Benchmarking a Transition Economy Capital Market

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ABSTRACT

As the centrally planned communist nations of Central Europe lacked liquid and efficient capital markets, financial systems architecture became instrumental to their transition into market economies. Now, after almost 17 years of operations, it is time to take a snapshot of one of these economies and compare it to a well developed capital market. This study is the first to provide a quantifiable comparison of the quality of the capital markets of a fully developed and a transition economy; namely Euronext France [Euronext] and the Warsaw Stock Exchange [WSE]. Using intraday data for the Euronext market and the WSE it is shown that while overall liquidity is certainly much greater in Euronext, range based intra-day volatility is significantly lower in the WSE. For stocks with the highest market capitalisation the WSE has lower transaction costs in the first [largest] decile than Euronext. These results indicate that while the established market is significantly more liquid in terms of average trade size and trade numbers it does not always offer lower transaction costs or volatility. This is a new result as most contributions to the literature argue that an emerging market within a transition economy will suffer from excess volatility.

1   INTRODUCTION

Many authors have described the stock markets of emerging markets and transition economies pejoratively as "excessively volatile." This paper contends that this label may in fact be premature and underserved when analysing the WSE. To provide a method for comparing the capital market of a fully developed economy to the capital market of a transition economy the differences in four measures of market quality for two representative markets, Euronext France [Euronext] and the Warsaw Stock Exchange [WSE] are investigated. As both markets investigated are built on the same market architecture this becomes a clean natural experiment. Particular attention is granted to volatility as the results presented here contradict the general view of transition economy market quality. In fact, it is arguable that many researchers have not drilled down sufficiently in particular markets to substantiate this perspective.

As documented in Demirgüç,-Kunt and Levine (1996) and others, it is generally accepted that an economy in transition from being centrally planned to a market economy requires an efficient set of capital markets; in particular, a liquid stock market that not only facilitates the movement of capital to existing firms but also promotes the development of new industries using both domestic and foreign capital. Capital markets also diminish information asymmetries that may be present in markets; particularly transition economies. The collapse of communism last century led most of the former centrally planned economies to artificially introduce one of the strongest symbols of capitalism into their economies; namely stock-

markets. Poland was no exception and with the financial aid of the French government, the expertise of the French Bourse (SBF), SICOVAM, and the French central depositary, the WSE was formed on October 16th 1990. The WSE was privatised with the owners being the Polish state, several banks, and the brokerages houses. This paper analyses quantitatively the difference between the market qualities of a fully developed capital-market in a first world industrial nation with a stock market functioning in a transition economy. This is the first such paper to statistically determine these differences at such a microeconomic level. The results from this paper are robust as they are based upon an experiment that is clean and natural due to the fact that the underling structures of both markets are effectively the same. In fact, the WSE is a replica of the Euronext market structure. This therefore, allows the researcher to accurately determine the statistically significant differences of market qualities present in both markets. The paper goes on to clarify and resolve some of the questions framed by Kairys (1999 and 2000) concerning the development of the WSE and the progress it has made after 2000. As this research measures the various market-microstructural variables of the WSE and compares it with Euronext France, a normative statement about the maturity of the WSE is possible. This paper also allows the reader to place the WSE in an historical context. By analysing the development of a capital market and comparing it with a fully developed market using the same platforms it is possible to determine the point-in-time stage of development of the WSE.

1.1 THEORETICAL BACKGROUND: MARKET ARCHITECTURE AND ECONOMIC TRANSITION

A liquid and efficient stock market is generally accepted to be a key feature a developed economy. As the centrally planned communist nations of Central Europe lacked such infrastructure, financial systems architecture was instrumental to their transition into market economies. Now, after almost 17 years of operations, it is time to take a snapshot of one of these economies and compare it to a well developed and regarded capital market. Earlier studies compare and contrast capital markets of first world industrial nations focusing on differences in market microstructure. Good examples of such papers are de Jong, Nijman and Röell (1995), Bessembinder (1999), and Venkataraman (2001). The point of departure for this research is to gauge economic development for a transition economy by comparing its market quality to an exchange built on the exact same market architecture. Both Euronext and the WSE are electronic limit order book markets with the only real differences being the size of the firms listed and the absence of foreign cross-listed firms at the WSE[i].

The symbiotic nature of capital markets and economic growth has been well documented and analysed by such authors as Demirgüç,-Kunt and Levine (1996) but there is a gap in the literature where the analysis of the dynamics and qualities of these newly developed markets should be. Without such analysis it is difficult to determine the nature of investment within a transition economy. In the absence of a liquid and efficient stock market, economic agents cannot invest with the knowledge that adequate liquidity is present to reduce many risks. In this situation, an investor would have to place their capital in investments that can be readily converted in a medium of exchange. Due to these liquidity constraints foreign direct investment is stifled, as is economic growth itself. Stock markets may be superior to commercial bank lending when considering raising funds as they are not subject to bank runs and may in fact offer other positive externalities such as the conveyance of more timely information flows, Hermes and Lensink (2000). This possible reduction in moral hazard and adverse selection costs is one of many reasons why the newly established Polish government introduced and fostered the development WSE in 1990 and its subsequent growth and development.

The analysis of emerging economies' capital markets has been investigated several times by authors such as Glen (1994), but rarely has there been attention granted to the 'recently' transitioned economies of Central and Eastern Europe. Kairys (1999) compares the stock exchanges of Poland, Latvia, and Lithuania and finds that while the three exchanges had similar market microstructures they exhibited varying degrees of success when measured by market quality metrics. Warsaw was shown to facilitate greater liquidity over the continuous order driven market while a fixed call auction market provided a framework more appropriate for facilitating exchange in the lower liquidity markets. This supported the theoretical work of Easley, Keifer, O'Hara, and Paperman (1996) who strongly argued that screen trading in low liquidity environments hinders the development of an emerging market. Rather than seeking an optimal market structure, this paper seeks to document the quantitative differences in market quality between a fully developed and transition economy operating off the same basic platform. The WSE after all, has already determined that the continuous trading mechanism coupled with a daily fixed price call auction is their optimal structure. Effectively, this research gives a metric to the state of the transition economy measured by its capital market qualities rather than the usual macroeconomic metrics such as GDP [Durnev, Li, Mørk and Yeung (2004)].

Scholtens (2000) discusses the relative merits of transition economies by focusing on developing capital markets as opposed to a focus on fostering banking finance. In theory, an economy with borrowers who possess strong credit reputations will lean towards a capital market like a stock market where information asymmetries can be nullified through the regular updating of market prices [Boot and Thakor (1997)]. Therefore, this paper may also claim to be able to normatively place Poland at a certain stage of its economic development. Empirical analysis however, states that financial system architecture is also based on the progress of its financial institution and the regulations used to keep them in order. The regulation of financial institutions is not addressed in this paper. Evidence suggests that there is a strong relationship between financial market development and growth. Scholtens (2000) presents the work of Goldsmith (1969), by suggesting that financial development largely occurs during the early stages of economic development when incomes are relatively low and therefore, there is a strong correlation between growth and market development. By investigating the WSE at a relatively advanced state, (where continuous trading was the norm) the authors can make a stronger case for pinpointing the WSE's true state of development.

As financial markets depend on liquidity, which is in turn based upon information flows, it can be seen that they are effectively a tool for good corporate governance. The WSE has strong disclosure rules for such events as mergers and acquisition which implies that corporate governance is maintained well and the market is informed of most events. Scholtens (2000) compares western economy macro economic indicators with Central European figures for the year 1995. In it he shows that there were large differences when stock market capitalisation in the transition economies was 10% compared to 5% in the western economies. The actual quality of these markets, when measured using market microstructure indicators is basically ignored with the reader having no idea of the true costs of liquidity. The Polish economy and the WSE are given sparse treatment as only basic descriptive statistics are reported. While the number of firms listed at the WSE grew from 9 to 83 from 1991 to 1996 the costs of trading nor of the volatility inherent in the market are not addressed. In particular, the comparisons that investors would face if having to choose between trading through Euronext and the WSE are not provided. Indeed, many managers of foreign companies may be wary of cross listing at the WSE as is done at Euronext. This means that Polish domestic investors may be investing in a limited universe and that foreign investors are

at an information disadvantage when choosing the location of their future investments. While Frydman (1998) shows that privatisation improves the investment performance of formally state owned enterprises there has been little to no work carried out on the performance of the markets themselves. Scholtens (2000) also reports turnover ratios (ratio of equity trade value to market capitalisation) for several transition economies but fails to determine the statistical significance of these differences. He states that these markets are extremely illiquid but does not define liquidity. Finding that the economic role of the stock market in Poland is limited as at 1996 due to limited direct foreign investment and liquidity Scholtens (2000) may have a limited perspective. Hermes and Lensink (2000) suggest that due to the thin liquidity of many transition economies' markets many may experience excessive volatility. Studies of the Asian financial markets conducted by Singh (1997) appear to confirm this while Cho (1986), as presented in Hermes *et al* argues that stock markets foster 'short-termism.' Banks on the other hand foster long-term growth and develop long-term relationships with the firms they are financing. Of course, this fails to critically analyse the moral hazard and adverse selections costs associated with this closed form of financing.

Liquidity has been a main-stay of the economics literature for some time and neither the market-microstructure or transition economy literature has been immune to its significance. The extant literature assumes varying definitions of liquidity. The standard definition is of immediacy of trade. An asset is deemed liquid if an investor can trade the asset quickly in large volumes without there being too great an impact on the price (Black 1971, and Glosten and Harris 1988). Therefore, in order facilitate these three influential factors; being time, volume and price must be analysed simultaneously. The liquidity of a stock market is partially dependent upon its microstructure. Hermes *et al* recognise this and suggest that the organisation of trading is of fundamental importance to policy makers in transition economies. Kairys (2000) finds that when continuous trading replaced a closed call auction market there both positive and negative repercussions. Firstly, the more liquid stocks improved in terms of liquidity and secondly the less-liquid stocks suffered. This paper furthers this work by applying a market-microstructure perspective and tool set to the WSE and more recent and rich data-set.

2   EMPIRICAL FRAMEWORK AND DATA

Several aspects of market quality are analysed both independently and cross-sectionally across the two markets. As the primary transaction cost measure the effective spread, which measures how far from the mid-point of the spread trade execution occurs is used. The effective spread is weighted by the trade volume of each trade to give greater emphasis to the feature that this measure estimates both actual paid transaction costs and market impact costs (how costly it is to execute larger trades). The trade volume weighted relative effective spread[ii]is:

$$2\sum_{t_0}^{t_c}\left\{\frac{ABS\left[Trade\,Price-\left\{\frac{Ask_t+Bid_t}{2}\right\}\right]}{\left\{\frac{Ask_t+Bid_t}{2}\right\}}\frac{[TradeVol_t]}{TotalTradeVol}\right\} \qquad \textbf{Eq.1}$$

Where, *to* is the time when regular trading commences during a trading day following an opening algorithm, *t* is time when a trade is executed, *tc* is the time when trading ceases for the day, and trade volume refers to the number of shares traded. Six components of transaction costs can be identified: brokerage, bid-ask spread, market impact, exchange fees and taxes (stamp duty) and the opportunity cost of an inability to make a desired trade due to transactions costs. Brokerage fees are excluded from the transaction cost measure as they may vary between customer and trade and are largely determined by competition and are not

directly related to the quality of the market structure. The transaction cost measure, the trade volume weighted relative effective spread, includes the bid-ask spread, exchange fees and taxes and to some extent market impact costs.

As the price volatility measure a range-based intraday volatility, calculated as the log of the daily high price minus log of the daily low price is utilised, see Alizadeh, Brandt and Diebold (2002):

High - Low Intraday Volatility= ln (high price)-ln(low price)   Eq.2

The range based volatility is well suited for measuring quality of market structure as it measures the intra-day price volatility only, which is expected to be affected more by the market structure than measures including overnight volatility. As the markets bearing scrutiny share the same design the actual volatility technique used becomes subordinate to the comparison itself.

Trade size (the average dollar value of all trades during one day) is studied as a measure of the ability of the market structure to cope with large trades and the number of trades (total number of trades per day). Effectively, this is a measure of resistance of the trading system to bursts of high activity. The product of trade size and number of trades conveniently provides the traded value which, according to Swan and Westerholm (2005), is the ultimate source of income for the exchange and hence an important determinant of policy for profit-driven exchanges such as Euronext and WSE.

The original data provided by *Reuters* to SIRCA (a financial services research organisation involving 26 universities in Australia and New Zealand) contains intra-day trade, quote, and volume information for all securities listed on the two exchanges. Consistent exchange specific information was obtained from the International Federation of Stock Exchanges' *Annual Year Books*, the official internet home pages of the exchanges, and the exchange rulebooks published by the relevant stock exchanges. Brokerage fees for institutional investors on an exchange-by-exchange basis were obtained from Chakravarty *et al.* (2004b). *Reuter's* intra-day trading and bid-ask spread data supplied by SIRCA is extracted for the period between the begining of March 2000 and the end of October 2001. The period chosen for the study is one of high volatility in world markets. It includes the last month of the 1990s technology driven bull market. 178 common stocks for Euronext and 79 for the WSE are analysed as they exhibit the highest security value traded during the period at both the WSE and Euronext. Also obtained were Thomson Financial *Datastream* data on share numbers and stock splits for as many stocks for which the data is available.

Intra-day trade-by-trade prices, numbers of trades and average trade size expressed in dollars, best bid-ask quotes or orders (whichever is applicable, for all included stocks), and calculated comparable exchange rate adjusted measures using intra-day data, were obtained and presented as daily time series for each company. The series for the average value of each stock is expressed daily in USD. Transaction taxes and exchange fees, expressed as relative measures on a round-trip basis were added to the effective spread calculations based on equation (1) above. Exchange fees and taxes for the WSE and Euronext are sourced from an industry participant.

Each selection of stocks from the respective markets broken into ten deciles in order to facilitate a detailed comparison. The stocks were initially ranked according to market

capitalisation at the start of 2000 (in USD) with the foreign stocks traded on Euronext removed from the sample to leave only listed domestic stocks.

Like most high frequency data, the samples tend to be non-normal in their distributional properties and thus require non-parametric econometric techniques when conducting tests of statistical significance[iii]. In particular, a Wilcoxon signed rank test is used to determine the statistical significance of the differences between the variables taken from each market (the data is effectively broken into daily results for the sample period and compared over time.). This is conducted using a one-tailed hypothesis testing at the 1% level. This means that the significance tests are not skewed by the choice of the normal distribution. Both the Euronext and WSE sample were then split into deciles from which comparisons were drawn. These results can be found in the following section.

3. RESULTS

The hypothesis posed in this work actually relates to the degree to which the WSE lags Euronext in its development rather than whether or not one market or the other is actually in a more developed state. This means that a two-tailed significance test is used to determine the depth of each market by statistically comparing each of the deciles of each market. This allows the researcher to gauge market quality in the form of volumes, spreads, and volatility at ten different market depths. Overall, the Euronext market clearly outperforms the WSE in virtually all of the variables tested. In particular, it can be seen in Table 1 that Euronext has across all deciles much lower transaction costs and higher trade numbers; both in amount and trade size. On the other hand, the WSE appears to attract lower market-wide volatility than the fully developed Euronext. The focus here is on four variables that should describe the merits of the liquidity of each market and allow for quick comparison. Transaction costs, as measured by the effective spread and augmented with institutional brokerage fees, tax, and stamp duties, is considered the best measure of the costs facing an investor making a deal. Trade size and the 'number of trades' data indicate the depth and frequency of trading and thus provide insights into another aspect of the liquidity of the market. Finally, the range based volatility measure, as opposed to the standard deviation of variance of the market makes sense of the possible risks of return facing an investor. Both the mean and the median are presented to give some indication of the distributions for each variable. This lends further credence to the use of non-parametric statistics due the skewness and kurtotic nature present in most of the data. (An Appendix with more detailed descriptions of data can be provided on request. Figure 1 shows the effective spread of each decile for both the WSE and Euronext . The expected outcome would be that the effective bid-ask spread would in all cases be lower for the French market than the 'newly' formed WSE. However, it is evident that the WSE outperforms the Euronext market in the first and tenth deciles, (although it must be admitted that this is only a minor advantage) and compares favourably in the eighth. In all other deciles the WSE exhibits higher transaction costs. In particular, Euronext is particularly 'cheap' in the second marche, or alternatively from decile 4 through to 7. This is consistent with much of the literature which suggests that in a transition market such as the WSE there will be concentration in trading for only a few companies at the expense of less liquid assets.

Figure 1: WSE and Euronext mean transaction costs across deciles
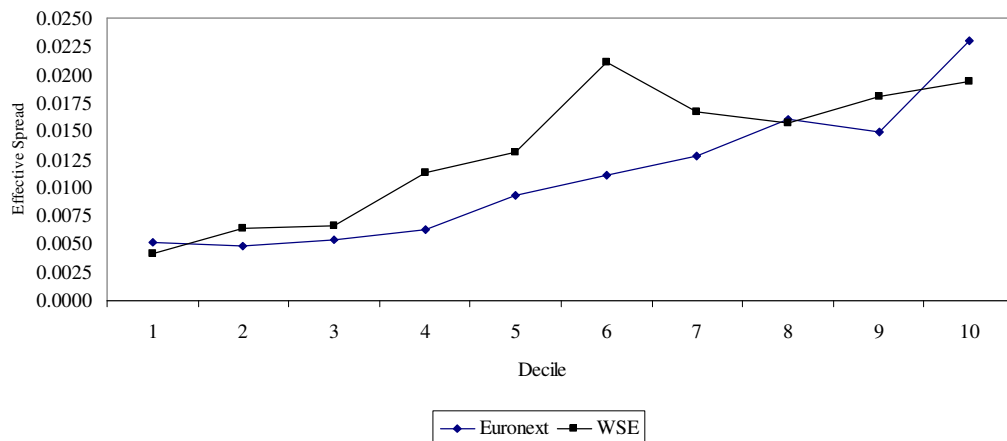
The Wilcoxon signed rank test (available from the corresponding author upon request) shows how many times the Euronext metric (in this case transaction costs as documented by the effective spread) are either greater than, less than, or equal to the WSE. All deciles show that the WSE has higher effective spreads in the vast majority of cases. Wilcoxon signed rank tests show that at the 1% level the difference between the WSE and Euronext is strongly significant for all deciles. Using both a one-tailed and two tailed test it is apparent that Euronext is a much cheaper market to trade in. Therefore, transaction costs are significantly lower for all deciles using the non-parametric tests. These tests use the median as a measurement rather than the mean due to the skewed and kurtotic nature of the data. That is why, even though the mean transaction costs are lower for the WSE at deciles one and ten they are significantly higher using the median. However, given that the mean is lower at certain points it is worth investigating the reasons behind this. Kairys et al (2000) suggest that the introduction of continuous trading in 1999 led to enhanced market quality for the most liquid stocks at all of the Poland, Latvia and Lithuania stock exchanges. The data presented here confirms these results as the mean of transaction costs for the WSE is lower than the fully developed economy's effective spread.

Table 1: WSE vs. Euronext: statistical differences between transaction costs across deciles

Transaction Costs		D1 WSE v ENX	D2 WSE v ENX	D3 WSE v ENX	D4 WSE v ENX	D5 WSE v ENX	D6 WSE v ENX	D7 WSE v ENX	D8 WSE v ENX	D9 WSE v ENX	D10 WSE v ENX
	Z	-12.49	-12.75	-12.72	-12.72	-12.71	-12.72	-12.72	-11.89	-12.30	-10.55

Poland, being a transition economy, and at a much earlier stage of its economic development (at least chronologically), has much lower trade volumes than Euronext. While the average number of trades is not the best measure of liquidity it does provide an insight into the mechanics of a market. As the relevant Y-axis show in Figure 2, the WSE clearly trades far more infrequently than Euronext . Even at the lowest deciles the number of trades in Euronext exceeds the WSE by a factor of 10. Interestingly, this ratio remains constant across the decile range indicating that the relative liquidity/depth of each market is similar. This supports the Wilcoxon signed rank tests that were conducted at both 99% and 95% significance levels. The WSE exhibited its highest turnover in decile one and then falls by around 28% in the second decile and an even greater 49% in the third. From then on trade numbers tend to stagnate and thus reveal the fact that the first two deciles only account for the majority of trading at the WSE. Euronext follows the orthodox in at least one way as a developed western market. At least three deciles, or arguably four, make up relatively large trade numbers in comparison to

the total. This indicates much greater depth than that of the WSE. Interestingly though the unorthodox also prevails in Euronext. The first decile is 97% smaller than the second indicating that the trade numbers are small. Pursuant to this, in order to be consistent with the market capitalisation rankings, the average price of the shares would have to be very high. Again, from decile five though, similar relative trading is obvious. The magnitude of the two scales of trading at each market is reinforced through the signed rank test. In only four trading days did the WSE have higher average trading amounts and these were only in four deciles. The Euronext market clearly dominates in the average trade size metric over the WSE.

All of this data indicates that the WSE must increase its liquidity in order to enhance its chances of competing with developed economies stock markets in attracting direct foreign investment. Levine (1991) and Smith, Starr, and Bencivenga (1995) argue that long term growth prospects are dependent upon liquidity in a stock market and the minimisation of certain risks that this feature provides. Also, the minimisation of asymmetric information will be induced by increasing liquidity flows through the number of trades. As mentioned earlier, and as Kairys (2000) suggested, the use of continuous trading facility at the WSE has increased liquidity at the top of the trading scale but may be detrimental to the lower end. As the WSE has only a few of the former, it may wish to increase lower decile trading liquidity, as expressed by the amount of trades, by either lowering transaction costs in the lower deciles (reducing either brokerage fees or stamp duties) or re-introducing the single call auction as suggested by Kairys (2000). The signed rank test is supported strongly by the Wilcoxon significance test that show significance at the 1% level using both one and two-tailed testing. Not only is this significant, but the z-score of nearly 13 indicates that there is no question of this significance, as does the asymptotic significance levels much lower than either .01 or .05.

Table 2: WSE vs. Euronext: statistical differences for average number of trades across deciles

| Number of Trades		D1 WSE v ENX	D2 WSE v ENX	D3 WSE v ENX	D4 WSE v ENX	D5 WSE v ENX	D6 WSE v ENX	D7 WSE v ENX	D8 WSE v ENX	D9 WSE v ENX	D10 WSE v ENX
	Z	-12.97	-12.97	-12.95	-12.95	-12.95	-12.95	-12.97	-12.97	-12.95	-12.95

Figure 2 presents the interesting case where the average trade number for decile one at Euronext the is less than the same relative decile in the WSE. The average number of trades per day per stock is about 1000 for the largest and 1900 for the second largest quintile in Euronext falling to around 200 for the smaller shares.

Figure 2: WSE and Euronext average number of trades
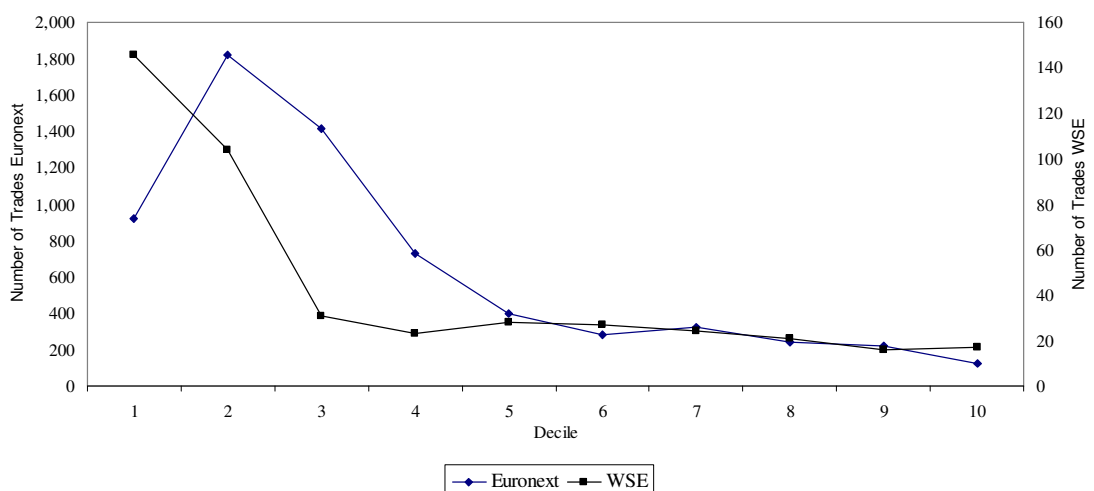
In Warsaw the average number of trades is about 150 for the largest quintile and less than 50 trades for quintiles three and above. The difference in number of trades between the largest and second largest quintiles in Euronext indicated that the average trade value would have to be very high in decile one in Euronext. This is the case as Figure 3 reports average trade size. Being 49% larger than the second decile shows that average trade value for decile one is in fact orthodox. This also indicates that large block trades exist in Euronext while the WSE supports (at least in decile 1) relatively more frequent smaller trading lots[iv]. Again, the shape of each curve indicates this. (In Figure 3 the scale for Euronext on the left y-axis is five to one compared to Warsaw on the right y-axis).

Figure 3: WSE and Euronext average trade size.
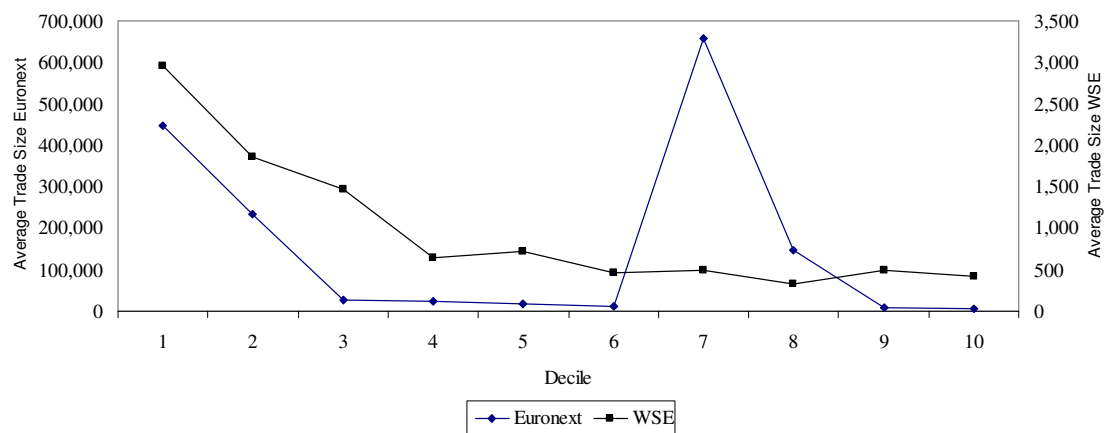
By analysing trade size differences the depth in the Euronext marke can be shown to exceed Warsaw by a ratio of around 28 to 1 in all deciles. (The scale for Euronext is five times higher than the scale for Warsaw in Figure 3.) A relative magnitude of this strength obviously means that the WSE will always rank below Euronext in average trade size. Liquidity under this guise allows the researcher to both positively and normatively state that the WSE is a far smaller market. Applicable to the liquidity results presented thus far is the work of Amihud, Mendelson and Lauterbach (1997) who showed that when the Te Aviv Stock Exchange introduced continuous trading (as the WSE had done prior to the sample date reported here), liquidity increased but only in the top-end stocks. In statistical significance terms the same story is true for average trade size as it was for the average number of trades. At the 1% level the WSE is significantly smaller than Euronext. This is true for all deciles. Interestingly in this case, the WSE exhibits stronger relative depth across the first five deciles in comparison to Euronext. The percentage fall from decile one to five is much smaller than the Euronext decline. This is contrary to the number of trades data where Euronext showed greater signs of depth than the WSE.

Table 3: WSE vs. Euronext: statistical differences for average trade size across deciles

Average Trade Size	D1 WSE v ENX	D2 WSE v ENX	D3 WSE v ENX	D4 WSE v ENX	D5 WSE v ENX	D6 WSE v ENX	D7 WSE v ENX	D8 WSE v ENX	D9 WSE v ENX	D10 WSE v ENX
Z	-12.98	-12.98	-12.95	-12.95	-12.95	-12.95	-12.98	-12.98	-12.95	-12.95

While liquidity is a major determinant of market quality so to is the volatility that an investor faces. This paper uses a intra-day range based volatility measure summarized on a daily level

in acordance with Alizadeh, Brandt and Diebold (2002). Volatility is often associated with limited liquidity as the price will only be impacted upon by information infrequently. Volatility may also be subject to information flows in a liquid stock but will exhibit less dramatic and discrete effects. Kairys (2000) asserted that the introduction of continuous trading at the WSE and two other transition economy stock exchanges led to greater liquidity in the most liquid stocks at the possible expense of the less liquid stocks. He therefore, suggested that a transition economy's stock market should have a tiered system where the lower liquid stocks are actually priced off a daily single call auction. His treatment of volatility though was limited. Figure 4, a representation of the volatility for each market across all deciles is quite clear. Each market can be compared against the other and to itself among each of the deciles. Euronext is reasonably static across the decile range except for decile 6. Typically, range-based volatility varies between 7% and 8%. The WSE on the other hand shows much smaller absolute variance in daily price changes. This is more than likely due to the smaller average number of trades and trade size in comparison to Euronext. The use of continuous trading at the WSE as opposed to the single call auctions used in other emerging stock markets in the former communist nations of Central Europe has also contributed to lower liquidity on WSE. Also evident, is the fact that the more liquid decile 1 experiences almost twice the volatility as the less liquid deciles. This is contrary to the theoretical work of Hermes and Hermes and Lensink (2000) and indicates that volatility is not a problem in the investigated transition economy; rather it is a lack of volatility. Volatility is a sign of activity due the process where information is continuously impounded into traded prices. Outside of the liquid top decile there is very little activity on Warsaw and hence volatility is also low. Durnev, Li, Mørk and Yeung (2004) describe a relation between volatility and firm-specific announcement activity. Given that the WSE enforces public disclosure the idea that low volatility is a function of limited information flows can be discounted.

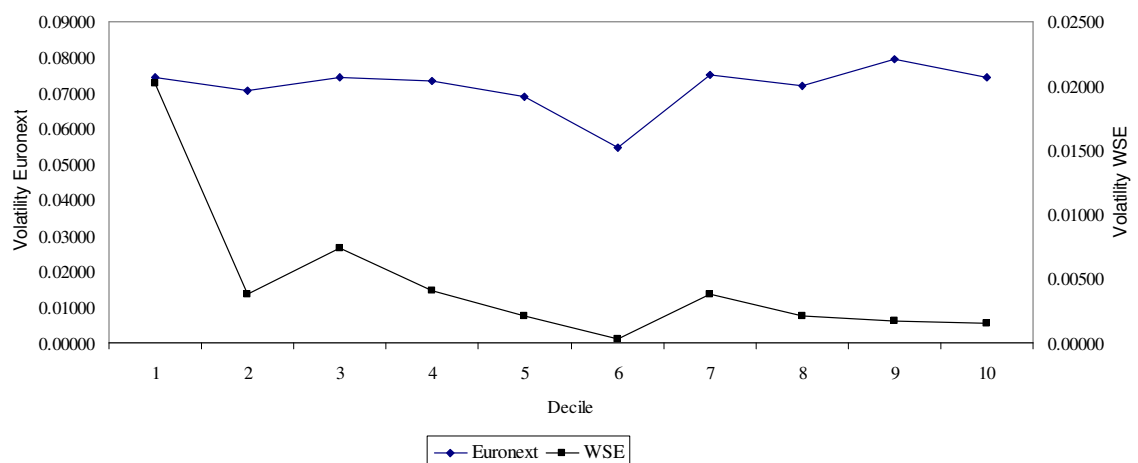**Figure 4: WSE and Euronext range based daily volatility across deciles.**

Table 4: WSE vs. Euronext: statistical differences for daily range based volatility across deciles

Range Based Volatility	D1 WSE v ENX	D2 WSE v ENX	D3 WSE v ENX	D4 WSE v ENX	D5 WSE v ENX	D6 WSE v ENX	D7 WSE v ENX	D8 WSE v ENX	D9 WSE v ENX	D10 WSE v ENX
Z	-12.29	-12.97	-12.95	-12.95	-12.95	-12.95	-12.98	-12.98	-12.73	-12.95

4.   CONCLUSION

This study shows that in most areas of market quality, the stock exchange in a representative transition economy, the Warsaw Stock Exchange is inferior to the stock market in a developed economy, the Euronext France. Liquidity is significantly higher when represented by trading volumes, average trade size and trade value. An interesting result is that WSE exhibits much smaller volatility than the Euronext. The low volatility is clearly a side effect of lower trading activity on the WSE than Euronext. However, since some of the highest capitalisation stocks on the WSE exhibit lower transaction costs than relatively similarly sized companies on Euronext, the WSE is an interesting alternative for foreign investors that seek to add liquid low risk stocks to their portfolios.

To provide a method for comparing the capital market of a fully developed economy to the capital market of a transition economy the differences in four measures of market quality for two representative markets are investigated. This has allowed a normative statement to be made that the emerging market of the Polish Transition economy is at a stage equal to that of many other emerging markets. Even though the Polish economy has grown strongly since 'independence' in 1989 it still requires further development. Statements of this nature are often made but not substantiated. Both markets have used the same trading platform yet produce different investment universes where investors face different outcomes in the form of return levels and variance. Even if the same systematic information were to flow simultaneously between these markets an investor at the WSE may suffer from lack of liquidity. Also, as transaction costs are nearly always higher in Poland than France, investors may simply be shunning the market. This is apparent when analysing the amount of trading going on in both markets. Policy makers in Poland need to analyse these data to attempt to attract not only domestic investment but also foreign investments and listings. Indeed, on Euronext, some of the largest and most active companies are large European and US companies that trade on Euronext simultaneously[v]. The WSE may be able to attract companies from other neighbouring emerging markets. A strong argument for the potential competitiveness of the WSE is the observation that a few of the highest capitalisation stocks on the WSE exhibit lower transaction costs and volatility than similarly sized companies on Euronext.

To further the work completed in this study it would interesting to investigate similar data covering a longer time period and to test for changes in market quality as a result of market-microstructure reforms. Also, of particular interest would be the measurement of the impacts on stock liquidity and volatility due to the introduction of equity derivatives at the WSE. A more general problem that emerges in this paper is the question if volatility is a good or bad characteristic in a capital market. This is the first contribution to the transition economy literature to compare the market quality of disparately developed economies in a quantitative manner. The description of lower volatility in the transition economy is contradictory to much of the emerging markets literature and deserving of future attention.

REFERENCES

Alizadeh, S., Brandt, M.W., and Diebold, F.X. (2002), "Range-based estimation of stochastic volatility models," *Journal of Finance*, Vol 57: 1047-1091.

Bessembinder, H., (1999), "Trade execution costs on NASDAQ and the NYSE: A post-reform comparison", *Journal of Financial and Quantitative Analysis*, Vol 42,:387-407.

Black, F. (1971) "Towards a Fully Automated Exchange, Part 1", *Financial Analysts Journal*, Vol 27:29-34.

Boot, A.W.A., and Thakor, A.V. (1997), "Financial systems architecture", *Review of Financial Studies*, Vol 10:693-733.

Chakravarty, S., Chiraphol N.C., and Christine J. (2004), "The choice of trading venue and relative price impact of institutional trading ADRs versus the underlying securities in their local markets," Working Paper, California State University, San Marcos - College of Business Administration.

Cho, Y.J. (1986), "Inefficiencies from financial liberation in the absence of well-functioning markets", *Journal of Money Credit and Banking*, Vol 18:88-102

Demirgüç,-Kunt, A., and Levine R. (1996), "Stock market development and financial intermediaries: Stylised facts", *World Bank Economic Review*, Vol 10:291-321.

Durnev, A., Li, K., Mørk. R, and Yeung, B. (2004), "Capital markets and capital allocation: Implications for economies in transition", *Economics of Transition*, Vol 12(4):593-634.

Easley, D., Kiefer, N., O'Hara, M., and Paperman, J. (1996), "Liquidity, information, and infrequently traded stocks", *The Journal of Finance*, Vol 51: 1405-1436.

Frydman, R., Hessel, M., and Rapaczynski, A. (1998), "Private ownership and corporate performance: Evidence from the transition economies" Mimeo, New York University February.

Glen J. (1994), "An introduction to the microstructure of emerging markets", International Finance Corporation discussion paper 24, Washington D.C.

Goldsmith, R.W. (1969), "*Financial structure and development*", Yale University Press, New Haven CT.

Hermes, N., and Lensink, R. (2000), "Financial system development in transition economies", *Journal of Banking and Finance*, Vol 24:507-524

de Jong, F., Nijman, T., and Röell, A.(1995), "A comparison of the cost of trading French shares on the Paris Bourse and on SEAQ International". *European Economic Review*, Vol 39:1277-1301.

Kairys, J.P. (1999), "A tale of three cities: is an electronic order book appropriate for transition economies?", *Working Paper*, University of Alberta.

Kairys, J.P., Kruz, R., and Kumpins, R. (2000), "Winners and losers from the introduction of continuous variable price trading: evidence from the Riga stock exchange", *Journal of Banking and Finance*, Vol 24: 603-624.

Levine, R. (1991), "Stock markets, growth, and tax policy." *Journal of Finance,* Vol.46: 1445-1465.

Meridian Securities Markets, (2001), *World stock exchange fact book*, Meridian

Scholtens, B. (2000), "Financial regulation and financial system architecture in Central Europe", *Journal of Banking and Finance*, Vol 24: 525-553.

Singh, A. (1997), "Financial liberalisation, stock markets and economic development", *The Economic Journal*, Vol 107 (May):771-783

Smith, B.D., Starr, R.M., and Bencivenga, V.R. (1995) "Liquidity of secondary capital markets: Allocative efficiency and the maturity composition of the capital stock," *Economic Theory*, Vol. 7(1):19-50.

Swan, P., and Westerholm. P.J. (2006), Market architecture and global exchange efficiency, Working paper, The University of Sydney and the University of New South Wales.

Venkataraman, K. (2001), "Automated versus floor trading: An analysis of execution costs on the Paris and New York exchanges. *Journal of Finance*, Vol 56:1445-1485.

World Stock Exchange Handbook (2001), Meridian Securities, Texas, USA.

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[i] The market structures for both markets are effectively the same. This has been confirmed using the World Stock Exchange Handbook (2001) and relevant websites. More detailed information can be obtained upon request from the corresponding author.

[ii] The effective spread is doubled to account for the round-trip cost of transacting. A smaller spread indicates lower transaction costs.

[iii] All econometrics used in this research, for each of the variables and across all ten deciles for both markets, are available from the corresponding author upon request.

[iv] The data used in this paper only includes on market trades reported through the Reuters database. It therefore, excludes off-market trades and indeed upstairs market trades.

[v] These foreign companies are excluded from our analysis since even if their market capitalization is great, only a fraction of the interest in these stocks is in France.