EUROPEAN CENTRAL BANK

EUROSYSTEM

WORKING PAPER SERIES

NO 1649 / MARCH 2014

GLOBAL CORPORATE BOND ISSUANCE

WHAT ROLE FOR US QUANTITATIVE EASING?

Marco Lo Duca, Giulio Nicoletti and Ariadna Vidal Martinez

In 2014 all ECB publications feature a motif taken from the €20 banknote.

Acknowledgements
The authors would like to thank participants in an internal ECB seminar and in the XI Emerging Markets Workshop organised by the Bank of Spain. The views presented in the paper are those of the authors and do not necessarily represent the views of the European Central Bank or the Eurosystem.

Marco Lo Duca (corresponding author)
European Central Bank; e-mail: marco.lo_duca@ecb.europa.eu

Giulio Nicoletti (corresponding author)
European Central Bank; e-mail: giulio.nicoletti@ecb.europa.eu

Ariadna Vidal Martinez
European Central Bank

Address	Kaiserstrasse 29, 60311 Frankfurt am Main, Germany
Postal address	Postfach 16 03 19, 60066 Frankfurt am Main, Germany
Telephone	+49 69 1344 0
Internet	http://www.ecb.europa.eu
Fax	+49 69 1344 6000

ISSN	1725-2806 (online)
EU Catalogue No	QB-AR-14-023-EN-N (online)

Abstract

The paper investigates the impact of US quantitative easing (QE) on global non-financial corporate bond issuance. It distinguishes between two QE instruments, MBS/GSE debt and Treasury bonds, and disentangles between two channels of transmission of QE to global bond markets, namely flow effects (purchases) and stock effects (holdings). We control for a number of domestic and global macro-financial factors. In particular, we control for weaknesses in cross-border and domestic banking which might have induced the corporate sector to issue more bonds. The results indicate that US QE had a large impact on corporate bond issuance, especially in emerging markets, and that flow effects (i.e. portfolio rebalancing) were the main transmission channel of QE. A counterfactual analysis shows that bond issuance in emerging markets since 2009 would have been halved without QE.

JEL Codes: E52, E58, F42, G15.

Keywords: monetary policy, quantitative easing, spill-overs, bond issuance, Federal Reserve, United States, crisis management, emerging markets.

NON -TECHNICAL SUMMARY

Despite a lively debate in international fora, little research has been devoted to the global implications of quantitative easing policies. This paper contributes to the literature on the international spill-overs of quantitative easing by quantifying the impact of the Fed's policies on global bond issuance in the non-financial sector.

Over the last four years global bond issuance increased markedly in the non-financial sector. The increase in issuance was largely synchronized across countries, suggesting that global factors were at play. The timing and the synchronisation of the issuance point to a role of quantitative easing policies (QE) in driving these developments.

The paper quantifies the role of US QE in driving corporate bond issuance in other countries by estimating a model where corporate bond issuance (at the level of the individual country in each quarter) is explained by a set of domestic and global variables, including US QE. In particular, we include in the model both the stock of securities held and the purchases by the FED under the large scale asset purchases (LSAP) programme, separating between two instruments, Treasuries and other securities (including Mortgage Backed Securities and Government Sponsored Enterprises debt). By including both stocks and purchases of securities we intend to respectively capture stock effects (i.e. large security holdings translating in favourable financing conditions) and flow effects (i.e. purchases inducing portfolio rebalancing) of QE.

Our results show that, in emerging markets, issuance would have been significantly lower without QE since 2009. A counterfactual analysis shows that issuance without QE would have been broadly half of the actual issuance since 2009, with the gap increasing in late 2012. In advanced economies, the impact of QE was less strong and concentrated in early 2009, mainly as a reflection of the MBS rather than Treasury purchases.

Concerning transmission mechanisms, in emerging markets, the 'Stock effect' i.e. QE translating in better financing conditions and lowering of risk premia, seems to be an important transmission channel. We found such stock effect of QE on bond markets to be additional to what already captured by reductions in both the VIX and the long term US interest rates following the QE policies. Purchases of securities (capturing "flow effects" i.e. QE inducing portfolio rebalancing across countries) seem to be the main transmission channel of QE to bond markets in advanced economies.

These findings are robust to a number of tests: in particular we also considered weak domestic and international banking activity as an explanatory factor for the observed strong corporate bond issuance (i.e. corporations substituting bank financing with direct market financing). We find evidence of a substitution channel between bank loans and bond issuance. However, the results show that this substitution channel is an additional rather than alternative explanatory factor to QE.

I Introduction and motivation

Since late 2008 major central banks entered into unchartered territory by adopting unconventional monetary policies (or quantitative easing programmes – QE) to repair the transmission mechanism and to provide monetary accommodation at the zero lower bound.[2]

Despite a lively debate in international *fora* on the global implications and risks of QE policies, especially in relation to excessive capital flows to emerging markets[3], little research has been devoted to the international spill-overs of QE[4]. Understanding the international spill-overs of these policies is particularly relevant at the current juncture as one of the major central banks, the Fed, is tapering its large quantitative easing program.

This paper contributes to the literature on the international spill-overs of quantitative easing by quantifying the impact of the Fed's policies on global bond issuance in the non-financial sector. As such, it contributes to a relatively small but increasing literature concerning the global implications of quantitative easing policies. Along our same thread, Fratzscher, Lo Duca and Straub (2013) analyze the impact of LSAP announcement and purchases on global financial markets and capital flows, differentiating between emerging markets and advanced economies. Other event studies document the international spill-overs of QE announcements to asset prices (Neely, 2010 and Bauer and Neely, 2012, Chen et al. 2011, IMF 2013a), while Hattori, Shrimpf and Sushko (2013) document the impact of QE announcements and operations on global tail risk[5]. We are not aware on recent studies focusing on global bond markets and this is the gap this paper aims at filling in the literature. An exception is the work by Gilchrist and Zagrajeck (2013) that find that quantitative easing policies have significantly lowered yields on corporate bonds for non-financial firms, although their analysis is restricted to corporate bond yields in the US.

In the last four years, global bond issuance increased markedly, especially in the non-financial corporate sector, while credit spreads shrank worldwide to levels similar to those prevailing in the 2005-2006 period of "financial exuberance". Figure 1 shows that volumes of corporate bond issuance

---

2 See Fawley and Neely (2012) for a description of unconventional monetary policy measures of major central banks.

3 See for example IMF 2010a, 2010b, 2011a, 2011b, 2011c, 2012, 2013a, 2013b; Ostry et al. 2010 and 2011.

4 The literature on QE is large and spans from theoretical studies assessing the implications of QE from a general equilibrium perspective to empirical studies measuring the impact of QE on financial markets. Concerning the latter group of empirical studies, which are closer to this study, they are predominantly event studies assessing the implications of QE for domestic (i.e. US) asset prices and attempting to identify the transmission channels of QE. Overall, the empirical literature shows that the LSAP lowered US Treasury yields (e.g. Gagnon et al. 2011; D'Amico and King 2012; Wright, 2011), with similar evidence for the UK (Joyce et al. 2011), and MBS yields (Hancock and Passmore 2011, Stroebel and Taylor . Krishnamurthy and Vissing-Jorgensen (2011) discuss the transmission channels of quantitative easing.

5 On the macro front, Gambacorta, Hofmann and Peersman (2012) look at the spill-overs of QE on output and inflation across advanced economies.

in emerging markets are simply unprecedented in history and bond issuance activity in advanced economies is also high according to historical standards.

Figure 2 shows that corporate bond issuance was strongly synchronised across a large sample of advanced and emerging economies[6] since 2009, with issuance in the highest quartile almost everywhere in 2012. This suggests that bond issuance volumes can be explained by common factors rather than by country/firm specific factors.

Therefore, the timing and the synchronisation of the issuance across countries point to a possible role of quantitative easing policies (QE) in driving these developments.

With the facts above mentioned as background, the paper aims at quantifying the impact of Large Scale Asset Purchases (LSAP) in the US on global corporate bond issuance. For our analysis, we use data on bond issuance for non-financial corporations aggregated at a country level for a panel of 38 advanced and emerging economies. The sample covers the period from 2000 to 2013 at quarterly frequency (source: Dealogic). We believe that the country-level data allow us to strike a balance between capturing heterogeneity in firms' decisions, which might be better described using firm-level data, and the possibility of covering several countries in order to search for common factors of corporate bond issuance, as for example, non-conventional monetary policies.

Regarding non-conventional monetary policy, we distinguish between two QE instruments, MBS/GSE debt and Treasury bonds, and we disentangle between two channels of transmission of QE to global bond markets, namely flow effects and stock effects. By crowding out investors from the market segments where the Fed intervenes, purchases might induce portfolio rebalancing across assets and regions, thereby increasing the demand for some securities when purchases take place ("flow effects"). This would positively affect bond issuance worldwide. At the same time, large security holdings by the Fed reduce the supply of certain assets to the public, thereby increasing asset prices, lowering yields and risk premiums. As a consequence, large security holdings by the Fed translate into better financing conditions ("stock effects"), leading to more bond issuance.

When investigating the impact of non-conventional monetary policy on bond issuance, we check the robustness of our findings with respect to a number of domestic and global macro-financial factors which could explain the facts highlighted in Figure 1 and 2. In particular, we control for weaknesses in cross-border and domestic banking and the associated reduction in loan capabilities of banks which might have induced the corporate sector to issue more bonds. Substitution between bank and market loans can be especially important for a number of advanced economies where banking systems are in distress and the credit supply remains weak. More broadly, the retrenchment of large banks from international markets can be an alternative or complementary explanation of observed common

6 For the list of countries in the sample see Table 12.

patterns of bond issuance across countries. Concerning other control variables, we use an extensive range of forecasts from different vintages of the IMF World Economic Outlook (WEO). Therefore our analysis can be considered a "real time" study.

Finally, the decision to focus on US non-conventional monetary policy is driven by two main rationales. First, the Fed LSAP programme is quantitatively very large and is the first to be tapered. Second, asset purchases were announced ex-ante by the Fed (the same is true for other central banks but not for all of them[7]), so that purchases can be taken as pre-determined with respect to prevailing economic conditions. As the Fed did not adapt the pace and size of purchases on the basis of evolving market conditions, econometric concerns related to possible endogeneity of purchases --which would require to specify a reaction function of asset purchases-- are mitigated. In addition, the Fed did not clearly use financial conditions in other economies as a target for monetary policy. Therefore, we believe that endogeneity is not a concern when analysing bond market developments outside the US. While the analysis focuses mainly on the impact of US QE policies, we also expand it to assess the overall impact of major central bank policies, to assess whether US QE really explains the lion's share of the observed bond issuance increase.

Coming to the results of this study, the analysis supports the view that QE in the US had a strong impact on bond issuance, especially in emerging markets. A counterfactual analysis shows that issuance in emerging markets without QE would have been broadly half of the actual issuance since 2009, with the gap increasing in late 2012. The level of security holdings (or "Stock effects" i.e. QE translating in better financing conditions) seem to be an important transmission channel to emerging markets. In advanced economies, the impact of QE was concentrated in early 2009, mainly as a reflection of the MBS rather than Treasury purchases. Purchases of securities (capturing "flow effects" i.e. QE inducing portfolio rebalancing across countries) seem to be the main transmission channel of QE to bond markets in advanced economies. The above mentioned results, survive a large number of robustness tests.

The paper is organised as follows: Section II discusses the transmission channels of QE to international capital markets; Section III describes the empirical approach; Section IV presents the results; Section V presents the robustness analysis including testing for substitution effects between bank loans and direct market financing; Section VI presents some extensions, covering other central banks' purchases and detailing how bond characteristics other than bond issuance changed due to QE; Section VII concludes.

[7] For example the Bank of Japan announced the size and timing only of some of its auctions in both its Asset Purchase Program (2010-2013) and in the latest Qualitative and Quantitative Monetary Easing.

II Transmission channels

The literature highlighted several non-mutually exclusive possible transmission channels connecting quantitative easing policies to increased corporate bond issuance. While disentangling among all transmission channels is beyond the scope of this paper, we relate more closely only to the ones which might have more direct policy implications, as we explain in this section.

According to the so called 'market timing' hypothesis (Baker et al 2002), expectations of low interest rates paid on debt can induce managers to stronger issuance in order to 'time the market' and profit from the (future) low rates. In this respect, as long as QE policies reduce global interest rates and/or create expectations of lower rates in the future, the incentive to increase issuance would be maintained. Alternatively, in the gap-filling theory of corporate debt, proposed by Greenwood et al (2010), when long term government bonds are purchased through QE by the public sector the corporate sector would act as liquidity provider by enhancing (long term) bond supply which would be absorbed by the markets. Our paper does not aim at precisely separating between the two above mentioned channels, however, the effects of LSAP on issuance we find in our baseline model (see next section) come above and beyond the ones captured movements in yields, which we control for. In this respect, one can interpret our results better in the light of the gap-filling theory of corporate debt rather than the market timing one.

This paper distinguishes between two other possible dimensions of the transmission mechanism from QE to increased bond issuance: stock effects which operate over the life of the LSAP program and flow effects which operate limitedly to the periods when purchases occur. The former is consistent with QE translating in better financing conditions in the presence of partially segmented markets as described in Hamilton and Wu (2012). The latter is consistent with portfolio rebalancing as outlined by the Fed chairman Ben Bernanke (2010): Fed purchases affect the available supply to private investors of the purchased assets, which would impact the price and lead to some degree of rebalancing towards other market segments, to the extent that the purchased asset is only imperfectly substitutable. The stock/flow distinction is consistent with the analysis of D'Amico and King (2012) and it is important insofar as the two channels can have different implications with respect to the *modus operandi* of tapering of the US QE program. Looking at capital flows, Fratzscher, Lo Duca and Straub (2013) already found evidence of portfolio rebalancing effects induced by US QE purchases.

More recently, both policy makers and work by the Fed have stressed also a signalling channel of QE as alternative to the portfolio rebalancing channel mentioned above. In the signalling channel, QE policies would help enhance the credibility of the Fed in maintaining interest rates low, at the zero lower bound, for a protracted period of time. For example, Bauer and Neely (2013), found evidence of both signalling and portfolio rebalancing channel when looking at the impact of the QE policies over yields in the global economy. While our main aim is not at settling the dispute between portfolio

rebalancing and signalling channel, our results can be better interpreted in the light of portfolio rebalancing for two main reasons: first, the effects of LSAP on issuance we find come above and beyond the ones captured movements in yields, second, in our robustness checks, we partially address the issue by using a term structure model (as in Adrian et al (2012)) to introduce separately risk premiums and expected path of interest rates in our regressions.

Finally, our analysis looks at effective purchases, rather than just announcements of programs as, for example, the actual portfolio rebalancing might take place only when the central bank is active on the market. Further justification for this choice can be given as follows. Under the efficient markets hypothesis, both prices and quantities would react immediately after the announcements of a QE programme, adjusting to the expected holdings of securities by the central bank. However, there are a number of reasons why purchases might have an impact on prices and, ultimately, volumes, which is the variable we are interested in[8:]

- Financial frictions: at least QE 1 was undertaken under dysfunctional financial markets which might have impaired arbitrage opportunities.
- Market participants might have expectations on the complex chain of portfolio rebalancing induced by central bank purchases and they might price assets accordingly. However, the actual portfolio rebalancing might be different than expected, leading to unexpected demand in some market segments, thereby inducing price and volume adjustments.

III Empirical methodology and data

We evaluate the impact of unconventional monetary policy in the US on global bond markets using the following panel setting (equation 1):

$$y_{i,t} = \beta\, MP_t + \gamma_1\, F_t + \gamma_2\, Z_{i,t} + \varepsilon_{i,t} \quad (1),$$

$$\text{With } MP_t = [treas_t\ ;\ mbs_t\ ;\ dtreas_t\ ;\ dmbs_t].$$

In our benchmark specification, the dependent variable $y_{i,t}$ is gross non-financial corporate bond issuance in country *i* at quarter *t*, expressed in percent of the GDP. As the dependent variable is censored (gross issuance cannot be lower than zero), the model is estimated as a panel Tobit equation. In the robustness section, we also use other econometric techniques.

Data on bond issuance are collected from Dealogic, which provides micro data at the level of individual bonds. After classifying bond issuance by sector (only considering non-financial corporation), volumes are aggregated by quarter and by country. In the robustness tests, we change

8 For example, Hamilton and Wu (2012) show that the actual shares of long term treasuries held by the Fed have predictive power on excess bond returns.

the measurement of the dependent variable and we express it in current euro billions or in constant euro billions (at 2000 Q1 exchange rates). Summary statistics for the dependent variable are reported in Table 1.

The explanatory variables are grouped in three sets: MP_t include variables related to quantitative easing policies in the US; F_t contains common global factors that might affect the supply of capital to corporate bond markets; finally, $Z_{i,t}$ includes domestic factors in country *i* that affect both the demand and the supply of capital in corporate bond markets. Summary statistics for the explanatory variables are reported in Table 2.

Regarding the explanatory variables related to unconventional monetary policy, we differentiate between two instruments, MBS/GSE purchases and Treasury purchases. Consistently with the work of D'Amico and King (2012) on Stock/Flow effects of central bank purchases, each instrument is allowed to have a stock and a flow effect on bond issuance. This leads to the following four explanatory variables included in the vector MP_t:

- $treas_t$: Stock of US Treasury bonds held by the Fed in quarter *t*, in percent of the total stock of US government debt. This variable should capture the stock effects of Treasury holdings by the Fed.
- mbs_t: Stock of mortgage backed securities (MBS) and Government Sponsored Enterprises (GSE) debt held by the Fed in quarter *t*, in percent of the total stock outstanding of MBS and GSE debt. This variable should capture the stock effects of MBS and GSE holdings by the Fed.
- $dtreas_t$: purchases of US Treasury bonds by the Fed in quarter *t*, in percent of the total stock of US government debt. This variable should capture the flow effects of Treasury purchases.
- $dmbs_t$: purchases of mortgage backed securities (MBS) and Government Sponsored Enterprises (GSE) debt by the Fed in quarter *t*, in percent of the total stock outstanding of MBS and GSE debt. This variable should capture the flow effects of MBS and GSE debt purchases.

Figure 3 displays the four explanatory variables related to unconventional monetary policy in the US.

The choice of expressing monetary policy variables in percentage of the amounts of securities outstanding reflects the fact that the larger the fraction of securities held by the central bank, the lower the supply of securities to the public, the higher the expected impact on prices and the larger the portfolio rebalancing. Along the same thread, the theoretical contribution by Vayanos and Vila (2009) and the subsequent findings of Hamilton and Wu (2012) showed that the stock of assets purchased by the central bank as compared to the stock of assets remaining to the public can be a driving factor of treasury yields. In the robustness section we change the way we measure monetary policy instruments. The choice of separating MBS and Treasuries comes from the possibility of financial

markets being segmented, as discussed by Stein (2012a, 2012b), who notices -- providing evidence supporting our choice-- that in such a case of market segmentation the effects of different Fed asset purchases might differ for credit markets.

It is worth noting that asset purchases were announced ex-ante by the Fed, so that purchases can be taken as pre-determined with respect to prevailing economic and financial conditions. Econometric concerns related to possible endogeneity of purchases - which would require specifying a reaction function of asset purchases - are therefore mitigated. This is especially true when looking at emerging markets, as the Fed (and other major central banks) did not clearly use financial conditions in emerging bond markets as a target for monetary policy.

Turning to the global explanatory variables included in the vector F_t, in our benchmark specification we consider:

US 10 year Treasury yield: average yield on the 10 year US Treasury bond in quarter *t*. Several studies document an inverse relation between bond issuance and (long term) yields. In particular, Baker and Wurgler (2002) and the ensuing literature on 'market timing' relate bond issuance to interest rates and highlight how an environment of low (long term) interest rates can be conductive to higher bond issuance. More intuitively, higher global yields, leading to tighter financing conditions, can be expected to have a negative impact on bond issuance.

VIX: average option implied volatility on the S&P500 index in quarter *t*, as measured by the VIX index, a popular measure of global uncertainty and risk aversion in the market place (Bekaert, Hoerova and Lo Duca, 2013). Several studies document an inverse relation between the financial market cycle and VIX (see, for example, Rey, 2013). Nevertheless, the case of the relation between bond issuance and VIX is not clear cut, as higher equity volatility can trigger safe-haven demand for safe bonds: this can extend not just to treasuries but also to corporate sector securities, depending also on the type or the investment grade of the security issued. However, in a study on hedging strategies of bond portfolios using VIX futures, empirical research by Standard & Poor (2011) drew a line between bonds from emerging markets and advanced economies. In particular, the authors show that demand of bonds from emerging markets tends to be negatively affected by VIX increases, while results are less clear-cut in the case of advanced economies. We allow for a different impact of VIX on bond issuance across groups of countries. More specifically, with an "emerging market" dummy, we capture the additional impact of VIX on emerging markets compared to advanced economies.

In the analysis, the following complication arises: US yields, and possibly VIX, are affected by US monetary policy (Bekaert, Hoerova and Lo Duca, 2013) and, in particular, quantitative easing policies (Fratzscher, Lo Duca and Straub, 2013). Therefore, QE is also transmitted to global bond issuance via lower US yields and lower VIX. As a consequence, relying on the variables included in the matrix MP_t might not fully capture the impact of US QE on global bond markets. On the other hand, if the

coefficients of the matrix MP_t are significant, they might provide a conservative estimate of the real impact of QE on global bond markets. We address this complication in the robustness analysis with a number of alternative modeling strategies: using lags; substituting the VIX with alternative measures of uncertainty which are not influenced by risk premia, such as the policy uncertainty index; separating term premium and expected interest rate path using a term structure model .

Finally, regarding the domestic explanatory variables included in the vector $Z_{i,t}$, in our benchmark specification we consider:

Real domestic policy rates: average central bank policy rate in quarter *t*, minus the one year ahead inflation forecast according to the prevailing IMF World Economic Outlook (WEO)[9].

Realized volatility of equity markets: average of the absolute the daily returns of the main equity index in quarter *t*. The realized volatility of the equity index is used as a proxy of time varying country risk. We allow for a different impact of country risk on bond issuance across groups of countries. More specifically, with an "emerging market" dummy, we capture the marginal impact of country risk on emerging markets compared to advanced economies.

Equity market performance: return of the main equity market index in quarter *t*. Equity market returns are used to control for a number of factors that are difficult to measure or for which data are not available for a number of countries. These factors include, for example, changes in sentiment due to political events or macroeconomic expectations. In addition, the performance of equity markets might be related to changes in overall financial conditions.[10] As discussed in Stein (2012b) and, to some extent in Elliott et al (2008), firms expecting positive returns on equity markets might decide to recur to the available cheap bond market in order to buy-back shares. This type of channel is also somehow captured by including equity returns.

As in our benchmark specification the dependent variable is scaled by the GDP, we do not include variables measuring economic activity. In the robustness section, however, we include several forward looking macro-economic indicators among the explanatory variables, when the dependent variable is not scaled by the GDP. In particular, all the economic variables that we use belong to different vintages of the IMF World Economic Outlook (WEO). Therefore our analysis can be considered a "real time" study.

Finally, substitution between bank and market loans can be especially important for a number of advanced economies where banking systems are in distress and the credit supply remains weak. More

9 We alternatively used nominal policy rates or real rates obtained by deducting current headline inflation. The results are not affected and the robustness checks are available on request.

10 A careful discussion of empirical findings on the relation between equity prices and bond issuance using US firm-level data can be found in Elliott et al (2008).

broadly, weak global banking can be an alternative or complementary explanation of commonalities of bond issuance across countries. We modify our model to control and address substitution effects in the robustness section.

IV Empirical results

Table 3 presents the results of the benchmark model in equation 1, as described in the previous section. To start with, we estimate a model where only the domestic explanatory variables are included in the analysis (i.e. the vectors MP_t and F_t are excluded from equation 1). We estimate this "domestic" model including all countries (column 1), emerging markets only (column 2) and advanced economies only (column 3). Overall, the domestic variables have the expected sign and most coefficients are statistically significant. For example, the results indicate that domestic monetary policy, as measured by the real policy rate, has a negative impact on bond issuance. On average, across all the countries in the sample, an increase by +1.0 percentage point (p.p.) in the real policy rate would permanently decrease issuance by -0.025% of GDP, the impact being stronger in advanced economies than in emerging markets. For comparison, the average quarterly issuance over the sample was 0.45% of the GDP in emerging markets and 0.60% of GDP in advanced economies. Country risk, as measured by the domestic realised volatility of the equity market, has a negative impact on issuance in emerging markets only, while domestic equity market returns, capturing several unobserved factors, are positively related to issuance in both advanced and emerging economies.

Columns 4 to 6 report the estimated coefficients for our full benchmark model ("Global model"), including domestic, global and quantitative easing explanatory variables, differentiating between all countries (4), emerging markets (5) and advanced economies (6). The inclusion of global and quantitative easing variables makes statistically insignificant all the domestic variables, excluding country risk which remains weakly significant for advanced economies.

Regarding the global variables, both US long term yields and global risk aversion (VIX) are statistically significant in the regressions, with the latter being relevant mainly for emerging markets, as expected. An increase in US long term yields by +1.0 p.p. translates into lower issuance by -0.085% of GDP across countries, with similar impact in emerging and advanced economies. An increase by +10.0 p.p. in VIX translates into lower issuance in EMEs by -0.08% of GDP.

Turning to the impact of unconventional policies, we find that both unconventional monetary policy instruments, i.e. interventions in MBS/GSE and Treasury markets, affected global bond issuance. In addition, the results show that flow effects prevail globally, although also stock effects are present, especially in emerging markets.

In our benchmark model, the regression that pools all the countries together (column 4), Fed purchases of MBS and Treasuries are statistically significant, while Fed holdings of securities are not.

We interpret this result as supporting the presence of flow effects of QE i.e. purchases of securities inducing portfolio rebalancing across countries. Regarding interventions in the Treasury market segment, purchases equal to 1% of the stock of US Treasury securities available to the public increase issuance by +0.1% of the GDP across countries. Regarding MBS, purchases equal to 1% of the stock of MBS securities available to the public increase bond issuance by 0.12% of GDP across countries. Overall, the cumulated purchases of MBS were around 10% of the stock of MBS securities available to the public, might have contributed to a cumulated issuance of 1.2% of the GDP across countries.

Differentiating between advanced economies and emerging markets shows that flow effects are present in both groups of countries, although they are stronger in advanced economies. In addition, there is some evidence that stock effects (both for Treasuries and MBS) played a role only in emerging markets. This suggests that the level of security holdings, i.e. QE translating in better financing conditions, was an important transmission channel to emerging markets, although this channel was less relevant than the portfolio rebalancing (flow effect) activated by the Fed purchases.

Overall, these results suggests that QE in the US played an important role in driving strong bond issuance in the non-financial corporate bond segment across the globe, in both emerging and advanced economies. The role of purchases in determining bond issuance suggests that QE is transmitted across countries mainly via flow effects related to portfolio rebalancing. By crowding out investors from the market segments where the Fed intervenes, purchases might induce portfolio rebalancing across assets and regions, thereby increasing the demand for some securities when Fed purchases take place (flow effects). This result is consistent with the findings of Fratzscher, Lo Duca and Straub (2013). Finally, the results suggest that the flow effects are slightly stronger for MBS, i.e. investors crowded out from the MBS/GSE debt market segment are more likely to "migrate" (or induce migration of other investors via indirect chain of purchases) to global corporate bond markets. These results seem plausible as the risk profile of MBS is close to that of corporate bonds. To the contrary, it can be expected that investors crowded out from the Treasury markets seek mostly securities that are safer than corporate bonds, which explains the lower flow effect of Treasury purchases.

In order to gauge the economic relevance of our results, Figures 4, 5, 6 and 7 show the actual issuance (black line), the issuance predicted by the model (dark grey line) and the counterfactual issuance without QE (light grey line) for emerging markets and advanced economies. The counterfactual has been calculated by setting QE purchases to zero and by keeping securities held in the Fed balance sheet unchanged as of 2008 Q4 (before the LSAP started). In addition, the counterfactual assumes that without QE the US 10 year yield would have set at the level observed in 2008 Q4 (Figure 4 and 5 – Scenario A) or converge at the sample average of 4% (Figure 6 and 7 – Scenario B), while VIX is set at the sample average of 22% (we change this assumption in the robustness section). The main finding

emerging from the figures is that issuance would have been significantly lower without QE since 2009 in emerging markets, while in advanced economies the impact of QE was concentrated in early 2009, mainly as reflection of the MBS rather than Treasury purchases. In particular, for emerging markets, the counterfactual issuance without QE is broadly half of the predicted/actual issuance since 2009, with the gap increasing in late 2012.

In the next section, we conduct a number of robustness tests to address issues that might affect the validity of our results.

V Robustness analysis

Alternative econometric techniques and different measurement of the dependent variable

Table 4 addresses concerns related to the econometric technique and the measurement of the dependent variable. The first column presents again the results of the benchmark model (as in Table 3, column 4). In column 2, the benchmark model is estimated with the Driscoll-Kraay fixed effect approach to account for cross sectional dependence. Column 3 uses the Pesaran-Smith mean group estimator to take into account cross-country heterogeneity. In column 4 to 9, we use the previous three econometric techniques (Panel Tobit, Driscoll-Kraay and Pesaran-Smith), although we change the measurement of the dependent variable. In columns 4 to 6, the dependent variable is expressed in billions of current euro, while in columns 7 to 9 it is expressed in billions of constant euros (as of 2000 Q1). As the dependent variable is not scaled by the GDP in columns 4 to 9, we introduce the one year ahead real GDP growth forecast, according the prevailing IMF World Economic Outlook, among the explanatory variables. The benchmark results are confirmed by all these different settings.

Trend and country dummies in the Tobit model

Table 5 addresses concerns related to different structural features across countries. For example, in a number of countries the increased issuance in recent years might simply reflect financial deepening and progress in developing bond markets. The inclusion of a linear trend, however, does not affect the results (Table 5, columns 1 to 3). In addition, the inclusion of country dummies to capture country fixed effects, which are not included by default in the Tobit estimation, does not affect the main results.

Substitution between bank lending and bond issuance

Substitution between bank and market finance can be especially important in a number of advanced economies where banking systems are in distress and the credit supply remains weak. For a theoretical investigation and further empirical analysis for the US of the relevance of such substitution phenomenon in the period after the 2008—2009 recession, the reader is referred to De Fiore and Uhlig (2012) and to Colla et al. (2012), which both show how banking distress can lead to a surge in

corporate bond issuance. More broadly, weak global banking can be an alternative or complementary explanation of commonalities of bond issuance across countries. To control for global and domestic banking sectors conditions we include a number of additional explanatory variables in Table 6. In addition, by using period dummies, we allow banking sector related variables to have a different impact on bond issuance before and after the global financial crisis (since 2009). Columns 1 to 3 add domestic credit ("claims") annual growth to the set of explanatory variables; columns 4 to 6 add international bank credit ("claims") to country j (annual growth); columns 7 to 9 add the performance of the domestic bank equity index; finally, columns 10 to 12 include bond issuance of financial corporations to capture the ability of banks to access market finance. The latter could also be considered a proxy of the health of the banking system. While some of the "bank-related" variables included in the model point to substitution effects between banking and market finance, the impact of QE survives these crucial robustness tests.

Alternative measurement of monetary policy instruments

In Table 7 we change the way we measure the main explanatory variables related to US QE instruments. We express the stock and the purchases of securities by the Fed in % of the US GDP (columns 1 to 3) and in trillions of US dollars (columns 4 to 6). In addition, we estimated the benchmark specification also by including a Taylor rule residual from the US instead of the Fed Fund rates (source: Haver Analytics). The results of the benchmark specification are broadly confirmed.

Refining the measurement of stock effects

In the analysis, the following complication arises: US yields, and possibly VIX, are affected by US quantitative easing policies. Therefore, QE is also transmitted to global bond issuance via lower US yields and lower VIX. On the one hand, we already found that the coefficients of the matrix MP_t are significant, which provides a conservative estimate of the real impact of QE on global bond markets. On the other hand, relying on the variables included in the matrix MP_t (i.e. quantities) might not fully capture the impact of US QE on global bond markets. In particular, part of the stock effects (i.e. the level of security holdings translating into better financing conditions), which we found weakly significant, might be captured by other variables as, for example, the US 10y yield and VIX. We address this complication with a number of alternative modeling strategies in Table 8 and 11.

First, in Table 8, we lag VIX and the US 10 year yield by one (columns 1 to 3) or two periods (columns 4 to 6), then we exclude them (columns 7 to 9). The purpose of this test is to check whether the coefficients in the matrix MP_t, in particular those related to the stock of Fed security holdings, become larger or more significant. This test, however, provides only weak evidence that the impact of QE might be stronger than in the benchmark specification. In particular, stock effects become slightly stronger when VIX and the US 10 year are excluded.

Second, in Table 9 (columns 1 to 3), we substitute VIX with an index of policy uncertainty (Bloom et al., 2012), which reflects uncertainty surrounding the economic cycle. Differently from VIX, policy uncertainty does not incorporate a component related to risk premia, which can be affected by QE. Replacing VIX with the US policy uncertainty index, however, does not make the impact of QE stronger.

For what concerns the US 10 year yield, we split it in a term premium component, which is largely influenced by QE policies, and the expected path of interest rates. For the decomposition we use the affine model proposed by Adrian et al. (2012) which specifically addresses over-time variations in the term premium. The results in Table 9, columns 7 to 9, show that term premium is strongly related to bond issuance, while the risk neutral yield is not. This provides evidence that QE might have impacted bond issuance via its influence on term premia (supporting the views expressed by Stein, 2012a and 2012b). Finally, in columns 4 to 6, we replace VIX with the policy uncertainty index and we replace the US 10 year with the risk neutral yield. Therefore, in this setting, we omit from the regression the term premia of both VIX and the 10 year yield, which might absorb part of the QE stock effects. In this way, we can check whether the coefficients in the matrix MP_t, especially those related to stock effects, become larger or more significant. The results show that stock effects become slightly significant (column 4) in this setting. Overall, however, the counterfactual analysis based on this model, presented in Figures 8 and 9 does not differ much from the analysis based on the benchmark model. This suggests that our benchmark model captures most of the impact of QE on global corporate bond markets.

VI Extending the analysis to other central banks and bond characteristics

Role of other central banks

In Table 10, we assess whether unconventional monetary policies of other central banks also played a role in driving global corporate bond issuance. In order to make central bank non-standard monetary policy measures comparable across countries, we first simplify the model for the US (column 1 to 3) by summing up Treasuries to MBS for purchases and holdings and by expressing them in % of the GDP. In this setting, the results of the model for the impact of US QE are once again confirmed as one can also gather from the counterfactual analysis reported in Figures 10 and 11. In column 4 to 6, in addition to the US QE variables, we separately include the average purchases and holdings of securities (in % of GDP) of other major central banks (ECB, BoE and BoJ). According to our estimates, QE programs tend to have similar flow effects on bond issuance across the different central banks: given its size relative to other programs, results suggest that US QE had a prominent role in driving global corporate bond issuance. However, any conclusion based on such regression can only be tentative. The Fed announced bond purchases ex ante, which alleviates the endogeneity concerns

of our analysis, while other central banks purchased bonds in response to market conditions. For example, under the Security Market Programme (SMP), the ECB purchased government bonds to calm distressed market conditions, while the BoJ did not release ex ante a clear schedule for all bond auctions. In such cases, when central bank policies are not predetermined, endogeneity issues might affect our results.

Impact of QE on the characteristics of bond issuance: credit rating, maturity, yield

In Table 11, in order to study the impact of QE on the characteristics of bond issuance, we replace our dependent variable with the average rating of the issuance (column 1 to 3), maturity in years (column 4 to 6) and yield to maturity (column 7 to 9). When looking at the average maturity in years and at the yield to maturity we control for the average rating. In this way, we control for a sample selection bias that might occur when the population of issuers changes across periods (Eichengreen and Mody, 1998). The preliminary results suggest that QE tends to be associated with issuance with lower average rating and shorter maturity.

VII Conclusions

The paper quantified the impact of Large Scale Asset Purchases (LSAP) in the US on global corporate bond issuance, distinguishing between two QE instruments, MBS/GSE debt and Treasury bonds, and disentangling between two channels of transmission of QE to global bond markets, namely flow effects and stock effects. When investigating the impact of non-conventional monetary policy on bond issuance, we control for a number of domestic and global macro-financial factors. In particular, we control for weaknesses in cross-border and domestic banking and the associated reduction in loan capabilities of banks which might have induced the corporate sector to issue more bonds.

The analysis shows that QE in the US had a strong impact on bond issuance, especially in emerging markets. A counterfactual analysis shows that issuance in emerging markets without QE would have been broadly half of the actual issuance since 2009, with the gap increasing in late 2012. The level of security holdings (or "Stock effects" i.e. QE translating in better financing conditions) seem to be an important transmission channel to emerging markets. In advanced economies, the impact of QE was concentrated in early 2009, mainly as a reflection of the MBS rather than Treasury purchases. Purchases of securities (capturing "flow effects" i.e. QE inducing portfolio rebalancing across countries) seem to the main transmission channel of QE to bond markets in advanced economies. The above mentioned results, survive a large number of robustness tests.

Finally, our analysis shows that, while unconventional monetary policy by other central banks might have also spilled over to global bond markets, US QE had a prominent role in driving global corporate

bond issuance. In addition, some preliminary results suggest that US QE was associated with issuance with lower average rating and shorter maturity.

References

Adrian, T, Crump R.K., Moench, E, 2012, "Pricing the Term Structure with Linear Regressions" Journal of Financial Economics, Forthcoming

Baker, M., Wurgler, J. 2002, "Market timing and capital structure", Journal of Finance pp. 1–32.

Bauer M.D., Neely C.J. 2013, "International Channels of the Fed's Unconventional Monetary Policy", Federal Reserve Bank of St Louis 028C

Bekaert, G., Hoerova, M. and Lo Duca M., 2013. "Risk, Uncertainty and Monetary Policy". Journal of Monetary Economics, Forthcoming.

Bernanke, B., 2009. The crisis and the policy response. London, 13 January 2009.

Bernanke, B., 2010. The economic outlook and monetary policy. Jackson Hole, Wyoming, 27 August 2010.

Baker, S., R., Bloom, N., Davies, S. J., 2013, "Measuring economic policy uncertainty", Mimeo.

Chen, L. H. P., 2011. Quantitative easing, liquidity spillover and emerging markets inflation. Finance & Economics, 2011-10.

Adrian T, Colla, P and H. S. Shin, 2012 , "Which Financial Frictions? Parsing the Evidence from the Financial Crisis of 2007-9" NBER Macroeconomics Annual, Volume 27, Daron Acemoglu, Jonathan Parker, and Michael Woodford, editors, 159 - 214, 2013

D'Amico, S. , King, T.B., 2012. "Flow and stock effect of large scale treasury purchases". Federal Reserve Board Finance and Economics Discussion Series, no. 2010-52.

De Fiore F. and Uhlig H. 2012, "Corporate Debt Structure and the Financial Crisis", mimeo ECB

Eichengreen, B. and Mody, A., 1998, "Interest rates in the north and capital flows in the south: is there a missing link?", International Finance, Vol. 1.

Elliott, W. B., Koëter-Kant J., Warr R.S. (2008), "Market timing and the debt–equity choice" Journal of Financial Intermediation, pp 175-197

Fawley, B., Neely, C. J., 2012. "Four stories of quantitative easing". mimeo, Federal Reserve Bank of St. Louis, October 2012.

Fratzschser, M., Lo Duca, M., Straub, R., 2013, "On the international spill-overs of US quantitative easing". ECB Working Paper No. 1557.

Gagnon, J., Raskin, M., Remache, J., Sack, B., 2011. "Large-scale asset purchases by the federal reserve: did they work?" Federal Reserve Bank of New York Staff Reports, no. 441.

Gambacorta, L., Hofmann, B., Peersman, G., 2012, "The Effectiveness of Unconventional Monetary Policy at the Zero Lower Bound: A Cross-Country Analysis". BIS Working Papers No. 384.

Gilchrist, S, Zakrajsek, E., 2013 "The Impact of the Federal Reserve's Large-Scale Asset Purchase Programs on Corporate Credit Risk", Journal of Monetary Economics, Forthcoming

Greenwood, R., Hanson, S, Stein, J.C. 2010 "A Gap-Filling Theory of Corporate Debt Maturity Choice". The Journal of Finance Vol. LXV, 3 June

Hamilton, J., Wu, J.C., 2011. "The effectiveness of alternative monetary policy tools in a zero lower bound environment". Journal of Money, Credit, and Banking 44, 3-46.

Hancock, D., Passmore, W., 2011. "Did the Federal Reserve's MBS Purchases Program, Lower Mortgage Rates?" Journal of Monetary Economics 58, 498-514.

Hattori, M., Shrimpf, A., and Sushko V. 2013. "The Response of Tail Risk Perceptions to Unconventional Monetary Policy", BIS Working Paper No 425.

IMF, 2010a, "The Fund's role regarding cross border capital flows", IMF Policy Paper; November 15, 2010.

IMF, 2010b, "Global financial stability report", April 2010.

IMF, 2011a, "Recent experiences in managing capital inflows - cross-cutting themes and possible framework", IMF Policy Paper; February 14, 2011.

IMF, 2011b, "The multilateral aspects of policies affecting capital flows", IMF Policy Paper; October 13, 2011.

IMF, 2011c, "Global financial stability report", April 2011.

IMF, 2012, "Liberalizing capital flows and managing outflows", IMF Policy Paper; March 13, 2012.

IMF, 2013a, "Global financial stability report", April 2013.

IMF, 2013b, "Global financial stability report", October 2013.

Joyce, M.A.S., Lasaosa, A., Stevens, I., and Tong, M., 2011. The financial market impact of quantitative easing in the United Kingdom. International Journal of Central Banking 7(3), 113-162.

Krishnamurthy A., Vissing-Jorgensen, A., 2011. The effects of quantitative easing on interest rates: channels and implications for policy. Brookings Papers on Economic Activity 2, 215-287

Neely, C.J., 2010. "The large scale asset purchases had large international effects." Federal Reserve Bank of St. Louis Working Paper Series, Working Paper 2010-018D.

Ostry, Ghosh, Habermeier, Chamon, Qureshi and Reinhardt, 2010, "Capital inflows: the role of controls," IMF Staff Position Note 10/04.

Ostry, Ghosh, Habermeier, Laeven, Chamon, Qureshi and Kokenyne, 2011, “Managing capital inflows: what tools to use?” IMF Staff Discussion Note 11/06.

Standard & Poor (2011): VIX futures and the hedging of bond portfolios, Index Research & Design, Mc-Graw-Hill Financial, December 2011.

Rey, H (2013): “Dilemma not Trilemma: The Global Financial Cycle and Monetary Policy Independence”, Jackson Hole Paper, August 2013

Stein, J. C., 2012a, “Evaluating large-scale asset purchases”, Washington DC, 11 October 2012.

Stein, J. C., 2012b, “Large-scale asset purchases”, Boston, Massachusetts, 30 November 2012.

Stroebel, J.C., Taylor, J.B., 2012. “Estimated impact of the federal reserve’s mortgage-backed securities purchase program”. International Journal of Central Banking 8(2), 1-42.

Vayanos, D, Vila, J.,L., 2009. "A Preferred-Habitat Model of the Term Structure of Interest Rates," NBER Working Papers 15487, National Bureau of Economic Research.

Wright, J.H., 2011. “What does monetary policy do to long term interest rates at the lower zero bound?” NBER Working Paper No. 17154.

Table 1: Summary statistics for the dependent variables

Variable	Description		Mean	Std Dev	Min	Max
Non-financial corporate bond issuance in % GDP	Total bond issuance by non-financial companies in % of nominal GDP. Source: Dealogic and IMF.	Emerging markets	0.45	0.60	0.00	5.13
		Advanced economies	0.60	0.83	0.00	13.29
Non-financial corporate bond issuance in bn. euros	Total bond issuance by non-financial companies in billions of euros. Source: Dealogic.	Emerging markets	2.37	6.39	0.00	84.17
		Advanced economies	9.05	21.46	0.00	197.69
Non-financial corporate bond issuance in bn. constant euros	Total issuance by non-financial companies in billions of constant euros (base year, 2000 Q1). Source: Dealogic.	Emerging markets	3.01	6.90	0.00	84.26
		Advanced economies	10.39	26.51	0.00	259.95

Note: Sample period 2000 Q1 to 2013Q2, quarterly data. The list of the countries included in the sample is in Table 12.

Table 2: Summary statistics for the main explanatory variables

Variable	Description	Mean	Std Dev	Min	Max
Fed purchases of US Treasuries in % of total US debt	Changes in the amount of long term Treasury bonds held by Federal Reserve as a % of the total US gross debt. Source: Datastream.	0.02	0.66	-2.32	1.74
Fed holdings of US Treasuries in % of total US debt	Amount of Treasury bonds held by Federal Reserve in % of the total US gross debt. Source: Datastream.	8.41	1.82	3.87	10.73
Fed purchases of MBS in % of total MBS	Changes in the amount of MBS and GSE debt held by Federal Reserve in % of total outstanding MBS and GSE debt. Source: Datastream and SIFMA.	0.22	0.71	-0.79	2.47
Fed holdings of MBS in % of total MBS	Amount of MBS and GSE debt held by Federal Reserve in % of total outstanding MBS and GSE debt. Source: Datastream and SIFMA.	2.89	4.38	0.00	11.45
Realised volatility of equities	Absolute value of daily returns of the main equity index in one country. Source: Datastream.	0.96	0.49	0.25	4.28
VIX	VIX Implied volatility on options on the S&P500 Index in %. Source: Datastream.	21.79	8.48	11.03	58.32
Central bank policy rate (real)	Official central bank interest rates minus expected inflation. Source: Datastream.	2.13	4.58	-38.36	53.60
Local Equity Returns	Local equity market returns in %. Source: Datastream.	0.61	12.38	-53.35	59.43
US 10y Bond Yield	Yield of 10 year Treasury Bond in the US in %. Source: Datastream.	3.98	1.12	1.62	6.42
Real GDP forecast	Forecast of annual real GDP growth rate, according to the prevailing IMF World Economic Outlook. Source: different vintages of the IMF WEO database.	3.22	2.04	-5.50	10.00
Domestic claims (real)	Real growth rate of domestic bank claims to the private sector. Source: IFS.	6.31	9.74	-65.47	82.97
Domestic claims (nominal)	Nominal growth rate of domestic bank claims to the private sector. Source: IFS.	10.05	10.43	-49.59	82.10
International bank lending (real)	Real growth rate of international bank claims in one country. Source: BIS.	9.72	20.14	-53.00	103.06
International bank lending (nominal)	Nominal growth rate of international bank claims in one country. Source: BIS.	5.90	21.12	-79.36	103.47
Taylor rule US	Taylor rule residual for the US. Source: Haver.	3.19	2.61	-3.96	6.43
US policy uncertainty	US policy uncertainty index. Source: Baker, Bloom and Davis (2013)	116.76	37.51	63.12	215.89
Risk neutral yield US 10y	Component of the US 10 year government bond yield. Source: Adrian, Crump, Moench (2012) and authors' calculations.	2.41	1.02	0.66	4.53
Term premium US 10y	Component of the US 10 year government bond yield. Source: Adrian, Crump, Moench (2012) and authors' calculations.	1.56	0.75	-0.28	2.55

Note: Sample period 2000 Q1 to 2013Q2, quarterly data.

Table 3: Determinants of bond issuance in non-financial sector as a % GDP (Benchmark model)

Dep. variable: Non-financial issuance in % GDP	(1)	(2)	(3)	(4)	(5)	(6)
		Domestic model			**Global model**	
Explanatory Variables	**ALL**	**EME**	**AE**	**ALL** *(Benchmark)*	**EME**	**AE**
Central bank (real) policy rate	-0.025***	-0.015***	-0.080***	-0.006	-0.003	-0.015
	(0.006)	(0.005)	(0.020)	(0.006)	(0.005)	(0.027)
Realised volatility of equities	0.052	-0.097**	0.078	-0.139*	0.091	-0.127
	(0.052)	(0.046)	(0.071)	(0.078)	(0.058)	(0.097)
Realised volatility of equities (EME dummy)	-0.130*			0.197*		
	(0.069)			(0.104)		
Equity returns	0.006***	0.004**	0.008***	0.002	0.003*	0.001
	(0.002)	(0.001)	(0.003)	(0.002)	(0.002)	(0.003)
US 10y Bond yield				-0.079***	-0.074***	-0.076*
				(0.026)	(0.028)	(0.044)
VIX				0.006	-0.008***	0.003
				(0.004)	(0.003)	(0.005)
VIX (EME dummy)				-0.017***		
				(0.005)		
MBS held in % of total MBS				0.005	0.013*	-0.002
				(0.006)	(0.007)	(0.010)
Treasuries held in % of total US Debt				0.004	0.019*	-0.006
				(0.011)	(0.011)	(0.017)
Purchases of Treasuries in % of total US Debt				0.102***	0.057*	0.136***
				(0.028)	(0.030)	(0.047)
Purchases of MBS in % of total MBS				0.118***	0.041	0.187***
				(0.027)	(0.028)	(0.044)
Constant	0.507***	0.497***	0.585***	0.785***	0.541**	0.933***
	(0.087)	(0.121)	(0.122)	(0.198)	(0.228)	(0.309)
Observations	1,907	920	987	1,907	920	987
Number of countries	37	18	19	37	18	19

Note: The table shows the estimated impact of the different monetary policy instruments and the other explanatory variables on the non-financial bond issuance according to the following equation 1:

$$y_{i,t} = \beta\, MP_t + \gamma_1\, F_t + \gamma_2\, Z_{i,t} + \varepsilon_{i,t} \qquad (1)$$

$$\text{With } MP_t = [treas_t\ ;\ mbs_t\ ;\ dtreas_t\ ;\ dmbs_t]$$

The dependent variable is indicated at the top of the table. The explanatory variables are grouped in three sets: MP_t includes variables related to quantitative easing policies in the US; F_t contains common global factors that might affect the supply of capital to corporate bond markets; finally, $Z_{i,t}$ includes domestic factors in country i that affect both the demand and the supply of capital in corporate bond markets. Full description of the model is in Section III. Description of the dependent and explanatory variables is in Table 3 and Table 4. Sample period: 2000Q1 and 2013Q1, quarterly frequency. The Domestic model (columns 1 to 3) omits global factors and US QE variables (i.e. F_t and MP_t are omitted). The model is estimated alternatively for all countries "All", emerging markets only "EME" and Advanced economies "AE". ***, ** and * indicate significance at the 1%, 5%, and 10% confidence levels, respectively.

Table 4: Changing the econometric approach and the measurement of the dependent variable

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Bond issuance in % GDP			Bond issuance in bn. euros			Bond issuance in bn. constant euros		
Explanatory Variables	Benchmark Tobit	FE with Driscoll-Kraay std err	Mean group estimator	Tobit	FE with Driscoll-Kraay std err	Mean group estimator	Tobit	FE with Driscoll-Kraay std err	Mean group estimator
Central bank (real) policy rate	-0.006	0.001	0.003	0.106**	0.101**	-0.119	0.082*	0.088**	-0.102
	(0.006)	(0.002)	(0.024)	(0.045)	(0.042)	(0.116)	(0.047)	(0.036)	(0.113)
Realised volatility of equities	-0.139*	-0.143**	-0.288*	-0.588	-0.691	-1.256**	-0.412	-0.531	-1.202**
	(0.078)	(0.065)	(0.165)	(0.523)	(0.443)	(0.599)	(0.548)	(0.468)	(0.604)
Realised volatility of equities (EME dummy)	0.197*	0.209***		0.645	0.784		0.211	0.399	
	(0.104)	(0.072)		(0.719)	(0.710)		(0.755)	(0.826)	
Equity returns	0.002	0.002	0.001						
	(0.002)	(0.002)	(0.002)						
US 10y Bond yield	-0.079***	-0.072*	-0.080**	-1.246***	-1.132***	-0.675**	-1.434***	-1.314***	-0.833***
	(0.026)	(0.042)	(0.033)	(0.181)	(0.353)	(0.277)	(0.189)	(0.337)	(0.276)
VIX	0.006	0.007	0.005	0.026	0.032	0.044	0.009	0.018	0.031
	(0.004)	(0.006)	(0.004)	(0.028)	(0.039)	(0.031)	(0.029)	(0.040)	(0.032)
VIX (EME dummy)	-0.017***	-0.015*		-0.100***	-0.077		-0.088**	-0.070	
	(0.005)	(0.008)		(0.035)	(0.053)		(0.037)	(0.058)	
MBS held in % of total MBS	0.005	0.004	0.002	0.101**	0.089	0.123*	0.097**	0.086	0.121
	(0.006)	(0.010)	(0.008)	(0.043)	(0.078)	(0.074)	(0.045)	(0.084)	(0.079)
Treasuries held in % of total US Debt	0.004	0.008	0.001	0.046	0.079	0.190*	-0.030	0.008	0.139
	(0.011)	(0.011)	(0.015)	(0.073)	(0.094)	(0.108)	(0.076)	(0.100)	(0.109)
Purchases of Treasuries in % of total US Debt	0.102***	0.086**	0.096*	0.662***	0.527**	0.084	0.792***	0.648**	0.163
	(0.028)	(0.042)	(0.054)	(0.197)	(0.235)	(0.115)	(0.206)	(0.271)	(0.137)
Purchases of MBS in % of total MBS	0.118***	0.112***	0.104***	1.406***	1.314***	0.604**	1.593***	1.497***	0.718***
	(0.027)	(0.036)	(0.030)	(0.201)	(0.218)	(0.264)	(0.210)	(0.218)	(0.267)
Real GDP forecast				0.688***	0.637***	-0.209	0.762***	0.710***	-0.223
				(0.110)	(0.134)	(0.213)	(0.116)	(0.152)	(0.214)
Constant	0.785***	0.743***	0.874***	5.105***	4.913**	5.302***	6.977***	6.692***	6.963***
	(0.198)	(0.264)	(0.328)	(1.474)	(2.207)	(1.467)	(1.569)	(2.234)	(1.788)
Observations	1,907	1,907	1,907	1,895	1,895	1,895	1,895	1,895	1,895
Number of countries	37	37	37	37	37	37	37	37	37

Note: See the note to Table 3. Dependent variable as indicated at the top of each column, econometric method indicated below the title of the column (Tobit, Driscoll-Kraay and mean-group Pesaran-Smith estimator). When the dependent variable is expressed in billions of (constant) euros, the model includes the forecast of the real GDP growth rate and omits equity returns.

Table 5: Controlling for a linear trend and fixed effects

Dep. variable: Non-financial issuance in % GDP	(1)	(2)	(3)	(4)	(5)	(6)
Explanatory Variables		**Linear trend**			**Country dummies**	
	ALL	**EME**	**AE**	**ALL**	**EME**	**AE**
Central bank (real) policy rate	-0.006	-0.003	-0.014	-0.002	-0.001	-0.015
	(0.006)	(0.005)	(0.027)	(0.006)	(0.005)	(0.027)
Realised volatility of equities	-0.134*	0.099*	-0.123	-0.127	0.103*	-0.104
	(0.079)	(0.059)	(0.098)	(0.078)	(0.057)	(0.097)
Realised volatility of equities (EME dummy)	0.196*			0.209**		
	(0.104)			(0.104)		
Equity returns	0.002	0.003*	0.001	0.002	0.003*	0.002
	(0.002)	(0.002)	(0.003)	(0.002)	(0.001)	(0.003)
US 10y Bond yield	-0.090**	-0.094**	-0.088	-0.083***	-0.077***	-0.076*
	(0.038)	(0.041)	(0.065)	(0.025)	(0.028)	(0.043)
VIX	0.005	-0.009***	0.002	0.005	-0.009***	0.002
	(0.004)	(0.003)	(0.006)	(0.004)	(0.003)	(0.005)
VIX (EME dummy)	-0.017***			-0.017***		
	(0.005)			(0.005)		
MBS held in % of total MBS	0.006	0.015**	-0.001	0.005	0.014**	-0.002
	(0.007)	(0.007)	(0.011)	(0.006)	(0.007)	(0.010)
Treasuries held in % of total US Debt	0.001	0.014	-0.009	0.003	0.019*	-0.006
	(0.013)	(0.014)	(0.021)	(0.010)	(0.011)	(0.017)
Purchases of Treasuries in % of total US Debt	0.104***	0.060**	0.139***	0.104***	0.057*	0.136***
	(0.029)	(0.030)	(0.048)	(0.028)	(0.030)	(0.046)
Purchases of MBS in % of total MBS	0.117***	0.039	0.186***	0.118***	0.041	0.188***
	(0.027)	(0.028)	(0.044)	(0.027)	(0.028)	(0.044)
Linear trend	-0.001	-0.002	-0.001			
	(0.003)	(0.003)	(0.005)			
Constant	0.895***	0.733**	1.050*	0.133	-0.021	0.780**
	(0.339)	(0.365)	(0.555)	(0.213)	(0.207)	(0.306)
Observations	1,907	920	987	1,907	920	987
Number of countries	37	18	19	37	18	19

Note: See note to Table 3. Tobit models with linear trend and country dummies. The coefficients of country dummies are not reported in the table.

Table 6: Controlling for conditions in the banking sector (substitution effects)

Dep. variable: Non-financial issuance in % GDP	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Explanatory variables	**Domestic lending**			**International lending**			**Bank equity**			**Financial bond issuance**		
	ALL	**EME**	**AE**	**ALL**	**EME**	**AE**	**ALL**	**EME**	**AE**	**ALL**	**EME**	**AE**
Central bank (real) policy rate	-0.005	-0.002	-0.011	-0.007	-0.004	-0.012	-0.006	-0.003	-0.014	-0.005	-0.004	-0.019
	(0.006)	(0.005)	(0.028)	(0.006)	(0.005)	(0.027)	(0.006)	(0.005)	(0.027)	(0.006)	(0.005)	(0.026)
Realised volatility of equities	-0.155*	0.100*	-0.152	-0.146*	0.093	-0.146	-0.139*	0.088	-0.128	-0.146*	0.092	-0.141
	(0.080)	(0.059)	(0.100)	(0.079)	(0.058)	(0.100)	(0.078)	(0.058)	(0.097)	(0.078)	(0.057)	(0.097)
Realised volatility of equities (EME dummy)	0.212**			0.198*			0.197*			0.207**		
	(0.107)			(0.105)			(0.104)			(0.105)		
Equity returns	0.002	0.003*	0.001	0.001	0.003*	0.001	0.000	0.002	-0.000	0.002	0.003*	0.002
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.004)	(0.002)	(0.001)	(0.003)
US 10y Bond yield	-0.084***	-0.068**	-0.082*	-0.082***	-0.078***	-0.077*	-0.081***	-0.073***	-0.081*	-0.080***	-0.056**	-0.070
	(0.027)	(0.029)	(0.047)	(0.026)	(0.029)	(0.045)	(0.026)	(0.028)	(0.044)	(0.026)	(0.028)	(0.043)
VIX	0.007	-0.006**	0.003	0.005	-0.010***	0.001	0.006	-0.008***	0.003	0.006	-0.007**	0.004
	(0.004)	(0.003)	(0.005)	(0.004)	(0.003)	(0.005)	(0.004)	(0.003)	(0.005)	(0.004)	(0.003)	(0.005)
VIX (EME dummy)	-0.018***			-0.018***			-0.018***			-0.018***		
	(0.005)			(0.005)			(0.005)			(0.005)		
MBS held in % of total MBS	0.007	0.024***	-0.003	0.004	0.014*	-0.004	0.005	0.013*	-0.002	0.007	0.008	0.008
	(0.007)	(0.008)	(0.011)	(0.007)	(0.007)	(0.011)	(0.006)	(0.007)	(0.011)	(0.007)	(0.007)	(0.012)
Treasuries held in % of total US Debt	0.005	0.031***	-0.011	0.004	0.017	-0.002	0.003	0.022*	-0.008	0.001	0.022**	-0.016
	(0.011)	(0.012)	(0.018)	(0.011)	(0.012)	(0.018)	(0.011)	(0.012)	(0.018)	(0.011)	(0.011)	(0.017)
Purchases of Treasuries in % of total US Debt	0.105***	0.060**	0.141***	0.100***	0.056*	0.131***	0.101***	0.051*	0.136***	0.104***	0.056*	0.142***
	(0.029)	(0.030)	(0.047)	(0.029)	(0.030)	(0.047)	(0.029)	(0.030)	(0.047)	(0.028)	(0.030)	(0.047)
Purchases of MBS in % of total MBS	0.121***	0.048	0.187***	0.123***	0.037	0.196***	0.113***	0.034	0.182***	0.122***	0.043	0.207***
	(0.028)	(0.029)	(0.047)	(0.029)	(0.032)	(0.047)	(0.027)	(0.029)	(0.045)	(0.027)	(0.028)	(0.045)
Domestic claims growth rate	0.002	0.005**	-0.002									
	(0.002)	(0.002)	(0.004)									
Domestic claims growth rate (>2009)	-0.005	-0.011**	-0.009									
	(0.005)	(0.005)	(0.012)									
International claims growth rate				-0.001	-0.001	-0.001						
				(0.001)	(0.001)	(0.002)						
International claims growth rate (>2009)				0.000	-0.000	-0.002						
				(0.002)	(0.002)	(0.004)						
Equity banks returns							0.001	0.000	0.002			
							(0.002)	(0.002)	(0.003)			
Equity banks returns (>2009)							0.001	0.003	-0.000			
							(0.002)	(0.002)	(0.003)			
Financial bond issuance in % GDP										-0.009	0.146**	-0.014
										(0.012)	(0.063)	(0.016)
Financial bond issuance in % GDP(>2009)										-0.016	0.081	-0.047*
										(0.018)	(0.066)	(0.026)
Constant	0.770***	0.315	1.015***	0.843***	0.624***	0.954***	0.794***	0.517**	0.962***	0.823***	0.365	1.030***
	(0.207)	(0.245)	(0.319)	(0.206)	(0.241)	(0.319)	(0.200)	(0.229)	(0.316)	(0.203)	(0.229)	(0.321)
Observations	1,861	899	962	1,874	905	969	1,907	920	987	1,907	920	987
Number of countries	37	18	19	37	18	19	37	18	19	37	18	19

Note: See note to Table 3. The additional variables included to control for banking fragility are indicated at the top of each column. Banking sector related variables area allowed to have a different impact on bond issuance before and after the global financial crisis. The variables interacted with post crisis dummies are indicated by ">2009".

Table 7: Alternative measurement of US QE related variables.

Dep. variable: Non-financial issuance in % GDP	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Explanatory variables		**QE in % GDP**			**QE in USD tr**			**Taylor Rule**	
	ALL	**EME**	**AE**	**ALL**	**EME**	**AE**	**ALL**	**EME**	**AE**
Taylor rule US							-0.035**	-0.018	-0.047**
							(0.015)	(0.016)	(0.024)
Central bank (real) policy rate	-0.006	-0.003	-0.013	-0.005	-0.002	-0.013	-0.006	-0.003	-0.010
	(0.006)	(0.005)	(0.027)	(0.006)	(0.005)	(0.027)	(0.006)	(0.005)	(0.027)
Realised volatility of equities	-0.136*	0.075	-0.114	-0.141*	0.067	-0.117	-0.126	0.096*	-0.109
	(0.078)	(0.057)	(0.097)	(0.078)	(0.058)	(0.097)	(0.078)	(0.058)	(0.097)
Realised volatility of equities (EME dummy)	0.190*			0.190*			0.194*		
	(0.104)			(0.104)			(0.104)		
Equity returns	0.002	0.004**	0.002	0.003	0.004**	0.002	0.001	0.002	0.000
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)
US 10y Bond yield	-0.066**	-0.044	-0.077	-0.051	-0.035	-0.059	-0.059**	-0.064**	-0.051
	(0.029)	(0.031)	(0.047)	(0.032)	(0.035)	(0.054)	(0.027)	(0.029)	(0.045)
VIX	0.007	-0.007**	0.003	0.008*	-0.006**	0.004	0.002	-0.010***	-0.003
	(0.004)	(0.003)	(0.005)	(0.004)	(0.003)	(0.005)	(0.004)	(0.003)	(0.006)
VIX (EME dummy)	-0.017***			-0.017***			-0.017***		
	(0.005)			(0.005)			(0.005)		
MBS holdings	0.005	0.017*	-0.006	0.033	0.121*	-0.046	-0.002	0.010	-0.011
	(0.008)	(0.009)	(0.014)	(0.060)	(0.064)	(0.098)	(0.007)	(0.008)	(0.011)
Treasury holdings	0.014	0.026*	0.006	0.098	0.141	0.071	0.001	0.018	-0.009
	(0.013)	(0.014)	(0.021)	(0.089)	(0.095)	(0.144)	(0.011)	(0.011)	(0.017)
Treasury purchases	0.106***	0.016	0.180***	0.687***	0.087	1.179***	0.072**	0.041	0.096*
	(0.036)	(0.038)	(0.060)	(0.251)	(0.264)	(0.413)	(0.031)	(0.033)	(0.051)
MBS purchases	0.146***	0.043	0.238***	1.058***	0.249	1.765***	0.072**	0.017	0.124**
	(0.033)	(0.035)	(0.054)	(0.233)	(0.247)	(0.379)	(0.033)	(0.035)	(0.054)
Constant	0.655***	0.400	0.819**	0.579**	0.407	0.689*	0.940***	0.623***	1.145***
	(0.223)	(0.254)	(0.349)	(0.235)	(0.265)	(0.371)	(0.209)	(0.240)	(0.327)
Observations	1,907	920	987	1,907	920	987	1,907	920	987
Number of countries	37	18	19	37	18	19	37	18	19

Note: See note to Table 3.QE variables (purchases and asset holdings) scaled by US GDP (column 1 to 3); QE variables (purchases and asset holdings) scaled in USD trillions (column 1 to 3); Benchmark model with the inclusion of a Taylor rule residual for the US.

Table 8: Lagging and excluding VIX and the US 10 year yield

Dep. variable: Non-financial issuance in % GDP	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Explanatory variables	**1 lag VIX and US 10y bond yield**			**2 lags VIX and US 10y bond yield**			**No lags VIX and US 10y bond yield**		
	ALL	**EME**	**AE**	**ALL**	**EME**	**AE**	**ALL**	**EME**	**AE**
Central bank (real) policy rate	-0.006	-0.004	-0.007	-0.009	-0.003	-0.033	-0.010*	-0.006	-0.035
	(0.006)	(0.005)	(0.026)	(0.006)	(0.005)	(0.027)	(0.006)	(0.005)	(0.024)
Realised volatility of equities	-0.146**	0.015	-0.208***	-0.048	0.014	-0.098	-0.019	0.005	-0.053
	(0.058)	(0.051)	(0.080)	(0.056)	(0.051)	(0.078)	(0.054)	(0.050)	(0.074)
Realised volatility of equities (EME dummy)	0.228**			0.085			0.055		
	(0.089)			(0.087)			(0.085)		
Equity returns	-0.000	0.003**	-0.002	0.002	0.004**	0.001	0.002	0.004**	0.002
	(0.002)	(0.002)	(0.003)	(0.002)	(0.001)	(0.003)	(0.002)	(0.001)	(0.003)
US 10y bond yield t-1	-0.076***	-0.051**	-0.101**						
	(0.023)	(0.026)	(0.040)						
VIX t-1	0.013***	-0.001	0.016***						
	(0.003)	(0.002)	(0.004)						
VIX (EME dummy)	-0.019***			-0.011***			-0.009***		
	(0.004)			(0.004)			(0.003)		
MBS held in % of total MBS	0.006	0.017***	-0.004	0.011*	0.014**	0.006	0.019***	0.025***	0.010
	(0.006)	(0.006)	(0.010)	(0.006)	(0.006)	(0.009)	(0.004)	(0.005)	(0.008)
Treasuries held in % of total US Debt	0.005	0.025**	-0.002	0.004	0.024**	-0.005	0.006	0.027**	-0.005
	(0.010)	(0.011)	(0.016)	(0.010)	(0.011)	(0.017)	(0.010)	(0.011)	(0.017)
Purchases of Treasuries in % of total US Debt	0.090***	0.035	0.128***	0.064**	0.026	0.090**	0.077***	0.025	0.111**
	(0.027)	(0.029)	(0.043)	(0.027)	(0.029)	(0.044)	(0.027)	(0.028)	(0.043)
Purchases of MBS in % of total MBS	0.056*	0.026	0.104**	0.077**	0.006	0.135***	0.122***	0.029	0.190***
	(0.029)	(0.031)	(0.046)	(0.030)	(0.032)	(0.049)	(0.027)	(0.028)	(0.043)
US 10y bond yield t-2				-0.045*	-0.073***	-0.017			
				(0.025)	(0.026)	(0.042)			
VIX t-2				0.007***	0.001	0.009**			
				(0.002)	(0.002)	(0.004)			
Constant	0.625***	0.307	0.801***	0.534***	0.383*	0.542*	0.422***	0.066	0.613***
	(0.180)	(0.213)	(0.275)	(0.183)	(0.213)	(0.281)	(0.138)	(0.169)	(0.205)
Observations	1,907	920	987	1,873	905	968	1,907	920	987
Number of countries	37	18	19	37	18	19	37	18	19

Note: See note to Table 3.

Table 9: Substituting VIX with Policy uncertainty index and 10y with term premia component

Dep. variable: Non-financial issuance in % GDP	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Explanatory Variables	**Policy uncertainty index**			**Policy incertainty & risk neutral yield**			**Term premia**		
	ALL	**EME**	**AE**	**ALL**	**EME**	**AE**	**ALL**	**EME**	**AE**
Central bank (real) policy rate	-0.006	-0.003	-0.018	-0.011*	-0.007	-0.039	-0.006	-0.003	-0.022
	(0.006)	(0.005)	(0.027)	(0.006)	(0.005)	(0.025)	(0.006)	(0.005)	(0.027)
Realised volatility of equities	-0.051	0.048	-0.139	-0.062	0.015	-0.139	-0.156**	0.082	-0.152
	(0.063)	(0.054)	(0.086)	(0.063)	(0.053)	(0.086)	(0.078)	(0.058)	(0.098)
Realised volatility of equities (EME dummy)	-0.027			-0.034			0.201*		
	(0.074)			(0.074)			(0.104)		
Equity returns	0.002	0.003*	0.002	0.003*	0.004**	0.002	0.002	0.003*	0.001
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)
US 10y Bond yield	-0.069**	-0.087***	-0.050						
	(0.030)	(0.033)	(0.050)						
US policy uncertainty	0.000	-0.002**	0.002	0.003**	0.000	0.004**			
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)			
US policy uncertainty (EME dummy)	-0.001			-0.001					
	(0.001)			(0.001)					
MBS held in % of total MBS	0.006	0.023***	-0.009	0.011*	0.029***	-0.007	0.008	0.015**	0.002
	(0.007)	(0.007)	(0.011)	(0.007)	(0.007)	(0.011)	(0.007)	(0.007)	(0.011)
Treasuries held in % of total US Debt	0.006	0.027**	-0.010	0.001	0.024**	-0.017	0.000	0.017	-0.011
	(0.010)	(0.011)	(0.017)	(0.011)	(0.012)	(0.017)	(0.011)	(0.011)	(0.017)
Purchases of Treasuries in % of total US Debt	0.098***	0.049	0.134***	0.077***	0.024	0.118***	0.106***	0.058*	0.140***
	(0.028)	(0.030)	(0.046)	(0.027)	(0.028)	(0.043)	(0.028)	(0.030)	(0.047)
Purchases of MBS in % of total MBS	0.114***	0.025	0.194***	0.120***	0.031	0.199***	0.115***	0.039	0.183***
	(0.027)	(0.028)	(0.043)	(0.027)	(0.028)	(0.043)	(0.027)	(0.028)	(0.044)
Risk neutral US 10y yield				0.049*	0.034	0.071	-0.042	-0.050	-0.026
				(0.028)	(0.030)	(0.045)	(0.031)	(0.034)	(0.052)
Term premium							-0.108***	-0.091***	-0.114**
							(0.029)	(0.031)	(0.048)
VIX							0.010**	-0.006*	0.008
							(0.004)	(0.003)	(0.006)
VIX (EME dummy)							-0.018***		
							(0.005)		
Constant	0.724***	0.600**	0.743**	0.122	-0.034	0.214	0.696***	0.480**	0.820***
	(0.227)	(0.258)	(0.357)	(0.177)	(0.209)	(0.268)	(0.202)	(0.233)	(0.315)
Observations	1,907	920	987	1,907	920	987	1,907	920	987
Number of countries	37	18	19	37	18	19	37	18	19

Note: See note to Table 3. Policy uncertainty index from Baker, Bloom and Davis (2012); decomposition of the US 10 year yield into a risk neutral and a term premium component as in Adrian, Crump, Moench (2012).

Table 10: Impact of US QE and Major Central Banks QE (sum of QE instruments for both)

Dep. variable: Non-financial issuance in % GDP	(1)	(2)	(3)	(4)	(5)	(6)
Explanatory Variables		**US**		**Major Central Banks ex US**		
	ALL	**EME**	**AE**	**ALL**	**EME**	**AE**
Central bank (real) policy rate	-0.005	-0.002	-0.011	-0.007	-0.003	-0.023
	(0.006)	(0.005)	(0.027)	(0.006)	(0.005)	(0.027)
Realised volatility of equities	-0.135*	0.077	-0.112	-0.135*	0.078	-0.116
	(0.078)	(0.057)	(0.097)	(0.077)	(0.057)	(0.096)
Realised volatility of equities (EME dummy)	0.191*			0.186*		
	(0.104)			(0.103)		
Equity returns	0.002	0.004**	0.002	0.001	0.003**	-0.001
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)
US 10y Bond yield	-0.075***	-0.051*	-0.090**	-0.053	-0.007	-0.086
	(0.026)	(0.029)	(0.044)	(0.043)	(0.047)	(0.069)
VIX	0.006	-0.007**	0.002	0.005	-0.006*	-0.002
	(0.004)	(0.003)	(0.005)	(0.004)	(0.003)	(0.006)
VIX (EME dummy)	-0.017***			-0.017***		
	(0.005)			(0.005)		
Stock effect US QE	0.006	0.018***	-0.005	-0.004	0.007	-0.014
	(0.006)	(0.006)	(0.010)	(0.009)	(0.010)	(0.015)
Flow effect US QE	0.125***	0.027	0.208***	0.110***	0.022	0.183***
	(0.023)	(0.024)	(0.038)	(0.023)	(0.025)	(0.038)
Stock effect of major CB QE (ex US)				0.011	0.023	0.000
				(0.019)	(0.020)	(0.030)
Flow effect of major CB QE (ex US)				0.111***	0.044	0.178***
				(0.030)	(0.032)	(0.049)
Constant	0.748***	0.480**	0.950***	0.698**	0.247	1.082**
	(0.191)	(0.222)	(0.297)	(0.283)	(0.316)	(0.448)
Observations	1,907	920	987	1,907	920	987
Number of countries	37	18	19	37	18	19

Note: See note to Table 3. Stock effect indicates central banks' security holdings (in % of GDP) under quantitative easing programmes (for the US it indicates MSB + Treasury holdings). Flow effect indicates central banks' security purchases (in % of GDP) under quantitative easing programmes (for the US it indicates MSB + Treasury purchases). In column 4 to 6, we include the average of purchases and holdings of securities (in % of GDP) across major central banks (Fed, ECB, BoE and BoJ).

Table 11: Characteristics of Bond issuances

Dep. variable: Non-financial issuance in % GDP	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Explanatory Variables		**Credit Rating**			**Years to maturity**			**Yield to maturity**	
	ALL	**EME**	**AE**	**ALL**	**EME**	**AE**	**ALL**	**EME**	**AE**
Central bank (real) policy rate	-0.062***	-0.043***	-0.511**	0.010	0.013	-0.140	0.091**	0.089**	0.181***
	(0.012)	(0.010)	(0.249)	(0.040)	(0.032)	(0.157)	(0.035)	(0.038)	(0.048)
Realised volatility of equities	-1.361***	-0.171	-0.338	-0.618	-0.101	-0.321	0.349***	0.218	0.232**
	(0.319)	(0.124)	(0.923)	(0.463)	(0.357)	(0.569)	(0.114)	(0.323)	(0.106)
Realised volatility of equities (EME dummy)	0.854**			0.747			-0.119	0.000	0.000
	(0.351)			(0.616)			(0.264)	(0.000)	(0.000)
Equity returns	-0.004	-0.002	0.041*	0.013	0.004	0.026	-0.002	-0.001	-0.003
	(0.004)	(0.003)	(0.023)	(0.010)	(0.010)	(0.018)	(0.003)	(0.004)	(0.004)
US 10y Bond yield	-0.040	-0.139**	0.190	-0.426***	-0.447**	-0.313	0.541***	0.668***	0.408***
	(0.077)	(0.066)	(0.468)	(0.158)	(0.183)	(0.258)	(0.120)	(0.178)	(0.110)
VIX	0.107***	0.010	0.165***	0.057**	-0.052***	0.063**	0.015	0.059***	0.019
	(0.022)	(0.007)	(0.060)	(0.025)	(0.018)	(0.030)	(0.011)	(0.015)	(0.012)
VIX (EME dummy)	-0.089***			-0.100***			0.042***	0.000	0.000
	(0.023)			(0.030)			(0.010)	(0.000)	(0.000)
Stock effect US QE	-0.054***	-0.004	-0.389***	-0.104***	-0.117***	-0.084	0.015	0.031	-0.003
	(0.017)	(0.015)	(0.123)	(0.035)	(0.040)	(0.057)	(0.022)	(0.024)	(0.021)
Flow effect US QE	0.068	-0.001	0.505	-0.246*	-0.105	-0.438**	0.027	0.028	0.051
	(0.067)	(0.058)	(0.420)	(0.137)	(0.153)	(0.222)	(0.055)	(0.057)	(0.061)
Credit rating				0.608***	0.332***	0.975***	-0.560***	-0.297***	-0.770***
				(0.106)	(0.121)	(0.175)	(0.055)	(0.103)	(0.060)
Constant	12.927***	11.504***	20.987***	4.110**	8.461***	-2.227	8.526***	4.978***	11.905***
	(0.617)	(0.571)	(3.025)	(1.723)	(1.857)	(2.933)	(1.015)	(1.547)	(0.913)
Observations	1,848	862	986	1,848	862	986	1,834	854	980
Number of countries	37	18	19	37	18	19	37	18	19

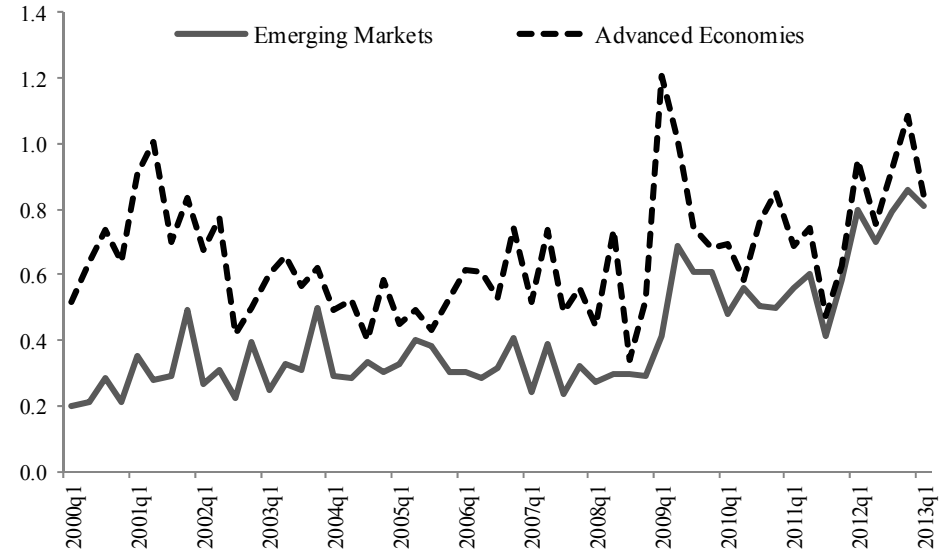
Note: See note to Table 3. Dependent variable as indicated in title of the column. Credit rating is an index ranging from 0 (lowest rating or non-rated) to 10.5 (AAA).

Table 12: List of countries in the sample

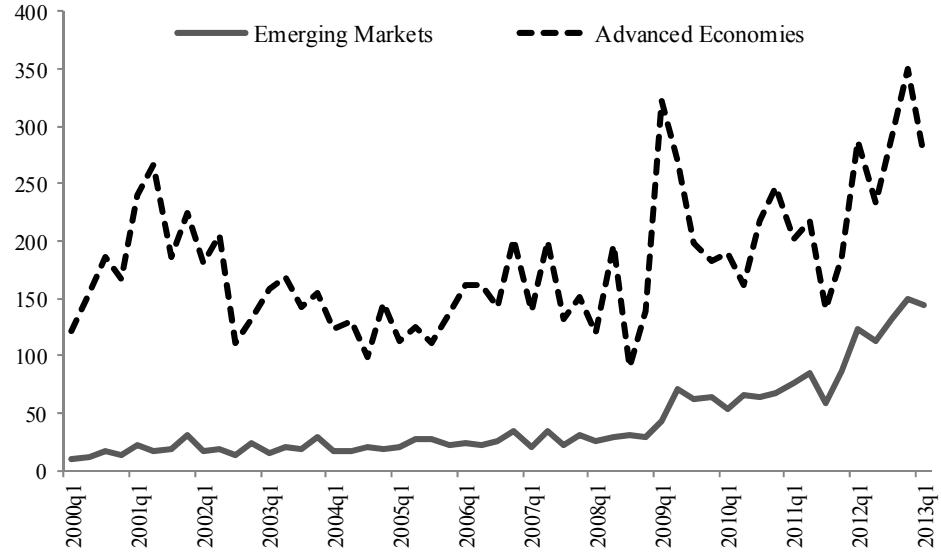
Emerging markets		Advanced economies	
Argentina	ARG	Australia	AUS
Brazil	BRA	Austria	AUT
Chile	CHL	Belgium	BEL
China	CHN	Canada	CAN
Hong Kong	HKG	Finland	FIN
Hungary	HUN	France	FRA
India	IND	Germany	DEU
Indonesia	IDN	Greece	GRC
Korea	KOR	Ireland	IRL
Malaysia	MYS	Italy	ITA
Mexico	MEX	Japan	JPN
Poland	POL	Luxembourg	LUX
Russia	RUS	Netherlands	NLD
Singapore	SGP	Norway	NOR
South Africa	ZAF	Portugal	PRT
Taiwan	TWN	Spain	ESP
Thailand	THA	Sweden	SWE
Turkey	TUR	Switzerland	CHE
		UK	GBR
		US	USA

Figure 1: Global bond issuance for non-financial corporations

Part A: In % GDP



Part B: In bn. of current euros



Part C: In bn. of constant euros

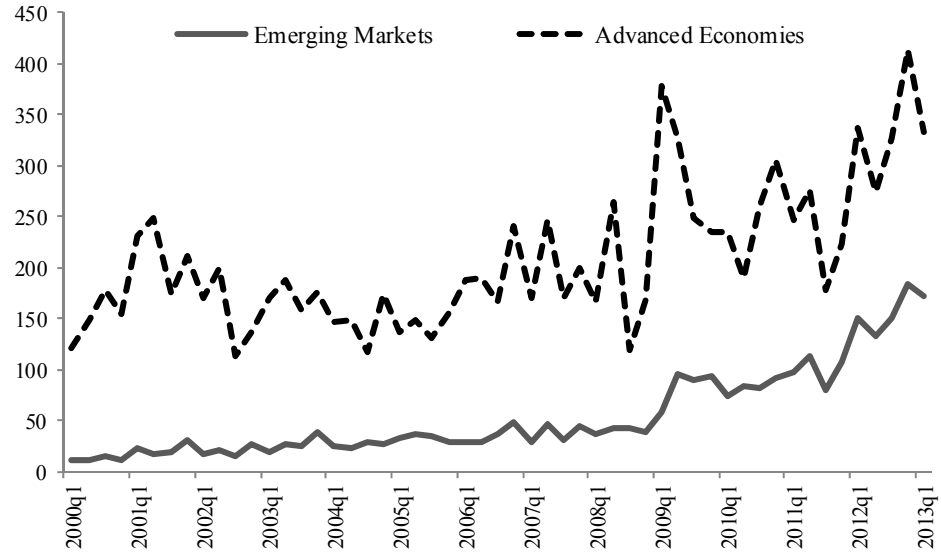


Figure 2: Synchronisation of non-financial bond issuance across countries

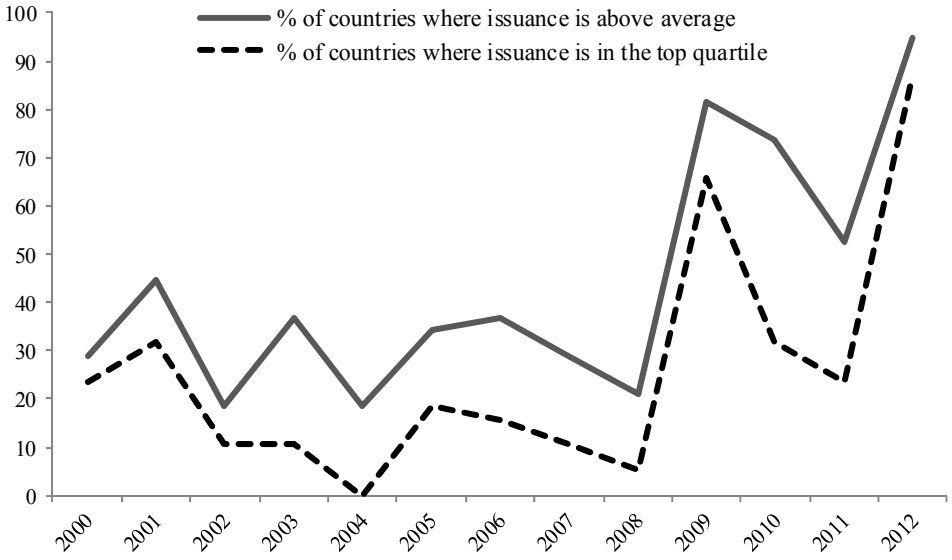
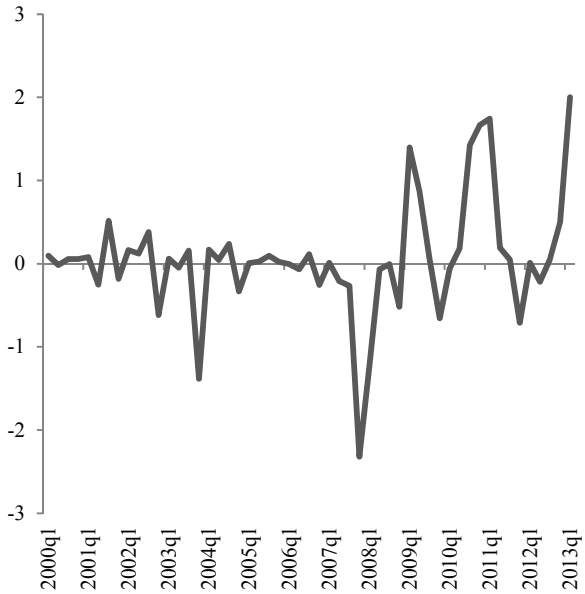


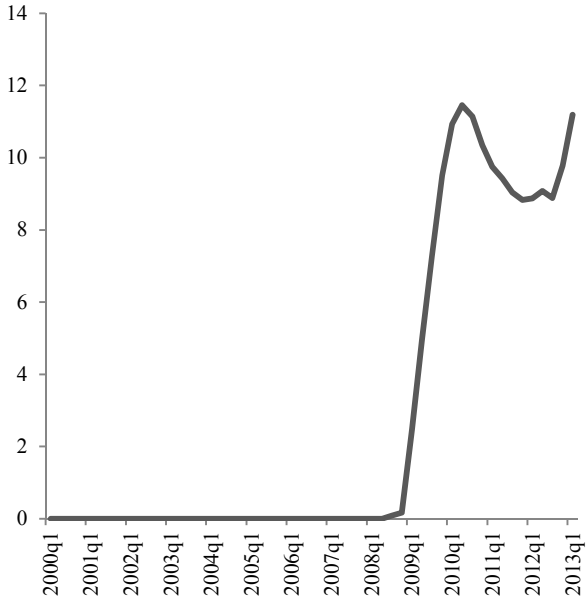
Figure 3: US QE

US Treasury securities held by Federal Reserve (% of US total debt)

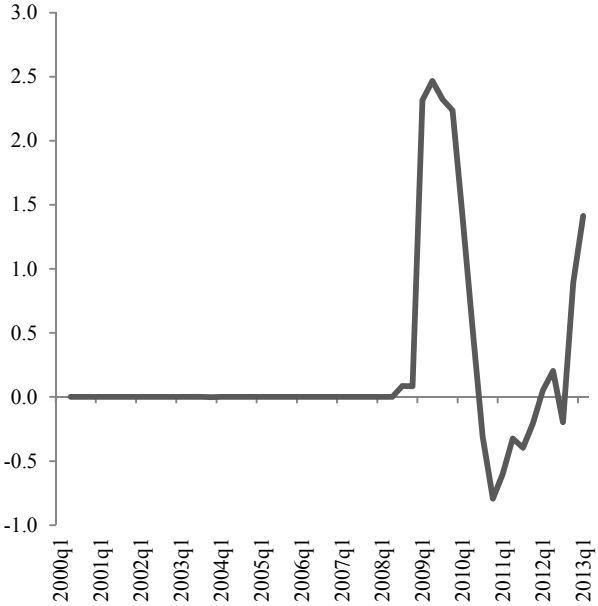
Changes in US Treasury securities held by Federal Reserve (% of US total debt)



MBS held by Federal Reserve (% of total MBS outstanding)



Changes in MBS held by Federal Reserve (% of total MBS outstanding)



Note: "MBS" includes GSE debt.

Figure 4: Counterfactual analysis based on the benchmark model for emerging markets – Scenario A

Non-financial bond Issuance in % GDP

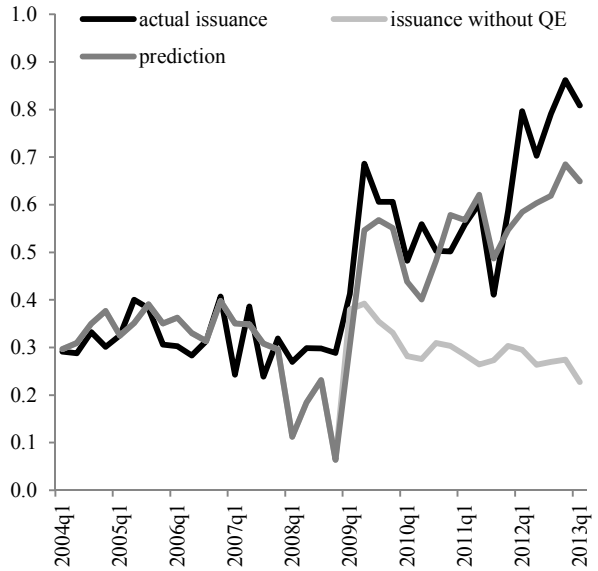
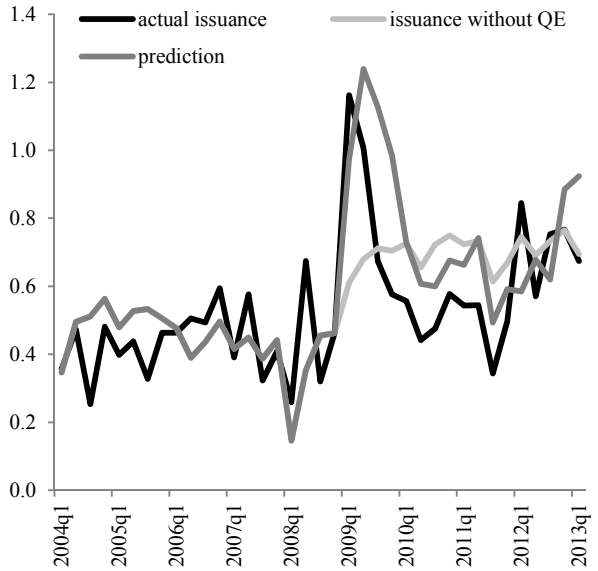


Figure 5: Counterfactual analysis based on the benchmark model for advanced economies – Scenario A

Issuance In % GDP



Note: the counterfactual analysis "issuance without QE" is based on the prediction of the benchmark model (Table 3, columns 2 and 3) when imposing the following settings: no asset purchases, security holdings (MBS and Treasuries) and US 10 year yield as of 2008 Q4, VIX at the historical average.

Figure 6: Counterfactual analysis based on the benchmark model for emerging markets – Scenario B

Non-financial bond Issuance in % GDP

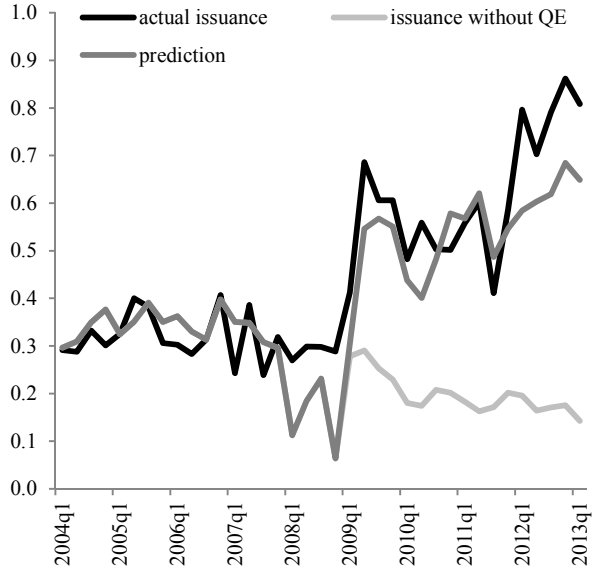
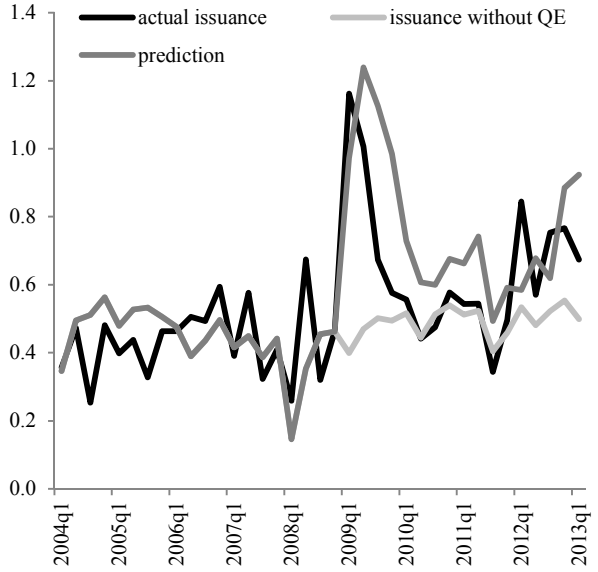


Figure 7: Counterfactual analysis based on the benchmark model for advanced economies – Scenario B

Non-financial bond Issuance in % GDP



Note: the counterfactual analysis "issuance without QE" is based on the prediction of the benchmark model (Table 3, columns 2 and 3) when imposing the following settings: no asset purchases, security holdings (MBS and Treasuries) as of 2008 Q4; VIX and US 10 year yield at the historical average.

Figure 8: Counterfactual analysis based on the model with term premium for emerging markets

Non-financial bond Issuance in % GDP

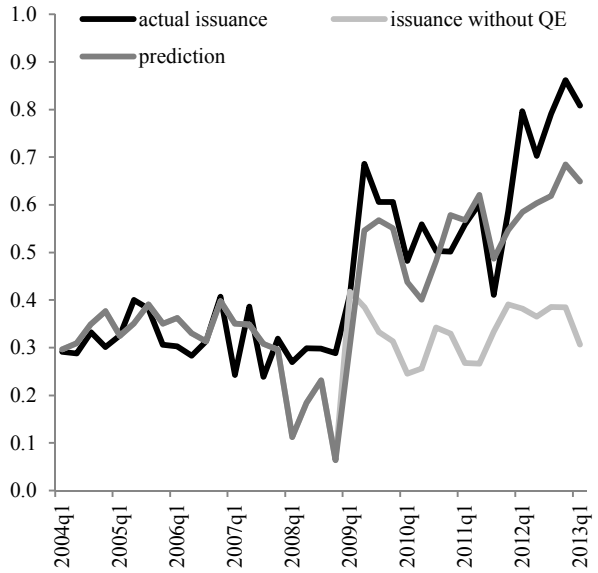
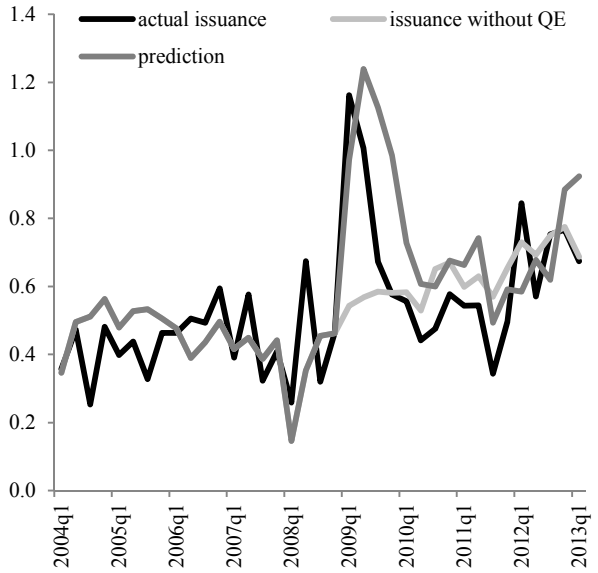


Figure 9: Counterfactual analysis based on the model with term premium for advanced economies

Non-financial bond Issuance in % GDP



Note: the counterfactual analysis "issuance without QE" is based on the prediction of the model in Table 9, columns 8 and 9, when imposing the following settings: no asset purchases, security holdings (MBS and Treasuries) as of 2008 Q4; VIX and term premium at the historical average.

Figure 10: Counterfactual analysis based on the model without separation between US QE instruments for emerging markets

Non-financial bond Issuance in % GDP

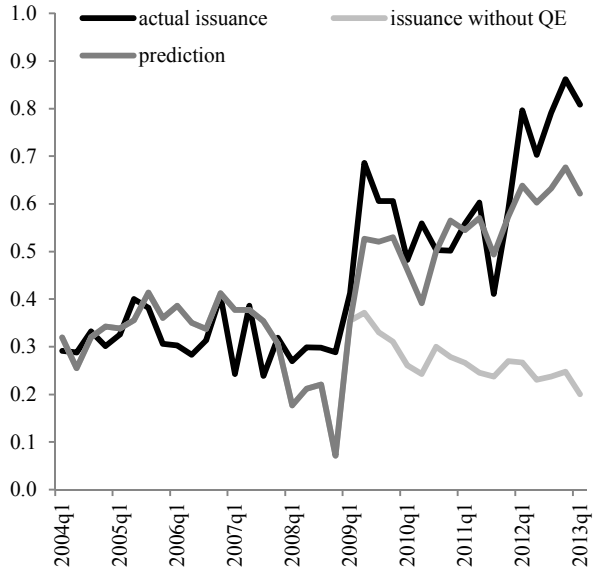
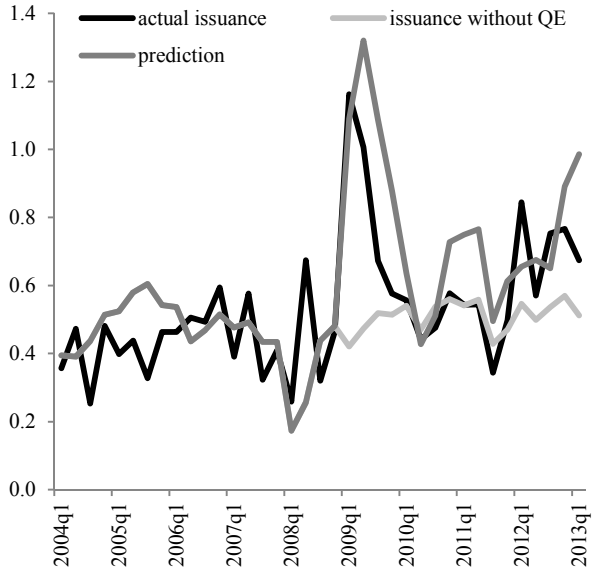


Figure 11: Counterfactual analysis based on the model without separation between US QE instruments for advanced economies

Non-financial bond Issuance in % GDP



Note: the counterfactual analysis "issuance without QE" is based on the prediction of the model in Table 10, columns 2 and 3, when imposing the following settings: no asset purchases, security holdings (MBS and Treasuries) as of 2008 Q4, VIX and US 10 year yield as at the historical average.