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# Why Are We Still Listening to this Dead British Guy: An Analysis of Emergency Liquidity Assistance in Germany During the Sovereign Debt Crisis

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**WHY ARE WE STILL LISTENING TO THIS DEAD BRITISH GUY: AN  
ANALYSIS OF EMERGENCY LIQUIDITY ASSISTANCE IN GERMANY  
DURING THE SOVEREIGN DEBT CRISIS**

by

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**SUBMITTED TO SCRIPPS COLLEGE IN PARTIAL FULFILLMENT OF THE  
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**Abstract**

Germany's position of power within the European Union disguises how impacted the German economy was by the 2008 Financial Crisis and Europe's subsequent Sovereign Debt Crisis. Two of Germany's major banks-Commerzbank and Bayerische Landesbank- suffered major losses and required emergency liquidity assistance (ELA) to survive. Walter Bagehot wrote the theory underpinning lenders of last resort (LLRs) in 1873 but how has the development of systemically important banks affected the usefulness of Bagehot's theory? This paper aims to explain why Germany is in need of updated LLR recommendations through an analysis of the ELA Germany at large, Commerzbank and Bayerische Landesbank received. It also aims to empirically prove the stigma and public distrust of ELA through a regression of Commerzbank's daily stock returns using an augmented Fama/French model. I find that Bagehot's theory and recommendations are out of date for our current global financial sector. I cannot empirically prove any stigma or public distrust of Commerzbank, there is no relationship between Commerzbank stock returns and the augmented Fama/French factors.

## I. Introduction

Germany has been viewed increasingly as the driving force behind the EU debt negotiations with good reason; Germans appear to be footing a disproportionate amount of the bill. To many onlookers Germany, and German banks, escaped the Financial Crisis unscathed. As Greece's continuing debt crisis covered international news, Germany was consistently painted as the unsympathetic aggressor. In everyday conversation it sounded like Germany did not face any obstacles to recovery, or even need a recovery at all. In reality, however, Germany suffered like every other nation and similarly its banks also required liquidity assistance. But how well did Germany disburse additional funds for liquidity assistance during this crisis?

Walter Bagehot wrote *Lombard Street: A Description of the Money Market* in 1873 in response to recent financial panics in London and the United Kingdom (UK). His frequently quoted book articulates what a Lender of Last Resort (LLR) is, who should take on that role and what they should do in the role. It became the standard theory behind LLRs despite how long ago it was written. Using his recommendations I will look at how liquidity assistance was provided to Germany as a whole through the European Central Bank (ECB). Taking into account the approval process for liquidity assistance, the type of liquidity assistance provided and, any collateral requirements, I will be analyzing if the ECB adhered to Bagehot's recommendations both to the letter and in spirit. Within Germany itself, many individual banks required and applied for liquidity assistance. I will be looking at two specific banks: Commerzbank and Bayerische Landesbank to see a snapshot of how Germany provided assistance to its own banks. Using the same analytic tools listed above, I will be analyzing whether Germany

followed Bagehot's recommendations when providing assistance to its own banks. These two banks are being chosen because of their importance to Germany's economy and the scope of funds they received. Finally, I will be running an event study on the ELA Commerzbank received to contextualize Bagehot's recommendation in a modern crisis.

Commerzbank is Germany's second largest private bank. It is truly global in scope, with numerous offshore branches, representatives in 50 countries across the globe, thousands of employees and over €500 billion of assets. A bank of this size and importance in Germany, and the world, will greatly affect the global economy if it suffers from a liquidity or solvency problem. Given the trend of increasing bank size and influence, and the new idea of banks being too systemically important to fail, Commerzbank can be seen as "too big to fail" in the German financial system.

Bayerische Landesbank is Germany's eighth largest financial institution and is now almost entirely owned by the state of Bavaria. Bavaria has the largest economy of any state in Germany, making it a wealthy region. Bayerische Landesbank holds over €200 billion in assets. While Bayerische Landesbank is a private bank, its unique status as a Landesbank, state owned, means that the taxpayers of Bavaria can be liable for providing bailout funds similar to how the United States provided bailouts following Lehman Brothers' collapse. Bayerische Landesbank is a large German bank with a far-reaching global impact. Continued confidence in Bayerische Landesbank is important for the continued growth of Bavaria's and the larger German economy.

Not only is Germany seen as being too efficient and effective to allow its banks to face these situations, the conversation around systemically important banks seems to be primarily a U.S. conversation. This is overwhelmingly false. Despite Germany being a

major financial hub for the European and world financial system, it faced many of the same problems and may have given special treatment to its most influential institutions.

Throughout the world, central, public and private banks faced major liquidity crises following the bursting of the U.S. housing market bubble and the collapse of Lehman Brothers in September 2008. Europe faced an additional Sovereign Debt Crisis during and after the 2008 Financial Crisis; my analysis will focus on this period, 2010 to present. This paper will investigate to what extent the implementation of ELA funds in Germany followed the recommendations presented by Walter Bagehot and whether the discovery of systemically important banks was relevant to the dispersal of funds. Germany's position of power in the European Union may have allowed it to inefficiently allocate emergency funds without following Bagehot's recommendations and not face any international outcry or consequences.

## II. Lit Review

The economic literature on emergency liquidity assistance (ELA) and lenders of last resort (LLRs) is vast; a search for academic articles on JSTOR had over one hundred and seventy thousand results. Unfortunately, literature on individual countries and their approach was more difficult to find. The following papers have provided a strong starting point; the first three cover my area of interest and provide an example of empirical evaluation. The fourth paper reviewed provided background on data sets for my empirical analysis. The fifth and final piece of literature reviewed is Bagehot's last chapter. It is one of the foundational sources on ELA and LLRs. Every paper I reviewed referenced Bagehot in some aspect and facilitates a jumping off point for my own analysis.

The first paper, "Financial Crises and Bank Funding: Recent Experience in the Euro Area" (2013), has Adrian van Rixtel and Gabriele Gasperini arguing three main points. First that banks turned towards secured liabilities, and reduced their unsecured liabilities and securitizations during the crisis. They argue that this is due to a change in what the European Central Bank and sovereign national banks would accept as collateral. Second, funding from sovereign central banks and the European Central Bank (ECB)/International Monetary Fund (IMF) was crucial in stabilizing the Euroarea during the height of the Financial Crisis following the failure of Lehman Brothers and again during the European Sovereign Debt Crisis. They claim that every bank in the Euroarea had difficulties with funding, whether in access or cost and "thus sovereign tensions morphed into a banking crisis". Without access to short term funding available in the market setting, banks were forced to turn to Lenders of Last Resort (LLRs). Lenders of

Last Resort are where banks can find liquidity if there is none available in the market.

They are seen as the “last resort” because that liquidity comes at a price.

Their third argument, that funding was increasingly segmented according to bank nationality and that access to funding was no longer due to their credit worthiness but offered primarily on the basis of their country of origin. Their most convincing data points for this argument were in the data for deposit funding. Peripheral countries (Greece, Portugal, and Spain) suffered from deposit outflows while core countries (France, Germany, Netherlands and Italy) witnessed deposit inflows. Rixtel and Gasperini mention that outflows from Greece, Portugal and Spain were not driven entirely by depositors seeking a safe haven but by depositors wanting access to funds during an economic downturn. This also speaks to a lack of confidence in the stability of the local banking systems; depositors were worried that they will not have access to their funds if they are kept in their local bank. France, Germany, Italy and The Netherlands received an increase of €296, €265, €203 and €57 billion euros respectively.

Despite the cause of deposit inflows and outflows, the unique structure of the EU meant that banks with large liquidity and funding difficulties were tied to their nation’s central bank for the LLR and ELA functions. The EU required that the central bank of the country in question was solely responsible for providing all ELA and assumed all the risk for each bank within that country. Not all countries’ central banks had the ability to provide liquidity to their struggling banking sector<sup>1</sup> and forced banks to look for other means of funding.

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<sup>1</sup> Any country within the European Monetary Union is no longer able to print their own money or create their own monetary policy. By adopting the euro, these countries ceded

Rixtel and Gasperini argue that the increased dependence on interbank borrowing emphasized and demonstrated the segmentation of available financing across national lines. The transformation of Germany into a net lender for Euroarea banks (after being a consistent borrower) demonstrates that Germany was flush with funding while many other Euro banks (namely those Italy and Spain) were desperate for funding and were net borrowers. They conclude the paper reiterating the strong connection between financial crises and bank funding because during periods of extreme financial turmoil access to funding markets becomes strained and forces all banks to find alternative funding sources or decrease their holdings. They explain how this harms the overall economy and end with “the principle that fiscal prudence is a prerequisite for bank stability.”

Of the three main points made in this paper, I find the third one most interesting and relevant to the scope of my paper. The first argument that banks turned towards securitized liabilities is well supported with empirical evidence; you see a drop in uncovered bonds across the Euroarea. Their second argument, funding from LLRs and the ECB/IMF was crucial in stabilizing the Euroarea, is hard to dispute. But the third argument, that funding was segmented across national lines, is interesting and not necessarily logical. The evidence Rixtel and Gasperini present is convincing, but simplistic. They ignore the number of multinational banks present in the Euroarea. Many large banks may be headquartered in one Euroarea country but have branches, which provide loans, in multiple other countries. They also ignore banks that have ownership in multiple countries. Italian banks have subsidiaries in France; Dutch banks have majority ownership from German shareholders. This paper provides a strong

argument for the importance of the nationality of a bank but it lacks a critical complication, cross-national banks.

In the second paper, “Central Banks as Lenders of Last Resort: Experiences During the 2007-10 Crisis and Lessons for the Future”, Dietrich Domanski, Richhild Moessner and William Nelson (2014) review Bagehot’s classical theory of LLRs, explain how ELA was dispersed during the crisis and finish the paper with recommendations for ELA policy in the future. The theory for LLRs centers on providing liquidity to solvent but illiquid banks at a penalty rate to discourage moral hazard with sufficient collateral. ELA should either be provided to prevent a disorderly bankruptcy and fire sale or, to the market as a whole via open market operations. The LLRs should use constructive ambiguity to avoid moral hazard, the LLR manages market expectations so no bank knows for sure if it will receive ELA and that reduces moral hazard.

The authors then describe how ELA was given during the crisis and the many different institutions created to manage liquidity. In the first phase of the crisis ELA was used primarily to “allow an orderly resolution of liquidity difficulties of financial institutions that were perceived as systemically important.” Following the fall of Lehman Brothers<sup>2</sup>, they argue that ELA expanded dramatically and not always in line with the theory of ELA. LLRs broadened the list of acceptable collateral, provided ELA in foreign currencies and extended the maturity of loans.

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<sup>2</sup> Lehman Brothers, the large American investment bank, filed for bankruptcy on September 15<sup>th</sup>, 2008 after the Federal Reserve denied Lehman Brothers ELA. Lehman filing for bankruptcy started the ripple effect of the Financial Crisis. A number of international firms held securities interrelated to Lehman Brothers in some manner so the collapse and subsequent bankruptcy of Lehman Brothers caused a \$737 billion decline in collateral for the securities lending market (Aitken & Singh, 2009).

Domanski *et al.* argue that although the practice of ELA violated the theory, the actions of LLRs were in the spirit of the theory. The LLRs acted to avoid the costly failure of institutions and limit the risk of contagion. Domanski *et al.* feel that ELA was often riskier than normal lending; LLRs increased moral hazard by providing ELA to non-traditional institutions. Central banks needed to find new strategies to handle liquidity problems outside of the banking sector, the new ELA provisions required central banks to make tough choices about drawing boundaries and most importantly, the stigma associated with receiving ELA was increased.

Domanski *et al.* end the paper with a review of policy changes that have been implemented following the crisis and a recommendation for more improvements. New liquidity regulations aim to reduce the need for ELA, the perimeter of regulation has been increased to include institutions that can cause system-wide shocks from liquidity problems and new policy initiatives that internalize the effects of excessive risk-taking to reduce moral hazard are in the works. The recommendations Domanski *et al.* make focus on changing the role of the central bank, using discretion for foreign currencies and, reducing the stigma associated with ELA.

The major arguments made in this paper, that the LLRs followed the spirit of ELA theory and the policy recommendations, seems possible. Whether the LLRs followed the theory of ELA as described by Bagehot, they still provided ELA to many institutions in a variety of ways. But they make an interesting observation. The Eurozone was able to give more ELA in a more effective manner because they had reduced the stigma associated with ELA. This paper provides an unconsidered avenue

for further discussion: How did the Eurozone reduce stigma and was it consistent within and throughout countries?

The third paper, “Did Emergency Liquidity Assistance (ELA) of the ECB Delay the Bankruptcy of Greek Banks?” features Martin R. Gotz, Rainer Haselmann, Jan Pieter Krahen and Sascha Steffen (2015) explaining the process of receiving ELA in the Eurozone, examining the decision to give Greece ELA and making recommendations for ways to improve ELA in the Eurozone. They lay out the conflict between the national central banks providing ELA but needing approval for ELA allocations from the European Central Bank (ECB)’s Council of Governors. This need for approval, they argue, makes the decision to provide additional funding and liquidity for a country in a time of crisis dependent on a consensus of European policy makers. Ultimately, they argue, “the assessment of a nation[al] bank’s solvency is intertwined with the decision at the higher level”.

Gotz *et al.* then claim that Greece was solvent according to the data they had available and that the ECB had no other decision than to extend the ELA until a decision was made at the “supra-national” level. The main recommendation from this paper was the need for increased transparency and availability of Eurozone ELA data. They argue that the market responds primarily to speculation because factual evidence is unavailable and the speculation is harmful to the market. Gotz *et al.* provide a country-specific method of analysis for Eurozone ELA. So despite the lack of investigable questions, this paper is infinitely useful to me as the main analysis of this paper is a single country.

The fourth paper reviewed for this thesis, “Fama/French Factors for Germany: Which Set is Best?” has Roman Brückner, Patrick Lehmann, Martin H. Schmidt and Richard Stehle discuss internet-based data sets from 6 different authors: Artmann, Finter, Kempf, Koch and Theissen (2012b), Hanauer, Kaserer and Rapp (2013), Schmidt, Schrimpf, von Arx, Wagner and Zeigler (2011), Marmi and Poma, Frazzini and themselves. In total, they analyze nine different factor set for Germany and three time series. They highlight differences in makeup of the data sets, compare the datasets empirically and give advice on when to use which data set.

The factor sets differ on their data sources, the included stock exchanges, the breakpoints and sample selection of the portfolios, the treatment of dual class firms, the tax imputations system, the rate of return on the market portfolio and a few other minor characteristics. There are three major data sources Stehle’s database of the Frankfurt stock exchange beginning in 1954, *Karlsruher Kapitalmarktdatenbank* (KKMDB) and DataStream; however, each author uses a slightly different data source. Artmann *et al.* use KKMDB and *Saling/Hoppenstedt Aktienfuhrer*, Brückner *et al.* use a number of sources including KKMDB and DataStream, Franzzini uses CRSP and XpressFeed Global, Hanauer *et al.* and Schmidt *et al.* use DataStream and Worldscope, Marmi and Poma use Factset.

The included stock exchanges for each author are predominantly the Frankfurt stock exchange but Franzzini’s stock exchanges are unknown and Schmidt *et al.*’s are listed as “probably all”. The ‘Small Minus Big’ (SMB) factor is calculated by subtracting the rate of return on large stocks from the rate of return on small stocks, so the breakpoint for small and large stocks is essential. There are three major choices, a

50/50 break (which Hanauer *et al.* and Artmann *et al.* use), Schmidt *et al.* use both breakpoints of 0.5 and 0.8 and Franzini only uses a breakpoint of 0.8. Except Hanauer *et al.*, all of the factor sets reviewed use separate (typically larger) samples of stocks for the calculation of the market portfolio than the factor portfolios.

The authors review three different methods for handling the dual class of stock issued by firms. The two classes, *Stammaktien* (common stocks) and *Vorzugsaktien* (non-voting preferred stock), can be treated as a unit, two separate observations, or only one type can be included. Brückner *et al.* and Hanauer *et al.* use the first method, Artmann *et al.* includes the class of stock with the longer availability of data, Schmidt *et al.*, Franzini and, Marmi and Poma remove non-voting shares. Brückner *et al.* are the only factor set to take the corporate income tax credit into account. All factor sets, except Artmann *et al.*, calculate their own proxy for the market portfolio from their own sample. Artmann *et al.*, uses DAFOX until 2004 and the CDAX starting in 2005.

Following their description of the factors sets individual characteristics, the authors then move to compare the factor sets empirically. They look at the number of observations in the portfolios, the means and standard deviations stability over time, the correlation coefficients and tests of means, and any economically significant differences. Brückner *et al.* conclude the paper reviewing applications of the factor sets and making recommendations based on proposed use of the factor sets.

This paper was essential to my statistical analysis section. Fama/French factors are easily available for America and there is only one factor set, but as Brückner *et al.* make clear Germany is not the same. Brückner *et al.*'s in depth comparison for a number of factor sets was invaluable. My major critique for this paper is that it reads often like

self-promotion. They highlight a number of key differences and through their own analysis but they only recommend three other factor sets besides their own (two of them with time constraints). The self-promotion however, was successful in this case because I use Brückner *et al.*'s factor set.

The final piece of literature reviewed is the famed chapter seven: “A More Exact Account of the Mode in Which the Bank of England Has Discharged Its Duty of Retaining a Good Bank Reserve, and of Administering It Effectually,” from Walter Bagehot’s book *Lombard Street: A Description of the Money Market*. Bagehot (1873) argues for a LLR’s existence and how it should function. He begins the chapter explaining how the Bank of England (BoE) was not meant to hold excess stock or become an LLR<sup>3</sup>. There is no legal justification for the BoE to have gained and continued this duty.

He continues by describing the crisis of 1864 and how the BoE responded to the crisis. Bagehot quotes the Governor of the Bank (Mr. Hankey) who praises BoE’s ability to easily lend funds to all who ask. Bagehot praises the decision for the BoE to hold the excess reserves in the system. He views it as critical that only one bank has this function and that it is clearly stated which bank holds this function. Bagehot quotes Mr. Hankey’s response to *The Economist* where Mr. Hankey lays out the basic functions of a LLR. Bagehot’s largest complaint on Hankey’s response was the assumption that BoE kept very large emergency funds at all times. Bagehot (1873) explains, “fresh money’

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<sup>3</sup> The Bank of England was not meant to have extra funds (stock) that were not being lent out to other businesses or individuals to make a profit for the bank. When other banks were short on necessary funds they could turn to BoE and receive some of its extra funds. Thus a lender of last resort was born.

could not be borrowed, even on the best security—even on Consols except at the Bank of England. There was no other lender to new borrowers.” Bagehot is arguing that the LLR must be an institution that has the ability to create new credit and new money. In a true panic, even the largest of reserves will not be enough.

Following his critique of Hankey’s response Bagehot advocates for a clear policy from the BoE to be announced so that the public knows what to expect. He insults the board of the BoE claiming, “they are a board of plain, sensible, prosperous English merchants.” He quotes two Bank directors and then immediately disagrees with what they are saying. Bagehot lists some instances of panic, the total bank reserves at that time and how those reserves impacted the money market to show how critical a strong emergency reserve is to the success of the economy of England.

Bagehot spends a lot of the chapter convincing the reader that holding and lending an emergency reserve is the most critical job of the BoE. He explains:

The keepers of the Banking reserve, whether one or many, are obliged then to use that reserve for their own safety. If they permit all other forms of credit to perish, their own will perish immediately, and in consequence. As to the Bank of England, however, this is denied. It is alleged that the Bank of England can keep aloof in a panic; that it can, if it will, let other banks and trades fail; that if it chooses, it can stand alone, and survive intact while all else perishes around it.

He argues that without spending the reserve there are no other forms of credit available to anyone and the entire economy will dry up. The BoE allowing all other forms of credit to perish would nowadays mean the interbank lending market and commercial paper market are at a standstill. Claiming that the BoE itself would perish is a bold statement, but if they have allowed all other forms of credit to be used without contributing, BoE will need an enormous amount of reserves released into the economy simultaneously to have a

chance of restarting that economy. Especially because “in a panic there is no new money to be had; everybody who has it clings to it, and will not part with it”. Bagehot goes through an elaborate explanation for why keeping extensive reserves is crucial to the wellbeing of the economy. This hinges on the idea that there is no new money. A bank cannot count on repaid liabilities to fund the reserves because no one is repaying their liabilities, nor can they sell stock or equity because there is no one willing to part with their liquid money to purchase them.

Bagehot ends the chapter with some tidbits of wisdom and advice for all banks potentially facing a panic in their economies. He opens with:

And for the Bank of England, as with other Banks in the same case, these advances, if they are to be made at all, should be made so as if possible to obtain the object for which they are made. The end is to stay the panic; and the advances should, if possible, stay the panic.

Bagehot is now using the experience of Bank of England and the number of panics that it had survived to extrapolate recommendations for how all LLRs can also survive any future panics and sustain their economies.

The two big takeaways are “that these loans should only be made at a very high rate of interest... these advances should be made on all good banking securities, and as largely the public ask for them”. The high rate of interest “operate as a heavy fine on unreasonable timidity, and will prevent the greatest number of applications by persons who do not require it”. Meaning that only banks that really need the credit will apply for loans, and they will apply immediately because the longer they wait the higher the interest rate. The advances are made freely to “stay alarm, and nothing therefore should be done to cause alarm. But the way to cause alarm is to refuse someone who has good security to offer”. The idea being as long as there are loans being given to these banks

then there cannot be any major problem with them. The advances are given on good securities because “no advances indeed need be made by which the Bank will ultimately lose”.

Bagehot argues that his recommendations are relevant and important because he sees lending reserves as the best way to get out of a panic, “this is the method of making its money go the farthest, and of enabling it to get through the panic if anything will so enable it.” He claims, “making no loans as we have seen will ruin it; making large loans and stopping, as we have also seen, will ruin it”. Basically the idea he is presenting is best because the other examples he provided have resulted in failure. The evidence he provides is analysis of The Bank of England in various panics in the mid-late nineteenth century, 1847, 1857 and 1866. He is surprisingly positive in his critique of bank procedures with one major caveat: the BoE must be more upfront and honest about how much credit it is willing to loan and on what security it will be made. He feels this will greatly decrease any panic because there will be confidence in the Bank and its actions.

Given the degree to which I will be discussing Bagehot’s recommendations in the rest of this paper, I will keep my comments here to a minimum. The greatest potential for Bagehot to be considered no longer relevant to our economy comes from the changes in the world’s economy since Bagehot published his book. Bagehot wrote about a single country, and panics that affected primarily that country. While England was arguably the strongest country in the world at the time of publication, its economy was much closer to being protected from attacks from the outside than any major country is now. The world did not have a “world economy” or a technology driven economy in the same sense that we do now. While there were international companies and banks, the world of

international finance has only gotten more complex and intertwined as time passed. The arguments that Bagehot makes and the recommendations he gives are very logical and well backed in the evidence he provides, but the world he is describing is dated and no longer in existence. This is the question I will spend the rest of the paper discussing, do his ideas still hold true in our modern, complicated and globalized financial system?

### III. Literature Analysis

In traditional economic theory *Lombard Street: A Description of the Money Market* by Walter Bagehot is the original word on the concept of Lenders of Last Resort (LLRs). Bagehot's writings in the nineteenth century still shape how modern economists evaluate LLRs. According to Bagehot (1873), in a financial panic "the holders of the ultimate Bank reserve (whether one bank or many) should lend to all that bring good securities quickly, freely, and readily." The "holders of ultimate bank reserves" are the bank(s) most easily equipped to provide large sums of currency without constraints. This typically falls on the central banking system (the banks able to directly enact monetary policy) because of its ability to print and create currency, but any bank with a large reserve of cash could fulfill this role. Critically Bagehot (1873) believes the holder of reserves "should lend to all that bring good securities quickly, freely, and readily". In other words, the LLRs should have funds easily available for any institution that can provide acceptable collateral. He complicates this standard by adding two rules:

First. That these loans should only be made at a very high rate of interest. This will operate as a heavy fine on unreasonable timidity, and will prevent the greatest number of applications by persons who do not require it. The rate should be raised early in the panic, so that the fine may be paid early; that no one may borrow out of idle precaution without paying well for it; that the Banking reserve may be protected as far as possible.

Secondly. That at this rate these advances should be made on all good banking securities, and as largely as the public ask for them.

These two rules function to penalize banks from unnecessarily seeking liquidity while providing a sense of security to the market as a whole because the LLR is carrying on as usual.

The problems of these rules are twofold; first, the high rate of interest Bagehot is advocating for will only worsen the liquidity problems for a bank. It is seeking excess funds because it cannot make current payments on the liabilities it already holds, charging a high rate of interest will discourage many banks from seeking excess liquidity because they cannot afford the interest and will further penalize and jeopardize banks that are facing a serious liquidity crisis. Bagehot avoids this dilemma by assuming a separating equilibrium for the banks pursuing liquidity assistance. There are two categories of banks, solvent but illiquid and insolvent. The LLR must choose which bank to provide emergency liquidity assistance (ELA) to but the LLR does not want to give ELA to an insolvent bank. The “penalty rate” interest rate ideally discourages insolvent banks from applying for ELA because the high interest rate will be impossible for insolvent banks to repay. Theoretically this reveals which banks are only illiquid because they will be the only banks applying for ELA from the LLRs. The insolvent banks will just fail.

The problem with assuming a separating equilibrium is that you assume banks, and bankers, would not try to game the system and that situations are static. As the Financial Crisis bled into the Sovereign Debt Crisis and just kept getting worse, it seemed that every financial institution was having difficulties meeting its solvency requirements. That is not to say that every institution was insolvent or even close to it, but there definitely were banks, and countries, disguising the magnitude of their financial woes. Many banks, and bankers, are incentivized to end the quarter on a high. They are motivated to hide how dire the situation really is until the latest round of bonuses have been approved or the first LLR agrees to provide ELA. Due to the chaos of the global

financial sector, LLRs were looking to each other as signaling devices for solvent and trustworthy banks. Once ELA was available from one source, ELA from many other sources would then become available.

As Domanski *et al* (2014) explained, approval of European Central Bank (ECB) emergency funds requires approval of the EU Board of Governors. This approval process inherently ties the analysis of bank solvency to approval of the government in charge. Given the strict requirements for government deficits and liquidity of financial institutions, EU countries had a strong incentive to lie about the true nature of their financial troubles. Violation of the Maastricht Treaty<sup>4</sup> could lead to not only a loss of ELA access but potentially to exit from the Eurozone as a whole. Governors from each country also had an incentive to please the other Governors if they knew their country would be asking for funds eventually.

Trying to keep in a country's good graces and keep up appearances violates Bagehot's assumption of a separating equilibrium. The moment a country is more concerned with being seen as solvent the incentive to remain truthful shifts. The politicized nature of ELA approval means that appearances are crucial for the survival of an EU country's economy. While this could work in favor of the separating equilibrium, countries may be more willing to let some banks fail because they do not want to be seen as asking too much from the ECB. The ECB also has an incentive to keep all of its major banks afloat. Insolvency and failure of a major EU bank would drastically reduce the confidence in the European banking and finance system.

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<sup>4</sup> The Maastricht Treaty officially established the European Union in 1993. Included in the Treaty were a number of fiscal requirements including limiting debt to 60% of GDP and no annual deficits greater than 3% of GDP.

This means the ECB has a large incentive to only approve funding for banks that are simply illiquid, but once ECB has approved funding for a bank they are very motivated to keep providing liquidity and credit until the entire panic is over and the bank is solvent again. No one, especially not a large and important central bank, wants to be seen making a mistake when providing funding and rescuing banks. The interconnected nature of the global economy now means that changes in one area of the world affect all economies. When Bagehot was writing the English economy was much more protected from shocks in the rest of the world.

Secondly, there is a lot of confusion and debate on what qualifies as “good banking securities”. At the peak of the bubble many more things may count as a good security than during the panic and liquidity crisis following the burst of the bubble. In fact, a bank facing a liquidity crisis may have many securities in its book that can no longer be defined as a good security and keep a bank that needs liquidity assistance from receiving it. Bagehot (1873) clarifies his definition of a good security as one that “in ordinary times is reckoned a good security” but this does not solve the problem. Banks that are severely affected by a liquidity crisis are also probably the banks holding the highest number of securities that no one views in “ordinary times” as good.

Following the 2008 Financial Crisis and its ongoing recovery, the provision of ELA funds has been scrutinized. The Eurozone provided a lot of liquidity to its member countries through each country’s central bank. As Domanski *et al* (2014) explains the funds were dispensed through a variety of methods including; central bank swap lines, extending credit to prevent failure of systematically important institutions, stepping into “malfunctioning interbank markets” and, providing funding to increase liquidity in

specific markets. They (2014) continue, the ECB provided ELA to “a much broader range of counterparties and against a broad range of collateral”. The Eurozone participated in exceptional long-term open market operations to solve shortage of term funding problems, and central bank swap lines to solve a shortage of reserves in foreign currencies. In late 2008 the ECB basically established a fully elastic supply of central bank reserves by moving to refinancing more banks with looser collateral standards at fixed rates.

The ECB dramatically increased what assets it was willing to accept as collateral and Germany followed suit by creating new liquidity providing programs. In 2008 it began accepting temporarily illiquid assets, especially asset backed securities (ABS), instead of liquid collateral. Domanski *et al.* (2014) demonstrates that this change in policy allowed the percentage of ABS pledged to rise from 6% to 28%. Having seen liquidity dry up in the covered bond market, ECB instituted the covered bond purchase program (CBPP). The CBPP allowed the ECB to buy up eligible covered bonds<sup>5</sup> up to €60 billion to provide needed liquidity into a crucial market for bank funding. Rixtel and Gasperini (2013) show that in December 2011 Germany re-activated a government-guaranteed bond issuance program<sup>6</sup>. All of these demonstrated an increase in LLR functions. The ECB and the German central bank realized the crisis was more far-reaching than the panics Bagehot analyzed and responded by taking more unorthodox actions to provide liquidity to their banks.

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<sup>5</sup> A covered bond is a bond backed by either mortgages or public sector loans

<sup>6</sup> The government guaranteed payment of interest and principal of private bonds in case the original bond issuer became insolvent or defaulted

The Long-Term Refinancing Operations (LTROs) provided by ECB and explained in Rixtel and Gasperini (2013) were conducted in December 2011 and February 2012 totaled around €1 trillion and provided alternatives to both short and long-term wholesale funding markets. Germany received €74 billion in LTRO funding from ECB. While the LTRO is not considered traditional ELA, it does function in a similar matter. It provides an influx of credit for a longer than average period, three years rather than several months, at a low interest rate with significantly reduced collateral requirements. LTRO funds are available in unlimited quantities (full allotment) by pledging a growing list of collateral to either the ECB or the home country's central bank. The interest rate available on the LTRO loans is based on the average of the overnight rate during the loan period but fell to as low as 1% during February 2012.

Following Bagehot's rules for LLRs, I believe he would disapprove of ECB's LTRO program. The ECB and subsequently Germany's Bundesanstalt für Finanzmarktstabilisierung (FMSA), central bank for financial market stabilization, did an unquestionably good job of providing easily available credit to all those who asked. They followed Bagehot's (1873) advice that "every gentleman who came here with adequate security was liberally dealt with" and "The Bank of England agrees to give other banks the requisite assistance in case of need, and the other banks agree to ask for it" but the ECB struggled with making funds readily available. The "full allotment" commitment of LTRO successfully satisfies the idea of easily available credit to all those who ask. Using Sonderfonds Finanzmarktstabilisierung, Special Financial Market Stabilization Funds (SoFFin), the institution set up to provide liquidity assistance for German banks; assistance is available provided an institution satisfies ten well advertised

criteria. Many banks did and SoFFin provided up to €530.8 billion in liquidity assistance from its creation in 2011 to mid-2015 (SoFFin 2015). Bagehot (1873) recommends, “in a panic the holders of the ultimate Bank reserve (whether one bank or many) should lend to all that bring good securities quickly, freely, and readily”. The freely and readily seem to be satisfied. Funds were also made available quickly, banks seeking SoFFin funds were approved using a computerized process to match firms with the announced criteria.

ECB funding however was much more of a process. As Götz *et al* (2015) explain, ECB funding is “intertwined with the decision at the higher level. Political and/or fiscal decision leading to a financial rescue of a sovereign indirectly also lead to the maintained solvency of its banks”. Because ECB funding requires approval from ECB’s Council of Governors, the process is immediately elongated and instantly politicized. Instead of being a pure evaluation of solvency and liquidity requirements, ELA approval is now tied to approval of the country’s government and policies. This extra step blatantly violates Bagehot’s recommendation for quickly available funds.

While in practice all LTRO funds were covered by collateral, the widespread nature of the 2008 Financial Crisis and subsequent Sovereign Debt Crisis made determining illiquidity versus insolvency extremely difficult. Banks may have originally been only illiquid but as the crisis continued to unfold they became insolvent. ECB and FMSA drastically increased their list of acceptable collateral past what Bagehot (1873) describes as “in ordinary times is reckoned a good security”. Quickly ABS were a significant portion of collateral put up to receive ECB funds and FMSA provided “Wind-down Agencies” for banks to unload “non-performing” assets and unload risk in exchange for available liquidity. Bagehot’s recommendations for LLRs are meant to

avoid potential losses from provided ELA and both ECB and FMSA have opened themselves up to potential losses.

FMSA provided a significant amount of credit to Commerzbank, originally €8.2 billion from SoFFin followed by another €15 billion in guarantees and eventually another €10 billion in capital and a 25% plus one takeover by SoFFin (Brown 2009). In total Germany provided €33.2 billion in credit and liquidity assistance to Commerzbank but it was still not enough to avoid a takeover and buyout by the public. According to Bagehot's two rules: liquidity assistance should be made at a high interest rate and that it should be supported by good collateral, Commerzbank succeeds in theory but unfortunately due to its place in the world economy, it is trapped by the high interest rate and the deterioration of its collateral.

While the original €8.2 billion in SoFFin liquidity was first provided at an 8.5% interest rate and then lowered to a 5.5% interest rate, Commerzbank required more liquidity assistance as time wore on and seemed to go from illiquid to insolvent. As time passed and more losses on Commerzbank's books became apparent the net worth of Commerzbank tanked, the total value of the stock market capitalization of the bank fell to €4 billion (nearly a quarter of the total government assistance). Expecting Commerzbank to repay the total debt plus 8.5% interest while the bank's value is falling and it is not making a profit seems illogical. Commerzbank suffered a loss of €716 million in the fourth quarter of 2012 and went multiple years without paying dividends to its stockholders. Commerzbank worked hard to raise capital, mostly through issuing new stock to existing shareholders in an effort to quickly pay back the German central bank and show strength. However, still being unable to pay shareholders easily demonstrates

that Commerzbank is still working towards full recovery years after receiving liquidity assistance.

SoFFin attempted to lower the interest rate it charged Commerzbank as the crisis went on, the original €8.2 was divided into two €4.1 billion tranches the first with an 8.5% interest rate and the second with a 5.5% interest rate. Those rates are enormously high as banks worldwide faced liquidity problems. SoFFin succeeded in penalizing Commerzbank for needing liquidity assistance and very probably dissuaded banks from requesting ELA but the high interest rates forced Commerzbank to focus on repaying the loans as quickly as possible rather than rebuilding its business to be profitable again. Commerzbank was also forced to return to SoFFin multiple times for more ELA of differing types begging the counterfactual of what would have happened if the interest rate provided for the ELA had been more manageable.

It is probably safe to assume that the collateral provided by Commerzbank would not have been accepted during ordinary times, as Bagehot recommends. ECB and FMSA increased their list of acceptable collateral because they realized that needy banks would be unable to provide the typical collateral. When bank needs as much ELA as Commerzbank did, they have a number of underperforming assets on their books. These underperforming assets would not be usable as collateral in an ordinary time. As this Crisis continued to unfold and Europe faced its own Crisis simultaneously more assets became unacceptable in ordinary times. SoFFin also considered banks on more facets than the available collateral; business strategy, use of funds received, remuneration of management, employees, etc., capital adequacy, dividend payments, time period, measures to foster competition, fund accountability and other provisions decided by the

supervising body. This holistic approach is presumably to give a chance for banks that are facing a collateral crunch on top of the liquidity crunch.

Commerzbank required more than one round of ELA from SoFFin and FMSA and the eventual takeover meant that Commerzbank became insolvent yet Germany continued to provide them with liquidity assistance. This is a clear violation of Bagehot's biggest point, never lend at a loss. As a bank requires more and more rounds of ELA it demonstrates that the situation is worse than originally anticipated or presented. A bank that only requires one round of ELA is probably only suffering from a small liquidity crisis or has realized that they are now insolvent and are following Bagehot's assumed separating equilibrium and taking themselves out of the game. A bank that needs more than one round has a growing need for liquidity, meaning they either lied in the first round because they were weary of being approved for the full amount needed, or their situation grew more dire as time went on leading them closer and closer to insolvency. Commerzbank required three separate capital influxes and was still so insolvent it needed a government takeover. As Commerzbank became progressively more illiquid and insolvent they should have taken themselves out of the running for more ELA.

SoFFin should have also realized that Commerzbank was sinking and not exposed themselves to that risk. It seems that they both suffered from an "in for a penny, in for a pound mentality": the more liquidity assistance provided to Commerzbank the more SoFFin is tied to Commerzbank's success. Once the original credit was dispersed, SoFFin looks bad if they provided assistance to a bank that subsequently failed. For appearances sake, SoFFin is motivated to ensure that every bank they approve for

liquidity assistance originally becomes and remains solvent to avoid further panic in the economy. While this should mean that SoFFin screens every institution applying for ELA very carefully and selectively approves funds, the dilemma of systemically important banks becomes relevant again.

According to Bagehot, SoFFin and FMSA should only provide funding to banks that can demonstrate they are solvent but illiquid without regard to how that will affect SoFFin and FMSA's image. Bagehot's standards mean that by providing lots of liquidity to anyone who asks and is able to provide proper collateral, FMSA and SoFFin would be able to avoid further panic. But Bagehot's plan to avoid a panic did not include systemically important banks. As it stands now, SoFFin and FMSA could do exactly as Bagehot asks but a greater panic could follow the failure of Commerzbank than a panic where Commerzbank is funneled undeserved liquidity assistance. Central banks in other countries have followed his advice, but when Lehman Brothers failed the consequences of that decision were felt worldwide. ELA is supposed to boost the confidence in an institution, it is supposed to show the public that the government has faith in the bank so everyone else should also. But if a bank is now considered "too big to fail", receiving ELA can have the opposite effect. That action now signals to the public that something is amiss within that institution. Instead of showing confidence in the security and solvency of a bank, giving ELA to a bank now shows concern for the wellbeing of the bank and may be followed by a takeover or run on the bank.

The third case is that of Bayerische Landesbank (BayernLB) and the state of Bavaria. BayernLB received €15.3 billion in guarantees from SoFFin from year end 2008 to year-end 2011 (SoFFin 2015). In addition to these funds, BayernLB also

received €10 billion in capital and a €4.8 billion risk shield from the Bavarian government (Bloomberg 2012). All of the ELA received by BayernLB and other similar Landesbanks has led to a discussion on the relevance of Landesbanks currently. BayernLB received over €30 billion in assistance from national and regional authorities and it was subject to a public bailout to ensure its survival in the future. BayernLB failed to provide good banking securities, but the lawmakers and taxpayers of Bavaria succeeding in providing easily accessible liquidity when asked. SoFFin also failed to avoid lending at a loss in this situation, the €15.3 billion in guarantees were given at market price rather than the actual value of asset at present time.

The interest SoFFin took for their guarantees fell between .5% and 2% (FMSA 2010). This seems like a much more reasonable interest rate to charge banks that are facing a liquidity crisis than the rate charged to Commerzbank, but BayernLB asked for a different type of assistance from SoFFin. While Commerzbank needed recapitalization, BayernLB only needed a guarantee for debt securities. A major part of this assistance meant that SoFFin accepted various securities from BayernLB and provided BayernLB with an amount of liquid capital equivalent to the amount of non-liquid securities they traded in. This functions less like a loan and more like a payment-in-kind. This allows SoFFin to charge a much lower interest rate rather than a traditional recapitalization loan. However, an additional 2% on €15.3 billion (€306 million) is a sizeable required interest payment and would theoretically act like a penalty rate as Bagehot advises.

The guarantees provided to BayernLB were done on the promise of “an adequate capital base” which BayernLB was able to produce. Many institutions had billions of dollars of securities they were willing to put up for guarantees. Receiving a guarantee on

an asset that is underperforming functions like free money. BayernLB had a large stake in the mortgage-backed securities market and as the floor continued to fall out of that market, having SoFFin provide a guarantee at face value rather than market value was an enormous capital injection. Truthfully, BayernLB did provide a lot of capital to receive a guarantee upon, but SoFFin's decision to provide a guarantee on the face value of the securities rather than the market value of the asset eliminates the idea of an "adequate capital base". If BayernLB can provide a portfolio full of assets with face values over €15 billion and receive that large of a guarantee even if the market value is significantly lower than that, what is the point of requiring collateral at all?

More alarmingly, guaranteeing face value of a security opens SoFFin up to major losses. Underperforming assets of this magnitude are not going to suddenly turn around and become well performing assets. Even if the guarantee is being provided at a moderate rate of interest for three to five years, mortgage-backed securities will never be worth the face value they had just before the bubble burst. At best SoFFin can hope to break even on the guarantees because of the interest, realistically they lent with the anticipation of a loss. This is a clear violation of Bagehot's recommendations.

Given BayernLB's ability to receive funds from the taxpayers of Bavaria also reduces the need to apply for SoFFin funding and meet their standards. Previous to the Financial Crisis BayernLB was still majority owned by the state of Bavaria, this unique Landesbank relationship means that the Bavarian government has a controlling stake in BayernLB. The controlling stake requires that the government of Bavaria be held ultimately responsible for the actions of BayernLB. The assumption of the separating equilibrium was again violated in this case. BayernLB is such a large part of this

economy that the incentives for BayernLB to remain solvent are very large and present for the bank and the state. Bavaria is such a large and wealthy state that the failing of its Landesbank would signal that the entire economy of that state is failing. By propping up its Landesbank Bavaria shows Germany, and the world as a whole, that Landesbanks and BayernLB in particular are still relevant, important and functional. All executives in BayernLB want that to be demonstrated to the public, they want to keep their jobs. The state of Bavaria is invested in keeping regional control of their bank, and too large a bailout from SoFFin would not allow that to happen. By providing a large amount of credit on whatever collateral was available lets the state of Bavaria keep such large control over their Landesbank and signals to the rest of the world that Bavaria and Germany are doing fine. Having to divulge that the bank you as a state regulate and manage is insolvent eliminates all faith that the people of Bavaria have in their lawmakers and could easily mean the lawmakers are out of a job. Both groups meant to regulate the dealings of BayernLB are invested in keeping up appearances as long as possible.

While the lawmakers of Bavaria did ensure that funds were easily available to BayernLB, they did not seem to assess whether the funds should be provided. Given the size of BayernLB and its importance to the economy of Bavaria, providing liquidity assistance seemed like an effective way to prevent a panic. By providing assistance from the state rather than the nation lawmakers ensured they would retain control of the Landesbank and it displays an image of control. BayernLB was critically important to the lawmakers of Bavaria and they were unwilling to let it be taken away from them either through a national takeover or a failure of the bank.

If BayernLB did require a large amount of financial assistance from the central government it would demonstrate that the financial situation in the bank was more dire than anticipated and would reflect poorly on the lawmakers and the state of Bavaria as a whole. The more dismal the situation appears to the outside world, the more likely BayernLB is to receive help from SoFFin or FMSA and the more likely the lawmakers of Bavaria are to lose their jobs (just look at Greece's rolling government roster). A separating equilibrium cannot hold in this situation, parties have too much to lose by being truthful and facing the consequences.

## IV. Data Analysis

The conclusions regarding stigma and a separating equilibrium raised earlier encouraged further investigation. In the financial world, a firm's stock price represents the public's trust in the company. Using simple laws of supply and demand, as public trust in the company or firm increases demand for the stock of that company rises and the stock price rises accordingly. The same works in reverse: lack of trust leads to a decrease in demand and a fall in the stock price. The analysis presented earlier in the paper led to the conclusion that the systemically important banks receipt of ELA would erode public confidence and therefore lower the rate of return on holding stock more than can be explained by typical market variance.

As explained earlier, "ELA is supposed to boost the confidence in an institution, it's supposed to show the public that the government has faith in the bank so everyone else should also...That action [receiving ELA] now signals to the public that something is amiss within that institution". As this paper focuses on two institutions--Commerzbank and BayernLB--it would be ideal to test this assumption for both banks but unfortunately BayernLB's status as a Landesbank means there is no publically available stock price. Commerzbank however, is a publically traded company and the data is available for it. To restate, the conclusion or hypothesis being tested empirically is: Commerzbank's status as a systemically important bank means the massive amounts of ELA received by Commerzbank should have provided an excess of public distrust in Commerzbank.

The excess public distrust would have shown up as an otherwise unexplained change in the rate of return for the bank's closing stock price. I will therefore conduct an

event study. The Fama/French 3 factor model is used to capture more explained variance than the traditional CAPM model. The factor considered for above market returns with CAPM is the riskiness of a stock or asset. The augmented Fama/French model used here incorporates three additional factors: Small Minus Large (SMB), High Minus Low (HML) and, Winner Minus Loser (WML) (Brückner *et al.*, 2014). Small Minus Big represents the difference in rates of return for firms with small market capitalization and the rates of return for firms with large market capitalization. The breakpoints for “small” and “big” firms were the median of the entire portfolio. High Minus Low represents the difference in rates of return for high value stocks and rates of return for low value, or growth, stocks. Winner Minus Loser represents a momentum factor; winners tend to keep winning, rising stocks continue to rise, and losers tend to keep losing, falling stocks continue to fall. WML is the difference between the rate of returns for winning stocks and the rate of returns for losing stocks. In order to capture variance in the total German market the rate of return for closing prices in Volkswagen stock was included. Including all of those variables my equation looks like the following:

$$R_C - R_f = \alpha + \beta_1 [R_m - R_f] + \beta_2 \text{SMB} + \beta_3 \text{HML} + \beta_4 \text{WML} + \beta_5 R_v + \epsilon$$

In this model  $R_C - R_f$  represents the rate of return for Commerzbank minus the risk-free rate of return, this difference represents the profitable return to holding Commerzbank stock.  $\alpha$  is the constant.  $R_m - R_f$  is the market rate of return minus the risk-free rate of return; this difference represents the profitability of holding the market portfolio.  $R_v$  is the rate of return for Volkswagen and  $\epsilon$  is the error term.

The focus is on the public’s response to the announcement of Commerzbank’s receipt of ELA funds. This happened on three separate dates: November 3rd, 2008;

January 8th, 2009 and; December 14th, 2011. The closeness of the first two dates reflects the chaos happening in the international banking and finance sectors during the beginning of the crisis while the distance from the third date gave the German public and the international community a lot of time to process what had happened and what Commerzbank's role in the crisis was.

The important nature of bailout announcements necessitates confidentiality until the official public statement is made, but given the potential for gain if one knew the information ahead of time it is likely that information was leaked. This information would be leaked to those most likely to take advantage of it, such as other higher ups in the financial or banking sector. That should be reflected by an unexplained decrease in the stock prices because demand for Commerzbank would fall. To accommodate this the regression was run four weeks ahead of the announcement, one week ahead of the announcement and on the day the announcement was officially made. Incorporating all of this information, the unexplained change should be highest one week out from the announcement (the decision for a bailout has been made and information has likely been disseminated to other people in power) for each bailout and overall for the third bailout (the time between the first two bailouts and the third bailout allowed time for public distrust to brew).

The coefficient of most importance is  $\beta_4$ . This is the beta in front of the momentum factor WML. If receiving ELA is being met with a stigma and public distrust that would make Commerzbank a losing firm. As losing firms continue to lose, the  $\beta$  in front of momentum should be negative, and large. The momentum of losing will perpetuate more losing and decrease profitable returns to Commerzbank.

The data set being used included the following variables: the daily market rate of return provided by Brückner *et al.*, the daily yield on the short term German bond, the rate of returns for the daily closing stock prices for Commerzbank and Volkswagen, adjusted for dividends, and the augmented German Fama/French factors (SMB, HML, and WML). The dates of the data set are from January 3rd, 2000 until December 30th, 2011. The daily returns are consistent and without holes, except for the major bank holiday from July 28th to August 18th, 2008. For consistency, all variables' differences were summed during that period.

Unfortunately for all of the regressions there is a lack of significant results. The highest r-squared term is 0.0032 for one week out from the first announcement, October 27th, 2008 (Table 1). As shown on the included table of results, the only significant coefficient is for the rate of return for the Volkswagen stock and it is only significant at the 10% level. Having such a low r-squared term in fact speaks to the lack of relationship between any of the variables, except between Commerzbank and Volkswagen. This relationship makes sense because both companies are predominantly affected by developments on the German stock market. Unsurprisingly the coefficient on the Volkswagen rate of return is positive, as both Commerzbank and Volkswagen are large multinational German firms so as one does well the other will benefit. If Volkswagen has record sales, that increases confidence in the entire German market and that is reflected in an increase in confidence for Commerzbank. Additionally, neither the augmented Fama/French variables nor the excess risk of the market bear any relationship to Commerzbank.

Table 1. Excess returns to Commerzbank daily stock holdings

Explanatory Variable	Coefficient
Profitable returns to the Market Portfolio ( $R_m - R_f$ )	- 0.0506 (0.1072)
Size (SMB)	0.1027 (0.1150)
Volume (HML)	0.0622 (0.0789)
Momentum (WML)	0.0068 (0.0581)
Volkswagen Rate of Return ( $R_v$ )	0.0649* (0.0369)
Constant ( $\alpha$ )	0.0851 (0.0579)

Notes:

N= 2281

$R^2 = 0.0032$

\*Statistical significance at 10%

Standard errors are in parentheses

As the data being used is a time-series, the Durbin-Watson and Breusch-Godfrey tests were run to detect possible autocorrelation. While the Durbin-Watson test did not indicate autocorrelation, the Breusch-Godfrey test did so the regression was corrected with Newey-West standard errors. The results of that regression are below (Table 2) but they further demonstrate the lack of significance problem; there are no longer any significant variables.

Table 2. Excess returns to Commerzbank daily stock holdings corrected for autocorrelation

Explanatory Variable	Coefficient
Profitable returns to the Market Portfolio ( $R_m - R_f$ )	-0.0506 (0.1021)
Size (SMB)	0.1027 (0.1064)
Volume (HML)	0.0622

	(0.0650)
Momentum (WML)	0.0067 (0.0512)
Volkswagen Rate of Return ( $R_v$ )	0.0649 (0.0423)
Constant ( $\alpha$ )	0.0851 (0.0591)

Notes:

N= 2281

F-stat= 1.62

df= 5, 2275

p-value= 0.1516

Newey-West standard errors are in parentheses

These results do not support the hypothesis stated above. One cannot draw conclusions about anything in this regression because of the insignificance of all variables included. Instead of being able to easily infer the presence of a quantifiable potential stigma of receiving ELA funds in this instance, no substantial conclusions can be drawn. While the number of observations included in this regression is high, the regression is only focused on one particular institution.

The literary analysis given earlier focuses on three case studies meant to exemplify how Bagehot's rules have failed in the new environment of systemically important banks. While ideally this regression would have demonstrated an unexpected stigma, the lack of any results does not definitively disprove the existence of a stigma. There is still a high possibility that the stigma is included in the large unexplained portion however, the lack of significance makes drawing any conclusions about the size and force of the stigma impossible. Rather the non-relationship demonstrated in this instance does not conclusively signal anything.

It should be made clear that this does not mean that there was no change in stock prices as when the bailouts were announced, stock prices changed -12.38%, +12.42%

and -6.25% on each bailout announcement date; rather the variables chosen in this particular regression hold no clues for explanation. A number of other opinions and variables could, and probably do, hold the keys for understanding. For example; perceptions of bank stock may have been very skewed during this time, regulatory changes may have been more important, the amount of the bailouts could have been very important, et cetera.

As the Financial Crisis deepened it became clear that banks and financial institutions were receiving a special treatment not seen before. The panic and confusion that grew out of the failure of Lehman Brothers paralyzed so many regulators and politicians from allowing many other institutions to fail. While regular business were still allowed to fail and not guaranteed receipt of any emergency funds, banks were not turned away and LLRs kept finding new ways to provide banks with funding. As banks, and particularly systemically important banks, were receiving special treatment, it logically follows that bank stock should receive special perceptions.

The EU's unique financial situation kept numerous countries informed of the regulations being imposed on other banks. Access to ELA funds required unanimous approval of the Board of Governors so countries seeking ELA for their banks would have disclosed how they were changing or regulating their banks. The EU environment provided an arena for direct comparison between countries. As such, the regulatory changes for Germany (as the financial powerhouse of the EU) would have been very important for investors in German banks. If the banking and regulatory environment was drastically changing the international community would have been very interested.

The definition of Commerzbank as a systemically important bank has never been disputed, it remains Germany's second largest private bank. After the fall of Lehman Brothers people began to use the phrases "systemically important" or "too big to fail". Securing a bailout for a large bank was no longer in contention. What was still up for discussion became the amount and makeup of the bailout: would it be a straight loan? Would it be through the government buying shares? Would it be a guarantee? Or of another form yet unseen? That uncertainty, as does any uncertainty, strains the markets and the price of stocks. These are just three examples of other variables not included that may explain the change in the price of Commerzbank stock, but because they were not a part of the regression stated above, again there are no conclusions that can be drawn.

## V. Conclusion

While Germany and its financial institutions may never face the public scrutiny that other countries, banks and emergency funds have faced, we now know Germany required ELA and dispersed it ineffectively. Walter Bagehot's recommendations provide a consistent baseline for judgment no matter the scale of the crisis. He does not take scope or amount given into consideration, making his advice easily applicable to modern problems. His three pieces of advice: lend freely to all who ask and can provide adequate collateral, at a high penalty rate and, avoid lending at a loss, should still apply today. Bagehot's separating equilibrium is critical to his recommendations but seems to no longer apply in today's situations. A separating equilibrium assumes that a situation is static and that all players will not try to beat the game. While bankers in nineteenth century England may have acted in the same manner, European countries and banks definitely violated those assumptions.

All institutions that find themselves in the LLR position are invested in the continued strength and solvency of the financial sector and should be doing everything they can to protect it. Following the 2008 Financial Crisis and the subsequent Sovereign Debt Crisis, the ECB found itself in that position. Following Bagehot's recommendations would mean that the ECB lent easily and freely to all those who asked at a high interest rate provided they gave substantial collateral. As the crises deepened, the types of collateral that were accepted grew and the types of liquidity assistance evolved and expanded. The penalty rate was not consistently charged, the interest rates on LTROs fell to one percent at one point. The ECB accepted the collateral at above market prices for many securities, especially ABS, and effectively lent at a loss.

Within Germany, the central bank did not do a stellar job following Bagehot's advice. FMSA and SoFFin provided substantial liquidity assistance to Commerzbank. In total €33.2 billion was provided, but Commerzbank still required a government takeover. Commerzbank provided evidence of being insolvent rather than illiquid but SoFFin either ignored the evidence or did not recognize the evidence and eventually confirmed its insolvent status by taking it over. The insolvency guarantees that SoFFin lent at a loss, Bagehot's biggest concern. It also demonstrates that the interest rate charged by SoFFin was not in fact a penalty rate, Commerzbank should have failed from the beginning (if the situation was static) or when they became insolvent (if the situation changed over time) because they were insolvent rather than string ECB and the German taxpayers along.

BayernLB and the state of Bavaria fared fairly similarly. SoFFin and FMSA failed to provide a penalty rate that successfully ensured a separating equilibrium would hold. While BayernLB did provide some form of collateral, SoFFin provided their guarantees at face value and the lawmakers of Bavaria were eager to provide funds to ensure that BayernLB remained in Bavarian control. Both of these actions opened up the German and Bavarian governments to losses, in strict violation of Bagehot's recommendations.

Empirically, however, Commerzbank fared a little bit better. The hypothesis of Commerzbank having lots of public distrust cannot be confirmed. The overall lack of a relationship between the augmented Fama/French factors and Commerzbank encourages further investigation. I conclude my data analysis with a few variables that may explain the non-relationship, a regression including those variables is the logical next step. If the

regression including the additional proposed variables has more significant results, the size of the public stigma and distrust can be more accurately predicted. As nothing has been definitively proven, or disproven, there is still plenty of empirical work that could follow the investigation and analysis of systemically important banks.

The limitations of my research came primarily from lack of data availability. Receiving ELA comes with a stigma and a connotation of financial insecurity. The continuous violations of Bagehot's separating equilibrium eliminate the possibility of a bank being seen as solvent when receiving ELA. When Bagehot wrote in 1873, ELA could be seen as a signal of solvency because a bank that was willing to undertake a loan at the penalty rate had the funds to be able to repay the loan at a later date. Now however, the incentives to follow a separating equilibrium and remain truthful when asking for ELA have changed so drastically that receiving ELA is now a signal for insolvency.

Banks, both public and private, are unlikely to make that information easily available until the stigma is eliminated and trust in institutions applying for ELA recovers. As it stands now, the culture around ELA seems unlikely to change. Greece's continued request for more liquidity assistance is still shrouded in some secrecy despite all the international news coverage. Unfortunately, in order to update the recommendations for LLRs in current times it is imperative that this information becomes more easily available. Creating generalizations and recommendations for what the LLR functions should be and how ELA should be dispersed becomes more accurate and realistic when there is more available data to test.

This research lends itself to the further development of LLRs and the theory behind their actions. While Bagehot's recommendations continue to be an important starting point for analyzing whether LLRs are effectively completing their tasks, the 2008 global Financial Crisis and Europe's subsequent Sovereign Debt Crisis have alerted us of how dependent and connected the world economy is. If systemically important financial institutions continue to be "too big to fail", the expectations for LLRs must be updated. Besides the problem of moral hazard from nearly guaranteed ELA availability, the penalty rate becomes pointless. Systemically important institutions will receive ELA whether they are illiquid or insolvent and the assumption separating equilibrium will never hold. Additionally, ensuring ELA is available to "too big to fail" banks requires accepting collateral that is often substandard because that is what is available and opens the LLR to potentially lending at a loss.

## VI. References

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