Posted on May 31, 2011 by Max Read more at http://www.maxkeiser.com/2011/05/upon-strauss-kahn-raising-his-concerns-with-american-government-officials-close-to-president-obama-he-was-%e2%80%98contacted%e2%80%99-by-%e2%80%98rogue-elements%e2%80%99-within-the-central-intelligenc/#zktvxwcLe2CWhAIv.99

to all the international institutions for their unexpected shocks that generate with their suspicious anti-social policies, complemented with fake "news".

7 Conclusion

It is difficult to measure market expectations, but they can be proxied by financial instruments (like, the exchange rates) that are set to be traded in the future and, thus, incorporate market expectations. The response of 10-year Treasury futures prices and currency futures using intraday data within a 15-minute symmetric window around the exact time of the release of macroeconomic "news" captures the market's reaction to the surprise. Foreign exchange futures are expressed in U.S. dollars so that an increase in the exchange rate indicates a depreciation of the U.S. dollar relative to a foreign currency. The real sector of the economy ("Main Street") is very important for every national economy. The long-run equilibrium value of the exchange rates must be determined by the countries' fundamentals and this is absent for the $/€ exchange rate.

Exchange rate futures tend to be relatively less sensitive to U.S. macroeconomic news. The euro is much more sensitive to U.S. macroeconomic surprises before than after the ZIB. There is more sensitivity to U.S. surprises in Japan's and Canada's currency responses post-2008. Both empirical evidence and theoretical discussion have long emphasized the impact of "news" on exchange rates. In most exchange rate models, the exchange rate acts as an asset price, and as such responds to "news" about future returns on assets. However, the exchange rate also plays a role in determining the relative price of non-durable goods when nominal goods prices are sticky. In this paper we investigated the exchange rate expectations for four different exchange rates ($/€, $/£, C$/$, and ¥/$), which are models of exchange rate forecasting. We examined the static expectations, the extrapolative, the adaptive, the rational, the regressive, some general specifications of these expectations, and we performed a few orthogonality tests.

If "news" about future asset returns causes movements in current exchange rates; then, when nominal prices are slow to adjust, this may cause changes in current relative goods prices that have no efficiency rationale. In this sense, anticipations of future shocks to fundamentals can cause current exchange rate misalignments. We outline a series of models in which an optimal policy eliminates the effects of "news" on exchange rates. Expectations affect exchange rates and are very sensitive to macro-variables (economic fundamentals). By using the extrapolative expectations, the results show that agents' expectations move the same direction. With the adaptive expectations test, we see that people adjust their expectations downward or upward based on the past-expected trend. Expectations are not rational for the forecasting of $/€ and $/£ exchange rates, but are rational for C$/$ and ¥/$. Regressive expectations do not affect the $/€ exchange rate,

which means that this spot rate is not moving with the economic fundamentals in the U.S. and EMU. The unbiased forward rate hypothesis holds for the four exchange rates. In general, agents are using exchange rate expectations more or less effectively to forecast exchange rates.

Lastly, by using orthogonality tests, we have a mixed effect of "news' on the risk premium. The U.S. and British "news" have no effect on \$/£ ($s_t - f_{t-1}$). The nominal short-term interest rates have significant effects on the exchange rate risk premia (rp_t). The equity markets risk premia (rp_m^e) have significant effects on the exchange rates risk premia (rp_t). Thus, expectations depend on many indicators, past values of spot and forward rates, economic fundamentals, and on the financial markets movements. The currency of a country depends on its real economy and on its public policies, which affect positively the long-run economic growth and the social welfare of the citizens (their wellbeing, i.e., "Americans first"). For this reason, the evidence show that the foreign exchange market efficiency is quite weak.

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