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Abstract

We employ senior bank loan officers' responses regarding actual and expected loan demand from enterprises linking successive surveys in order to determine the dominant expectation formation mechanism that best describes European senior bank loan officers' expectations. We utilize quarterly data for loan demand from enterprises from the European Bank Lending Survey for 14 Euro-area countries spanning the period 2003Q1 to 2019Q4. Our findings suggest that the adaptive expectations mechanism is compatible with senior bank loan officers' expectations for loan demand from enterprises. Our study contributes to the understanding of the formation of loan demand expectations and hence our findings can be very useful for monetary policy purposes.

Keywords: Adaptive expectations; bank lending survey; loan demand; survey-based expectations

JEL classification*:* C33, C53, D84

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"Expectations are central to the conduct of monetary policy"

Luis de Guindos, Vice-President of the ECB - Annual Congress of the European Economic Association, Manchester, 27 August 2019[1]

1. Introduction

In the framework of monetary policy, it is essential to comprehend how agents (senior bank loan officers in our case) form their expectations for loan demand from enterprises. According to Anastasiou and Drakos (2019), monetary authorities evaluate the conditions of the banking sector for the purpose of designing and implementing the proper policies, not only by depending on *hard statistics*, but also by complementing them with the so-called *soft data* reflecting demand and supply conditions.

Anastasiou and Drakos (2019) studied how senior bank loan officers form their expectations for loan supply in the Euro-area. However, this study sheds light only on the expectation formation mechanisms of the supply side of the loan market. We set out to fill this gap in the literature by examining the equally interesting research question of how senior bank loan officers shape their loan demand expectations in the Euro-area. In other words, are senior bank loan officers' expectations for loan demand from enterprises rational, adaptive or regressive? To the best of our knowledge, this is the first empirical study in the literature that tries to answer this question.

We utilize survey responses from successive surveys obtained from the Bank Lending Survey (BLS) in order to examine how bank loan officers' expectations of future business loan demand are fulfilled when are confronted with the realized outcomes. Our results qualify adaptive expectations as the mechanism that most adequately describes the formation of expectations.

[1] https://www.ecb.europa.eu/press/key/date/2019/html/ecb.sp190827~0941246e14.en.html

This study also contributes to the empirical literature on expectation formation mechanisms in the following manner: in order to empirically evaluate the above expectations, we use survey data on expectations for loan demand from enterprises for all the available countries (14 Eurozone countries) included in the BLS dataset. To the best of our knowledge, existing studies have not used these data before, and we aim at filling this gap in the literature.

The remainder of the paper is structured as follows: In Section 2, we present a comprehensive literature review, while Section 3 describes the data and the variables we use. In Section 4, we describe the econometric methodology, and Section 5 presents the estimation results. Finally, Section 6 concludes.

2. Literature Review

The notion of rational expectations was a paradigm shift in economics. Muth (1961) was the first to introduce the idea of the rational expectations hypothesis (REH hereafter). According to Muth (1961), rational expectations are defined as "the true mathematical expectation of the variable of interest conditional on information on all other related variables known." After his pioneering study, Lucas (1972), Frenkel (1975), Sargent and Wallace (1976), and Goodwin and Sheffrin (1982) further developed the notion of REH. These studies on rational expectations have produced a revolution in economics[2], spawning a significant amount of literature regarding the efficiency and formation of the expectations hypothesis.

However, many studies have been conducted supporting that the REH is not always the best way of describing the economy. Chow (1989, 2011) explained that adaptive expectations are superior to rational expectations by providing strong econometric evidence. Moosa and

[2] Pesaran (1987), Goodwin and Sheffrin (1982), and Dominitz and Manski (1997) have mentioned that the notion of the REH has impressively revised the way that economic policy, as well as economic modeling, is conducted.

Shamsuddin (2004) concluded that the expectation formation mechanism that dominates the exchange rate market is the adaptive expectations hypothesis. Finally, Jongen and Verschoor (2007) found that interest rate forecasts are not rational, thus implying that agents do not use all the existing information they have in an efficient way.

According to Chow (1989, 2011) and Drakos (2008), there is a plethora of reasons why the REH has been criticized by the literature. First, the REH does not premise any special expectation formation mechanism. Second, the REH states that regardless of how forecasts are produced, agents' rationality, in combination with market discipline, should eradicate all persistent errors and lead all participants/agents to make efficient use of all the available information. Another important disadvantage of testing the REH empirically is that the expectation (forecast) errors are usually formed through ex-post observed data. A way to bypass this disadvantage is to measure expectations by relying on survey data (Pesaran and Weale, 2006; Drakos, 2008; Miah et. al., 2016).

Expectations have been modeled in an ad hoc manner by many previous studies. However, there is a rapidly increasing amount of research on the mechanisms that form the expectations employing survey data[3] (Frankel and Froot, 1987; Fraser and MacDonald, 1993; Madsen, 1996; Dominitz and Manski, 1997; Dutt and Ghosh, 1997; Kim, 1997; Pesaran and Weale, 2006; Drakos, 2008; Prat and Uctum, 2011; Dave 2011; Miah et. al., 2016; Anastasiou and Drakos, 2019). The main benefit of using survey data is that by definition correspond to expectations that the respondents state. As Manski (2004) asserted, one of the best ways to assess both the accuracy and

[3] A significant number of studies have also shown that macroeconomic models demonstrate better performance when survey-based expectations are employed rather than model-constructed expectations (see, for e.g., Batchelor, 1986; Madsen, 1996; Lee and Shields, 2000).

the correctness of expectations is to follow the respondents as time passes and then contrast their expectations with the real events they experience.

3. Data Issues

For both actual (realized) and expected loan demand from enterprises (LD) we employ data from the BLS. The BLS is a survey-based database updated four times a year (i.e., on a quarterly basis) by the ECB, encompassing very useful information about the bank lending conditions in the Euro-area. Specifically, the European Central Bank (ECB) dispatches a questionnaire to senior bank loan officers from 150 Euro-area banks inviting them to provide information about the realized developments along with their expectations for the future. The BLS contains 22 questions, both backward and forward-looking, on past and expected developments respectively.

In any given BLS issue, senior bank loan officers are invited to respond on the future (expected) LD from enterprises, as well as for the corresponding occurred (actual) LD from enterprises in the previous period. Consequently, by linking successive survey responses, we investigate whether senior bank loan officers' expectations for LD from enterprises are formed rationally, and if deviations from rationality exist, we examine whether they conform to other widely known expectation formation mechanisms (i.e., adaptive and regressive expectations).

In the following boxes we provide the relevant questions from the BLS:

Question Q6*: Over the past three months (apart from normal seasonal fluctuations), how has the demand for loans or credit line to enterprises changed at your bank? Please refer to the financing need of enterprises independent of whether this need will result in a loan or not.*

Answer:

- *Decreased considerably*
- *Decreased somewhat*
- *Remained basically unchanged*
- *Increased somewhat*
- *Increased considerably*

Source: Bank Lending Survey Questionnaire, Section 1: Loans or credit lines to enterprises, question Q6.

Question Q9*: Please indicate how you expect demand for loans or credit lines to enterprises to change at your bank over the next three months (apart from normal seasonal fluctuations)? Please refer to the financing need of enterprises independent of whether this need will result in a loan or not.*

Answer:

- *Decreased considerably*
- *Decreased somewhat*
- *Remained basically unchanged*
- *Increased somewhat*
- *Increased considerably*

Source: Bank Lending Survey Questionnaire, Section 1: Loans or credit lines to enterprises, question Q9.

Our sample covers the period 2003Q1-2019Q4 for 14 Euro-area countries. This produces an unbalanced panel dataset of 769 observations, consisting of country-quarterly dimensions. Moreover, the data for LD are provided by the BLS as a *diffusion index*[4] and not as the senior bank loan officers' raw responses. Pursuant to the definition of the diffusion index, lower (greater)

[4] For a detailed definition of the diffusion index, see the Glossary of the Bank Lending Survey of the ECB: (https://www.ecb.europa.eu/stats/pdf/ecbblsglossary.en.pdf).

values signify decreased (increased) LD from enterprises. In Table 1, we report the sample averages of each CS by country.

*******Insert Table 1 here*******

In Figure 1, we depict the trajectory between the actual and expected LD from enterprises across the Euro-area countries of our sample. Although both actual and expected LD seem to have a common trajectory across time, expected LD is higher than actual LD. In other words, there doesn't seem to be a one-for-one relationship between expected and actual LD. This observation provides preliminary evidence in favor of the REH not being consistent with the data. Last, we observe that both LD types experienced significant decreases (i.e., lower loan demand from enterprises) with the onset of the recent financial crisis.

*******Insert Figure 1 here*******

4. Empirical Methodology and Testable Hypotheses

The starting point of our empirical methodology is to test for the REH. The REH is the expectation formation mechanism according to which agents use all the relevant and available optimal (i.e., rational and efficient) information, which sooner or later will expunge systematic forecasting errors. In other words, pursuant to the REH, agents do not make any systematic errors in forecasting because they take into consideration the whole set of available information.

The scatterplot of Figure 2 provides a pictorial representation of the actual vs. expected LD from enterprises. According to Figure 2, it is unclear whether senior bank loan officers' expectations for loan demand are formed rationally.

*******Insert Figure 2 here*******

Following Lovell (1986), Drakos (2008) and Anastasiou and Drakos (2019), we examine the REH by employing the following model:

$$LD_{i,t}^{A} = \alpha_0 + \alpha_1 LD_{i,t-1}^{E} + e_{i,t}, \quad (1)$$

where *i, t, A* and *E* denote country, time, actual LD and expected LD, respectively. We express the expected LD from enterprises with a time lag at the right-hand side of the equation to signify that the expectations for loan demand have been shaped prior to the actual outcome.

In order to accept the REH, the following associated joint hypotheses of unbiasedness must not be rejected:

$$\text{Ho: } \alpha_0 = 0, \alpha_1 = 1.$$

Next, we turn our attention to test the adaptive expectations hypothesis. The adaptive expectations mechanism is defined as a way of forming expectations in which the future value of the under-examination variable is solely dependent on its past values. Consistent with the adaptive expectations mechanism, senior bank loan officers modify their expectations in each period depending on the expectation (or forecasting) error of the previous period. If a zero forecasting error existed (i.e., a perfect forecast in the previous period), it would suggest that the previous expectation would be maintained perpetually (Lovell, 1986).

Following Lovell (1986), Moosa and Shamsuddin (2004), Drakos (2008), and Anastasiou and Drakos (2019), we define the adaptive expectations model as:

$$\Delta LD_{i,t-1}^{E} = \theta\left(LD_{i,t-2}^{E} - LD_{i,t-1}^{A}\right) + \varepsilon_{i,t}, \quad (2)$$

where *i*, *t*, *A* and *E* denote country, time, actual LD and expected LD, respectively. Parameter θ is the coefficient of adaptation, showing the pace of adjustment to the previous period's

expectation error. In order to accept the adaptive expectations hypothesis, parameter θ must be statistically significant and lie in the interval (-1,0).

We test whether parameter θ is statistically significant, and we also test whether θ is different from its maximum theoretical value (-1):

(a) H_0: $\theta = 0$

(b) H_0: $\theta = -1$.

According to the regressive expectations hypothesis, agents adjust their expectations pertaining to the previous period's deviation from the mean for the under-examination variable (LD in our case). That is, agents believe that the variable of interest shows a propensity to move towards its average value (Drakos, 2008). Following Pesaran and Weale (2006), Drakos (2008), Dave (2011), and Anastasiou and Drakos (2019), the regressive expectations mechanism can be specified as follows:

$$\Delta LD_{i,t-1}^{E} = \psi\left(\tilde{g} - LD_{i,t}^{A}\right) + \varepsilon_{i,t,} \quad (3)$$

where i, t, A, E, Δ, $\tilde{g}$ and ψ denote country, time, actual LD, expected LD, first differences, the sample mean of the actual LD and the adjustment parameter, respectively.

The REH is consistent with the data if and only if parameter ψ is statistically significant, positive and lies in the (0, 1) interval. In addition, apart from testing whether parameter ψ is different from zero, we also examine whether it is different from its maximum theoretical value (+1):

(a) H_0: $\psi = 0$

(b) H_0: $\psi = 1$.

5. Estimation Results

We estimate our econometric specifications with both fixed and random effects (Wooldridge, 2010). The Hausman (1978) specification test suggests that the fixed effects estimator is the most suitable methodology for the rational and adaptive expectations models, while for the regressive expectations model it suggests the random effects estimator as the most appropriate method. Nevertheless, we report the results for both estimation methodologies.

Table 2 contains all the estimation results for each expectation formation mechanism along with the corresponding hypotheses tests. As far as the results of the REH are concerned, although we find that parameter a_1 is statistically significant at the 1% level, we emphatically reject the null hypothesis that the parameter is equal to 1. This finding provides evidence against the unbiasedness hypothesis and consequently against rationality. Therefore, we conclude that senior bank loan officers do not form their expectations for loan demand from enterprises rationally. In other words, the REH is not consistent with our data.

With respect to the adaptive expectations mechanism, we document that the speed of adjustment θ is statistically significant at the 1% level (i.e., non-trivial). We also find that parameter θ is different from its maximum theoretical value of -1. The absolute magnitude of the point estimate of parameter θ suggests an adaptation rate of about 45.6% and 47.5% for the random and fixed effects approaches, respectively. Thus, 2.19 and 2.11 time periods are needed, on average, to cover the distance between the actual and expected LD for both random and fixed effects methods, respectively.

Parameter θ carries a negative sign, suggesting that if senior bank loan officers had overestimated (underestimated) the actual LD in the current period, they would then adjust downwards (upwards) their expectations for the next period. Moreover, we find that the point

estimate parameter θ lies in the (0, 1) interval for both random and fixed effects estimation methodologies, respectively. Therefore, we document that adaptive expectations are consistent with our data. Our findings are in line with the results of Anastasiou and Drakos (2019), who also found that the adaptive expectations hypothesis is the dominant expectation formation mechanism for the European bank loan officers' expectations for bank loan supply.

Moving to the regressive expectations hypothesis, although we find that the adjustment parameter ψ is non-trivial in both estimation methods, its point estimates were found to be negative. Therefore, the regressive expectations mechanism is not consistent with our data.

*******Insert Table 2 here*******

Apart from examining which expectation formation mechanism best describes our data for the whole sample, we deem it appropriate to conduct a sensitivity analysis re-estimating our models breaking our sample into two sub groups. Specifically, we break our sample into core and peripheral Euro-area countries. Following Anastasiou et. al., (2019), we define Austria, Belgium, Cyprus, Estonia, Germany, Latvia, Lithuania, Luxembourg and Slovenia as core countries while Greece, Ireland, Italy, Portugal and Spain are considered peripheral ones. Therefore, we re-estimate each of our models twice, once for each country group.

In Tables 3 and 4, we report the results for the core and peripheral countries, respectively. We find for both country groups that the adaptive expectations hypothesis is the dominant expectation formation mechanism. Thus, our findings are robust since they retain their significance even when we divide our sample.

*******Insert Tables 3 and 4 here*******

Given that our sample covers the pre-crisis, the crisis and the post-crisis period, we consider it imperative to demonstrate a second sensitivity analysis. In particular, we re-estimate the baseline specifications twice, once for the pre-crisis period (2003Q1-2007Q4) and once for the crisis period (2008Q1-2016Q1). We define the beginning of the recent financial crisis in Europe the year 2008 (Ivashina, and Scharfstein, 2010; Lane, 2012; Demirguc Kunt et. al., 2013; Gibson et. al., 2016). Furthermore, following Anastasiou et. al., (2019) we define the crisis period in the Euro-area to last until 2016Q1. The estimation results reported in Tables 5 and 6 are in line with our previous findings, which suggest that either before or during the 2008 financial crisis the European senior bank loan officers form their expectations for LD in an adaptive manner.

*******Insert Tables 5 and 6 here*******

6. Conclusions

We utilize survey data from the BLS for the period 2003Q1-2019Q4 and for 14 Euro-area countries to explore the performance of diverse competing expectation formation mechanisms for senior bank loan officers' expectations for loan demand. We study the three major expectation formation mechanisms, the rational, adaptive and regressive expectations mechanisms. Our results indicate that senior bank loan officers do not shape their expectations for loan demand from enterprises rationally. We find evidence in favor of the adaptive expectations mechanism being the best description of the data. Our results are consistent for every country group we examined (all Euro-area, core and peripheral countries). We also document that either before or during the 2008 financial crisis the European senior bank loan officers form their expectations for LD in an adaptive manner.

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Tables

Table 1: Mean values of LD by country		
Diffusion Indices		
Countries	$\mathbf{LD^{A}_{i,t}}$	$\mathbf{LD^{E}_{i,t-1}}$
Austria	-2.432	4.441
Belgium	0.029	8.382
Cyprus	2.194	9.867
Estonia	2.059	8.367
Germany	3.194	5.323
Greece	-2.507	7.426
Ireland	3.865	6.779
Italy	-1.194	6.558
Latvia	-0.600	6.485
Lithuania	-0.784	0.941
Luxembourg	-2.906	5.953
Portugal	10.434	11.304
Slovenia	20.526	15.263
Spain	-5.164	2.558
Total (average for the Euro-area)	0.577	6.565

Notes: (a) This table reports the mean diffusion indices of both actual and expected loan demand from enterprises by country along with the corresponding mean diffusion indices for the whole sample (average for the Euro-area), (b) $LD^{A}_{i,t}$ and $LD^{E}_{i,t-1}$ denote actual and expected LD respectively.

Table 2: Estimation results for each expectation formation mechanism – Full Sample						
	Rational		**Adaptive**		**Regressive**	
	Fixed Effects	**Random Effects**	**Fixed Effects**	**Random Effects**	**Fixed Effects**	**Random Effects**
α_1	0.611*** (0.047)	0.619*** (0.045)	-	-	-	-
θ	-	-	-0.475*** (0.037)	-0.456*** (0.036)	-	-
ψ	-	-	-	-	-0.070** (0.020)	-0.064*** (0.022)
Constant	-3.608*** (0.318)	-3.216*** (1.166)	2.830*** (0.232)	2.710*** (0.406)	-0.117*** (0.001)	-0.117 (0.124)
Diagnostics						
Observations	769					
R^2	0.309	0.309	0.282	0.282	0.007	0.007
F-test (p-value)	0.000	0.000	0.000	0.000	0.014	0.004
Hausman-test (p-value)	0.001		0.000		0.413	
Hypothesis Testing (probability values)						
H_0: $\alpha_1 = 0$	0.000	0.000	-	-	-	-
H_0: $\alpha_1 = 1$	0.000	0.000	-	-	-	-
H_0: $\psi = 0$	-	-	-	-	0.014	0.004
H_0: $\theta = 0$	-	-	0.000	0.000	-	-
H_0: $\psi = +1$	-	-	-	-	0.000	0.000
H_0: $\theta = -1$	-	-	0.000	0.000	-	-

Notes: (a) This table reports estimation results for each expectation formation mechanism for the full sample, (b) *, **, *** denote statistical significance at the 10, 5, and 1 percent level respectively, (c) numbers in parentheses denote cluster robust standard errors, (d) α_1, θ and ψ are the estimated parameters for Rational, Adaptive and Regressive Expectations respectively, (e) Hausman-test denotes the Hausman (1978) test and its p-values suggest that the fixed effects estimator is the most suitable methodology for the rational and adaptive expectations models, while for the regressive expectations model suggest the random effects estimator as the most appropriate method.

Table 3: Estimation results for each expectation formation mechanism - Core Euro-area countries						
	Rational		**Adaptive**		**Regressive**	
	Fixed Effects	**Random Effects**	**Fixed Effects**	**Random Effects**	**Fixed Effects**	**Random Effects**
α_1	0.550*** (0.045)	0.558*** (0.041)	-	-	-	-
θ	-	-	-0.477*** (0.029)	-0.454*** (0.026)	-	-
ψ	-	-	-	-	-0.069** (0.027)	-0.061*** (0.023)
Constant	-2.812*** (0.313)	-2.326 (1.492)	2.698*** (0.175)	2.562*** (0.488)	-0.153*** (0.011)	-0.150 (0.177)
Diagnostics						
Observations	479					
R^2	0.261	0.261	0.275	0.275	0.005	0.060
F-test (p-value)	0.000	0.000	0.000	0.000	0.034	0.009
Hausman-test (p-value)	0.016		0.003		0.477	
Hypothesis Testing (probability values)						
H_0: $\alpha_1 = 0$	0.000	0.000	-	-	-	-
H_0: $\alpha_1 = 1$	0.000	0.000	-	-	-	-
H_0: $\psi = 0$	-	-	-	-	0.034	0.009
H_0: $\theta = 0$	-	-	0.000	0.000	-	-
H_0: $\psi = +1$	-	-	-	-	0.000	0.000
H_0: $\theta = -1$	-	-	0.000	0.000	-	-

Notes: (a) This table reports estimation results for each expectation formation mechanism for the core Euro-area countries , (b) *, **, *** denote statistical significance at the 10, 5, and 1 percent level respectively, (c) numbers in parentheses denote cluster robust standard errors, (d) α_1, θ and ψ are the estimated parameters for Rational, Adaptive and Regressive Expectations respectively, (e) Hausman-test denotes the Hausman (1978) test and its p-values suggest that the fixed effects estimator is the most suitable methodology for the rational and adaptive expectations models, while for the regressive expectations model suggest the random effects estimator as the most appropriate method.

Table 4: Estimation results for each expectation formation mechanism - Peripheral Euro-area countries						
	Rational		**Adaptive**		**Regressive**	
	Fixed Effects	**Random Effects**	**Fixed Effects**	**Random Effects**	**Fixed Effects**	**Random Effects**
α_1	0.682*** (0.078)	0.691*** (0.073)	-	-	-	-
θ	-	-	-0.473*** (0.087)	-0.459*** (0.086)	-	-
ψ	-	-	-	-	-0.071 (0.046)	-0.067 (0.042)
Constant	-4.686*** (0.496)	-4.423** (2.041)	3.049*** (0.585)	2.958*** (0.768)	-0.055 (0.042)	-0.059 (0.208)
Diagnostics						
Observations	290					
R^2	0.370	0371	0.293	0.293	0.008	0.009
F-test (p-value)	0.001	0.000	0.005	0.000	0.198	0.117
Hausman-test (p-value)	0.000		0.062		0.671	
Hypothesis Testing (probability values)						
H_0: $\alpha_1 = 0$	0.001	0.000	-	-	-	-
H_0: $\alpha_1 = 1$	0.015	0.000	-	-	-	-
H_0: $\psi = 0$	-	-	-	-	0.198	0.117
H_0: $\theta = 0$	-	-	0.005	0.000	-	-
H_0: $\psi = +1$	-	-	-	-	0.000	0.000
H_0: $\theta = -1$	-	-	0.004	0.000	-	-

Notes: (a) This table reports estimation results for each expectation formation mechanism for the peripheral Euro-area countries, (b) *, **, *** denote statistical significance at the 10, 5, and 1 percent level respectively, (c) numbers in parentheses denote cluster robust standard errors, (d) α_1, θ and ψ are the estimated parameters for Rational, Adaptive and Regressive Expectations respectively, (e) Hausman-test denotes the Hausman (1978) test and its p-values suggest that the fixed effects estimator is the most suitable methodology for the rational and adaptive expectations models, while for the regressive expectations model suggest the random effects estimator as the most appropriate method.

Table 5: Estimation results for each expectation formation mechanism – Pre-crisis period						
	Rational		**Adaptive**		**Regressive**	
	Fixed Effects	**Random Effects**	**Fixed Effects**	**Random Effects**	**Fixed Effects**	**Random Effects**
α_1	0.560*** (0.092)	0.559*** (0.086)	-	-	-	-
θ	-	-	-0.571*** (0.050)	-0.455*** (0.057)	-	-
ψ	-	-	-	-	-0.131* (0.060)	-0.099 (0.061)
Constant	-2.327** (0.971)	-1.931 (1.658)	4.266*** (0.354)	3.445*** (1.113)	-0.176 (0.185)	-0.080 (0.632)
Diagnostics						
Observations	183		173			
R^2	0.279	0.279	0.365	0.364	0.019	0.018
F-test (p-value)	0.000	0.000	0.000	0.000	0.058	0.104
Hausman-test (p-value)	0.962		0.000		0.289	
Hypothesis Testing (probability values)						
H_0: $\alpha_1 = 0$	0.000	0.000	-	-	-	-
H_0: $\alpha_1 = 1$	0.001	0.000	-	-	-	-
H_0: $\psi = 0$	-	-	-	-	0.058	0.104
H_0: $\theta = 0$	-	-	0.000	0.000	-	-
H_0: $\psi = +1$	-	-	-	-	0.000	0.000
H_0: $\theta = -1$	-	-	0.000	0.000	-	-

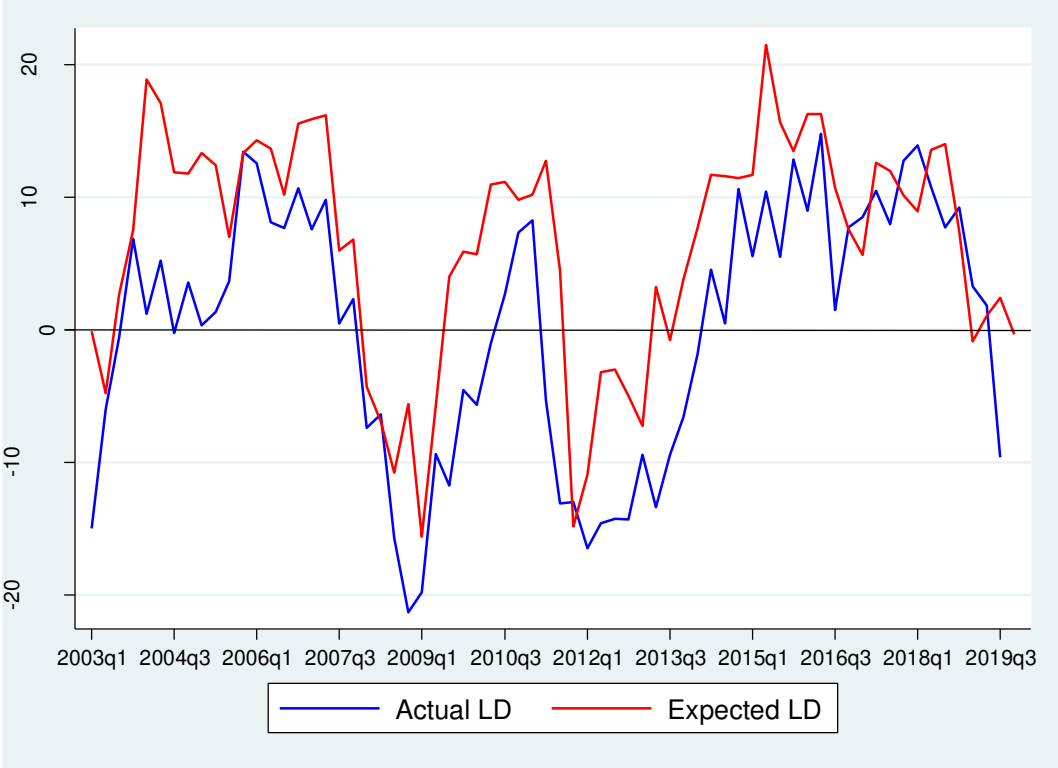
Notes: (a) This table reports estimation results for each expectation formation mechanism for the for the full sample but for the Pre-crisis period, (b) *, **, *** denote statistical significance at the 10, 5, and 1 percent level respectively, (c) numbers in parentheses denote cluster robust standard errors, (d) α_1, θ and ψ are the estimated parameters for Rational, Adaptive and Regressive Expectations respectively, (e) Hausman-test denotes the Hausman (1978) test and its p-values suggest that the fixed effects estimator is the most suitable methodology for the adaptive expectations models, while for both the rational and the regressive expectation models suggest the random effects estimator as the most appropriate method.

Table 6: Estimation results for each expectation formation mechanism – Crisis period						
	Rational		**Adaptive**		**Regressive**	
	Fixed Effects	**Random Effects**	**Fixed Effects**	**Random Effects**	**Fixed Effects**	**Random Effects**
α_1	0.623*** (0.050)	0.635*** (0.047)	-	-	-	-
θ	-	-	-0.483*** (0.048)	-0.457*** (0.044)	-	-
ψ	-	-	-	-	-0.067** (0.025)	-0.057*** (0.022)
Constant	-3.911*** (0.279)	-3.560*** (1.336)	2.660*** (0.292)	2.501*** (0.515)	-0.156*** (0.025)	-0.166 (0.182)
Diagnostics						
Observations	586		596			
R^2	0.302	0.312	0.303	0.284	0.008	0.007
F-test (p-value)	0.001	0.000	0.005	0.000	0.021	0.009
Hausman-test (p-value)	0.002		0.000		0.324	
Hypothesis Testing (probability values)						
H_0: $\alpha_1 = 0$	0.000	0.000	-	-	-	-
H_0: $\alpha_1 = 1$	0.000	0.000	-	-	-	-
H_0: $\psi = 0$	-	-	-	-	0.021	0.009
H_0: $\theta = 0$	-	-	0.000	0.000	-	-
H_0: $\psi = +1$	-	-	-	-	0.000	0.000
H_0: $\theta = -1$	-	-	0.000	0.000	-	-

Notes: (a) This table reports estimation results for each expectation formation mechanism for the full sample but for the crisis period, (b) *, **, *** denote statistical significance at the 10, 5, and 1 percent level respectively, (c) numbers in parentheses denote cluster robust standard errors, (d) α_1, θ and ψ are the estimated parameters for Rational, Adaptive and Regressive Expectations respectively, (e) Hausman-test denotes the Hausman (1978) test and its p-values suggest that the fixed effects estimator is the most suitable methodology for the rational and adaptive expectations models, while for the regressive expectations model suggest the random effects estimator as the most appropriate method.

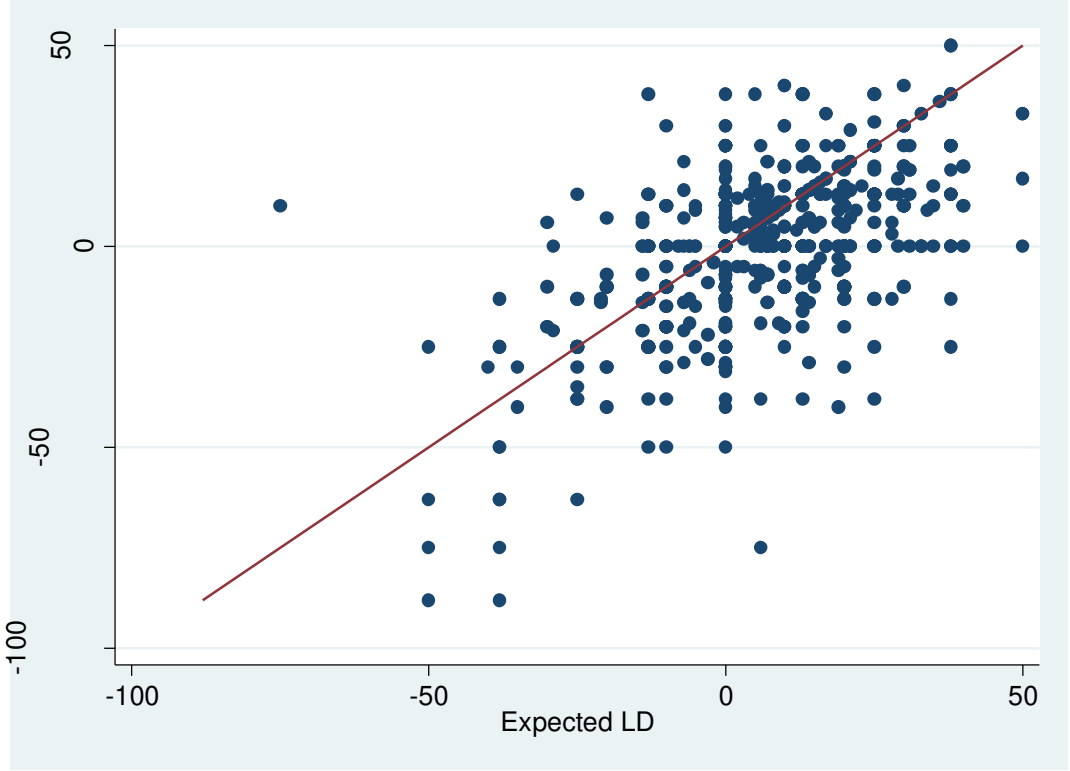
Figures

Figure 1: Trajectory between actual vs expected average loan demand across the Euro-area countries



Source: Own calculations, ECB

Figure 2: Scatter plot of actual vs expected loan demand



Source: Own calculations, ECB