An empirical investigation into the causes and effects of liquidity

Economics

1. Introduction

Emerging market sovereign bonds and US high-yield corporate bonds have increasingly become competing asset classes over the past decade. Investors have turned to both markets in the search for high yield following global economic slowdown and low global interest rates.

One main concern investors have about both bond markets is their liquidity risk. Owing to the nature of fixed income securities, higher return is often associated with higher risk. High-yield bonds have below investment grade ratings because of the high probability of default of the country issuing the security. This means that it can be difficult to sell such assets at the correct market price and so a liquidity premium exists. This can be measured by the difference between the bid and ask prices on the bond in question.

If investors are increasingly willing to hold such bonds in the wake of global economic slowdown and because of the impressive returns such asset classes achieve, it is interesting to consider if changes in liquidity in one market will affect changes in liquidity of the opposing market. Then the macroeconomic fundamentals that cause such changes to take place need to be examined.

This paper uses data on average monthly bid-ask spreads1 in the JP Morgan Emerging Market Bond Index (Global) and the Merrill Lynch US High-Yield Fund Index as a measure of liquidity in order to examine the cross-liquidity effects of the two bond markets. 2 A set of macroeconomic explanatory variables are used in a multivariate cointegration framework, 3 in order to examine the causes of changes in liquidity of the two asset classes.

The conclusions that are derived follow. There is indeed a long run, steady state relationship that exists between the two opposing asset classes, suggesting that the cross-liquidity effects of each type of bond are significant in influencing investor's choices. There does exist a common macroeconomic variable that affects the liquidity of each type of bond, expressed by the yield on 10-year US Government Treasury Bonds. 4 Other macroeconomic variables do have significant impacts on the individual bond markets, but are not as significant as the yield on 10-year US Government Bonds and do not simultaneously affect both markets.

2. Description of the Markets and Previous Literature

2. 1 Emerging Sovereign Bond Market

The expansion of emerging markets as a fixed income class in the 1980s occurred as countries increasingly turned from bank loans, to bond issues in order to raise capital. Institutions such as the World Bank and IMF recommended that, emerging markets finance government deficits, through bond sales, in open competitive markets, in order to aid development and maintain monetary policy independence, even though it may initially mean a higher cost of issuance, with less direct control over financial institutions. 5

Figures in a paper by Eichengreen and Mody (February 1998) use values taken from the IMF in 1997. These show that bonds issued by developing countries rose from negligible levels in the 1980's, (less than $3. 5 billion in 1989), to $24 billion in 1992, more than $50 billion per annum in the period 1993 - 1995, an unprecedented $102 billion in 1996 and even higher levels

in 1997. As a matter of comparison, table 2. 1 below provides figures on bond issuance by country for 2002 - 2004.

These statistics show that an even wider range of countries began to issue sovereign bonds post-1997 and that the level of issue per quarter, for these years, far exceeded the level of issue per annum that occurred leading up to 1997. As a result, these international capital markets are more diversified and function more efficiently. Specifically, there is a broader investor base available, to provide financing for emerging market sovereigns, which has helped to diversify risk. 6 This has mainly occurred because investment managers were looking to take advantage of excess returns, by investing in emerging market bonds and defaulted bank loans to developing countries. Firstly, such managers created dedicated emerging market portfolios, which aimed at providing investors with high-income returns and substantial potential for capital appreciation. This trend then developed further, so that emerging market instruments became more widely used as part of broader portfolios, often global and international bond portfolios.

Debt Securities Issued Abroad: 2002 - 2004 (in millions of US$)

Table 2. 1

2. 2 US High-Yield Corporate Bond Market

The high-yield corporate bond market developed during the 1980s, in the United States and was a symbol of market growth, during that decade. A high yield bond is one issued by a company, which is considered to be of a comparatively higher credit risk. Most of the bonds are speculative grade,

which are therefore rated Baa, or lower by Moody's Investors Service, or BBB or lower, by Standard & Poor's.

Before the 1980's most high-yield bonds were because of former top quality, investment grade issuers receiving credit rating downgrades. High-yield bonds were also often used to finance merger and takeover activities. At present, the market has widened and the high-yield market now includes many different types of dealer and issuer, with many different kinds of objective:

Companies turn to the high-yield market seeking capital, as they start up their businesses, hoping in the future to build up their operational history and capital strength, in order to receive an investment grade rating. The Expert Law website7 suggests that other companies may be looking to refinance debt, using high-yield bonds, in order to pay down lines of credit, retire older bonds or consolidate credit at attractive rates of interest. Some firms may not be able to finance all their capital needs, through bank loans or earnings, and therefore look to the high-yield market as a means of doing so. There are even specialist buy-out companies, which use the high-yield debt as a way of raising money to buy a public corporation from its shareholders, often for the benefit of a private investment group.

2. 3 What kinds of investors are participating in these markets?

Investors are attracted into both markets, because of the attractive yield premium potential and they are willing to accept the additional risk of such

securities, on at least a portion of their assets, in order to obtain this. Three different types of investors are therefore apparent.

* Firstly, there are long-term research based, portfolio investors who are seeking capital appreciation, based on steady or improving fundamental conditions.

* Secondly, there are trading oriented investors that take advantage of liquidity cycles, country specific events, in the case of emerging bonds, or company specific events, in the case of US corporate bonds.

* Finally, there are investors that use the bonds as an asset diversification tool, perhaps only holding a small percentage of their portfolios in one of the asset classes and simply looking for high short-term returns.

Other specific investors that are noted to participate in the US high-yield corporate market include mutual funds which pool the assets of investors to create portfolios of high-yield bonds. There are many different types of mutual funds, all will invest in different types of portfolio, with some focusing on high-yield bonds and others using high-yield bonds as only a small proportion of their holdings. Insurance companies also invest their own capital in high-yield bonds and participate in the market through separate accounts offered in variable insurance and annuity products. Pension funds may also look to the high-yield market as a way of earning higher rates of return than those available from investment-grade bonds, or investing in issuer's stock. Livingston (2003) also considers Collateralised Bond Obligations (CBOs); these are debt instruments that use a pool of high-yield

bonds, diversified by issuer and industry, as collateral for an investment-grade style product. CBOs may have several " tiers" which offer different maturities or levels of risk.

2. 4 What are the risks of investing in such markets?

The risks of holding bonds in the two separate markets are quite varied, with some similarities and other specific market risks:

Sovereign bond risk encompasses a wide spectrum of dangers. Ferrucci et al. (2004), consider the following key factors in emerging markets to be extremely important for investors to monitor:

* The structure of the government's debt and debt service (external and internal).

* Its international asset position.

* The fiscal position of the government.

* Prospects for domestic output and demand.

* A projection of dollar cash flows for the country, derived from international trade and investment.

It is also very important to monitor the quality of the economic policies in place, such as IMF fund programs. In addition, political and institutional environments are good indicators, but are somewhat harder to quantify. Emerging market bond prices also tend to show, as a rule, high sensitivity to random events and the impact of changes in the international markets. For

example, around May 10th 2004 when US non-farm payroll data was released, leading to the fear of an imminent interest rate rise by the Federal Reserve because the data was much stronger than was anticipated. Consequently changes in liquidity and volatility in emerging bond markets were experienced. 8

Credit risk is an important consideration for both markets. In emerging markets some of the key factors outlined above can affect this. For US corporations, credit risk is affected by the actual or perceived deterioration of the financial health of the issuing company, rather than the US economy as a whole. Choudry (2003) explains how this risk is much greater in the high-yield bond market than for investment grade bonds. Factors such as business cycle volatility, excessive leverage or threats from competitors may lead to default.

There is also some economic risk in holding high-yield bonds. For example, in times of recession, such as in 1990 when US GDP had three successive quarters of negative growth, the principle value and total return of high-yield bonds declined significantly. 9 It is noted that during times of recession, high-yield bonds fare much worse than their investment grade counterparts do. This can lead to massive sell-offs in the high-yield market during times of economic stress.

Interest rate risk will affect prices on both types of fixed-income security, as shown above, in the sensitivity of emerging market bonds to changes in international market conditions. All bonds traded have a negative correlation with interest rates, so that an interest rate rise would cause the price of a

bond to fall. Another important consideration to the focus of this paper is liquidity risk, referring to the investor's ability to sell a bond quickly and at an efficient price.

2. 5 Previous Literature

Relatively little research has focused on secondary bond markets in U. S high-yield corporate debt and emerging market sovereign debt. With the emergence of new technologies, however, making quoted prices in such debt instruments more reliable and more widely available, the increasing importance of these markets becomes apparent. Investors look towards them, in order to diversify their portfolios, in turn leading to more research.

A paper by Ferrucci et al. (2004) looks at capital flows and yield spreads in emerging market economies (EMEs). Consequently it is a very useful tool in considering what could affect debt in the two markets. It uses a push and pull framework to analyse the variables that will affect the supply and demand of capital to EMEs and the yield spreads on EME debt. Yield spreads measure the premium required by investors to hold securities issued by borrowers which are perceived to be more likely to default than a government security (thus US Treasury bill yields are often the base comparison for the spread). Yield spreads, therefore, contain information on the liquidity of such debt because the liquidity premium will be incorporated into the yield spread calculations.

Of all the factors considered to affect capital flows, the variables of interest to the context of this paper are the following push variables:

* The opportunity cost of lending (measured by global equity returns)

* The risk appetite of lenders (spread differential between low and high rated US corporate bonds).

It is deemed that a high equity index (S&P 500 is used as a proxy for this) is a sign of higher US/World growth and impacts negatively on EME capital flows because of improved macroeconomic and investor confidence diverting spending into developed countries. The spread differential on low and high rated US corporate bonds has a significant negative relationship with capital flows. This implies that as the yield difference between the two falls, investors will turn to EMEs as an alternative investment opportunity.

The variables of interest to this paper that affect yield spreads are also push variables:

* The yield of 30-day US Treasury Bills

* The yield of 10-year US Government bonds.

Short-term US interest rates have a large significant effect on EM spreads. The hypothesis the authors' provide is that lower global risk-free rates make risky debt look more attractive on a yield basis, lowering the cost of borrowing from EMEs (hence solvency risk) and increasing investor risk tolerance. This is also consistent with earlier empirical findings. The longer-term US interest rates, however, have a strong negative impact on EM spreads. This contradicts earlier empirical findings cited in this article but is consistent with other authors such as Eichengreen and Mody (1998) and

McGuire and Schrijvers (2003). The intuition behind this result is that the higher yield curves raise the current cost of borrowing to EMEs.

Eichengreen and Mody (1998) conducted a similar study to the paper by Ferrucci et al. discussed above. The only variable they include in their analysis that is of significance for this paper is the yield on 10-year US Government bonds. Results obtained confirm the importance of interest rates in the major centres as determinants of capital flows. That is, as US rates rise, a declining number of emerging market issuers come to the market. This decline increases the price and reduces the yield spread on their bonds. To summarise, although there is a demand-side effect of investors shifting to emerging market debt in periods of low money-centre rates as they search for yield, supply-side effects to do with timing of EM issues and borrower's willingness to accept them at any price appears to be dominant in the market.

Min (1998) also conducted a similar study to the two papers described above; although it solely focuses on explaining emerging market yield spreads using macroeconomic fundamentals. The variables he found to be statistically significant were the average inflation rate and exchange rates of the countries included in the index. The inflation rate is taken as the average Consumer Price Indices (CPI) of the EMEs. The inflation rate is often used as a proxy for the quality of economic management. If there is a high inflation rate, the yield spread is lower because, inflation erodes the return on the bonds.

The exchange rate (measured by the nominal exchange rates, adjusted for CPI inflation) measures the trade competitiveness of an economy. This demonstrates the importance of inappropriate exchange rate policies in EMEs, appreciation of the exchange rate will adversely affect the yield spread. This was highlighted in the Latin American capital flight, 10 when sustained real appreciation of the exchange rate of the currencies played a major role in over borrowing. This will reduce liquidity in the long run, as fewer investors will want to hold Latin American debt and the bid-ask spread will widen, because of the increased liquidity premium.

Variables found not to be significant, but may be of interest to consider are changes in international interest rates and oil prices. The 3-month US Treasury bill rate was used to capture the effects of external financial developments. It was hypothesised that this rate would affect the cost of new borrowing and the interest charges on existing debt. Similarly, a supply shock of oil price increases could cause a world recession and increased demand for capital in oil exporting countries (e. g. Russia, Mexico, Indonesia and Venezuela). Hence, it was postulated that a higher real oil price would cause a higher yield spread

Woodward (1983) identified forces that explain the liquidity premium, independent of the shape of the term structure and level of interest rates. The paper also considered whether holding a bond in the short term is more/less risky than holding one in the longer term. The short-term strategy proved to have a lower rate of return, on average, over the near and distant future. Accordingly, implying that the liquidity premium is positive and is

affected by individuals' time-and-state distributed endowments, preferences for risk bearing and consumption, beliefs (and timing of information arrival affecting beliefs) and productive opportunities.

Burnett et al. (1998) examines junk bond (i. e. high-yield) characteristics and behaviour by analysing the influence of economic cycles and periods of reduced liquidity on the behaviour of junk bonds. Of particular interest in this article is the regression of junk and investment grade bond returns against Treasury-bond returns (as a measure of long-term interest rates) and S&P 500 returns (measure of economic activity). This led the authors to the conclusion that large abnormal returns on junk bonds are related to changes in their liquidity. The sensitivity of junk bonds to these variables is also considered, this is because junk bonds are considered to be complex securities that exhibit characteristics of both equity and debt. As follows, their sensitivity changes during the period analysed. During 'good' times junk bonds' returns respond both to Treasury bond returns and stock returns, but are more sensitive to Treasury-bond returns. In 'bad' times (economic contraction and high default rates) they are sensitive only to stock returns.

Copeland and Galai (1983) looked at the trade off that market makers must make in deciding how best to optimise their positions. Market makers try to set a bid-ask spread, which will maximise the difference between expected revenues, from liquidity motivated traders and expected losses to information motivated traders. As a result of analysis, it can be proven that the bid-ask spread functions as a measure of market activity, depth and

continuity. It also negatively correlates with the degree of competition in the market.

Chordia et al. (2003) looked at stock and Treasury bond markets over a period of more than 1800 trading days. They found that return volatility is an important driver of liquidity and that common factors drive liquidity and volatility in stock and bond markets. For example, through trading activity and asset allocation strategies, shifting wealth between stock and bond markets. A negative 'information shock' causes a flight to quality as investors substitute safe assets for risky assets. This could be extremely relevant for policy implications because trading activity in one market could predict trading activity, and in turn liquidity in another. Also leads and lags in volatility and liquidity shocks may have cross - effects. For example, macroeconomic shocks to liquidity and volatility get reflected in one market before another, so that liquidity in one market could influence future liquidity in another. Another interesting relationship they highlight is that unexpected decreases (increases) in the Federal Fund interest rate have an ameliorative (adverse) effect on liquidity as well as volatility.

3. Theoretical framework and variable selection

The theoretical underpinning for this paper is that emerging markets and mature financial markets are more integrated today than at any other time since the First World War. One indicator of the growing degree of integration is the closer trends of securities prices. The correlation between changes in emerging market bond spreads and changes in US high-yield bond spreads is significantly higher today than a decade ago, despite important differences

in the fundamentals underlying the two asset classes. According to Wooldridge et al. (2003), these higher correlations suggest global factors common to mature and emerging markets, rather than local idiosyncratic factors increasingly explain price movements. Thus, it is extremely evident as to why investors are progressively viewing emerging market and US high-yield bonds to be competing asset classes.

Many studies have looked at the returns, yield spreads, volatility and liquidity of bonds in each individual market and what variables affect these measures. However, relatively little work has been conducted into comparing the two asset classes, more specifically comparing the liquidity of them. This paper attempts to compare the two markets to find out if there are cross-liquidity affects and then attempts to seek out which variables affect liquidity of the bonds in each market. This will then enable an analysis as to whether the two markets are inextricably linked via liquidity and whether similar variables affect the liquidity of bonds in each market.

3. 1 What is liquidity?

Although many academics will often refer to liquidity in the context of fixed income security markets there is no widely accepted definition of liquidity. O'Hara (1995) as cited in Gwilym et al. (2002) defines it as the ability to trade a security quickly and with little cost. Mackintosh (1995), as also cited in Gwilym et al., suggest that practioners would define a liquid issue as one in which two way markets are available to investors, in reasonable size, over an extended period without undue disruptions or difficulties in establishing

fair value. In general Lybek et al. (2002), propose that liquid markets exhibit five main characteristics:

(i) Tightness; implies low transaction costs so that pricing information in the market is efficient.

(ii) Immediacy; considers the time efficiency with which this takes place.

(iii) Depth; indicates that there are abundant orders from potential buyers and sellers above and below the true price of the security.

(iv) Breadth; hints that these orders are large and numerous in size.

(v) Resiliency; the tendency of markets to correct if prices do not reflect true fundamentals.

3. 2 What effects does liquidity have in bond markets?

There has been very little academic research done into role of liquidity in bond markets, but recent crises in financial markets have triggered studies on how to better judge the state of market liquidity and how to better predict and prevent liquidity crises. In particular, the Russian debt moratorium in August 1998 triggered studies by the Bank for International Settlements.

In fixed income markets, a common and systematic source of pricing discrepancy occurs because of illiquid bonds {Gwilym et al. (2002)}. Sarig et al. (1989) as cited in this paper have found further evidence of this. The authors postulate that government bond prices are recorded more accurately than corporate bond prices. This is because of the higher liquidity

in the government bond market and higher uniformity of traded assets. Also in this article, Amihud et al. (1986) found that a difference in the liquidity of US Treasury Bills and US Treasury Bonds affects yields to maturity. This leads them to conclude that expected returns are a decreasing function of liquidity because investors require compensation for higher transactions costs in less liquid markets.

Kalimipalli et al. (2002) considered the relationship between liquidity and volatility in the corporate bond market. They found that in general, higher volatility in the returns on assets has two implications for investors: firstly, that they face a higher inventory risk on account of imbalances in their portfolios due to uncertainty in the market and secondly, that they face a higher possibility of dealing with informed traders. As a result bid-ask spreads are wider, so bonds are illiquid. In summation, a positive relationship between volatility and illiquidity exists that could indicate either a higher adverse selection component or a transitory component, or both.

Thus, it is very informative for investors to consider the liquidity effects of the bonds they purchase. More specifically to this paper it is of interest to see how these liquidity effects come about and how, indeed if at all they affect investors choices.

3. 3 How to measure liquidity?

Sarr et al. (2002) explain that liquidity measures classify into four main categories:

(i) Transaction cost measures that capture costs of trading in the financial assets and any frictions in the secondary markets.

(ii) Volume-based measures look at the volume of transactions rather than price variability, mainly in order to capture depth and breadth of the market.

(iii) Equilibrium price-based measures try to capture movements towards equilibrium prices to measure resiliency.

(iv) Market-impact measures attempt to differentiate between price movements from liquidity of other factors and movements relating to the release of new information in order to measure elements of resiliency and speed of price discovery.

There is no single measure that unequivocally measures tightness, immediacy, depth, breadth and resiliency.

The bid-ask spread is a measure that is frequently used in econometric analysis of fixed income markets. It is a transaction cost technique of measuring liquidity using the difference between the price of buying and selling the asset in question. This measure captures order-processing costs, asymmetric information costs, inventory-carrying costs and oligopolistic market structure costs. Owing to the fact that all of these types of cost are encapsulated in the bid-ask spread, the measure also takes into consideration some factors of immediacy, breadth and resilience. This is mainly because, if the costs described above are low, then there will be a high number of market participants.