Credit, Bonds, Stocks and Growth in Seven Large Economies

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Abstract

We use annual real GDP and the volume of the bond, stock and credit markets to assess the causal relationship between the aggregate bond market development and economic growth in the USA, Japan, Germany, Great Britain, Italy, France and the Netherlands over the 1950 to 2001 period. The literature on the real – financial nexus to date has focused on the credit and stock markets, with few exceptions. Partially due to data availability problems, the impact of bond markets on economic growth has not yet been examined in the same way. To fill this gap we provide empirical evidence for long-run equilibrium and Granger causality in at least one direction in the relationship among real GDP and bond, credit and stock markets in seven economies with large bond markets. The supply-leading hypothesis that development of the financial markets enhances growth is supported in all countries except for Germany. The demand-leading hypothesis that economic development pulls the development of the financial markets is supported only for Germany. A feedback between domestic credits and output is found in Japan. There is evidence for a feedback between the equity markets and real output in Japan and the Netherlands.

Finance-Growth-Nexus Homepage: http://fgr.wu-wien.ac.at/institut/ef/nexus.html

Credit, Bonds, Stocks and Growth in Seven Large Economies[1]

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1   Background

The attention towards the nexus between the financial and the real sector continues and this reflects the importance of this topic for economic development.[5] The growing literature on the subject has nevertheless focused on the credit and stock markets and has largely ignored the role of the bond markets as an essential source of external financing (Wachtel, 2001; DeBondt, 2002). Favara (2003) points out that besides stock markets, developed bond markets provide information on the positive effects of financial deepening on economic growth.[6] Hawkins (2002:42) asserts that the bond market can lead to a healthier banking system by improving market discipline, and that corporate bond issuance can help central banks achieve steady economic growth. The few research efforts on the bond-growth-nexus concentrated on certain regions over fairly short time horizons (DeBondt, 2002, Buch 2002), dealt with financial crisis situations rather than the whole business cycle (Batten and Kim, 2000; Herring and Chatusripitak, 2000; Kaminsky and Reinhart, 2002), with sectoral issues of bond markets (Fink, Haiss, Kirchner, 2005; Fink, Haiss, Kirchner, Thorwartl, 2005) or linked GDP growth to the term structure of interest rates in order to forecast recessions (Harvey, 1989, 1991; Gamber, 1996; Gerlach and Smets, 1997; Ahrens, 2002). Fink, Haiss, Hristoforova (2003, 2004) offered a first empirical evidence on the bond-growth causal relationship using a VAR/VECM setting and Granger causality test. We expand the naïve bivariate model (2003) to include credit, bond and stock markets, and real GDP growth. We explicitly emphasize the interactions between the bond amounts outstanding and the GDP growth rate and asses the questions whether bond, equity and credit financing compete or complement each other with respect to facilitating access to capital funds and thereby enhance economic activity. Specifically, we model the causal relationships between the bond amounts outstanding and GDP growth in the USA, Japan, Germany, Great Britain, Italy, France and the Netherlands over the last fifty years (data-permitting). The stock amounts outstanding and private domestic credit are included in the models in order to control for substitution effects among the individual market segments over different credit cycles.

The paper is organized as follows: section two presents descriptive statistics of the bond markets and the rationale for this work. Section three elaborates on the importance of bond financing. Section four reviews the empirical literature on the finance-growth nexus. Section five outlines the methodology used. Section six presents the empirical findings, discusses the results and sketches some ideas for further research. The data sources are reported in the appendix.

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[5] To name but three large research networks: Research teams of the World Bank specialize on financial structures issues (http://www.worldbank.org/research/projects/finstructure); CEPR (http://www.cepr.org/research/networks/fertn) on the legal and political framework of finance and their implications for real growth; and the ECB-CFS Research Network on Capital Markets and Financial Integration in Europe (http://www.eu-financial-system.org/ecbcfs.html).

[6] Favara (2003), p.20.

2 Development of the aggregate bond markets

As noted by Frederico Galizia (2001), the importance of internal finance as a principal source of funds for corporations in the main European economies has been increasing through the mid 1990s. He notes that loans are the most used source of external finance, whereas equity issues rank second, and bond issues are minimal. Nevertheless, the development of a corporate bond market in continental Europe is a more recent phenomenon which is not captured by the data utilized by Galizia, which spans the 1981 to 1996 period. According to ECB surveys (ECB, 2001a: 42ff; ECB, 2003: 54ff), the key external financing instruments in the European Union are still bank loans and trade credits with bond and equity financing catching up on them[7]. In a recent publication by Citigroup, Buckland et al (2004) observe that the UK/ European equity market is shrinking, equitisation has ended and de-equitisation has begun. Companies are increasingly turning to debt markets as primary source of capital. This shift is seen as a response to forces among which would be low interest rates, the lingering effects of the bear market, changes in the asset allocation process and increased regulation.

If the last decade was the decade of equity markets, then the next will be the decade of credit (both syndicated loans and bonds), as repeated stock market crashes followed by severe recessions and the last equity market bubble burst in 2001 have lead both issuers and investors to reconsider the benefits of bonds as a financing instrument and an investment vehicle. Bonds provide issuers with an alternative access to long-term financing especially for large projects which may exceed the lending capacity of individual banks. As an alternative to loan financing, bonds offer the chance to reach a broader investor base and lower the cost of capital. As bonds usually rank below bank and syndicated loans in terms of security, they pay higher coupons and appeal to investors with a higher risk appetite as compared to investors in broadly syndicated loans. As an alternative to stock issuance, bonds do not incorporate any ownership rights and claims on income or assets. In addition to the outlined benefits for corporations (i.e. direct access to a broad investor base, intermediation cost reduction), bond issues have been increasingly used to finance government expenditures which are not covered by taxes. From a broader economic perspective, among the advantages of an integrated and efficient bond market are the provision of an extra source of long-term corporate financing, a more efficient monetary policy through re-financing operations, and risk sharing enhancement which reduces the probability of systemic crisis by limiting the concentration of financial risk in the banking sector (Turner, 2002). Thus, bond amounts outstanding became more important than stock amounts outstanding and now exceed one-third of the entire financial assets (TFA) in the USA (37%), and in the European Union (EU15: 37%, Euro-12: 39.4%). In its 2002 overview of the world bond markets Merrill Lynch reports that in spite of widening fiscal deficits, the share of central governments' bonds in the world bond

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[7] A model addressing questions such as "What explains differences in the financial structure of the US and the euro area? What are the implications of these differences for allocations?" can be found at De Fiore and Uhlig, 2005.

market continued to fall to 30% in 2001 from 41.4% back in 1995, which represents a 12-year low. This decline concerns primarily the English-speaking and Scandinavian economies, whereas government markets in Japan and the euro area continued to grow. The share of the Eurobond market continued to increase from 8.8% in 1995 up to 14.5% in 2001. The rise in the percentage share represented by the corporate market of the world bond market is not that large: its share grew form 27% in 1995 to 29.7% in 2001 (Merrill Lynch, 2002). The volume of debt securities outstanding (government, financial and corporate bonds) exceeds the stock amounts outstanding in percentage of total financial assets (TFA) in the USA, Japan, Germany, Italy, France, and the Netherlands (Table 1).

Table 1: Bond amounts outstanding and relative size of major financial sectors in 2001

Country	Bond amounts outstanding ($m)	Financial assets in % of GDP				Financial sectors in % of TFA		
		Bonds	Credit	Stocks	TFA	Bonds	Credit	Stocks
EU15+4	33,765,100	149.7	172.6	104.0	426.4	35.1	40.5	24.4
EU15	9,804,000	123.9	125.1	85.5	334.5	37.0	37.4	25.6
Euro-12	7,595,200	124.3	121.2	70.3	315.8	39.4	38.4	22.3
USA	17,772,100	176.3	162.9	137.1	476.3	37.0	34.2	28.8
JPN	5,912,800	142.6	292.5	55.0	490.1	29.1	59.7	11.2
GER	2,139,000	115.3	144.5	57.2	316.9	36.4	45.6	18.0
UK	1,677,600	117.6	141.3	151.2	410.1	28.7	34.5	36.9
ITA	1,507,500	138.3	98.2	47.9	284.4	48.6	34.5	16.8
FRA	1,439,600	109.8	106.2	89.1	305.1	36.0	34.8	29.2
NL	919,800	239.2	138.8	128.4	506.4	47.2	27.4	25.4

Notes: Countries are ranked in the descending order of the size of the bond market in $mm. Calculations are based on real 2001 data. TFA: Total financial assets = bond amounts outstanding + stock amounts outstanding + domestic credit provided by banks and MFIs. Sources: IFS, BIS, FIBV, OECD, national sources.

The US Dollar bond market grew from $1,485 billions in 1980 to $17,091 billions in 2001. The share of total government, municipal and treasury bonds decreased from 65.5%, 19.4% and 27.4%, respectively in 1980 to 50.3%, 8.6% and 12.6% in 2001, while corporate bonds gained in importance. The structure of the euro bond market changed over the 1998 to 2001 period: In the mid 1990s the restrictive Maastricht criteria lead to stagnation in the European government bond issuance. As a result, the share of government securities in percent of the total nominal value outstanding fell from 54.7% in 1998 to 48.4% in 2001, the share of non-government bonds (financial including German Pfandbriefe and non-financial) from 45.3% in 1998 to 51.6% in 2001, respectively (Merrill Lynch, 2002: 42). Corporate bond issuance in Europe was enhanced by the introduction of the euro in 1999 (Harm, 2001; ECB 2001a; Peree and Steinherr, 2001; De Bondt, 2002; Fink and Fenz, 2002; Neaime and Paschakis, 2002, European Commission, 2002), which integrated the segmented national bond markets of the member countries. The most pronounced effects were a strong trend in overall issuance with an increasing share of private relative to public bond issuance, and an increased foreign issuers' activity (European Commission, 2002: 147). At the end of 1999 the amounts of euro-denominated debt securities issued by euro area non-financial corporations reached almost 3% of total corporate liabilities in the euro area, compared with 10% in the USA and Japan (ECB, 2001b). At the

end of 2001 this ratio increased to 7% of total liabilities of euro area non-financial corporations (ECB, 2002d). The average annual growth rate of the amounts outstanding of euro-denominated debt issued by euro area non-financials, which can be derived form this increase, is around 20% in the first three years after the introduction of the euro.

The government bond markets profit from the increased liquidity and the investor base diversification resulting from a better integration of the market segment. As recorded by Peree and Steinherr (2001: 8ff), at the advent of the euro Germany and Italy substantially increased their individual bond issue sizes to provide investors with adequate liquidity. The increased competition among issuers is expected to lead to the development of a wider innovative product range over time, which would enhance efficient and innovative public debt management Europe (European Commission, 2002: 156). Spain, for example, issued bonds with maturities where the largest borrowers (France, Germany and Italy) are not very active. The Netherlands and Belgium used buy-backs and exchange offers to reduce the number of government bonds and to merge them into larger issues (Peree and Steinherr, 2001: 9). Denomination in euro facilitates companies to issue (euro denominated) corporate bonds in other than their domestic markets and increases competition in bond underwriting (and thereby lowers the cost of long-term capital), as evidenced by the sharp rise in net issuance in the first two quarters of 1998. After a temporary decline it peaked in 1999 (more than 360 billions of US dollars) and remained at relatively high levels compared with the pre-euro period (IMF 2003: 137). The share of European corporate bond amounts outstanding doubled to 16.3% of total non-government bond amounts outstanding during the 1995 to 2000 period according to BIS 2001 data. However, it still lags behind the USD corporate bond market, although in the USA the ratio of total non-government bond amounts outstanding declined over the same period by roughly 4% to 24.8%. The recently observed growth in corporate bond issuance is most probably the result of a long-term process of disintermediation within the predominantly bank-oriented financial systems of continental Europe, which closes a gap in the European financial system. Telecom and automotive companies were among the most active issuers. As the bond market becomes more liquid and mature, smaller firms are also expected to make use of this financing opportunity (European Commission, 2002: 159). As only about 500 European companies have corporate ratings by the rating agencies (Standard and Poor's, Moody's, and Fitch Ratings) against approximately 3,000 rated in the USA (ECB, 2001c), there is still large potential in Europe.

The ongoing development of the securities markets and the growing institutional investors' base suggest that debt securities financing will gain importance within the European Union and globally in the mid- to long-term (ECB, 2001a, 2001b, 2002a, 2004, 2005; European Commission, 2002; London Economics et al, 2002). Joint efforts for developing Asian bond markets by East-Asia-Pacific central banks and the IMF may provide an additional trigger (Parsons, 2003; Haiss, Marin,

2005).[8] Bond markets exhibit remarkable average growth rates during the floating exchange-rate regime since its inception in 1973 until 2001 (Table 2).

Table 2: Average annualized bond market growth rates of the individual countries

growth rates	FRA	GER	ITA	JPN	NL	UK	USA
1973-78	series starts in 1977	13.85	15.68	26.92	23.96	series starts in 1976	11.98
1979-84	24.51	11.03	20.26	14.12	13.85	13.10	13.33
1985-90	14.20	8.52	14.27	7.10	17.31	0.85	12.66
1991-96	9.47	14.76	12.44	6.68	14.12	16.08	7.64
1997-01	8.34	8.68	5.27	6.93	19.94	13.67	8.83
1999-01	9.00	6.23	8.81	7.71	18.02	11.46	7.28

Note: On alphabetical order of country tickers. Values are reported in percent. Growth rates are calculated as $(\sqrt[k]{x_{t+k}/x_t} - 1) * 100$ where k denotes the number of years and x represents the outstanding amounts of securities in the starting year. Source: own calculations.

Generally, bond market growth has been high and relatively stable during the investigated period, while stock markets show remarkable fluctuations due to inherent valuation effects.

We briefly skim through the developments of the financial markets in the individual countries in the sample. A commonly observed pattern across all countries is the decline in equity amounts outstanding in the late 1990s in favor of a pronounced upward trend in bond financing. The French bond market grew strongly over the considered period. The corporate bond market has experienced some growth in recent years, while the market for debt securities issued by financial institutions was declining. In 1993 the bond markets left credit markets behind, which is in line with the long-term process of disintermediation in the predominantly bank-oriented financial systems of continental Europe.

The rising financing needs of the state after the German reunification drove the strong expansion of the German bond market from 1992 to 1995. Afterwards international bonds and debt securities issued by financial institutions gained importance. Nevertheless, Germany remains a credit-oriented culture with credits amounts of more than 45% of total financial assets (TFA).

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[8] More on the development of bond markets in emerging markets can be found at Luengnaruemitchai and Ong, 2005 as well as at IMF, 2005.

Table 3: Development of the bond, stock and credit markets against GDP

Development of the French GDP and Financial Markets

Development of the German GDP and Financial Markets

Development of the Italian GDP and Financial Markets

Development of the Japanese GDP and Financial Markets

Development of Netherland's GDP and Financial Markets

Development of the UK GDP and Financial Markets
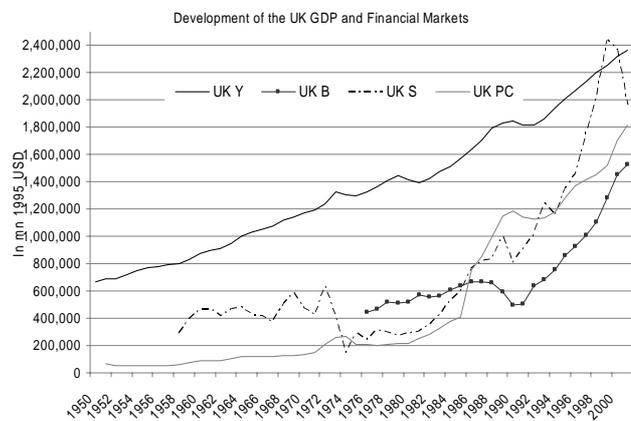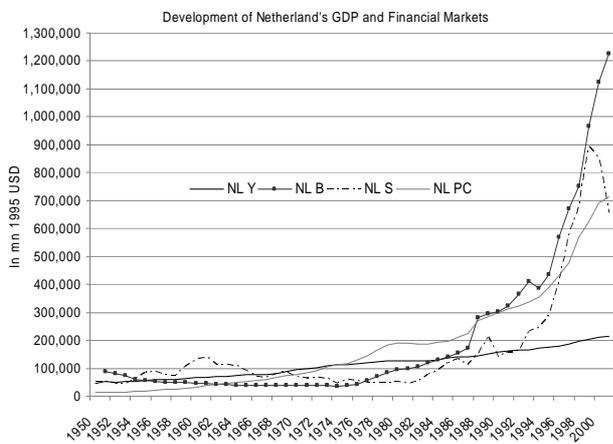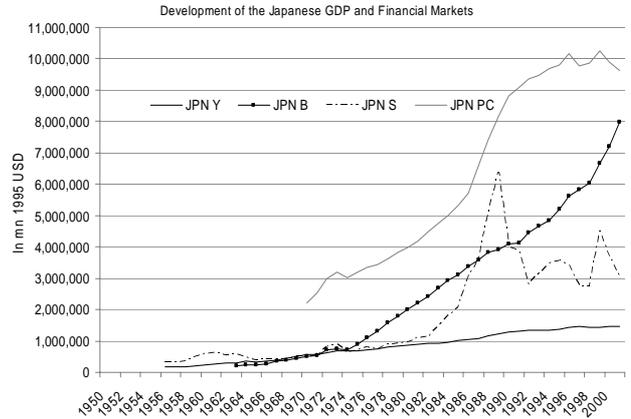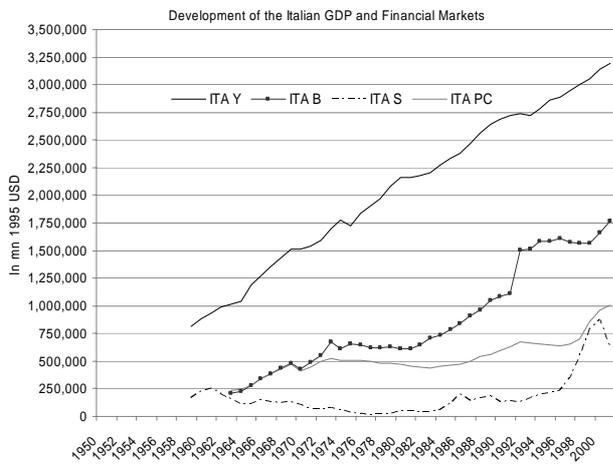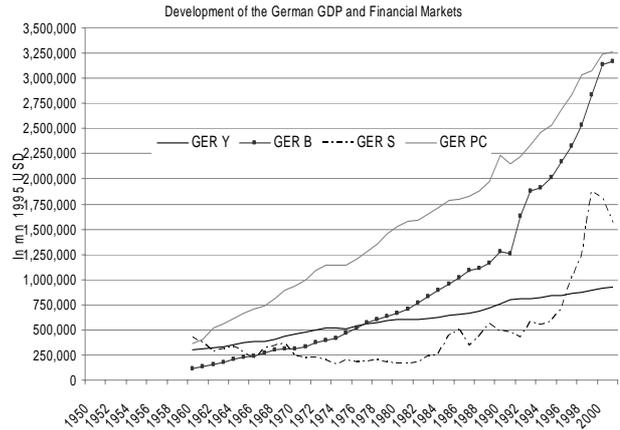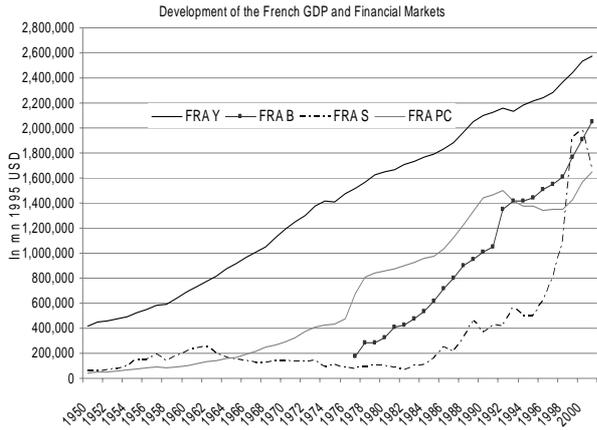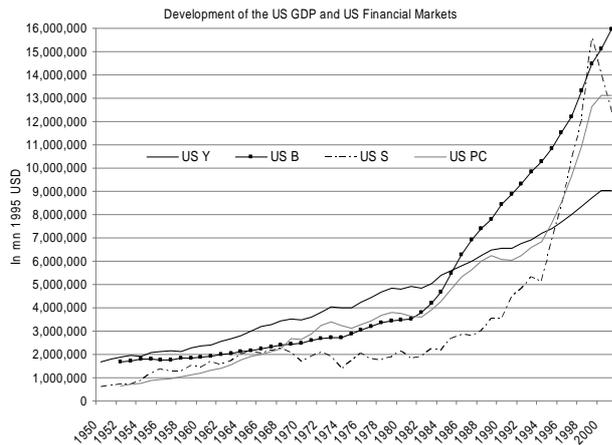
Note: Y denotes GDP, B denotes bond amounts outstanding, S denotes stock amounts outstanding, PC denotes private credit.

In Italy bond and credit are the preferred financing sources. Due to the excessive stock of public debt, the restrictions of the Maastricht criteria lead to a dramatic decrease in the government bond amounts, whereas at the same time the amounts of international debt securities increased.

In Japan bond and credit financing have become popular over the last three decades due to increased government financing. Other debt securities became less important, which is quite the opposite of the US experience. According to the statistics reported by Batten and Szilagyi (2003: 84), in September 2001 financial institutions held 52.2% of TFA in the Japanese economy (compared with 51.9% in March 1998). The shrinking of the Japanese banking sector suggests that some restructuring within the financial system has taken place, which drove the growth of insurance and pension funds. Insurance and pension funds are found to play a key role in the establishment of viable institutional investor base for corporate bonds (Batten and Szilagyi, 2003: 85). Although in the past public financial institutions made much greater use of bond issues than private companies, the latter exhibit a distinct trend towards disintermediation. Batten and Szilagyi (2003: 89ff.) report statistics on the private companies' outstandings in domestic debt securities that allow for the conclusion that Japanese corporations able to issue debt try to reduce their dependence on bank loans.

In the Netherlands the bond market grew substantially during the last three decades. The main driving force in the 1990s was the international market segment, whereas the government bond sector stagnated. The equity and domestic credit markets experienced the same upward trend, though 1999 marked a sharp decline in the equity amounts outstanding, whereas the aggregate bond amounts outstanding continued to grow at the same pace. These developments let us conclude that substitution effects among the different sources of financing took place.

Debt instruments in the UK have enjoyed high popularity and represent the largest market segment in the late 1970s (data is available from 1977). The reduction in bond amounts outstanding in the late 1980s has to some extend been caused by the tight fiscal policy of the Thatcher era. In the 1990s the British bond market grew strongly – initially thanks to an expansion of the government bond

sector, but then mainly due to a boom in the international bond issuance. The most recent developments plotted above, i.e. simultaneous growth in bond amounts outstanding and domestic credit amounts, and a sharp drop in equity amounts outstanding, let us conclude on a transition taking place away from equity towards debt financing, or in other words, substitution between financing instruments in favor of bonds and credit.

In the 1970s the bond amounts outstanding in the USA exceeded the stock amounts. However, all three financial market segments tracked GDP growth quite closely. Since early 1980s the outstanding amount of debt securities has been following a steady growth path, which became particularly pronounced after 1992. While in the 1980s the loose fiscal policy of the Reagan administration was probably the driving force of this growth, the structural analysis of the bond market in the 1990s tells a different story. The economic boom of the 1990s resulted in a decline in the government bonds as the Clinton administration reduced debt.

3   The bond channel

To put the study into context, it appears useful to outline theoretically the characteristics of bonds as financing instrument. Bonds as financial contracts combine some features of both bank credit and stocks, but exhibit differences with regard to transaction costs, liquidity, the level of information disclosure and cost, scale, marketability, investor type, borrower type and institutional setup. These product-related issues translate into the respective financing channels and the range of triggers for GDP growth. Bonds represent debt, they are contracts to borrow a certain principal amount with a certain maturity at specified interest and repayment schedule, while stock claims promise payment of a share in profits on a pro rata basis and usually convey a proportionate vote in important corporate governance matters. Bond and stock issuers and investors do not need to have any relationship to each other, whereas bank loans are credit contracts between a borrower and a single or a few lenders, and tend to be smaller than bond issues and less liquid (Eigengreen and Mody, 2000). Bank lenders and borrowers frequently share other business relationships as well (e.g. Berger and Udell, 2002; Santos, 1998; Stanton, 2002). Banks can therefore offer long term relationships to borrowers not available in the debtor-securities-markets, which reduce information asymmetry and moral hazard (Davis, 2001:12). While bank credit provides financing to the small-scale retail segment and for shorter maturities, bonds are used to raise larger volumes by corporations, financial institutions, the government, and mortgage institutions for longer maturities (with shorter maturities covered by commercial paper and smaller volumes raised rather via private placements). The choice among bank debt, market debt securities and stocks has been studied extensively on the borrower level. According to the Rajan model (1992), the choice between bank debt and bond issuance is driven by the trade-off between the costs and benefits to the firm arising from the informational advantage of the bank with regard to other lenders. Based upon that setting, Chemmanur and Fulghieri (1994) allow for debt

renegotiations in the event of financial distress and conclude that firms with a lower probability of financial distress choose bonds over bank loans. Bolton and Freixas (2000) similarly find that firms turn to banks as source of investment mainly because banks are good at helping them through times of financial distress. As this financial flexibility is costly, the relatively mature and safer firms tap the bond markets, while the riskier firms have to bear the costs and turn to bank finance. Size and institutional environment permitting, firms are willing to incur the costs of issuing bonds because it gives them access to capital markets and saves them the costs of contracting with a bank (Santos, 1998). Boot and Thakor (1997) also show that borrowers of higher discernible credit quality increasingly access the bond markets rather than banks. Denis and Mihov (2003) emphasize the importance of the credit quality argument in a similar way.

In addition to the institutional differences, there is also a difference with regard to the content being financed, as for example a significant part of bank loans are granted to households to finance housing (Thiel, 2001:12; ECB, 2003:51). Bonds come in larger chunks to warrant the heavy fixed cost of issuing a direct financial claim to large borrowers, i.e. may lower marginal transaction cost compared to raising the same volume via retail banking, whereas small borrowers cannot access debt securities markets due to the high fixed cost of an issue (Davis, 2001:12). Different from bilateral bank credit, bonds are usually in bearer format so that payments of interest and principal are made to the holders of the bond, implying they can be traded on the capital market. This suggests that bond markets, similar to stock markets, make financial assets less risky because they allow investors to buy and sell quickly and cheaply when they wish to alter their portfolio.[9] Easy access and less-risky assets (for example government bonds) improve the allocation of capital, an important channel of economic growth (Arestis, Demetriades Luitel, 2001:18). The provision of liquidity through organized exchanges also encourages investors to transfer their surpluses from short-term assets to the long-term capital market, granting firms access to permanent capital for large projects that may enjoy scale economies (Thiel, 2001:18; Wachtel, 2001:350).

While the provision of bank credit requires an individual credit risk check, raising money via bond issuance is more standardized, with due diligence, info memos and prospectus made public. Most bond issues are regularly rated by rating agencies, while only certain categories of corporate credit like project loans or syndicated loans are rated as well in most European countries. The decision to raise money via bond issuance thus implies a rather high level of stock-like public disclosure, representing a corporate governance approach quite different from bilateral bank credit. The bond market produces a market evaluation of company and country/currency developments. This valuation of assets by the bond market provides benchmarks for the value of business assets, which can provide important signals to other business units and investors. If bond markets are developed and information costs for bondholders are low, bond spreads tend to be low (Buch, 2002). Underdeveloped bond

markets may deprive the economy of a crucial source of information, and limit risk pooling and risk-sharing opportunities (Herring and Chatusripitak, 2000).[10] Well-developed bond markets may both enhance corporate control and improve the efficiency of financial markets. Effects of new information flows may, however, also introduce higher price volatility compared to bank credit, which may undermine the ability of bond markets to promote an efficient funds allocation. Bond prices also provide important signals to economic agents help adjust individual perceptions. Bonds are generally used for financing long-term and very long-term investments (as opposed to short-term consumption financing or revolving credit lines) by both public and corporate debtors. Bonds play a special role in raising large volumes for company restructuring and reshaping industries in mergers and takeovers, privatization and refinancing of public licenses (most notably auction financing of telecom privatization and bandwidth auctioning; Galati and Tsatsaronis, 2001; ECB, 2003:55). Bond finance thus may also be an important input factor contributing to the realization of technical progress (Thiel, 2001). In that sense bond markets encourage specialization as well as acquisition and dissimination of information, qualities also attributed to stock markets (Arestis, Demetriades and Luintel, 2001). Perhaps it is this role of restructuring and quick provision of large-chunk finance to growth sectors that makes the absence of a bond market render an economy less efficient and significantly more vulnerable to financial crisis (Herring and Chatusripitak, 2000:4).

While the emphasis here is on bonds, it has to be noted that bond, stock and bank credit markets are interrelated (see Davis, 2001, or Wachtel, 2001 for a review). The relative maturity of these sectors may be of major impact on the magnitude and type of relationship between them (Hawkins, 2002), as may be the case for regulatory interference.[11] Their functional relationship can be that of substitute sources of corporate, government and financial sector finance since when a firm issues new bonds its borrowing needs from banks declines (Bolton and Freixas, 2002). In case of a banking crisis, the bond markets serve as a "spare tire" (Greenspan, 2000) and may close the gap in fresh money, as was the case following the Franklin National failure in the US in 1974 (Davis, 2001:8) and during the Basle-I-accord-related credit rationing in the early 1990s in the US (Hawkins, 2002). However, it could also be difficult to place corporate bonds (Hawkins, 2002).

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[9] According to Bolton and Freixas (2000) and Hull and Tesar (2001), the reliance on bank finance increases in the riskiness of firms whereas the share of bond finance declines.

[10] The argument here goes beyond spread size. More fundamentally, Herring and Chatusripitak (2000) argue that in the absence of a bond market, an economy will lack a market-determined term structure of interest rates that accurately reflect the opportunity cost of funds at each maturity and which also is a major prerequisite to the development of derivatives markets that enable economic agents to manage financial risks.

[11] For Japan, Abiad and Ashoka (2003) argue, that the development of the government bond sector created demand for cutting restrictions on the corporate bond sector. The growth of the corporate bond sector caused a revenue decline for commercial banks, which were prevented from participating in the bond market. This led the government to liberalize the scope of banking activities.

4 Literature Review

4.1 Causal relationships between the financial and real sector

Five hypotheses describe the possible causality patterns between economic activity and finance: (1) supply-leading; (2) demand-leading; (3) interdependence; (4) no causal relation; and (5) negative causality from finance to growth (Blum, Federmair, Fink and Haiss, 2002). The *supply-leading* hypothesis maintains that accumulation of financial assets triggers economic growth. The modern branch of the supply-leading finance literature unarguably begins with the works of Mc Kinnon (1973) and Shaw (1973). The major consensus ever since is that finance positively influences real economic performance. The *demand-leading* hypothesis assumes that real growth drives the emergence and establishment of financial centers. This hypothesis regards financial development as endogenously determined by the real economy or its needs. This view is consistent with the Coase theorem (1956) and the new institutional economics, which argues that institutions adjust to market imperfections in a way that maximizes individual utilities. Lucas (1988) promotes the view that there is *no causal link* between the financial sector and real economic development. This assertion holds only in a neo-classical world of zero transaction costs (Graff, 2000) and perfect information. In such a world, the Modigliani-Miller theorem (1958) holds and institutions, particularly financial institutions, do not matter. The irrelevance hypothesis has been attacked from various sides. Economists increasingly deny the existence of frictionless markets due to informational issues (e.g. Hirshleifer and Teoh, 2003; Shiller, 2003), agency problems (e.g. Santos, 1998), transaction cost economics[12] (e.g. Williamson, 1991), stakeholder issues (e.g. Barringer and Harrison, 2000; Freeman, 1984) and the influence of the respective institutional (e.g. DiMaggio and Powell, 1983) and legal environment (e.g. Barth, Caprio and Levine, 2003; La Porta, Lopez-de-Silanes and Shleifer, 1998; Levine, 2002). Generally, the importance of institutions is now more acknowledged than in the past and a large number of empirical studies present strong evidence for the relevance of finance for real growth[13]. Most of them use as explanatory variables one or more financial variables, such as various money aggregates, usually relative to (real) GDP, credits to non-financial institutions, and bank assets as a measure of the banking sector. Market capitalization, stock market turnover and stock market cycle features (Hahn, 2002; Edwards, Gómez Biscarri and Pérez de Gracia, 2003) are drawn to describe the capital markets. Researchers have only recently attempted to include internal financing (notably Rivaud, Dunset, Dubocage and Salais, 2001, and Claessens and Laeven, 2002), trade credit (Fisman and Love, 2003; de Blasio, 2003), international financial integration (Edison, Levine, Ricci and Sløk, 2002) and the interaction with inflation (notably Rousseau and Wachtel, 2002). Control variables and

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[12] While production costs of organizations vary (for example as a result of scale, learning and location), transaction costs also vary, and include expenses derived from arranging, managing, and monitoring transactions across markets. See Barringer and Harrison (2000:369) for a review.

[13] For a recent overview see Favara, G. (2003), An Empirical Reassessment of the Relationship between Finance and Growth, IMF Working Paper WP/03/123.

conditioning sets of empirical studies cover a wide range of macroeconomic, institutional and educational indicators. In the studies reviewed here, the dependent variable is mainly real per capita GDP growth. In some cases investment-related variables are used also. Studies operating on the industry-level additionally use value added as a dependent variable.

4.2 Empirical studies on bank intermediation, stock markets and growth

While cross-country studies generally test the a priori assumption that finance influences the real economy (Levine, Renelt, 1992; King, Levine, 1992; Atje, Jovanovic, 1993; Sala-i-Martin, 1997; Berthélemy, Varoudakis, 1997; Graff, 2000; Rivaud-Danset, Dubocage, Salais, 2001; Leahy, Schich, Wehinger, Pelgrin, Thorgeirsson, 2001; Claessens, Laeven, 2002, Hahn, 2002), time-series analyses typically address the question of causality via Granger causality tests (Arestis and Demetriades, 1997; Kugler and Neusser, 1998; Darrat, 1999; Shan, Morris and Sun, 2001). There is weak empirical evidence in favor of the supply-leading pattern in the early stages of (financial) economic development, as well as of demand-leading causality in the very long run. The supply-leading pattern can be traced back to Joseph Schumpeter (1911), who asserts that a well-functioning banking system promotes technological innovation by selectively funding the most innovative and creative enterprises having the best prospects of success. Most studies using time-series analysis focus on the banking sector and the stock markets in order to evaluate the (positive) impact of the bank intermediation and efficient stock markets on real growth. The evidence is heterogeneous (Levine, 1997; Wachtel, 2001).[14]

Similarly, earlier time-series studies concentrate only on the banking sector and stock markets and neglect the bond markets, but they partly employ a similar testing methodology as utilized in this paper. The focus on the banking and the stock market segments could be due to availability of data (Thiel, 2001:45; Wachtel, 2001:352). The most frequently found pattern supports the supply-leading hypothesis, and in some cases bi-directional causality. Hannson and Jonung (1997) examine a single country (Sweden) over a very long time period, which makes it possible to test long-term causality patterns in the sense of Patrick (1966) or Gerschenkron (1962). The evidence based on cointegration analysis shows bi-directional causality between bank credit and real per capita GDP for most of the time from 1834 to 1991 and supply-leading causality for the 1890 to 1934 period. Rousseau and Wachtel (1998) find evidence for supply-leading finance in USA, Canada, UK, Sweden, and Norway for the 1871 to 1929 period. Arestis and Demetriades (1997) employ the classical Granger causality test together with system exogeneity analysis to investigate the links between the stock market capitalization and per capita GDP in the USA and Germany based on quarterly data for a shorter period (1979-1991). In the case of Germany, they find evidence for supply-leading finance, and no causality in the USA. Kugler and Neusser (1998) use financial sector GDP of 13 OECD countries

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[14] A detailed review of the studies is provided in Fink, Haiss, Hristoforova (2003).

from 1960 to 1997 as an explanatory variable, and the GDP of the manufacturing sector as a dependent variable, and find a whole range of possible causality patterns varying across countries and time. Al-Yousif (2002) applies a cross-country and a time-series approach (1970-1999) and finds bi-directional causality to be the dominant, yet not the only observable pattern. The recent study by Shan, Morris and Sun (2001) covers 6 EU countries, three EU accesston countries and China, and investigates the dynamic link between real per capita GDP growth and bank credits measured by the loans granted by commercial and other deposit-taking banks. They apply the Granger causality test within a VAR setting with a conditioning set and find demand-leading, supply-leading, and bi-directional evidence.

4.3 Previous studies on the bond-growth nexus

Empirical studies on the bond-growth nexus are scarce and the vast majority of research on the finance-growth nexus focuses on the impact of banks and stocks on growth. Over the last ten years, several studies have shown that the changes in the slope of the yield curve (the difference between the long-term and the short-term yield) contain information about future real economic performance (Harvey, 1989, 1991; Bernanke, 1990; Estralla and Hardouvelis, 1991; Gamber, 1996; Ahrens, 2002). While the pricing side may be relevant as a signal for the economy and there is some relation to growth, we focus on the supply function of bonds. Davis (2001) applies financial cost variables (short-term interest rate, credit spread, share prices, term spread) and financial demand variables (real investment, the investment-GDP-ratio, the ratio between borrowing and investment) to explain the change in real corporate debt securities net issuance in the U.S., Canada, the U.K. and Japan. Corporate debt securities issuance is found to be more sensitive to cost elements and less sensitive to the business cycle compared to bank loans. Herring and Chatusripitak (2000) investigate the implications of the absence of a well-functioning bond market for savings, the quality and quantity of investment and risk management. They conclude that the absence of a developed bond market may render an economy less efficient and significantly more vulnerable to financial crises (Schinasi and Todd-Smith, 1998; Batten and Kim, 2001). Szilagy, Battan and Fetherston (2003) argue that countries with developed bond markets fared comparatively better during the Asian banking and financial crises. Eichengreen and Luengnaruemitchai (2004) investigate the reasons for the slow bond market development in Asian countries. They find that larger economies and countries with competitive banking systems have also better capitalized bond markets. Buch (2002) and London Economics et al (2002) concentrate on the cost effects of bond financing on the financial sectors. Buch (2002) compares cross-border bank debt and bond holdings and finds that host country GDP has a significant and positive impact on both. Lower information costs in more developed bond markets lead to more bond finance. London Economics et al (2002) study the direct impact of European integration on the equity and corporate bond markets and its indirect impact on capital formation and GDP. They find that a reduction in the cost of bond finance together with an increase in the share of bond finance in

total debt finance causes rise in output. Similar to Thiel (2001), they argue that deregulation-driven M&A, the phasing in of the Euro, and UMTS telecom licensing provide major growth triggers to corporate bond issuance.

De Bondt (2002) provides evidence on the structure and dynamics of the corporate bond market in the Euro zone after the introduction of the euro, i.e. over a rather short time horizon (1999:01-2001:06). The paper reviews three theoretical frameworks of corporate bond issuance: (1) a simultaneous model of all corporate financial liabilities in a portfolio modeling framework, (2) a supply-and-demand model for corporate bonds simultaneously, and (3) a supply function of corporate bonds. The third approach is adopted due to data limitations. The financing needs and substitution between debt securities and other sources of corporate finance are considered as main explanatory factors for bond supply. Corporate debt issuance is positively correlated with mergers and acquisitions and with industrial production, taken as a proxy of investment expenditures or working capital. The timing and size of these explanatory factors for corporate debt securities issuance differ across maturity. The introduction of the euro triggered (at least partially) corporate restructuring, which in turn resulted in financing needs for M&A. M&A are reflected in short-term bond issuance in the same month and with a one-quarter lag, and in long-term bond issuance after three quarters. A one-to-one relation between corporate debt securities issuance and industrial production is found. Regression results and Granger causality tests show that various macroeconomic factors explain movements in corporate bond spread which have forecasting power for real output growth.

Table 4: The link between debt securities and growth: Overview of the studies on bonds

Category, Authors, Year of publication		Focus	Market segments Sample coverage	Major findings
Theoretical	Goldsmith 1969	Financial structure-& development - Real development relationship.	Primarily intermediation in up to 20 countries: 1860-1963.	The ratios of financial assets to real wealth in different countries converge in the long run.
	Herring & Chatusripitak 2000	Implications of the absence of a well-functioning bond market for savings, quality and quantity of investment, risk management	Flow-of-funds-data for South-East Asian countries, Australia, Japan, the UK and the USA	The absence of domestic bond markets may cause: loss of information contained in market determined interest rates, leading to over or under investment and less efficient allocation of capital; loss of welfare to savers, resulting in less investment; higher cost of capital to firms, a higher reliance on FDI and international financial markets, and a bias towards short-term investment; the(highly leveraged) banking sector will be larger than it would otherwise be. In combination these issues render an economy more vulnerable to crisis and lower GDP growth.
Empirical	Rousseau & Wachtel 1998	Ratio of sum of financial institution assets, corporate stocks and bonds to total financial assets	USA, Canada, UK, Sweden, Norway 1871-1929	In applying granger causality in a VAR vector error correction model, evidence of one-way causality from finance to real per capita output growth is provided.

Category, Authors, Year of publication		Focus	Market segments Sample coverage	Major findings
Empirical (continued)	Davis & Ioannidis 2002	Are debt securities and bank loans substitutes or complements	Flow-of-funds data for the U.S. 1979-1999	Positive relation is found between debt security financing and banking financing. Issuance of corporate debt securities is significantly explained by bank loans, the difference between the t-bill rate and the prime rate, the spread between corporate and government bonds, the stock market index return, and cyclical fluctuations of corporate investment.
	Buch 2002	Determinants of cross-border claims of banks and international bond holdings	1997 data for 75 countries, full data for France, Italy, Japan, UK & USA	GDP per capita and GDP of the host country have a significant and positive impact on both cross-border claims of banks and of cross-border bond holdings. The importance of bond lending rises as countries develop, with mild support that countries for which information costs are low receive more bond finance.
	London Economics et al 2002	Impact of EU financial market integration on equity and bond market, capital formation and GDP	Euro-denominated corporate bond stock within the European Union Member countries	The growth in the cumulative stock of Euro-denominated corporate bonds issued by non-financial European firms caused a decline in credit spreads. Mild support is found for a reduction in trading cost by total bond market size. The combination of the reduction in the cost of bond finance together with the increase in the share of bond finance in total debt finance is argued to cause a rise in output.
	G. de Bondt, 2002	Corporate debt securities in the Euro area.	Euro area corporate debt securities: 1999:01-2001:06.	Corporate debt issuance is positively related to M&A and industrial production. Substitution with other sources of finance is related to cost differentials. Timing and size of explanatory factors of corporate debt securities issuance differ across maturity. Corporate bond spreads lag short-term interest rates and lead real economic growth.
	Fink, Haiss, Hristoforova 2003a	Bond market growth & GDP growth	11 EU economies: 1950-2000	Empirical evidence for causality patterns supporting the supply-leading approach in the UK, Germany, Austria, the Netherlands and Spain. Evidence of interdependence between bond market capitalization growth and real output growth in Finland and Italy.
	Fink, Haiss, Kirchner, Thorwartl 2005	Sectoral bond market growth & GDP growth	15 EU economies, USA and Japan: 1951-2000 / 1970-2000	Examination for different bond sectors (government / corporate / financial institutions bonds): Economic growth is causal for net issue values of government bonds (demand leading approach) while net issuance of corporate and financial institutions bonds are causal for economic growth (supply-leading approach).
Descriptive	Köke, Schröder 2002	Eastern European capital markets: historical development & legal settings	Czech Republic, Hungary, Poland: 1995-2000	Stock markets grew unevenly across countries, with developments in the Czech Republic being particularly disappointing. Bond markets dominated by public sector debt securities (exception: the Czech Republic, where corporate bonds are significant). The importance of internal finance for firms' investment is higher than in EU countries (exception: Hungary). Bank credit remains the main source of external finance even for listed firms.
	ECB 2002b	Importance of financial sector development in EU accession countries	12 EU Accession Countries (AC)	AC financial sectors are dominated even more strongly by the banking sector than those of the euro area countries. Banks crowd out the corporate debt market. Good firms prefer to be listed abroad rather than using the narrow domestic markets. The development of capital markets would possibly follow further strengthening of the banking sector. A positive correlation between financial sector development and growth is plausible, but the experience is too short to assess.

Our paper advances on this earlier work in several ways: Our time horizon encompasses 25 to 50 years and therefore several business cycles. We look at the aggregate bond market instead of single segments and therefore capture the aggregate effect of gross public and private investment financing. We use changes in stock variables instead of flow variables to account for valuation changes and implicitly for changes in the interest rate level, too. We employ the aggregate bond amounts outstanding instead of bond issuance or interest rate spreads to achieve comparability with earlier work on stock and bank markets and real growth. Public bonds are included because in many countries

public investment makes up a major fraction of total investment. Moreover, studies examining the link between bank credit and growth hardly distinguish between credits granted by public and by private banks. La Porta, Lozep-de-Silanes and Shleifer (2002) recently drew attention to the important role of government bank ownership in many countries. Accordingly, our model consists of real GDP growth, real bond amounts outstanding, real stock amounts outstanding and domestic credit to the private sector. Theoretically, real capital stock growth might be used as an intermediate variable between financial markets and GDP growth if there were not the usual problem to assemble reliable data on the real capital stock (taking into account depreciation rates and valuation changes over time).

5 Methodology

Our aim is to examine the causal relationship between the development of the bond, stock and credit sectors development and economic growth in seven developed economies over the 1950 to 2001 time period. The direction of the causality is of a particular interest as it may help explain the driving forces for the emergence and development of financial markets. Thereby it can convey policy implications how to enhance continuing financial growth, which eventually leads to capital accumulation. The direction of the causality cannot be tested via cross-country approaches, as they usually assume a priori that finance influences growth (e.g. Darrat, 1999, Favara 2003). At least European markets for debt issues up to 2000 were still largely segmented along national borders (Harm, 2001: 245), and this provides another reason why the time-series approach is more appropriate than a cross-country or a panel data approach. Therefore we perform a time-series analysis within a VAR framework, where the growth rate of each series is regressed on lagged changes. If there is evidence for a long-run equilibrium relationship, a cointegrating term enters the regression as well. The tests are in real terms in order to account for possible inflationary effects. The notation used throughout the paper uses the following abbreviations, whereas lower case letters generally denote natural logarithms of the variables used, and Greek letters are used to denote regression coefficients:

y_t denotes real GDP

b_t denotes bond amounts outstanding

s_t denotes stock amounts outstanding

pc_t denotes domestic credit to the private sector

$\alpha_{k,r}$ denote(s) the adjustment coefficient(s) in the cointegrating equation(s)

β denote(s) the coefficients of the levels in the cointegarting equation(s)

All series are converted to USD using the 1995 USD exchange rate to reflect real 1995 US dollars in order to achieve better readability. The 1995 USD exchange rate is preferred to the current USD exchange rate in order to avoid the impact of exchange rate fluctuations on the time series variables. Otherwise the information on the size of the debt markets and the level of economic activity would be distorted. Next, the series are transformed into natural logarithms to produce more homogeneous time series. First differences of the natural logarithms of the level variables are

commonly interpreted as growth rates. As the natural logarithms of the variables in levels are co-integrated, the examined relationships imply level effects and not permanent growth effects. For the second to be true, the growth rate of real output needs to be co-integrated with the level of the bond market capitalization. This requires the growth rate of output to have the same order of integration as the other variables in the model(s) in levels, which is ruled out by the finding that all variables are difference stationary.

The order of integration of the time series is determined with the Augmented Dickey and Fuller (ADF) and Phillips-Perron (PP) unit root tests. The ADF test is most commonly used, but it requires homoscedastic and uncorrelated errors in the data generating process. The PP nonparametric test generalizes the ADF test and allows for less restrictive assumptions for the investigated time series (Darrat, 1999). Both tests were performed to ensure unbiased inference about the order of integration of the variables. The lag order of the ADF regressions that ensures uncorrelated residuals is selected via the Akaike's Information Criterion (AIC). As expected, both tests show that all series are non-stationary in levels and stationary in first differences.[15] Therefore we proceed with the Johansen test for cointegration. We select the appropriate lag order for the Vector Error Correction Models (VECM) based on the minimum value of the AIC. The maximum lag number is capped at four years for two reasons: First, since this is the assumed length of one credit cycle, it is economically reasonable to allow for developments in the financial sector to affect the real sector within one credit cycle and vice versa. Second, due to the annual frequency and the limited data points, a longer lag would result in loss of degrees of freedom. By using annual data we alleviate the potential weakness of the study by Arestis et al. (2001), where vector error correction methods, and specifically the Johansen (1988) approach, is applied to quarterly data in five economies. As Beck and Levine (2004) correctly point out, it is not clear whether the use of such high-frequency data and error correction techniques fully abstract from high frequency factors influencing the links among the banking, stock markets and growth to focus on long-run economic relationships. Of course, we could have used five-year averages as Beck and Levine (2004) in order to abstract from business cycle phenomena. However, this is not possible due to the anyway short time series available in the first place (maximal 50 observations).

The conclusion about cointegration is taken on the basis of the trace and maximum eiqenvalue test statistics produced by the Johansen test at the 5% level. If the series are cointegrated, in addition to the independent lagged changes, the error-correction term (which is the formal representation of the long-run equilibrium) provides an extra channel for Granger-causality in at least one direction (Granger, 1986). The Granger-causality restriction corresponds to the restriction that the error-correction term does not enter the regression. Therefore, b_t Granger-causes y_t if its coefficient *and/or* the coefficient of the error-correction term are statistically significant (Darrat, 1999). We refer to this

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[15] To save space, the output of the unit root tests on the time series in levels and first differences (test specifications include an intercept and a linear trend), are not reproduced here, but are available upon request.

as long-term causality and test the adjustment coefficient for significance. To check for short-term causality we additionally perform an F-test on the lagged changes in the VECM.

The empirical analysis then focuses on the long-run relationships, as the investigated relationship between the financial and the real sectors is inherently a long-term one. Lastly, it has to be noted, that a statistically significant coefficient of the error-correction term does not allow for further inferences on the direction of the long-run causality. This difficulty arises from the fact that the error-correction term results from a regression on two non-stationary variables (essentially, it is an OLS regression on the levels of the variables, which, as documented by the ADF and PP unit root tests, are not stationary). In case the Johansen test statistics fail to find evidence for cointegration, we specify a VAR model in first differences. Within the VAR framework we perform a Granger test for causality on the lags to test for short-run interactions among the growth in the amounts outstanding of stocks, bonds, credit and GDP growth.

6 Empirical Results

This section presents and discusses the regression results of the econometric models outlined above concerning the links between economic growth, credit, bond and stock market development. A review of the country sample and the error-correction models is offered in table 5. The term α is typically less than unity, unless there is overshooting, and the closer its value to one, the faster is the adjustment of the dependent variable to its correct long-term level as estimated by the model.

Table 5: Country Sample (countries in alphabetical order)

Country	Sample	No. Observations	Model (lag)
France	**1980 2001**	**22**	**VECM (2)**
Germany	**1964 2001**	**38**	**VECM (3)**
Italy	**1965 2001**	**37**	**VECM (1)**
Japan	**1975 2001**	**27**	**VECM (4)**
Netherlands	**1954 2001**	**48**	**VECM (2)**
UK	**1979 2001**	**23**	**VECM (2)**
USA	**1957 2001**	**45**	**VECM (4)**

Table 6: Vector Error Correction Models Estimates (VECM). Long-run equilibrium relationships

Country	DV	α CE 1	t-ratio	α CE 2	t-ratio	α CE 3	t-ratio
France	dBond	-0.34	[-1.79]	-0.05	[-0.29]	-	-
	dY	-0.03	[-1.04]	0.02	[1.07]	-	-
	dStock	1.60	**[2.34]**	2.19	**[3.95]**	-	-
	dPCredit	-0.02	[-0.17]	0.04	[0.45]	-	-

Country	DV	α CE 1	t-ratio	α CE 2	t-ratio	α CE 3	t-ratio
Germany	dBond	0.17	**[3.10]**	-	-	-	-
	dY	0.04	[1.48]	-	-	-	-
	dStock	0.68	**[2.26]**	-	-	-	-
	dPCredit	0.15	**[4.39]**	-	-	-	-
Italy	dBond	0.02	[0.21]	-0.06	[-1.15]	-	-
	dY	0.05	**[2.53]**	-0.05	**[-3.69]**	-	-
	dStock	0.71	**[2.74]**	-0.49	**[-2.64]**	-	-
	dPCredit	-0.05	[-0.95]	0.00	[-0.01]	-	-
Japan	dBond	-0.06	[-0.59]	0.21	[0.44]	-	-
	DY	0.00	[0.08]	-0.06	[-0.47]	-	-
	dStock	-0.92	[-1.64]	6.23	**[2.19]**	-	-
	dPCredit	-0.34	**[-4.75]**	1.82	**[5.03]**	-	-
NL	dBond	-0.05	[-1.08]	0.47	[1.10]	-0.07	[-0.37]
	dY	0.00	[-0.46]	0.09	[1.16]	-0.04	[-1.06]
	dStock	0.18	**[2.25]**	0.55	[0.71]	-0.24	[-0.76]
	dPCredit	-0.07	**[-3.35]**	1.06	**[5.47]**	-0.43	**[-5.41]**
UK	dBond	-0.61	**[-2.61]**	-	-	-	-
	dY	0.01	[0.31]	-	-	-	-
	dStock	0.26	[0.57]	-	-	-	-
	dPCredit	-0.48	[-1.11]	-	-	-	-
USA	dBond	-0.12	**[-1.73]**	0.53	**[3.15]**	-	-
	dY	-0.04	[-0.59]	-0.17	[-1.14]	-	-
	dStock	0.87	**[2.31]**	-0.06	[-0.06]	-	-
	dPCredit	-0.07	[-0.45]	0.42	[1.15]	-	-

Notes: GDP time series generally start in 1950 and are denoted by Y. DV denotes dependent variable. Growth rates are denoted by a *d* before the variable. CE denotes cointegrating equation. The number of cointegrating equations (up to three) corresponds to the rank of the cointegrating matrix. α denotes adjustment coefficient. *t*-ratios are given in square brackets next to the estimated coefficients. The detailed VEC specifications are not reported in the text to save space but are available upon request.

France: The French stock markets converge to the long-term equilibrium level estimated by the error-correction terms. In addition, short-term changes in the level of credit volume are Granger causal to the stock amounts growth (positive influence). Changes in the bond amounts outstanding and in the credit volumes are Granger causal to GDP growth. The coefficient of the one-year lagged change in bond amounts outstanding is negative and very low (-0.07), whereas the positive coefficient of the one-year lagged change in domestic credit (0.30) is interpreted as relatively strong positive effect of the banking sector on growth.

Germany: The growth rates of the individual financial segments converge to the long-term equilibrium defined by the error correction term (which is normalized to last period's bond amounts outstanding) as evidenced by the positive and highly statistically significant speed of adjustment coefficients. The same does not apply to the real growth. In the short-term, private credit growth is found to explain changes in the bond amounts outstanding, as well as both bond and stock amounts changes explain subsequent changes in the private credit growth with a two- and three-year lag, respectively. The negative coefficients of these lagged changes allow for the conclusion that the German financial sectors are negatively correlated with the subsequent amounts of credits granted. The test for Granger causality on the lags that enter the regressions shows that changes in the credit

amounts are Granger causal for bond amount changes, as well as that both bond and stock amount changes are Granger causal for changes in the level of domestic credit, and lastly that GDP growth is Granger causal for the stock market development. We interpret these patterns as an evidence of substitution effects amongs the different types of financing used by corporations in Germany.

Italy: Both GDP growth and stock amounts growth adjust to their correct long-term values as estimated by the error-correction terms. In the sort-term (within a year), private credit growth positively influences both GDP growth and growth of the stock amounts outstanding. The bond markets do not respond in any way to the developments of either the financial markets or GDP (none of the estimated coefficients is statistically significant).

Japan: The finding that GDP growth and bond market growth in Japan are linked both in the long term as well as over short-term horizons is attributable to a combination of regulatory effects, spillover effects from the banking sector and spillover effects from public debt. Both the Japanese government spending as well as the corporate investment activity over the analyzed period has been largely financed through government bond issuance. The large share of outstanding Japanese Government Securities has been issued to offer banks an alternative form of investment (Batten and Szilagyi, 2003:85). Growing government bond issuance shifted Japanese borrowing from private towards the public borrowers. The Japanese government has become increasingly leveraged over time, with roughly 85% raised via debt securities, with considerable parts of the proceeds used for bank bailouts. Currently, the amount of Japanese government bonds is ballooning contrary to policy aims to reduce the government deficit and ensure stable absorption of the bonds in the market (Lehman Brothers Japan Bond Research, 2003). Our findings capture the growing role of financial intermediaries in Japan's financial system. According to the statistics reported by Batten and Szilagyi (2003:84), in September 2001 financial institutions held 52.2% of TFA in the Japanese economy (compared with 51.9% in March 1998). The alleged shrinking of the Japanese banking sector suggests that some restructuring within the financial system has taken place, the expression of which is the growth of insurance and pension funds. These are found to play a key role in the establishment of viable institutional investor base for corporate bonds (Batten and Szilagyi, 2003:85). Although in the past public financial institutions made much greater use of bond issues than private companies, the latter exhibit a distinct trend towards disintermediation. Batten and Szilagyi (2003:89 ff.) report statistics on the private companies' outstandings in domestic debt securities that allow for the conclusion that Japanese corporations able to issue debt try to reduce their dependence on bank loans.

The Netherlands: Credit changes and stock amounts changes converge in the long run to the estimated values. In the short run, bond amounts growth and GDP growth jointly Granger cause stock amounts changes. There is evidence for feedback between stock amounts growth and GDP growth, and GDP growth is further Granger causal to credit volume growth.

United Kingdom: This finding looks reasonable when considering the fact that the British stock markets are far more efficient and liquid than the stock markets in continental Europe where bank loans and bonds are still the preferred from of corporate financing. Alternative explanations could be rooted either in spillover effects from international into domestic U.K. bond markets or large scale bond issuance by U.S. based institutions out of London since the inception of the Euro driven by currency and interest rate differentials as indicated by Fink and Fenz (2002). The role loan and bond securitization have played since 1998 needs also to be taken into account when comparing the British and the US fixed income markets with the European markets, as especially after the 1998 crisis the securitization of corporate loans and bonds gained on importance over the stocks as an alternative investment, which offers more diversification and a higher risk-adjusted return. The Granger causality test fails to identify the direction of the causality in the short run.

In the *USA* the corporate bond markets are developed best compared to the rest of the world, bond market financing overtook loan financing through domestic banks (Hawkins, 2002:42). In the early 1990s, as well as in the recent situation, banks in the USA are rationing credit. In such an environment the bond markets substitute bank lending as a source of corporate funding (Hawkins 2002:43).

Table 7: Summary of the causality patterns (countries in alphabetical order)

Hypothesis	Supply-leading			Demand-leading			Substitution effects					
Country	Bonds to GDP	Stocks to GDP	Pcredit to GDP	GDP to Bonds	GDP to Stocks	GDP to Pcredit	Bonds to Stocks	Bonds to Pcredit	Stocks to Bonds	Stocks to Pcredit	Pcredit to Bonds	Pcredit to Stocks
France	0.05		0.00									0.02
Germany					0.03			0.05		0.02	0.00	
Italy			0.03									0.09
Japan	0.00	0.01	0.03		0.02	0.00	0.00	0.00		0.00	0.07	0.00
Netherlands		0.00			0.05	0.03	0.02	0.10				
UK	0.05	0.03										
USA		0.08					0.01	0.02				

7 Summary and conclusion

We use annual real data on the bond amounts outstanding and GDP in seven developed economies over the 1950 to 2001 time period while controlling for the stock markets development in order to assess the hypotheses of supply-leading and demand-leading finance, and to capture any substitution and complementary effects between bond and stock market financing. Cointegration techniques and Granger causality tests are used to perform the empirical work. Causality in at least one direction, as identified by the error-correction models, runs in all but two economies in the sample of seven countries examined here. We find support in favor of the supply-leading hypothesis that developed financial markets enhance real economic activity, which corresponds to causality from either bond market growth or stock market growth or credit amounts growth to GDP growth, in all

except for Germany. Support for the demand-leading hypothesis that economic development enhances the development of the financial markets is found in Germany, Japan, and the Netherlands. Thus in a number of countries we were able to present evidence for interdependence (Table 6).

The causality patterns differ from country to country due to the heterogeneity of market structures and the different degree of openness and international integration of the capital markets in our country sample. Interpreted in the context of the theoretical studies on the bond channel, our findings are not deprived from economic backing and even confirm the various observations with respect to both the historical evolution and the hypotheses with respect to the role of the bond markets.

Via the EC-term causality in at least one direction, if not feedback, runs in all but two economies in the sample when in addition to the bond amounts stock amounts enter the regressions. When all the three financial market segments and GDP series are jointly modeled, there is evidence for long-term convergence within a maximum of four years. The short-term empirical findings which can be derived from this setting are: The *supply-leading* hypothesis that development of the financial markets serves as an impulse for real economic activity corresponds to causality from either bond market growth or stock market growth or credit amounts growth to GDP growth. Support for this proposition is found in all countries except for Germany. The *demand-leading* hypothesis that economic development pulls the development of the financial markets as they need to satisfy the increasing financing needs of a booming economy translates into causality from the real sector to one or more of the financial market segments. Such an isolated pattern is found only in Germany. A *feedback* between domestic credits and output, as well as between stock market growth and output growth, is found in Japan, and for the latter case in the Netherlands.

In order to offer a satisfying and profound interpretation of the statistical relationships identified in this survey, a deep knowledge of the historical economic evolution of each country is needed. Future theoretical assimilation of the presented findings would therefore be only of a benefit to the current research. Considering the five Euro area countries, the findings are consistent with the view expressed in the recent study by Hartmann, Maddaloni and Manganelli (2003) on the structure and integration of the euro area financial systems. Possibly the reduction of government financing that happened due to the constraints imposed by the Stability and Growth Pact, created room for more financing of non-financial corporations. The latter may have been first the consequence of the general decrease in interest rates that we have witnessed over the last six years (1995-2001) and that created incentives for investments by the corporate sector. And second, investors with a long-term investment horizon had to turn to non-government assets (Hartmann et al. 2003:13). In the USA, where the corporate bond markets are developed best compared to the rest of the world, bond market financing overtook loan financing through domestic banks (Hawkins, 2002:42). In the early 1990s, as well as in the recent situation, banks in the USA are rationing credit. In such an environment bond markets substitute bank lending as a source of corporate funding (Hawkins 2002:43).

Apparently, our research constitutes only a very first step towards the integration of the aggregate bond markets in the discussion on the finance-growth nexus. The presented evidence is encouraging in unveiling the existence of causal relations between the fixed-income financial sector and the real sector – a path that has been largely neglected in favor of the extensive research on the role of the stock markets in promoting growth. The deficiency of the relatively short time sample available for some countries is that it cannot be split to test for structural breaks and linearity in the relationships found. The latter is desirable considering the Portuguese and Spanish financial market development from autarky to more integrated financial sector after joining the European Community (EC) in 1986. Utilization of higher frequency data instead of the annual data used in this study would offer a possibility to reject our findings or to find even stronger causal ties. As the log levels of the variables under investigation are co-integrated, the examined relationships imply level effects and not permanent growth effects. For the second to be true, the growth rate of real output needs be co-integrated with the level of the bond market capitalization. This case necessitates that the growth rate of output has the same order of integration as the level of real bond market capitalization, which is ruled out by the finding that both variables are difference stationary.

At a later point in time, similar research applied to Central and Eastern European and /or Asian countries would convey very interesting insights for comparative and policy-making purposes. As our surveillance shows, sufficiently long time series needed to perform a time-series analysis for these countries are still not available, but this perspective provides a positive practical step for future research in international finance.

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APPENDIX

We use annual observations spanning the 1950-2001 time period (criterion for inclusion is sufficient data availability for all variables of interest). The aggregate amount of bonds outstanding is drawn to measure the size of bond markets. The stock amounts outstanding measure the size of the equity markets, and domestic private credit measures the banking sector. GDP data are from the IFS of the IMF, and the OECD Historical Statistics (1960-1997, 1998 Paris) and National Accounts of OECD Countries, Volume 1 (Main Aggregates, Paris, diverse issues), and are drawn from the WIFO database (http://www.wifo.at/db/index.html). The nominal GDP time series are from the IFS (99B). The real GDP series until 1969 are converted by transforming the nominal GDP from the IFS with the GDP-deflator from the IFS (99BVP). The real GDP series from 1970 to 2001 are drawn from the OECD National Accounts (FIN"B1_GE_VOB). The OECD Historical Statistics index is used for Austria (till 1963) and Portugal (till 1968). The data on bond amounts outstanding from 1990 to 2001 comes from the BIS and comprises domestic debt securities of all issuers (Table 16A), international debt securities by country of residence, money market instruments (Table 14A) and international debt securities by country of residence, bonds and notes (Table 14B). Data until 1989 is composed as follows:

Data sources of bond amounts outstanding before 1990

Country	Time span	Series	Source
FRA	1977-1989 1977-1989 1990-2001	Financial & corporate sector Public sector All bond types	IFS * GFS (total domestic debt) * BIS
GER	1950-1989 1950-1989 1990-2001	Financial, corporate & foreign bonds Public sector All bond types	IFS GFS (1950-1974: total government debt; 1975-1989: total public debt) BIS
ITA	1963-1977 1978-1989 1990-2001	All bond types Financial, corporate & foreign bonds Public sector All bond types	IFS * IFS * GFS (domestic government bonds & bills) * BIS
JPN	1963-1989 1990-2001	All bond types	IFS (row 26AB) * BIS
NL	1951-1964 1965-1989 1965-1989 1990-2001	All bond types Financial, corporate & foreign bonds Public sector All bond types	GFS (domestic government securities) * IFS * GFS * BIS
UK	1976-1989 1990-2001	All bond types	National sources (outstanding amounts of government bonds) * BIS
USA	1950-1989 1990-2001	All bond types	BIS (EDBAUS01: securities outstanding) * BIS

Note: In alphabetical order. Asterisk denotes series that partly consist of original data in value terms. Missing data have been calculated with the help of index time series, which were made available mostly by the same reporting institution.

The composition of the government sector differs from country to country, which may distort comparisons. For instance, in the USA, the government sector includes bonds issued by the central government, agencies (including mortgage securities), and municipalities. In other countries, the government sector is not that broad. In Germany, Pfandbriefe are included in the corporate sector. The time series data on the stock amounts outstanding are drawn from the FIBV data tape (http://www.fibv.com). The equity market figures include only shares of domestic companies; common and preferred shares; shares without voting rights, and exclude investment funds; rights, warrants, convertible instruments; options, futures; listed foreign shares; companies whose only business goal is to hold shares of other listed companies. Other sources used when some data points were missing are:

Sources of stock amounts outstanding data

Country	Time horizon	Series/ Source
FRA	1950-1973	IFS-Stock market index (row 62)
	2001-2002	Euronext
GER	1959-1969	DAX-Stock market index (http://deutsche-boerse.com/)
	1970-1973	IFS-Stock market index (row 62)
ITA	1950-1974	IFS-Stock market index (row 62)
JPN	1950-1973	IFS-Stock market index (row 62)
NL	1950-1973	IFS-Stock market index (row 62)
	2001-2002	Euronext
UK	1957-1965	IFS-Stock market index (row 62)
	1966-1978	Market Capitalization of Domestic Companies (http://www.londonstockexchange.com/market/historic.asp)
USA	1950-1973	IFS-Stock market index (row 62)

For the domestic credit to private sector I use data from the IFS: rows 32D; 52D (USA, Japan) and 32D_U (after the introduction of the euro in the European Union). Following the standards set by international organizations such as the BIS, nominal value outstanding is reported for all bond markets. The nominal data are deflated with the GDP deflator to account for price inflationary effects.

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