

Bubble, bubble, credit trouble?

The effect of EU membership on household loan rates

Abstract

This paper examines what effect EU accession – officially joining the EU as a full member – has on the new member state's market for household credit. Low lending rates have a positive effect on consumer welfare by increasing disposable income, but can also contribute to economic disaster (notably the recent subprime and sovereign-debt crises). The main purpose of this paper is to aid policymakers and other stakeholders in crafting informed credit market policy. We create a model of rate-setting behavior that can be used as a tool for predicting effects of economic, financial, and political reform, and use this model to empirically estimate the effect of EU accession on national household credit rates. We find that EU accession correlates with a drop in lending rates, which is more pronounced for short-term consumption loans than for long-term home loans. We attempt to evaluate whether this drop in lending rates stems from policy and regulative changes or from other factors, but cannot draw any reliable conclusions in this area.

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Subject and purpose

In Keynesian theory, low lending rates contribute to welfare, stimulate consumption, and promote economic growth. In the past decade, they have created indebtedness spirals that have brought several European economies to their knees.

The 2007 U.S. subprime crisis unleashed a worldwide financial crisis, with painful consequences for the European Union (and especially the Eurozone). Historically low interest rates in economies including Greece, Spain, Portugal, and Ireland had promoted unsustainable borrowing among households and businesses. When the crisis hit and default became widespread, member state governments – many already entrenched in sovereign debt – attempted to prevent market panic and save financial institutions through capital injections, liquidity provisions, and guarantees. The unsustainable household and business debt was channeled into unsustainable sovereign debt. In early 2010, several governments began to show signs of buckling under the pressure. Ever since, the supranational European Union has struggled with reining in member states' indebtedness.

Household credit rates – the rates at which a commercial bank lends funds to consumers, as opposed to businesses – is an important factor that affects overall debt levels in an economy. Household and business indebtedness leads to bank indebtedness (as banks borrow lending capital from each other and from central banks). Since banks have generally become less capitalized and more default-sensitive in the last decade than ever before, and often rest on the promise of a bail-out when times turn sour, this exposes sovereigns to significant risk (interview, Standard & Poor's employee Apr 2013). Policymakers are working to resolve this problem through capital requirement demands (such as the Basel Accords) and other regulative measures.

This paper aims to support policymakers by evaluating one of the potential causes of low interest rates: membership in the European Union (links have already been uncovered between EMU membership and low interest rates (e.g. Lane 2006)). We also aim to construct a model that can aid stakeholders in predicting effects on interest rates of monetary, financial, and political reform. Our reason for only examining household interest rates, rather than including corporate interest rates as well, is twofold: to limit the scope of this paper, and to focus on aspects of consumer welfare rather than corporate welfare, since this is often of greater interest to policymakers (striving, naturally, to get re-elected).

Several countries stand on the Union's doorstep. This paper asks: what effect does EU membership have on household interest rates in a new member state? Can we observe a link between EU membership and a drop in interest rates, as has been observed for EMU membership? What implications does this have for policymakers striving to control indebtedness?

Our research is by necessity limited to the countries who acceded – entered the EU as full members – in 2004 or 2007, 12 in total, since no interest rate data for the older 15 members stretch back to before their accessions. Among these states, we are limited to those whose central banks have recorded and maintained solid data that is comparable over time. This has resulted in a sample of four countries: Bulgaria (2007), the Czech Republic, Estonia, and Hungary (all 2004).

Background information

EU accession

“EU accession” refers to the point in time at which a country becomes a full member of the European Union. The EU is an economic and political union currently consisting of 27 member states, which operates through a system of supranational independent institutions and decision-making between member states’ governments. Its primary purpose is to promote a single common market and free movement of people, goods, services, and capital within the Union (European Commission 2013).

EU accession impacts conditions in a new member state in two main areas. First, all aspiring member states must adapt their regulatory and judicial environments to fit EU standards. Second, new member states gain access to the EU-wide common market. Policy harmonization processes are usually set in motion before accession, so that the acceding country will have reached a base level of institutional quality on the date of accession. Final technical barriers to trade are removed on this date (Trichet 2004).

We will discuss specific effects of EU accession that are interesting for this research throughout the background section. Note, for now, that we define “the effect of EU accession” as the effects of policy changes and economic convergence resulting from regulative harmonization, coupled with the effects of access to the common market.

Two main types of household credit

There are two major categories of household loans, with different characteristics: **home loans** and **consumption loans**. Home loan rates are usually lower than consumption loan rates, for reasons discussed below.

Secured vs. unsecured

Home loans, as indicated by the name, are loans for house purchases. They are secured, meaning the borrower puts his house up as collateral, allowing the bank to repossess it in case of default. Home loans are therefore of a relatively low-risk nature from the bank’s perspective, provided property laws are well

defined and consistently upheld.

Long-term vs. short-term

Home loans have long maturities (several years as opposed to a few months), increasing the probability that negative events – hyperinflation, default, bankruptcy, regulatory changes, etc. – will impact the bank's profit conditions at some point during the term. This adds to the risk that must be compensated through the interest rate. From this perspective, we would expect a longer-term loan to be priced higher than an otherwise identical short-term loan. However, this effect pales in comparison with the risk perception effect of collateral, as discussed above. Furthermore, long-term loans are valuable in that they tie borrowers to banks over the long haul and often encourage a full – and profitable – switch to the bank's services. A full-service customer generates significant cash flow even when he enjoys low lending rates, which also helps explain why home loans tend to be cheaper than consumption loans (Karagiannis, Panagopoulos & Spiliotis 2012).

Domestic vs. international

Home loan markets remain largely national (although many policymakers have called for a common EU-wide legal framework) due to differences in housing markets, capital markets, subsidy environments, and financial services (Dübel & Rothmund 2011). With consumption loans, however, policymakers have worked towards creating an EU-wide market since 1986, when the first Consumer Credit Directive (Council Directive 87/102/EEC) was put into effect. The EU-wide market for consumption loans has been put through several rounds of regulative changes and harmonization efforts (further discussed on page 15), with the most recent being the 2011 revision of the second Consumer Credit Directive from 2008 (Council Directive 2008/48/EC). Creating an EU-wide integrated market for consumption loans thus remains an important issue on the EU agenda, and policymakers display continued determination to create conditions that stimulate a thriving cross-border market for consumption credit.

Consequences of the structural differences

EU directives work by requiring member states to adapt their national legislation to meet EU standards. Since there are no directives about home loans, nothing in the regulative climate surrounding national home loan markets needs to change as a consequence of EU accession. The legislation surrounding consumption loans, however, must be harmonized with the rest of the Union. We would therefore expect a more significant reaction to EU accession from regulative harmonization for consumption loans than for home loans.

In summary, the structural differences between the two loan types are significant enough to warrant separating them in the forthcoming analysis. The difference in internationalization, in particular, encourages us to believe that consumption loan rates may react more strongly to EU accession than

home loan rates. We shall therefore evaluate the effect of EU accession on home loans and consumption loans separately.

Creating a model of rate-setting behavior

Interest rates are driven by supply-side conditions and decisions (those of banks and credit institutions) to a much greater extent than by borrower demand, due to the intense regulative climate surrounding the financial sector. In the literature (e.g. Gambacorta 2004), interest rates are sometimes used explicitly as a way to disentangle loan supply from loan demand. Accordingly, this paper shall disregard the behavioral, psychological, and consumption-smoothing models needed to understand the subtleties of loan demand dynamics, and instead focus on the supply side and bank rate-setting behavior.

EU accession is a complex process that affects many aspects underlying household interest rates. In order to systematically assess the effect of accession, we have structured the current stock of knowledge about household credit and rate-setting behavior into a model that will serve as the foundation for our analysis. While the overarching framework is our own construction, the constituent parts in the model are all firmly rooted in the literature. Our hope is that the model will contribute to the reader's intuitive understanding of rate-setting behavior and aid policymakers and other stakeholders in deconstructing and predicting the effects on household credit rates of complex policy changes.

In our framework, interest rates are set within a given interval, specific to each economy, with an upper bound determined by classical supply and demand. Below that bound, interest rates can be defined in terms of three layers (figure 1). These are:

1. **Capital funding costs**, in other words the rate a bank pays for the funds it lends out, acquired from internal deposits, from a central bank, or another commercial bank.
2. **A risk premium**, split into two parts:
 - **Default risk**, or the risk of monetary loss in case a borrower fails to repay his loan, defined by individual and institutional characteristics.
 - **Other lending risk factors**, including inflation and currency risk.
3. **A profit margin**, determined by competitive considerations.

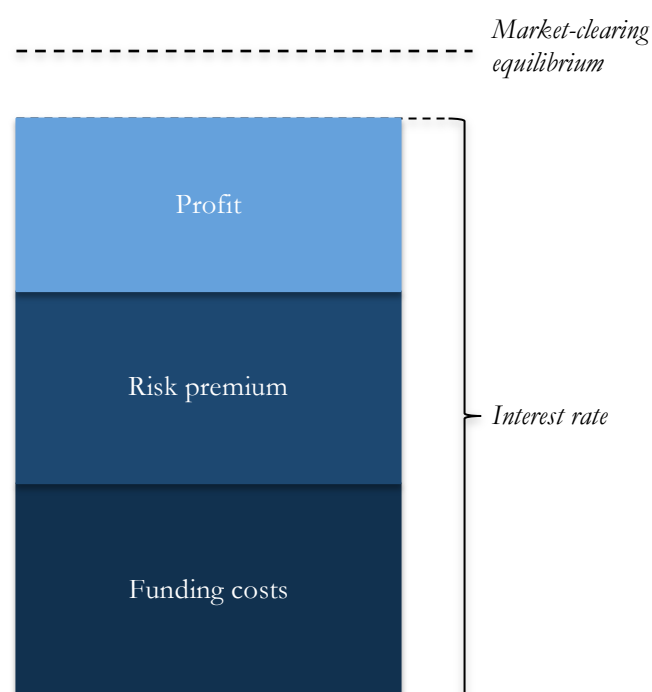


Figure 1: The three layers of an interest rate, not scaled according to relative importance

Taking these factors into account, our model defines rate-setting behavior in terms of five main considerations for the lender:

1. **Supply and demand,**
2. **Funding costs,**
3. **Default risk,**
4. **Other lending risk factors,**
5. **Competitive strategy.**

The model below (Figure 2) is the model we will refer to as “our model” for the remainder of the paper.

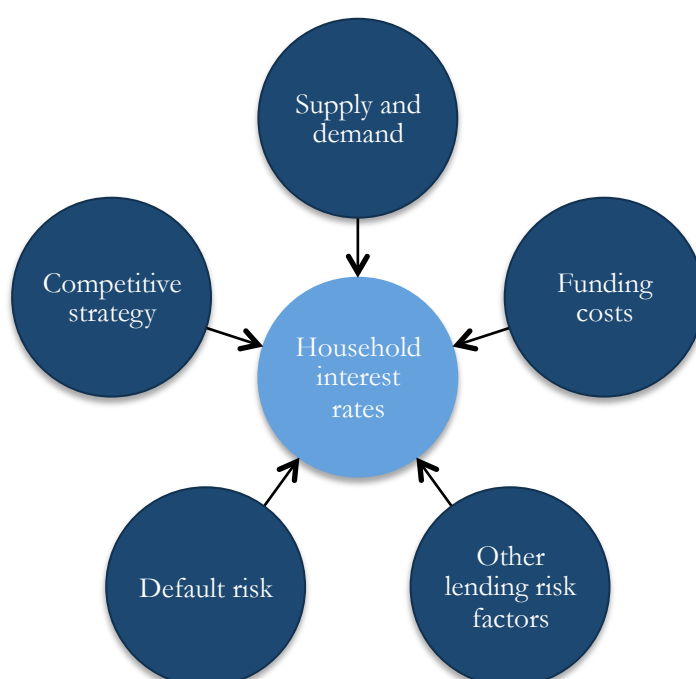


Figure 2: The five main factors underlying how banks set interest rates

For the remainder of the paper, we will use our model to identify as many aspects as possible that affect household interest rates, with the aim of examining dynamics between accession and the five factors. We recognize that EU accession will likely affect most or all of the factors in this model, an issue we shall discuss throughout the paper.

Supply and demand in household credit markets

Intuitively, we might assume that credit markets work through supply and demand. A loan’s interest rate would define its “price” and the volume of new loans the market supply at this price, and interest rates would converge at the market-clearing equilibrium. In reality, however, a supply and demand framework only illustrates part of the story.

There are several reasons why a simple supply and demand framework does not hold. First, banks in Western countries rarely if ever operate under conditions of perfect competition, because intense regulatory climates create high barriers both to entry and exit and determine what banks can and cannot do. In the literature, strong support has been found for the idea that the banking sectors of most Western countries operate under conditions of monopolistic competition (Bikker & Haaf 2002). Second, consumers do not necessarily make rational choices about credit with regard to its “pricing.” A study carried out in 2011 with regard to credit card rates concluded that, on average, consumers underestimate their credit card rates by as much as 30-33% due to overconfidence, optimism bias, and financial illiteracy (Frank 2011). Third, banks face a distortive moral hazard problem: high-risk borrowers are willing to pay higher loan rates than stable borrowers, but also come with significantly higher default risk. This issue prevents the market from clearing by incentivizing banks to set interest rates below equilibrium, increasing the pool of willing credit applicants and thereby allowing them to turn away bad apples and fill their balance sheets with low-risk, stable loans. This phenomenon is called “credit rationing” (Stiglitz & Weiss 1981).

While interest rates are not directly affected by the dynamics of supply and demand, we conclude from the credit rationing phenomenon that supply and demand does in fact have one major impact: **over the long run, the market-clearing equilibrium at which banks attract only high-risk borrowers defines the upper bound of the interval in which we expect to observe an economy’s household credit rates.**

Economic growth or decline is the main driver of shifts in supply and demand in the overall credit market, including both business and household credit. As a country’s economic climate improves, businesses require more credit to finance expansion (Patrick 1966). Increased demand for business loans improves bank profitability, which in turn can affect rate-setting decisions with respect to household loans. While the specific dynamics between economic growth and household credit can be hard to disentangle from the effects of economic growth on the total credit market, it is the best available way to capture these dynamics (further discussed in the section about control variables, page 23).

Funding costs

In order to lend money, banks need to acquire capital in the first place – either from in-house deposits, a central bank, another bank via the interbank lending market, or by issuing bonds on the capital market. While funding via capital markets is common in highly developed economies including most older EU member states, it normally only accounts for a minor share of financing in developing economies (Corvoisier & Gropp 2001), including the countries in our sample, and several countries on the doorstep of accession. In order to limit the scope of this paper, we shall disregard the complexities of capital market funding dynamics.

Capital from in-house deposits comes at the cost of the **deposit rate**. Since banks set their own deposit rates along with loan rates, we may be inclined to believe they set them with regard to the loan rates, thus rendering deposit rates endogenous – but the literature indicates otherwise. In a study carried out in 1999, banks that were heavily dependent on non-insured funding (i.e. bonds) were shown to adjust their deposit rates more (and more quickly) than banks whose liabilities were less sensitive to market movements (Berlin & Mester 1999). Since bonds normally only account for a small portion of bank liabilities in financially developing countries, it follows that their banks would be comparatively slow about monitoring and adjusting their deposit rates. So, even if deposit rates are set with regard to loan rates, they will still not change quickly enough to be deemed endogenous. This view is further supported elsewhere in the literature. For example, Kauko (2005) claims, “Interest rate pass-through [the level of adjustment in lending rates in response to changes in corresponding market rates] is very strong, possibly complete, in the case of lending rates; in the case of deposit rates the pass-through is far from complete, even in the long term.”

Loans are never funded solely by deposits, so banks depend on other financial institutions for acquiring lendable funds. A country’s central bank makes liquidity available to commercial banks at the price of the **central bank rate**. Central banks exhibit very specific rate-setting behavior in that their main purpose is macroeconomic: to mitigate the effect of boom and bust business cycles, and to work for certain goals such as low unemployment, inflation control, or exchange rate stability. A central bank makes liquidity available at a rate set in accordance with its monetary policy, but it then relies on the interbank lending market for allocating those funds and determining their true market value, by means of **interbank rates** (Weltewitz 2009). While central bank rates have traditionally been regarded as strongly influential on lending rates (Biefang-Frisancho Mariscal & Howells 2002), the interbank rate is a better indicator of true funding costs: it is very highly correlated with the central bank rate, but more indicative of the true market value of liquidity.

Our model splits capital funding costs from other risk factors, but in reality the relationship between funding costs and interest rates must also be considered from a risk perspective. Liquidity risk is defined as the risk of lending capital decreasing in availability or increasing in price, which is captured directly in measures of funding costs such as interbank rates. The effect of funding costs on interest rates can be interpreted in terms of creditors requiring compensation for liquidity risk: an increase in overall liquidity risk in the market (which is captured fairly efficiently by the interbank rates) contributes to raising lending rates.

Default risk

A major portion of bank rate-setting behavior comes down to accounting for risk. One highly specific type of risk is known as default risk: the risk of borrowers failing to repay all or part of their loans. This incurs monetary losses for the creditor, unless funds can be recovered for example by repossessing

collateral. Banks require adequate compensation, both for individual risk factors and the quality (or lack thereof) of institutions that uphold (or fail to uphold) creditor protection. The level of compensation requirement depends on two main factors: the likelihood that default will occur, and the severity of the consequences for the creditor when it does.

The **individual characteristics** determining a borrower's creditworthiness include socio-economic factors such as age, education, and marital status, as well as economic factors such as net wealth and income (Vandone 2009). These effects are largely unaffected by EU accession (although post-accession economic growth could affect individual borrower characteristics to some extent, for example by increasing overall net wealth in the economy).

There are two main institutional aspects that affect the probability and consequences of default. First, the required compensation for default risk is affected by **the efficiency of the judicial system**. Courts are an important platform for contract enforcement, and therefore directly linked to creditor protection. Any systemic weakness in creditor protection encourages opportunistic creditors to default on their loans (called "strategic default" as opposed to "accidental default"). Furthermore, in addition to creating increased incentives for borrowers to default, inefficiencies in the judicial system also affect banks' abilities to repossess collateral. This limits their ability to recover funds, raising the risk of incurring monetary losses and thus reducing the interest rate "rebate" for secured loans that stem from their comparatively low-risk nature (Jappelli, Pagano & Bianco 2005).

Second, the risk of default occurring is affected by **the quality of information sharing and transparency**. When financial institutions collaborate to provide each other with transparent information about socio-economic and other factors affecting individual default risk, as well as information on borrowers' system-wide debt exposure, the risk of overindebtedness and subsequent defaults decreases significantly. Information transparency also decreases moral hazard and incentives for strategic default, as borrowers know that the information will be available to all creditors in the future (Vandone 2009). Going forward, we shall focus on institutional factors affecting default risk, since they are more directly affected by EU membership.

Other lending risk factors

Many factors combine to create the risk climate surrounding a country's credit market, but there are two factors we have not yet discussed that are of particular importance. One of them is specific to internationalized credit markets, including the EU.

One of the most well-publicized, classic types of lending risk, **inflation**, is closely monitored by most financial institutions because of its relation to real interest rates. This relationship was illustrated by Fisher (1977 [1930]): $(1 + r) = (1 + i)/(1 + \pi)$, where i is the nominal interest rate, π the inflation rate, and r

the real interest rate. The interpretation of this model is straightforward: in order for real interest rates (real profit for the banks) to stay constant, nominal interest rates (lending rates) must be adjusted to compensate for inflation. The Mundell-Tobin framework (Mundell 1963, Tobin 1965) agrees that there is a connection between nominal rates and inflation (albeit a nonlinear one) but also asserts that inflation expectations have a significant impact on financial decision-making. These expectations are formed with respect to current inflation and the credibility and targets of the central bank as well as other financial indicators, and often suffer from significant uncertainty that increases with loan terms and macroeconomic insecurity.

Cross-border credit institutions face a very specific type of lending risk: **currency risk**. Since foreign financial institutions only interact with shareholders in the home currency, they face two major categories of currency problems. First, if they lend to borrowers in the local currency, appreciation of the local currency leads to profit and depreciation to losses that have nothing to do with the bank's actual operations. While currency gains and losses are reported as separate financial posts on the income statement, to allow for fair judgment of the bank's operative performance, in the end they still translate directly into gains or losses for shareholders. Second, if banks lend to borrowers in the home currency, local currency depreciation increases the financial costs for the borrower, thereby increasing default risk (Claeys & Hainz 2006). Cross-border institutions therefore need to continuously monitor exchange rates and exchange rate expectations, and factor this information into their assessment and required compensation for lending risk.

Competitive strategy

Lending rates are affected by **boom and bust business cycles**, as we might intuitively expect. Household credit becomes more expensive when default risk due to job loss or other personal economic upheaval increases, and vice versa. This pattern has been empirically verified, but risk dynamics are not the sole underlying reason for the observed business cycle influence: a major reason for this rate-setting behavior comes down to bank competition in a monopolistically competitive environment (Aliaga-Diaz & Olivero 2010). Since loans, especially those with long maturities, tie borrowers to banks over the long haul, a bank's household loan stock can be regarded as a basis for business expansion (Petersen & Rajan 1995). In many cases, banks offer lower rates on the condition that customers make a full switch, letting the new bank provide all their day-to-day financial services – the reasoning being that switching costs will be sufficiently high to deter the customer from taking his business elsewhere when the business cycle turns downwards and the costs of the bank's services become less generous (Karagiannis, Panagopoulos & Spiliotis 2012). This behavior should increase in intensity with overall creditor competition.

In summary, creditors charge lower rates when the economy is on the upturn, partially because general market and individual risk decreases – but also because they strategically slice target profit margins for competitive reasons.

Summary

We have structured the existing stock of knowledge about household interest rates into a model of bank rate-setting behavior that features five factors:

- **Supply and demand**, which defines the market-clearing equilibrium. Banks set rates below equilibrium, to attract quality borrowers rather than the high-risk ones who are prepared to incur more expensive debt.
- **Funding cost of capital**, determined by interbank, central bank, and deposit rates. Higher funding costs contribute to higher interest rates.
- **Default risk**, both individual and institutional, determines the risk of monetary losses when borrowers fail to repay loans. Higher risk requires banks to compensate by raising the prices of their services.
- **Other lending risk factors**, including inflation expectations and, for cross-border lenders, currency risk. Again, higher risk contributes to higher rates.
- **Competitive strategy**, determined by business cycle dynamics and competitive intensity. When the economy is on the upswing, lenders strategically lower their rates to attract customers and gain market share.

Effects of EU accession

Regulative harmonization and economic convergence

In the process of becoming a full EU member, countries need to adapt to existing regulations and policies. For example, members are required to treat their exchange rate as a matter of common interest, aim at achieving and maintaining price stability, and restrict public sector deficits and debt ratios. The Maastricht Treaty (European Community 1992) splits EU membership into three stages, each requiring an increasing degree of economic convergence with the other member states:

1. Membership in the European Union,
2. Participation in the Union's multilateral exchange rate mechanism, ERM II, for a minimum of two years (ERM II can be described as a testing phase ahead of EMU accession that aims to evaluate the sustainability of the overall convergence process. ERM II requires members to emulate EMU membership by fixing their exchange rates to the Euro with a fluctuation band of $\pm 15\%$, and make any exchange rate policy decisions together with the European Central Bank),
3. Membership in the European Monetary Union, EMU.

EU policymakers recognize that economic conditions in acceding countries differ considerably in nominal, real and structural terms, and therefore work tightly with national offices to create unique

convergence strategies for each acceding country. There is no consistent regulative “roadmap” to EU accession. Each country is actively coached to convergence in the period leading up to accession, as well as in the periods leading up to ERM II and EMU membership (Hämäläinen 2003). While we cannot define any specific regulative changes and institutional improvements that stem from EU accession and apply to all countries, we can conclude that all acceding member states will enjoy improvements in their regulative and institutional climates, which should improve creditor protection and decrease lending risk.

There are a few directives and regulations that specifically deal with consumption loan markets, and the current trend points towards increased EU-wide harmonization and incentives for cross-border lending. In 1986 and later in 2008, the European Parliament created Consumer Credit Directives (Council Directive 87/102/EEC, Council Directive 2008/48/EC) with the explicit objective of creating a harmonized European market for consumption loans. The 1986 directive (which was in effect at the time of the 2004 and 2007 accession rounds) focused mainly on borrower protection, while the 2008 directive pushed for full harmonization and increased protection for creditors as well. For example, it mandates borrower creditworthiness assessments, requires banks to share national creditworthiness databases with cross-border lenders, and improves the efficiency of dispute resolutions between creditors and borrowers by encouraging swift out-of-court proceedings (Article 8-9, 24, Council Directive 2008/48/EC).

Since the second consumer credit directive was not put into effect until 2008, we do not expect to observe any significant effects of these particular institutional improvements in our sample. However, the new directive illustrates that the EU-level desire to work for harmonized household credit markets, made explicit through the 1986 directive, remains high – and therefore likely an important consideration when constructing acceding member states’ individual harmonization roadmaps.

The main consequence of regulative harmonization and economic convergence, in terms of our model, is its effect on default risk (and, to a less obvious extent, currency risk and inflation expectations). Judicial efficiency and information transparency should improve along with other institutions, increasing creditor protection and decreasing the likelihood of strategic default. The Maastricht requirement that member states treat their exchange rate policies as a matter of common interest, and the promise of future membership of ERM II and EMU, should – to some extent – decrease currency risk. Collaboration between national central banks and the European Central Bank should raise the national central bank’s credibility, thereby contributing to steering expectations towards low, stable inflation.

Consequences of the enlarged market

Access to the EU-wide common market affects several of the rate-setting dimensions. The enlarged market directly affects two areas: funding costs are affected as creditors gain access to an enlarged interbank market, and competitive strategies are affected as end consumers gain widespread access to international credit, which increases competitive intensity (Trichet 2004).

A more subtle effect on household credit rates from the enlarged market relates to corporate credit. National businesses can leverage EU accession and the period of economic growth that usually follows (Trichet 2004) to expand internationally and reap economies of scale. This increases national demand for credit, as corporations look to finance new operations. Corporate credit constitutes a large portion of most banks' balance sheets, and is therefore an important determinant of bank profitability. A strong stock of corporate loans gives a bank the option to lower household credit rates further to gain market share (as banks are prone to do, according to Karagiannis, Panagopoulos & Spiliotis 2012). Post-accession economic growth also creates another effect, stemming from the enlarged market: it attracts international credit institutions (and other investors) seeking profit opportunities in “tiger economies,” which should contribute to increasing national credit supply. A final consequence of the enlarged market is that consumers gain easy access to a greater range of goods, which could increase propensity to consume and thereby national demand for credit. Overall, the net effects on supply and demand are hard to predict.



Figure 3: The effect of EU accession on the five main factors

Economic preconditions in the new member states

The degree to which EU membership (through harmonization and convergence, and the enlarged market) affects the different dimensions of rate-setting behavior depends on the individual country's characteristics. While a full evaluation of each country's pre-existing conditions is beyond the scope of this paper, we will discuss some common characteristics of the states that acceded in 2004 and 2007 in the next section, to provide context for the forthcoming analysis.

Macroeconomic trends

The 10 countries that acceded in 2004 received significant attention in the policy literature, and much attention was given to evaluating their economic characteristics and commonalities.

Many new member states shared certain objective characteristics ahead of accession. Most of their economies, measured in terms of real GDP, were (and remain) small compared to the older EU15 group of member states (see chart 1). Several of the new members are former Soviet states, meaning they had undergone more than a decade of “favorable macroeconomic conditions owing to considerable progress in real and nominal convergence” following the introduction of market-based economic policy (Corvoisier & Gropp 2001). Most new member states experienced stronger GDP growth than the older member states (see chart 2), and average inflation levels had fallen from double digit-figures in 1998 to Euro area levels in 2003 (European Central Bank 2005).

Banking sector characteristics

According to the European Central Bank (2005), the new member state banking sectors shared some common characteristics ahead of accession.

1. Their economies relied more heavily on bank finance than direct market finance. In other words, their credit markets were far more developed than their capital markets, compared to EU15 countries, which justifies our decision to disregard the influence of capital markets on rate-setting behavior. Lacking financial markets also encouraged banks to rely heavily on deposits for lending capital (as much as 66% of bank liabilities were deposits).
2. Foreign bank presence was very large, normally in the form of subsidiaries – on average, 72% of banking sector assets were foreign-owned – which affects the relative importance of cross-border issues like currency risk.
3. Their banks' loan-to-asset ratios were catching up with those of EU15 banks, meaning they were expanding their lending activities – and household lending, home loans in particular, was the fastest growing type of credit.

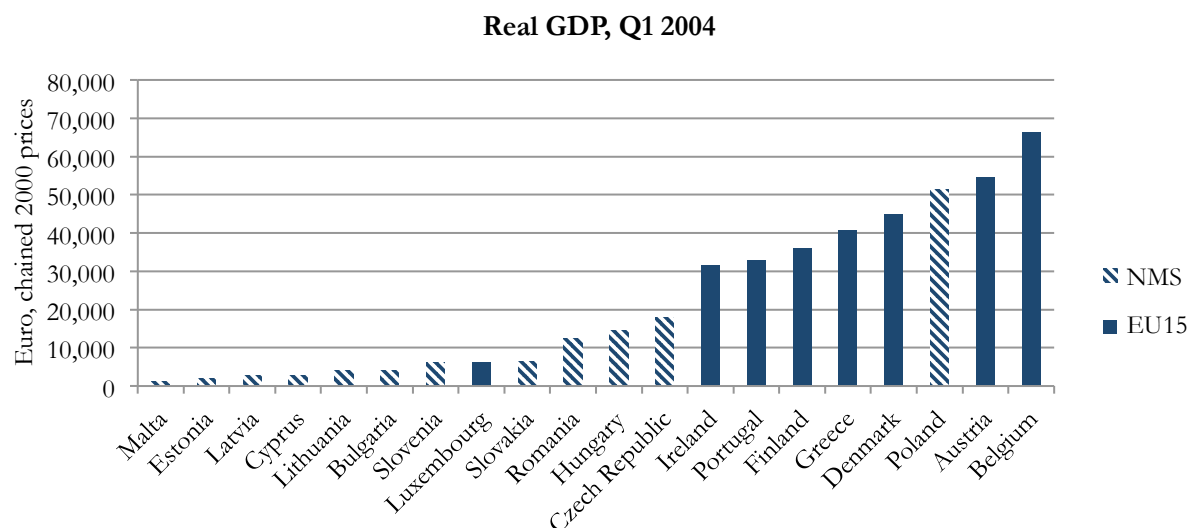


Chart 1: Real GDP excluding the seven largest economies, Q1 2004

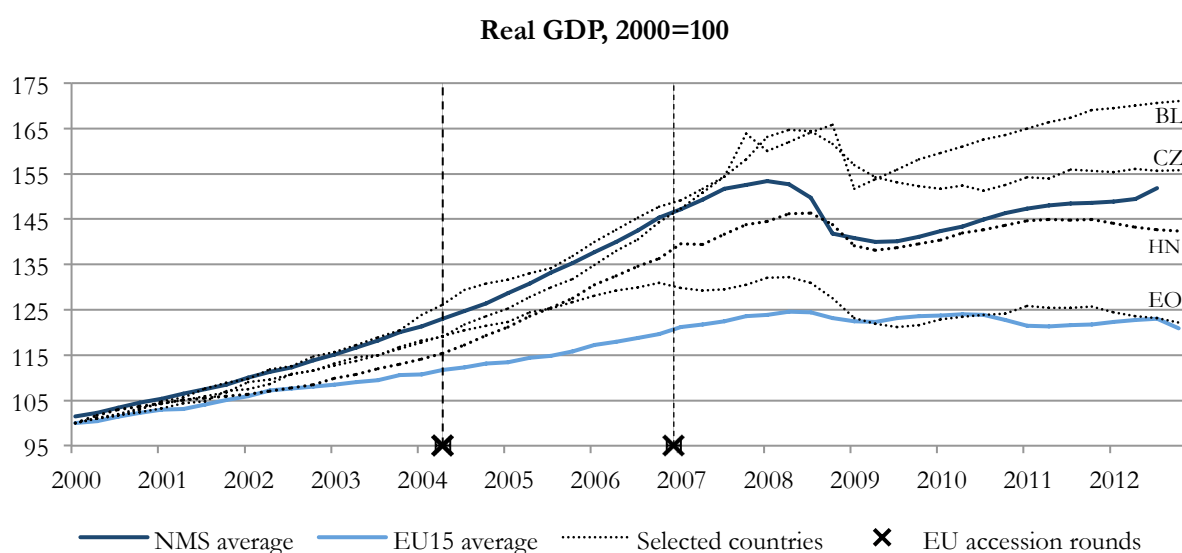


Chart 2: Real GDP, indexed to 2000

Country-specific differences

The new member states are sometimes regarded as a homogenous group and they do share certain common characteristics. However, they also display some significant cross-country differences. We shall discuss some individual deviations from the perspective of our model.

Supply and demand: Economic growth leads to increased demand for credit, but also to increased supply as investors seek profitable opportunities in “tiger economies.” These dynamics can be very country-specific. Estonia deviates from the other countries in that it had a comparatively well-developed financial system and functioning capital market that helped encourage foreign investment (European Central Bank 2005), which implies that shifts in the market-clearing equilibrium following accession would have been different in Estonia than in the other three countries.

Capital funding costs: Interest rates in the Czech Republic were disproportionately insensitive to changes in the interbank and central bank rates, because the Czech Republic enjoyed a solid, old-school financial system with a strong tradition of consumer confidence and highly developed infrastructure. This allowed banks to rely even more heavily on deposits for funding (European Central Bank 2005). The Bulgarian interbank market was far less developed than in the other countries, and therefore likely responded differently to EU accession (Berlemann & Nenovsky 2004).

Default risk: Changes in institutional quality and creditor protection is an expected effect of EU accession. As has been mentioned, every country was coached to regulative harmonization individually.

Other lending risk factors: Currency risk was a larger issue in Hungary than in the other countries (International Monetary Fund 2010). In the Czech Republic it was a minimal issue, due to its relatively low ratio of foreign currency denominated loans (Allen, Bartiloro & Kowalewski 2005). Concerning inflation, in 2003 Hungary – previously a “model” accession country – suffered from large economic problems including accelerating inflation. During this year, the central bank increased central interest rates by 600 basis points to 12.5% to restore macroeconomic stability (Kovács & Moulin 2004). Problems with central bank credibility remain today (e.g. Szakacs & Than 2012), meaning Hungary suffers from problems related to inflation expectations.

Competitive strategy: Increased competitive intensity is also an expected effect of EU accession. Bulgarian banks and customers have historically had higher propensity to substitute local currency loans with foreign currency loans (Brozoza-Brzezina, Chmielewski & Niedzwiedzinska 2010), which is a sign of responsiveness to changing international market conditions – indicating that Bulgaria experienced a stronger response to accession in the competitive area than the other countries.

And finally, timing: Our four countries represent both the 2004 and the 2007 EU accession rounds. Including countries from both rounds makes it easier to distinguish the EU effect, by making the accession timing factor less important (otherwise, the results would have been distorted by time-specific macroeconomic events such as the 2007 subprime crisis). In the same vein, the Estonian economy overheated in 2006 (Lamine 2008), which causes a range of disturbances in the lending rate data after that time.

Research questions and hypotheses

EU membership affects national credit markets for two main reasons: harmonized regulations and access to the EU-wide market. Harmonized regulation contributes to institutional improvements that increase creditor protection and decrease incentives for strategic default, especially in the case of developing

economies including the countries in our sample. This decreases the required compensation for default risk, and therefore contributes to lower credit rates. Regulative aspects should also contribute to decreasing currency risk, as member states are told to treat their exchange rate policies as matters of common interest, and decreasing inflation expectations, as collaboration with the European Central Bank increases the clout and credibility of domestic central banks. Access to the EU-wide market has the direct effect of granting banks access to a larger interbank market, which eases access to lending capital, and of creating a fiercer competitive climate as customers gain access to international creditors' offerings. The larger market may also have important consequences for overall credit supply and demand in the acceding country, although these effects are harder to predict. Overall, we expect the most significant effects to stem from institutional improvements, which in our model translates to decreased default risk.

Since consumption loans are far more internationalized than home loans, and due to the existence of specific EU directives that directly impact national consumption credit markets, we expect EU accession to have a comparatively greater impact on this category.

Our hypotheses:

- 1. The effect of EU accession is a decrease in household credit rates that is comparatively greater for consumption loans, but significant for both loan types.**
- 2. We expect a major portion of this effect to stem from institutional improvements that stem from regulative harmonization, in our model defined as decreased default risk.**

Method

This paper's aim is to assess the effect of EU accession on household credit rates in the acceding country, and to provide a framework for analyzing and predicting the effects of policy on household credit rates. Accordingly, we have constructed a model of rate-setting behavior defining household credit rates in terms of five factors. As has been discussed, we expect different reactions for the two main loan categories (home loans and consumption loans), and we will therefore analyze the two loan types separately, using our model.

We collect time series data on interest rates directly from the countries' central banks, and extract the remaining time series data through Thomson Reuters Datastream. Sources and other details about the data are outlined in appendix 1 and further discussed in the next section.

Our analytical approach is straightforward. We will attempt to tease out the effect of EU accession by creating an econometric model that accounts for all five dimensions in our rate-setting model (the details

will be discussed in the next section). In the first stage of our analysis, we will evaluate the statistical and economic significance of the EU dummy in relation to hypothesis 1, which predicts a significantly negative coefficient on the EU dummy for both consumption and home loans, with greater magnitude for consumption loans. In the second stage, we deal with hypothesis 2. We recognize that our explanatory variables – held fixed in our first regression – are also affected by EU accession (discussed on pages 14-16). Through interaction analysis, we aim to assess the scope and significance of the changes in the relationships between the control variables and the interest rates following EU accession. Do institutional improvements account for a large portion of the effect on interest rates, or would it be more accurate to attribute the effect to changes in one or more of the control variables?

Data and sources

The lending rate data

The central focus of our regressions is, of course, the data on new member state household credit rates – but that data is also our main limitation. As has already been discussed, this research will be restricted to the countries that provide the best data: **Bulgaria, the Czech Republic, Estonia, and Hungary**. We have 10 years' worth of monthly observations (January 2002 – December 2012).

The time comparability issue

The core criterion for these data series is that they have to be comparable across time: observations from the years before accession have to be comparable to observations made afterwards. This is not necessarily the case, since many countries change some reporting standards in connection with their EU accession, and for some countries the methodological shift is so significant that the data from before and after the accession cannot be compared at all (at least not without advanced data manipulation in direct collaboration with the central banks, beyond the scope of this paper). For the four countries in our sample, however, their respective central banks provide reliable, comparable monthly data, which we have confirmed through direct contact with the central banks.

Differences in interest rate data segmentation

Our regressions will feature two main categories of household credit rates: home loan rates and consumption loan rates. Consumption loans was defined in the first Consumer Credit Directive (Council Directive 87/102/EEC) as unsecured loans ranging from EUR 200 to 20,000 (the upper bound was raised to EUR 75,000 in the 2008 directive), excluding overdrafts, zero-interest loans, revolving credit (which includes most types of credit cards) and other forms of short-term credit. Loans for house purchases are not defined at the EU level.

The countries' central banks vary in their efforts to segment the lending rate data into subcategories. Some countries provide different data sets for different loan maturities. Most of them explicitly separate home loans from consumption loans. One of the countries provides almost no segmentation, however: in Estonia, the statistical office has chosen to simply split rates into "long-term" and "short-term." For the purposes of this paper, we shall treat Estonia's data on long-term credits as data on home loans, since the vast majority of house purchase loans would be included under the long-term label, and vice versa with consumption loans.

Pooled observations or country-specific analysis?

The four countries in our sample are different, and we expect country-specific reactions to EU accession that likely deviate from a pooled result. Can we justify aggregating the data?

First of all, we have data for four countries, each with specific "problems" (both in terms of data quality and country characteristics) that affect the individual observable effects of EU accession in each country. Luckily, these issues are specific enough (refer back to pages 18-19 for a discussion) that only one out of four countries experience each problem. When we pool the data, each country's troubled data points are matched with three "healthy" observations, contributing to larger variation in the sample. This gives us more reliable results by mitigating the effects of timing-specific effects and diminishing the effects of any given country's deviations in terms of a specific explanatory variable. Furthermore, aggregating the observations allows us to disregard the impact of accession timing. Our data sample contains data from both the 2004 and 2007 accession rounds, making a pooled regression more appropriate for separating EU accession effects from year-specific effects including both shocks and macro trends. Finally, we have a fairly small set of observations for each country, which is an immediate problem that is resolved by pooling the data.

Uncovering trustworthy country-specific effects of EU accession cannot be done without great statistical difficulty. It requires detailed knowledge of each country's preconditions and regulatory changes and a thorough analysis of developments in their banking sectors, which is beyond the scope of this paper. For the above reasons, we will use pooled observations in the forthcoming analysis.

Control variables

Control for changes in supply and demand: Real GDP growth

Economic growth affects the total credit market in an economy by expanding demand for corporate loans. A strong stock of corporate loans contribute to strong bank profitability and affects rate-setting behavior in relation to all types of credits, including household credit. Real GDP growth is used a proxy for changes in aggregate loan demand. The GDP data comes from Eurostat.

Control for changes in funding costs: Interbank and deposit rates

Our regressions could either use interbank rates or central bank rates for measuring changes in external funding costs. We observe correlations ranging from 0.9350-0.9837 between countries' central bank rates and interbank rates, which precludes us from using both. As discussed on page 11, we have intuitive reasons for preferring interbank rates to central bank rates, and the interbank rate also has higher explanatory power in terms of R-squared. We use 3-month interbank rates, since that is the golden standard: loans with longer maturities are also often priced according to the 3-month rate. The interbank rate data comes from the national central banks.

We shall also capture changes in the cost of internal funding by controlling for household deposit rates, extracted from national central banks together with the lending rates.

Control for changes in other risk factors: Government bond yields, spot and forward exchange rates

The go-to method of hedging for inflation is investing in government bonds, so government bond yields constitute the go-to proxy for inflation expectations. We have used bond yield data from the International Monetary Fund, which defines their maturities simply as "long-term."

We also need a control for currency risk. A spot exchange rate is the current exchange rate, and a forward exchange rate is a rate at which you must exchange the currency at some contracted future date (for example, a one-month forward Euro to Hungarian Forint (HUF) exchange contract allows an investor to exchange Euro for Forints in one month at the forward rate, regardless of the spot rate in a month and any fluctuations along the way). Forward rates are used for hedging purposes – they are, in other words, used directly for managing currency risk.

Two main aspects affect a forward rate: changes in expectations of exchange rate movements (for example, if the HUF is expected to appreciate vs. the EUR, the forward EUR to HUF rate will be pushed upwards relative to the spot rate), and a time-varying risk premium (Landon & Smith 1999). In general, investors – cross-border banks, in our case – are assumed to be risk-averse. As a bank's exposure to any given currency grows, or exchange rate volatility increases, it will be more willing to pay for the safety of a forward contract. This, through market mechanisms, should contribute to driving forward rates up in

times of high risk, relative to spot rates. The difference between forward rates and spot rates, then, vary across time in response both to exchange rate expectations and risk factors. A positive difference implies expected future appreciation and/or increased risk, while a negative difference implies expected future depreciation and/or decreased risk. While an imperfect measure, we will use this difference to proxy for currency risk. The exchange rate data comes from WM/Reuters.

Control for changes in competitive strategy: Industrial production

We expect a significant business cycle effect on rate-setting behavior that comes down to competition and business expansion. Since banks strive for first-mover advantages, this effect is better captured by using a leading indicator (a “pre-measure”) of business cycle movements than by controlling for GDP, which is infrequently reported and records past business cycle developments. The go-to leading indicator of business cycle movements is industrial production, which is reported on a monthly basis. The data on industrial production comes from Eurostat.

Control for changes in default risk?

Hypothesis 2 states that we will see significant changes in this area from EU accession. These effects will be captured by an EU dummy (0 before accession, 1 afterwards), together with other effects of EU accession, and then extracted through interaction analysis.

Heteroskedasticity

Using the Breusch-Pagan test we cannot reject linear forms of heteroskedasticity in the residuals of the pooled sample regressions. We reject non-linear forms using the White test. Looking at plots of residuals against fitted values from the regressions using the pooled sample (see appendix 3) we see that the variance is higher for larger fitted values (however, the number of observations in this area is low). Looking at the same plots for individual countries, we can easily conclude that this is due to the explosion in interest rates observed in Estonia in 2006 onwards, during its time of crisis. We have used robust standard errors in all regressions to correct for this, and the statistical validity of our results should be reliable.

Data manipulation

We have had to manipulate the data according to the following:

- Because **GDP** is only reported quarterly, and records information about the preceding quarter, we have replaced empty values with those of the following period (so that $GDP(t - 2), GDP(t - 1) = GDP(t)$), where t is one month.

- We do not have data on **Estonian forward exchange rates** before EU accession. Since the country has upheld a firm peg in relation to the Euro for the entire time span of this research, we have set Estonia's currency risk to 0 up until accession (the currency risk is near-zero for the entire series). Both Estonian exchange rate series end at the time of Estonia's 2010 entrance into the EMU, meaning currency risk becomes a true 0 from there on.
- Our **year dummies** are shifted: $y00$ is defined as year 2000 and year 2001 leading up to but not including July. $y01$ is the second half of year 2001 and the first half of 2002, etc. The reason for shifting the year dummies this way is that Bulgaria acceded on the 1st of January, which would otherwise have caused perfect collinearity with the year dummies.

The regression models

The basic outlines of our models are as follows:

$$home_i = \beta_0 + \beta_1 * EU_i + \beta_2 * interbank_i + \beta_3 * deposit_i + \beta_4 * gvyield_i + \beta_5 * currisk_i + \beta_6 * IP_i + \beta_7 * GDP_i + \sum_{a=2001}^{2012} \gamma_a * year_a + \sum_{b=2}^{12} \gamma_b * month_b + \sum_{c=czech}^{hungary} \gamma_c * country_c$$

$$consumption_i = \beta_0 + \beta_1 * EU_i + \beta_2 * interbank_i + \beta_3 * deposit_i + \beta_4 * gvyield_i + \beta_5 * currisk_i + \beta_6 * IP_i + \beta_7 * GDP_i + \sum_{a=2001}^{2012} \gamma_a * year_a + \sum_{b=2}^{12} \gamma_b * month_b + \sum_{c=czech}^{hungary} \gamma_c * country_c$$

Where:

- *home* is the weighted average national long-term/home loan rate
- *consumption* is the weighted average national short-term/consumption loan rate
- *EU* is the EU dummy, 0 before accession and 1 afterwards
- *interbank* is the 3-month national overnight interbank rate
- *deposit* is the weighted average national household deposit rate
- *gvyield* is the national long-term government bond yield
- *currisk* is the difference between the forward exchange rate and the spot rate, with a positive difference implying increased risk and/or future appreciation (and vice versa)
- *IP* is industrial production, volume index, base year 2010
- *GDP* is real GDP at market prices, in local currency, base year 2005
- $year_a$, a goes from 2001 to 2012, $n = 12$, base year 2000
- $month_b$, b goes from February to December, $n = 11$, base month January
- $country_c$, Czech Republic, Estonia, and Hungary, $n = 3$, base country Bulgaria

We use year and month dummy variables to control for seasonality and macroeconomic trends, and to further distinguish the EU effect from general time effects. In order to avoid overcontrolling we have consistently selected time series that have not been seasonally adjusted. We also use country dummies to control for country-specific differences.

Analysis

We observe a drop in household loan rates following EU accession, after controlling for six major interest rate determinants, that is larger for consumption loan rates than for home loan rates – which falls perfectly in line with hypothesis 1. The effect is both economically and statistically significant: a 5.7 percentage point drop in consumption loan rates and a 2.5 percentage point drop in home loan rates at the 1% level (see table 1). Furthermore, the main regression supports our model. All of the control variables are significant for one or both of the loan types, and the coefficients are generally intuitively appealing.

Hypothesis 1: A drop in interest rates – and support for our model

Our model predicts that higher funding costs should correspond to higher interest rates, and we do indeed generally see positive coefficients on interbank and deposit rates (though the interbank rate is statistically insignificant for consumption loans). The deposit rate has a negative coefficient for home loans, however, which could be explained by expanding on the competitive-strategic framework. We have already discussed that creditors often decrease interest rates when the economy is booming to gain market share (a theory further supported in the data, as seen by the negative coefficient on industrial production for home loans). This theory could be expanded to include deposit rates, as retail banks might choose to increase deposit rates as an additional tool for converting new customers. This effect should not, and does not, receive empirical support for consumption loans, because – as discussed – the primary vehicle for strategic competition decisions and tying customers to the bank is long-term home loans.

The data also supports our model's prediction that interest rates increase with inflation expectations: we see positive and significant coefficients on government bond yields. The coefficients on currency risk, however, are counterintuitive – but due to a number of problems with the proxy and overall economic insignificance for our four-country sample, as discussed below, we can disregard these results.

Variables	Consump. loan rates	Home loan rates
EU dummy	-5.656*** (0.789)	-2.510*** (0.509)
Interbank rate	0.252 (0.251)	1.036*** (0.209)
Deposit rate	1.638*** (0.275)	-0.493*** (0.168)
Government bond yield	1.532*** (0.330)	1.136*** (0.212)
Currency risk	-4.254*** (1.146)	-1.891*** (0.724)
Industrial production	0.0772 (0.0492)	-0.0826*** (0.0269)
GDP	0.126*** (0.0349)	0.0126 (0.0226)
Constant	-14.06*** (5.125)	6.959** (3.343)
Month dummies	Y	Y
Year dummies	Y	Y
Country dummies	Y	Y
Observations	416	416
R-squared	0.512	0.877
<i>Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$</i>		

Table 1: Results of the main regression

As was discussed on page 19, currency risk is only a significant issue in Hungary (we observe much larger variance and absolute values in the data for Hungarian currency risk than in that of the other countries, see appendices 1 and 6). As can be seen in appendix 4 (displaying individual-country regressions), the coefficient on currency risk for Hungary is significant and positive (0.780***) for home loans, consistent with our expectations. The coefficients lack both economic and statistical significance for the other countries, except for Estonia where the effect is economically insignificant. The results further decrease in relevance if we consider the countries' exchange rate regimes. Both Estonia's and Bulgaria's currencies were (and remain) pegged or otherwise tied to the Euro (see appendix 6), guaranteeing a high degree of currency correlation and low risk for cross-border lenders. We must also recall the imperfect nature of this proxy: the numbers our regressions treat as "large" currency risk may not be indicative of risk at all, but simply a measure of expected future appreciation.

Our model also states that the upper bound of an economy's household credit rates depends on the equilibrium between aggregate supply and demand for credit, the latter proxied by GDP. The data supports our assumption that higher demand for loans, stemming from GDP growth, increases

consumption loan rates. This result is intuitively appealing, since we might expect demand for short-term consumption loans to be relatively more affected by the psychological effects of mid-term economic growth than long-term home loans.

Differences in the countries' reactions to EU accession

Looking at country specific regressions (appendix 4), the observed drop in interest rates from EU accession only seems to hold for Czech home loans (-0.178***) and Estonian consumption loans (-3.819***). Bulgarian and Hungarian home loans (0.912**, 0.390*) and Czech and Hungarian consumption loans (1.181***, 0.734***) instead seem to increase with EU accession. While this may appear to invalidate our results, we cannot ignore the possibility that the counterintuitive coefficients from the individual regressions may stem from data- and country-specific problems that are mitigated by pooling the data, as discussed on page 22.

Hypothesis 2: Uncertain relative importance of institutional improvements

We recognize that several of our control variables may also be affected by EU accession (see page 16). Holding the explanatory variables fixed, as we do above, the EU dummy captures the whole effect of EU accession – from changes in the institutional climate that affect default risk, changes in inflation expectations and currency risk, and changes stemming from the enlarged market (which we expect to affect funding costs, competitive strategy, and – to an uncertain extent – supply and demand). If hypothesis 2 holds, we should not observe any major change in the value or significance of the EU dummy in the interaction analyses, where we control for changes in the underlying relationships between the controls and the interest rates.

The effects captured by the EU dummy stem both from institutional improvements (as well as other factors we have not explicitly controlled for) and from changes in the relationships between control variables and lending rates. The latter can be attributed either to changes in the absolute values of the controls, “true” changes in their underlying relationship to the interest rates, or both. By performing a simple regression of each control variable on the EU dummy (see appendix 5), we can assess which controls experience significant changes in absolute values following EU accession. As seen in table 2, three controls change significantly: government bond yields, industrial production, and GDP. For these variables, the uncertainty surrounding the changed relationship limits our ability to assess their “true” contribution to the effect of EU accession. In the case of industrial production and GDP it is even harder to confidently interpret the coefficients, since both variables are highly correlated with the EU dummy (0.419 and 0.455, which is very high considering the EU dummy only takes on values of 0 or 1).

Variables	Government bond yield	Industrial production	GDP
EU	-0.738*** (0.169)	21.69*** (1.088)	20.14*** (0.970)
Constant	6.484*** (0.136)	79.88*** (0.879)	87.02*** (0.769)
Observations	552	552	518
R-squared	0.034	0.419	0.455
<i>Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$</i>			

Table 2: Simple regressions of control variables on the EU dummy, significant results

Any observed EU dummy changes in the interaction analyses of the remaining control variables, on the other hand, cannot be attributed to large changes in absolute values of the controls. Since these effects must stem from changes in the underlying relationships to the interest rates, we can evaluate their contribution to the effect of EU accession with more confidence.

To assess changes in the control variables' relationships to the interest rates, we perform a series of regressions that include interaction terms for each control variable with the EU dummy (see table 3). By comparing the coefficient on the EU dummy with and without interaction terms, we can assess to what extent changes in any particular control variable contribute to the observed effect of EU accession. If the changes in the EU dummy are only minor, the results support our hypothesis that a major portion of the effect on household credit rates stem from institutional improvements/decreased default risk.

The EU dummy loses its statistical significance, either completely or partially and for both loan types, in four of the interaction regressions: currency risk (for consumption loans), government bond yields, industrial production, and GDP. We have already discussed the problematic nature of the currency risk proxy (pages 23-24), and accordingly approach the results from its interaction regression with significant reservations. Consider the fact that the coefficients on the EU dummy change to -0.0527 for consumption loans and 0.614*** for home loans from -5.656*** and -2.510***, respectively, indicating that a change in the relationship between currency risk and household interest rates (banks requiring lower compensation for incurring currency risk, or perceiving lower currency risk) accounts for almost the entire effect observed in our main regression. Given the problems with the proxy and its economic insignificance (discussed above), we shall not give much attention to this result. We are also aware of the issues surrounding the latter three variables: we cannot know whether the loss of significance and changes in coefficients on the EU dummy in these regressions are indicative of significant changes in the relationships between the controls and the interest rates – “true” effects of EU accession – or simply products of high correlation with the EU dummy and/or significant changes in absolute values.

Variables	Original regr.		Currency risk		Interbank rate		Deposit rate		Industrial prod.		Gvt. bond yield		GDP	
	Cons.	Home	Cons.	Home	Cons.	Home	Cons.	Home	Cons.	Home	Cons.	Home	Cons.	Home
EU dummy	-5.656*** (0.789)	-2.510*** (0.509)	-0.0527 (0.221)	0.614*** (0.196)	-4.403*** (0.928)	-2.453*** (0.660)	-3.031*** (1.007)	-1.884** (0.733)	-3.612 (3.992)	-3.477 (2.840)	-2.736* (1.488)	-1.208 (0.943)	-6.460 (4.204)	-4.032 (2.768)
Curr. risk * EU	x	x	-1.078*** (0.245)	0.140 (0.140)	x	x	x	x	x	x	x	x	x	x
Interbank * EU	x	x	x	x	-0.288** (0.136)	-0.0130 (0.0829)	x	x	x	x	x	x	x	x
Deposit * EU	x	x	x	x	x	x	-0.592*** (0.172)	-0.141 (0.103)	x	x	x	x	x	x
IP * EU	x	x	x	x	x	x	x	x	-0.0206 (0.0384)	0.00973 (0.0264)	x	x	x	x
G.B. yield * EU	x	x	x	x	x	x	x	x	x	x	-0.606** (0.272)	-0.270 (0.170)	x	x
GDP * EU	x	x	x	x	x	x	x	x	x	x	x	x	0.00790 (0.0397)	0.0150 (0.0249)
Interbank rate	0.252 (0.251)	1.036*** (0.209)	-0.265*** (0.0859)	-0.140* (0.0760)	0.355 (0.256)	1.041*** (0.211)	0.0363 (0.259)	0.985*** (0.215)	0.259 (0.252)	1.033*** (0.210)	0.133 (0.257)	0.983*** (0.213)	0.250 (0.252)	1.033*** (0.210)
Currency risk	-4.254*** (1.146)	-1.891*** (0.724)	1.552*** (0.331)	1.135*** (0.259)	-4.622*** (1.201)	-1.907*** (0.720)	-4.792*** (1.213)	-2.019*** (0.731)	-4.297*** (1.157)	-1.870** (0.735)	-4.495*** (1.171)	-1.998*** (0.725)	-4.242*** (1.155)	-1.867** (0.727)
Gvt. bond yield	1.532*** (0.330)	1.136*** (0.212)	-0.192*** (0.0627)	0.0799 (0.0671)	1.643*** (0.344)	1.141*** (0.218)	1.717*** (0.344)	1.180*** (0.218)	1.532*** (0.331)	1.135*** (0.212)	2.170*** (0.450)	1.420*** (0.281)	1.533*** (0.330)	1.138*** (0.212)
Industrial prod.	0.0772 (0.0492)	-0.0826*** (0.0269)	-0.0146 (0.00935)	-0.0217** (0.00938)	0.0872* (0.0506)	-0.0822*** (0.0275)	0.0927* (0.0503)	-0.0789*** (0.0274)	0.0960 (0.0595)	-0.0915** (0.0358)	0.0865* (0.0501)	-0.0784*** (0.0272)	0.0760 (0.0509)	-0.0847*** (0.0274)
GDP	0.126*** (0.0349)	0.0126 (0.0226)	0.0226*** (0.00816)	0.0274*** (0.00767)	0.108*** (0.0370)	0.0117 (0.0239)	0.0989*** (0.0367)	0.00606 (0.0239)	0.127*** (0.0352)	0.0120 (0.0225)	0.106*** (0.0378)	0.00375 (0.0242)	0.120*** (0.0450)	0.000183 (0.0306)
Deposit rate	1.638*** (0.275)	-0.493*** (0.168)	0.294*** (0.0698)	-0.0324 (0.0662)	1.745*** (0.291)	-0.488*** (0.168)	2.348*** (0.381)	-0.324 (0.202)	1.636*** (0.275)	-0.492*** (0.169)	1.743*** (0.284)	-0.446*** (0.170)	1.635*** (0.277)	-0.500*** (0.170)
Constant	-14.06*** (5.125)	6.959** (3.343)	15.67*** (0.992)	7.762*** (0.850)	-15.33*** (5.249)	10.80*** (3.268)	-16.21*** (5.241)	10.34*** (3.255)	-15.56*** (6.006)	11.57*** (3.662)	-16.87*** (5.327)	9.604*** (3.272)	-13.41** (6.398)	12.08*** (3.862)
Year dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Month dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Country dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	416	416	336	336	416	416	416	416	416	416	416	416	416	416
R-squared	0.512	0.877	0.827	0.988	0.516	0.877	0.522	0.877	0.512	0.877	0.515	0.877	0.512	0.877

Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 3: Interaction regressions

For the two interaction regressions that are valid, however, we observe reasonable results. In the interaction analysis of interbank rates, we see a decrease in magnitude to -4.403 (-5.656) for consumption loans and -2.453 (-2.510) for home loans with no loss of statistical significance. In the analysis of deposit rates we observe similar results with decreases to -3.031 (-5.656) for consumption loans and -1.884 (-2.510) for home loans, with only a slight loss in statistical significance for the latter (to the 5% level from the 1% level). These results suggest that the relationships between these funding costs and interest rates are in fact affected by accession, and should therefore be considered part of the effect of EU accession. The decreases in magnitude of the coefficients on the EU dummy are fairly small, however, indicating that institutional improvements do in fact account for a major portion of the effect on interest rates. Since we cannot rely on the results from the other four regressions, however, we cannot draw any conclusions about the effect of institutional improvements relative to the effects of changes in relationships between the rates and other explanatory variables.

Summary of analysis

We find support for our first hypothesis: EU accession correlates with an economically and statistically significant drop in interest rates, that is more pronounced for consumption loans than for home loans. We do not find any strong support for our second hypothesis, due to the problematic nature of the currency risk proxy and high correlations between certain control variables and the EU dummy. The interaction analyses we deemed reliable uncovered some support for this hypothesis, but the results are far from conclusive.

Conclusions

We hypothesized that we would observe a drop in household credit rates following EU accession, and that this drop would be more prominent for consumption loans than for home loans. **Our research supports this hypothesis.** In our sample, EU membership does in fact correlate with a decrease in household interest rates, after controlling for four out of the five main factors in our rate-setting model through six explanatory variables, with a comparatively steeper drop in consumption loan rates. We also uncovered support for our rate-setting model itself.

We also hypothesized that a major portion of the observed effect of EU accession should stem from improvements in the acceding country's institutional climate (or, in terms of our model, from decreases in default risk). These effects were captured in the EU dummy that supported our first hypothesis. This dummy also captured effects of changes in the control variables' relationships to the interest rates. Through interaction analysis we attempted to disentangle the control variables from the EU dummy, with

the aim of assessing the importance of institutional improvements relative to changes in the controls. We uncovered some support for our second hypothesis, but this result must be approached with caution. In the two reliable interaction analyses (for deposit and interbank rates) the coefficients on the EU dummy decreased somewhat in magnitude but remained significant. This indicates that these controls contribute to the effect of EU accession, but also that the other factors captured by the EU dummy – including institutional improvements – remain highly significant. For various reasons, the other four interaction analyses yielded unreliable results. **We cannot draw any reliable conclusions about this hypothesis.**

Policy implications of our results

The support we have found for our first hypothesis – that EU accession correlates with a drop in household credit rates – tells us that policymakers striving to control indebtedness should keep an eye on the credit markets of newly acceded countries. Excessively low interest rates can lead to debt spirals with highly negative consequences for an economy. Monitoring lending rates (and their underlying determinants, for example as defined by our rate-setting model) will at least provide awareness and enough time to take appropriate action if any credit market shows signs of overheating.

The slight support we have found for our second hypothesis implies that EU regulations have a significant impact on national credit markets (although these results must be approached with significant caution). If this is indeed the case, it is well worth policymakers' time to craft considered, balanced, and appropriate regulation. While low rates have been proven problematic in the past, they are not necessarily an evil. Regulations have the power to steer developments in both national and union-wide credit markets, and policymakers must always consider the trade-off between immediate consumer welfare and long-term economic risk.

Suggestions for future research

Our conclusions are based on a fairly limited data sample of four countries, largely due to lacking interest rate data. We see potential for taking this research further by using a larger number of countries to expand the dataset, for example by working with national central banks to repair time series that have been distorted by methodological changes. Regarding our first hypothesis, a larger dataset can be used to find stronger statistical support for a conclusion about the EU accession effect on household credit rates. Regarding our second hypothesis, we suggest taking the analysis one step further by directly questioning where the accession effect comes from (in other words, what underlying factors contribute to the effect and how), rather than starting from a hypothesis about the relative importance of regulations. This information should be of prime interest to policymakers and other stakeholders, who can learn to which extent political efforts versus effective market reactions underlie the changing lending rates. An analysis

based on a larger and more detailed dataset together with better knowledge about country-specific characteristics can aid in extracting this knowledge.

A more far-reaching economic consequence of household credit rates is, as discussed, the overall debt levels in an economy. An interesting topic related to this area is how consumption behavior is affected by cheaper and easier access to credit, coupled with enlarged access to consumer goods through the common market. This information should improve policymaking aiming both at controlling debt levels and increasing consumer welfare in the Union. We see potential for researching this area both in the new member states and in countries on the brink of accession.

Summary

Household interest rates are not only important for immediate consumer welfare, but in the long run contribute to determining the overall level of indebtedness in an economy. We have examined what effect EU accession – officially joining the EU as a full member – has on household credit rates in the acceding country, both long-term home loan rates and short-term consumption loan rates.

We have structured the current stock of knowledge about household interest rates into a model of bank rate-setting behavior. The model's purpose is threefold: to serve as the basis for our analysis, to aid the reader's intuitive understanding, and to provide policymakers and other stakeholders with a tool to help predict the effects of financial, economic or political reform. It features five main interest rate determinants:

- **Supply and demand**, which defines the market-clearing equilibrium. Banks set rates below equilibrium to attract quality borrowers rather than the high-risk ones who are prepared to incur more expensive debt.
- **Capital funding costs**, determined by interbank, central bank, and deposit rates.
- **Default risk**, both individual and institutional, determines the risk of monetary losses when borrowers fail to repay loans. Higher risk requires greater compensation, and therefore contributes to higher rates.
- **Other lending risk factors**, namely inflation expectations and (for cross-border lenders) currency risk. Again, higher risk contributes to higher rates.
- **Competitive strategy**, determined by business cycle dynamics and competitive intensity. When the economy is on the upswing, or in response to competition, lenders strategically lower their rates to attract customers and gain market share.

We then moved on to outline what effects regulative harmonization, economic convergence, and the enlarged market should have on these five factors, and noted that the scope of these effects are determined by each acceding state's economic preconditions. However, every new member state works tightly with the Union ahead of accession to create a unique roadmap to harmonization and convergence, which implies that each new member state should enjoy institutional improvements regardless of preconditions.

The model, coupled with the other information in the background section, led us to two hypotheses:

1. That EU accession correlates with a drop in interest rates, and that this drop is greater for consumption loans than for home loans. We found support for this hypothesis.
2. That a major portion of the effect can be attributed to institutional improvements, stemming from regulative harmonization (in terms of our model, that a major portion of the effect can be attributed to changes in default risk). We found slight support for this hypothesis but cannot draw any reliable conclusions.

The connection between EU membership and falling household credit rates tells us that EU-level policymakers would do well to monitor credit markets in newly acceded countries. The slight support we find for high relative importance of institutional improvements and regulations implies that it is well worth policymakers' time to craft balanced and appropriate regulation, always keeping the tradeoff between immediate consumer welfare and long-term economic risk in mind.

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Appendices

Appendix 1: Detailed information on data and sources

Appendix 2: Summary statistics

Appendix 3: Heteroskedasticity

Appendix 4: Main regression for individual countries

Appendix 5: Simple regressions of each control variable on the EU dummy

Appendix 6: Exchange rates

For the interested, more information is available upon request, including:

- Country-specific interaction analyses
- Information on correlation between variables
- Extended information on Hungarian currency risk
- Extended information on heteroskedasticity, including plots for individual countries
- The complete dataset

Appendix I: Detailed information on data and sources

Notes:

NSA: Not seasonally adjusted,

WDA: Working days adjusted.

Real GDP	Bulgaria	Czech Republic	Estonia	Hungary
<i>Source</i>	Eurostat via Datastream	Eurostat via Datastream	Eurostat via Datastream	Eurostat via Datastream
<i>Notes</i>	NSA, Index, 2005=100	NSA, Index, 2005=100	NSA, Index, 2005=100	NSA, Index, 2005=100
<i>Observation frequency</i>	Quarterly	Quarterly	Quarterly	Quarterly
Date extracted: March 16, 2013				

Interbank rates	Bulgaria	Czech Republic	Estonia	Hungary
<i>Source</i>	Bulgarian National Bank via Datastream	Czech National Bank via Datastream	Bank of Estonia via Datastream	Hungarian National Bank via Datastream
<i>Notes</i>	SOFIBOR 3-month overnight rate, %	PRIBOR 3-month overnight rate, %	TALIBOR 3-month overnight rate, %	BUBOR 3-month overnight rate, %
<i>Observation frequency</i>	Monthly	Monthly	Monthly	Monthly
Date extracted: April 2, 2013				

Deposit rates	Bulgaria	Czech Republic	Estonia	Hungary
<i>Source</i>	Bulgarian National Bank	Czech National Bank	Bank of Estonia	Hungarian National Bank
<i>Notes</i>	%	%	%	%
<i>Observation frequency</i>	Monthly	Monthly	Monthly	Monthly
Date extracted: April 2, 2013				

Gvt. bond yields	Bulgaria	Czech Republic	Estonia	Hungary
<i>Source</i>	IMF via Datastream	IMF via Datastream	IMF via Datastream	IMF via Datastream
<i>Notes</i>	Long-term, %	Long-term, %	Long-term, %	Long-term, %
<i>Observation frequency</i>	Monthly	Monthly	Monthly	Monthly
Date extracted: March 16, 2013				

Spot exch. rates	Bulgaria	Czech Republic	Estonia	Hungary
<i>Source</i>	WM/Reuters via Datastream	WM/Reuters via Datastream	WM/Reuters via Datastream	WM/Reuters via Datastream
<i>Notes</i>	EUR to Lev	EUR to Koruna	EUR to Kroon, end 2010 with EMU	EUR to Forint
<i>Observation frequency</i>	Monthly	Monthly	Monthly	Monthly
Date extracted: February 21, 2013				

Fwd. exch. rates	Bulgaria	Czech Republic	Estonia	Hungary
<i>Source</i>	WM/Reuters via Datastream	WM/Reuters via Datastream	WM/Reuters via Datastream	WM/Reuters via Datastream
<i>Notes</i>	1-month, Lev to EUR	1-month, Koruna to EUR	1-month, Kroon to EUR, ends 2010 with EMU	1-month, Forint to EUR
<i>Observation frequency</i>	Monthly	Monthly	Monthly	Monthly
Date extracted: February 21, 2013				

Industrial prod.	Bulgaria	Czech Republic	Estonia	Hungary
<i>Source</i>	Eurostat via Datastream	Eurostat via Datastream	Eurostat via Datastream	Eurostat via Datastream
<i>Notes</i>	Volume index, WDA, 2010=100	Volume index, WDA, 2010=100	Volume index, WDA, 2010=100	Volume index, WDA, 2010=100
<i>Observation frequency</i>	Monthly	Monthly	Monthly	Monthly
Date extracted: April 2, 2013				

Appendix 2: Summary statistics

Sample	Variable	N	Max	Min	Mean	S.D.	P10	P50	P90
<i>Pooled</i>	Consumption loan rate	550	40.76	5.76	13.21	4.20	9.91	12.76	16.01
	Home loan rate	550	28.38	4.35	11.44	4.97	5.14	10.45	17.91
	Interbank rate	514	15.08	0.34	4.43	2.63	1.57	3.68	8.18
	Government bond yield	552	11.65	1.92	6.00	1.92	3.78	5.77	8.46
	Deposit rate	503	9.46	0.85	3.98	2.23	1.23	4.18	6.93
	Spot exchange rate	552	315.67	1.95	73.78	106.78	1.96	15.65	265.75
	Forward exchange rate	450	316.93	1.95	88.87	113.70	1.96	25.53	269.55
	Currency risk	450	2.52	-0.04	0.35	0.60	-0.01	0.00	1.27
	GDP	518	132.70	65.60	99.69	14.43	79.90	100.00	118.30
	Industrial production	552	130.98	51.30	94.03	15.97	71.30	95.92	113.60
<i>Bulgaria</i>	Consumption loan rate	156	19.13	10.04	13.54	2.17	11.30	12.36	17.13
	Home loan rate	156	17.90	6.68	10.97	2.86	8.51	9.38	15.75
	Interbank rate	118	7.26	0.96	3.70	1.37	2.66	3.21	6.09
	Government bond yield	156	8.14	3.22	5.67	1.22	4.16	5.48	7.30
	Deposit rate	107	7.31	3.67	5.10	1.08	4.02	4.97	6.98
	Spot exchange rate	105	0.01	0.00	0.00	0.00	0.00	0.00	0.00
	Forward exchange rate	131	132.70	66.10	99.37	18.59	72.50	96.80	126.20
	Currency risk	156	130.98	62.44	96.66	17.20	69.82	99.24	118.61
<i>Czech R.</i>	Consumption loan rate	131	15.05	12.67	13.98	0.59	13.18	13.98	14.63
	Home loan rate	131	7.65	4.61	5.56	0.81	4.85	5.22	7.01
	Interbank rate	132	4.57	0.34	2.22	1.02	1.01	2.14	3.90
	Government bond yield	132	5.55	1.92	4.11	0.72	3.34	4.05	5.06
	Deposit rate	132	2.53	1.15	1.37	0.26	1.18	1.28	1.59
	Spot exchange rate	132	0.04	-0.04	0.00	0.01	-0.02	0.00	0.02
	Forward exchange rate	128	120.50	80.20	105.61	11.60	88.10	108.90	119.20
	Currency risk	132	118.07	68.72	95.30	12.40	78.87	96.57	111.27
<i>Estonia</i>	Consumption loan rate	132	40.76	5.76	13.68	7.87	7.18	11.20	23.77
	Home loan rate	132	28.38	4.35	12.34	4.99	5.62	11.63	19.26
	Interbank rate	132	7.27	0.88	3.78	1.60	2.19	3.65	5.91
	Government bond yield	132	11.23	3.50	6.77	2.35	4.11	6.09	10.45
	Deposit rate	132	5.87	0.85	3.25	1.26	1.98	3.09	4.88
	Spot exchange rate	81	0.08	0.00	0.01	0.02	0.00	0.00	0.05
	Forward exchange rate	131	122.80	65.60	95.18	15.51	73.80	95.10	116.40
	Currency risk	132	122.50	51.30	87.32	18.28	62.50	86.25	113.20
<i>Hungary</i>	Consumption loan rate	131	15.79	9.69	11.56	1.51	9.95	11.10	13.38
	Home loan rate	131	20.70	14.42	16.96	1.41	15.46	16.75	18.63
	Interbank rate	132	15.08	5.23	7.94	1.89	5.99	7.62	10.40
	Government bond yield	132	11.65	5.64	7.52	0.99	6.57	7.32	8.65
	Deposit rate	132	9.46	4.29	6.41	1.48	4.69	6.19	8.91
	Spot exchange rate	132	2.52	0.19	1.20	0.45	0.76	1.08	1.82
	Forward exchange rate	128	111.60	80.60	98.73	7.45	89.30	99.00	107.70
	Currency risk	132	122.50	68.40	96.35	13.19	78.20	97.25	113.10

Comparison of summary statistics, before vs. after accession

	N		Max		Min		Mean		S.D.		P10		P90	
	Bef.	Aft.	Bef.	Aft.	Bef.	Aft.	Bef.	Aft.	Bef.	Aft.	Bef.	Aft.	Bef.	Aft.
<i>Pooled sample</i>														
Cons. loan rate	192	358	19.13	40.76	6.76	5.76	13.22	13.19	2.68	4.82	9.04	9.95	16.38	14.97
Home loan rate	192	358	20.70	28.38	5.36	4.35	11.94	11.17	4.21	5.31	6.44	4.98	17.67	17.95
Interbank rate	154	360	15.08	11.80	2.00	0.34	4.53	4.38	2.60	2.64	2.37	1.05	9.22	7.86
G.B. yield	192	360	11.23	11.65	3.49	1.92	6.48	5.75	2.04	1.80	4.16	3.65	9.86	8.24
Deposit rate	143	360	9.37	9.46	1.26	0.85	3.92	4.00	1.89	2.36	1.55	1.21	6.84	6.98
Spot exch. rate	192	360	267.33	315.67	1.95	1.96	46.05	88.57	84.91	114.16	1.95	1.96	244.10	273.64
Fwd exch. rate	90	360	269.75	316.93	1.95	1.96	88.72	88.91	110.31	114.68	1.96	1.96	256.25	275.28
Currency risk	90	360	2.52	2.22	-0.01	-0.04	0.44	0.33	0.72	0.56	0.00	-0.01	1.58	1.24
GDP	192	326	120.20	132.70	65.60	89.30	87.02	107.16	11.53	10.11	72.30	93.40	99.70	120.50
Industrial prod.	192	360	122.13	130.98	51.30	73.20	79.88	101.57	13.90	11.16	63.50	86.22	99.53	116.02
<i>Bulgaria</i>														
Cons. loan rate	84	72	19.13	12.41	10.04	10.48	14.95	11.89	2.06	0.53	12.29	11.06	17.68	12.35
Home loan rate	84	72	17.90	9.84	6.68	8.31	12.54	9.13	3.12	0.39	8.39	8.53	16.16	9.61
Interbank rate	46	72	4.80	7.26	2.79	0.96	3.27	3.98	0.35	1.67	2.99	2.04	3.67	6.31
G.B. yield	84	72	8.14	7.77	3.49	3.22	5.81	5.50	1.33	1.06	3.90	4.27	7.35	7.14
Deposit rate	35	72	4.23	7.31	3.67	4.26	4.03	5.61	0.14	0.95	3.78	4.31	4.16	7.17
Spot exch. rate	84	72	1.96	1.96	1.95	1.96	1.95	1.96	0.00	0.00	1.95	1.96	1.96	1.96
Fwd exch. rate	33	72	1.96	1.96	1.95	1.96	1.96	1.96	0.00	0.00	1.96	1.96	1.96	1.96
Currency risk	33	72	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
GDP	84	47	120.20	132.70	66.10	92.50	90.13	115.88	14.37	13.00	71.70	95.00	112.40	131.80
Industrial prod.	84	72	122.13	130.98	62.44	84.23	86.99	107.95	15.86	10.58	68.19	93.76	110.12	122.72
<i>Czech</i>														
Cons. loan rate	28	103	15.01	15.05	12.67	13.12	13.67	14.06	0.61	0.56	12.99	13.30	14.62	14.65
Home loan rate	28	103	7.65	6.17	6.26	4.61	6.93	5.18	0.45	0.35	6.31	4.84	7.61	5.79
Interbank rate	28	104	4.57	4.35	2.00	0.34	2.77	2.07	0.83	1.02	2.01	0.98	4.26	3.89
G.B. yield	28	104	5.55	5.45	3.49	1.92	4.52	4.00	0.56	0.73	3.75	3.26	5.32	5.02
Deposit rate	28	104	2.53	1.59	1.26	1.15	1.67	1.29	0.40	0.12	1.27	1.18	2.29	1.51
Spot exch. rate	28	104	33.09	31.83	29.35	23.35	31.54	26.91	0.90	2.24	30.32	24.46	32.68	30.13

Fwd exch. rate	28	104	33.08	31.83	29.35	23.33	31.54	26.91	0.90	2.24	30.32	24.44	32.68	30.12
Currency risk	28	104	0.04	0.03	-0.01	-0.04	0.00	0.00	0.01	0.02	-0.01	-0.02	0.02	0.02
GDP	28	100	93.70	120.50	80.20	91.50	88.35	110.45	4.00	7.78	82.90	99.25	93.50	119.70
Industrial prod.	28	104	89.76	118.07	68.72	81.26	78.51	99.83	5.91	9.43	71.18	86.77	87.59	111.99

Estonia

Cons. loan rate	52	80	15.04	40.76	6.76	5.76	9.95	16.10	1.79	9.26	7.81	6.71	11.90	33.17
Home loan rate	52	80	13.04	28.38	5.36	4.35	10.09	13.80	2.78	5.56	5.62	5.77	12.73	21.45
Interbank rate	52	80	5.68	7.27	2.37	0.88	3.99	3.64	1.13	1.84	2.37	1.20	5.46	6.25
G.B. yield	52	80	11.23	9.92	4.56	3.50	8.27	5.80	2.42	1.71	4.79	4.01	10.82	8.38
Deposit rate	52	80	4.88	5.87	1.94	0.85	3.44	3.13	0.98	1.41	2.06	1.36	4.67	5.01
Spot exch. rate	52	80	15.66	15.65	15.63	15.65	15.65	15.65	0.00	0.00	15.64	15.65	15.65	15.65
Fwd exch. rate	1	80	15.65	15.72	15.65	15.64	15.65	15.66	x	0.02	15.65	15.65	15.65	15.70
Currency risk	1	80	0.00	0.08	0.00	0.00	0.00	0.01	x	0.02	0.00	0.00	0.00	0.05
GDP	52	79	93.70	122.80	65.60	91.40	79.42	105.55	7.45	9.49	70.50	92.20	88.50	119.90
Industrial prod.	52	80	87.70	122.50	51.30	73.20	69.49	98.91	8.98	12.53	58.70	81.65	81.50	115.00

Hungary

Cons. loan rate	28	103	15.79	13.52	12.46	9.69	13.70	10.98	1.08	1.00	12.73	9.92	15.31	12.60
Home loan rate	28	103	20.70	18.54	17.05	14.42	18.59	16.52	1.13	1.12	17.15	15.09	20.23	18.05
Interbank rate	28	104	15.08	11.80	5.97	5.23	9.37	7.55	2.08	1.65	6.50	5.85	12.52	9.85
G.B. yield	28	104	8.65	11.65	5.97	5.64	7.14	7.62	0.69	1.04	6.33	6.65	8.24	8.77
Deposit rate	28	104	9.37	9.46	4.91	4.29	6.94	6.27	1.28	1.50	4.95	4.57	9.26	8.91
Spot exch. rate	28	104	267.33	315.67	234.49	232.63	249.35	266.30	9.27	17.67	237.07	245.95	263.94	290.75
Fwd exch. rate	28	104	269.75	316.93	235.69	233.36	250.76	267.45	9.67	17.76	238.27	247.32	266.38	292.06
Currency risk	28	104	2.52	2.22	0.19	0.39	1.41	1.14	0.56	0.39	0.83	0.75	2.43	1.81
GDP	28	100	98.50	111.60	80.60	89.30	90.48	101.04	5.34	6.23	83.00	91.70	98.50	108.50
Industrial prod.	28	104	91.60	122.50	68.40	78.20	79.22	100.96	6.21	10.49	72.60	87.10	89.40	114.40

Appendix 3: Heteroskedasticity

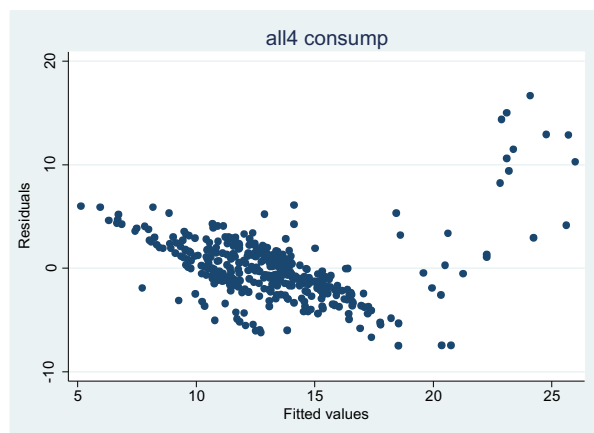


Figure 1: Residuals vs. fitted values, pooled sample, consumption loans

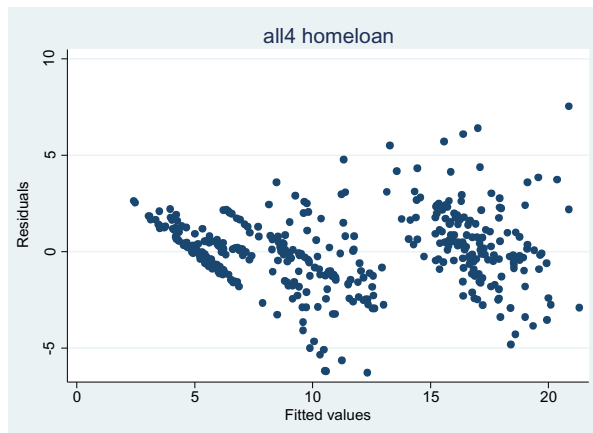


Figure 2: Residuals vs. fitted values, pooled sample, home loans

Breusch-Pagan / Cook-Weisberg test for linear heteroskedasticity

H₀: Constant variance

Variables: fitted values of consumption rates/home loan rates

	Pooled sample		Bulgaria		Czech Rep.		Estonia		Hungary	
	Cons.	Home	Cons.	Home	Cons.	Home	Cons.	Home	Cons.	Home
chi2(1)	358.05	30.76	1.60	0.01	2.90	3.13	6.35	0.00	3.80	0.17
Prob > chi2	0.0000	0.0000	0.2059	0.9036	0.0883	0.0768	0.0117	0.9965	0.0513	0.6764

White's test for H₀: homoskedasticity

H_a: unrestricted heteroskedasticity

	Pooled sample		Bulgaria		Czech Rep.		Estonia		Hungary	
	Cons.	Home	Cons.	Home	Cons.	Home	Cons.	Home	Cons.	Home
chi2(n)	405.77	402.95	80.00	80.00	128.00	128.00	80.00	80.00	128.00	128.00
Prob > chi2	0.1740	0.2004	0.4474	0.4474	0.4584	0.4584	0.4474	0.4474	0.4584	0.4584

Appendix 4: Main regression for individual countries

Variables	Pooled sample		Bulgaria		Czech Republic		Estonia		Hungary	
	Cons.	Home	Cons.	Home	Cons.	Home	Cons.	Home	Cons.	Home
EU dummy	-5.656*** (0.789)	-2.510*** (0.509)	0.0235 (0.353)	0.912** (0.346)	1.181*** (0.265)	-0.178*** (0.0370)	-3.819** (1.611)	0.204 (0.914)	0.734*** (0.231)	0.390* (0.208)
Interbank rate	0.252 (0.251)	1.036*** (0.209)	-0.0266 (0.167)	0.106 (0.219)	-0.218 (0.144)	-0.0969*** (0.0366)	-1.694 (2.369)	3.076*** (1.044)	0.0294 (0.0718)	-0.0844 (0.0843)
Currency risk	-4.254*** (1.146)	-1.891*** (0.724)	49.52 (94.41)	-74.44 (106.1)	-4.741 (5.254)	0.699 (1.105)	-188.0** (88.15)	-40.28 (48.65)	0.244 (0.196)	0.780*** (0.223)
Government bond yield	1.532*** (0.330)	1.136*** (0.212)	-0.0768 (0.218)	0.584* (0.292)	0.187** (0.0785)	0.00490 (0.0270)	2.924*** (1.012)	1.325*** (0.475)	0.0218 (0.0844)	-0.0124 (0.0690)
Industrial production	0.0772 (0.0492)	-0.0826*** (0.0269)	-0.0570** (0.0229)	-0.0663** (0.0296)	0.0195 (0.0155)	0.000570 (0.00381)	0.384** (0.188)	-0.0460 (0.0751)	0.00376 (0.0122)	-0.0184 (0.0148)
GDP	0.126*** (0.0349)	0.0126 (0.0226)	0.0135 (0.0285)	0.00977 (0.0394)	-0.0564** (0.0254)	-0.0190** (0.00740)	-0.339 (0.267)	-0.0952 (0.133)	-0.0886*** (0.0268)	-0.0753** (0.0370)
Deposit rate	1.638*** (0.275)	-0.493*** (0.168)	-0.0552 (0.301)	-0.641* (0.337)	1.019* (0.554)	0.811*** (0.172)	5.984** (2.859)	-3.293** (1.245)	0.111 (0.0838)	0.245** (0.0942)
Constant	-14.06*** (5.125)	6.959** (3.343)	19.11*** (2.740)	15.70*** (4.066)	14.61*** (2.453)	7.523*** (0.628)	-11.19 (15.02)	9.142 (9.442)	20.64*** (2.255)	25.69*** (2.658)
Year dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Month dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Country dummies	Y	Y	N	N	N	N	N	N	N	N
Observations	416	416	80	80	128	128	80	80	128	128
R-squared	0.512	0.877	0.861	0.842	0.781	0.994	0.850	0.911	0.948	0.938

Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Appendix 5: Simple regressions of each control variable on the EU dummy

Pooled sample	Interbank r.	Curr. risk	G.B. yield	Ind. prod.	GDP	Deposit r.
EU dummy	-0.146 (0.254)	-0.106 (0.0702)	-0.738*** (0.169)	21.69*** (1.088)	20.14*** (0.970)	0.0822 (0.221)
Constant	4.531*** (0.212)	0.438*** (0.0628)	6.484*** (0.136)	79.88*** (0.879)	87.02*** (0.769)	3.921*** (0.187)
R-squared	0.001	0.005	0.034	0.419	0.455	0.000
<i>Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$</i>						

Appendix 6: Exchange rates

