

Ya. V. Khomenko,
DrHab (Economics)

O. I. Molchanov,
K. S. Sheyka,

Donetsk National Technical University

A PRACTICAL APPROACH FOR QUANTIFYING COUNTRY RISK ON THE UKRAINIAN STOCK MARKET

Introduction. This paper aimed to shed some light on the way the country risk premium should be introduced to the traditional CAMP model. In most emerging market valuations a risk adjustment takes place by adding a spread called the “country risk premium” to the rate determined by the CAPM of an equivalent investment in a developed market. Some experts modify CAMP model using this addition analyzing market stocks or investments which are reflected by country uncertainties.

Incorporating a country risk premium in the discount rate is inconsistent with the assumptions of the CAPM. And if country risk is going to have an impact on the discount rate a way must be found to modify the CAPM without altering its fundamentals.

Introduction a country risk means that it, firstly, must be evaluated somehow and then be included to the CAMP traditional formula.

As a result, we propose a modification of CAPM for stock evaluation in emerging countries taking into consideration market and stock exchange data and involving only the country’s systematic risk. This modification is an improvement over the existing model for conditions prevailing in emerging countries.

Historical Background. In 1959 Markowitz was the first to develop the modern portfolio theory, which was the base for CAPM research. He proved that investors should create their portfolio in order to offer themselves a maximum level of return for a given level of risk or, a minimum level of risk for a given level of return. [1] The modern portfolio theory has proposed models of asset pricing in fully efficient markets. Markowitz showed in his theory that stocks are related to each other and that the risk can be decreased through diversification.

Sharpe (1964) and Lintner (1965) continued the work of Markowitz and constructed the famous Capital Asset Pricing Model (CAPM). Basically, the model was developed to explain the differences in risk premium across assets. The CAPM shows clearly that these differences are generated by the differences in the assets’ riskiness, i.e. the higher the risk of an asset, the higher the risk premium demanded by investors.

The general equation of the model is:

$$E(R_i) = R_f + b_i(E(R_m) - R_f) \quad (1)$$

where:

$E(R_i)$ – expected return of stock i ;

β_i – relative risk of share i ;

$E(R_m)$ – expected return of the market;

R_f – risk-free interest rate such as interest arising from government bonds [2].

Coefficient β_i is the sensitivity of the expected excess asset returns to the expected excess market returns [3].

A very important consequence of this model is the separation theorem, which says that in the capital markets the risk has two components: diversifiable (or non-systematic) risk and non-diversifiable (systematic) risk. When pricing, the only significant risk is the systematic one, since investors can just get rid of the non-systematic risk through diversification. Sharpe and Lintner show that the true measure of risk is the well-known beta coefficient.

So, the CAPM is very important for investors and stock markets, because it helps to estimate the return of our portfolio (asset) and relationships between risk and income, to test efficient market hypothesis and helps to determine the selection of stocks in the portfolio.

Country risk. According to the CAPM, the only relevant risk is given by beta: a measure of the covariance between the project’s return and the return of the market portfolio. Hence, companies in different industries have different (relevant) risk. Nonetheless, this rationale does not account for geography. The companies in the same industry but in different countries could have the same risk but investors frequently demand different returns from the same business depending on its location. This particular risk associated with the geographical location of the investment is known as country risk.

The capital asset pricing model is rather good method of risk estimation. But it is fully applicable without any modification for developed countries. However, the CAPM is not relevant in the developing world for the following reasons:

1. Greater uncertainty causes investments in emerging countries to tend to be riskier than investments

in developed markets. Such kind of risk must be somehow quantified.

2. The main indicator for what could be considered to be the “market portfolio” in emerging markets is the stock price index. But this index is rarely a good proxy of the real local business environment.

3. Local businesses are subject to strong foreign impacts in much greater measure than their counterparts in developed countries.

4. To a far larger degree than in the developed world, the great majority of companies are controlled by family groups or a few shareholders. In general, such investors are not well diversified, since these businesses usually represent an important proportion of their proportions. The CAPM ignores the impact of the project on investors’ portfolios, but often this cannot be done in developing countries. [5], [6]

So, for an adequate estimation for developed countries we need some extensions and modifications.

Emerging markets allow investors to access high returns and unique investment opportunities. However, these opportunities carry high risks. Usually such kind of risks are included in definition of “country risk”.

Country risk an important, and often overlooked, component of the cost of capital. Factors like political instability, natural disasters, and economic turmoil all cause investors to demand a premium for putting their capital at risk. Country Risk Premium (CRP) is the additional risk associated with investing in an international company rather than the domestic market. Macroeconomic factors such as political instability, volatile exchange rates and economic turmoil causes investors to be wary of overseas investment opportunities and thus require a premium for investing. The country risk premium (CRP) is higher for developing markets than for developed nations. This premium increases the cost of capital at which an investment’s cash flows are discounted, negatively impacting the stock’s valuation. [14].

Reputation is the key for assessing country risk. Reputation is built upon a country’s social peace and institutional behaviour through time. A high degree of social stability and extended periods of institutional consistency and continuity earn a nation trustworthiness and low levels of country risk. Observe that country risk does not have as much to do with the quality of economic policies as with their stability and consistency [6].

The Country Risk Adjustment. Most practitioners are convinced that developing countries are inherently riskier. Hence a higher return must be expected from investments in these nations to account for the additional “country risk”. In most valuations this risk adjustment is accomplished by adding a spread called the “country risk premium” to the discount rate of an equivalent investment in a developed market.

The majority of practical models are based on the

CAPM (Capital Asset Pricing Model). The most popular one is probably the following adapted CAPM:

$$E(R_i) = R_f + b_i(E(R_m) - R_f) + CR \quad (2)$$

where:

CR is a country risk premium [7].

It is worth reminding that one of the most important assumptions of the CAPM is that investors are fully diversified meaning that they are able to diversify at negligible cost all the intrinsic risks of their investments, so that only those risks that cannot be diversified away must be accounted for in the discount rate. These non-diversifiable risks are known as systematic since they are correlated with the market portfolio.

There are many other variants to this well-known approach. What they all have in common is that the discount rate is estimated using the CAPM as the base model and the resulting expected return is adjusted with a measure of country risk. Some common adjustments follow:

- An additional risk premium is added to or subtracted from the discount rate resulting from the model described above. The magnitude of this additional premium is often quite subjective and depends on the country where the project takes place, or
- The relative volatility of the stock market index of the emerging country is factored in, or
- The country risk premium is added to the market risk premium, or
- The country risk adjustment depends on the proportion of foreign revenues of the firm or project. [7], [8], [9].

Methodology of country risk evaluating. In practice, a number of methods for country risk evaluating could be introduced because of variety of approaches to them. But we introduce two of them, most obvious ones:

- Modified International CAPM (MICAPM)
- Systematic Country Risk Modulator (SCRM) [8]

Modified International CAPM

This approach is much the same as traditional CAPM but has one but very important distinction. To include CRP in our model we use weighted beta which is indicated as b_w . So the whole formula will be the following.

$$E(R_i) = R_f + b_w(E(R_m) - R_f) + CR \quad (3)$$

b_w is computed as:

$$b_w = \sum_{i=1}^n a_i \cdot b_{Bi} \quad (4)$$

where,

b_{Bi} – stands for the beta of a similar investment in country i ;

a_i – is the net weight in the firm’s overall operating cash flows of the portion of cash flows associated with country i .

b_{Bi} is computed as:

$$b_{Bi} = b_{BM} \cdot b_{iM}$$

b_{BM} is the beta of a similar business in a developed country with respect to a market proxy (i.e. S&P 500);
 b_{iM} is the beta of the relevant country stock market index with respect to the market proxy.

Systematic Country Risk Modulator

$$E(R_i) = R_f + b_w(E(R_m) - R_f) + I CR \quad (5)$$

where,

CR is a proxy for the country risk premium, say the yield spread between government bonds;

I is the square of the sample correlation coefficient between the historical returns of the local stock market index and the market proxy index. This parameter can be interpreted as the proportion of total variability of the returns of the local stock market index that can be explained by the returns of the proxy market index.

$$I = (b_{iM})^2 \cdot \left[\frac{S_M}{S_i} \right]^2 \quad (6)$$

where,

b_{iM} is the beta of the local stock market index with respect to the market proxy;

S_M is the standard deviation of the market proxy returns;

S_i is the standard deviation of the local index returns.

Data and Sample Selection. The present case is realized by using the data about companies traded in the Ukrainian Stock Exchange (UX). The data are obtained from UX Data Base. The source of data is an official web-site of the Ukrainian Exchange [12]. The study covers the period from 29.07.2009 to 05.08.2011.

The study uses daily stock returns of 14 companies traded in the market in the year 2009 – 2011. The selected sample consists of 14 stocks that are included in the formation of the UX and PFTS indices.

All securities included in the sample are traded on the UX on a continuous basis throughout the full Ukrainian stock exchange trading day.

The 1-year Ukrainian Government Bonds (UGB) are used as the proxy for the Ukrainian risk-free asset. The yields were obtained from the statistic data of the National Bank of Ukraine. Also, for calculating the country risk premium (CR in the formula) US Treasury Bond (USTB) were taken. The data were obtained from U.S. Department of the Treasury data base. [13]

Results and Analysis. For testing method of Systematic Country Risk Modulator was used. Analyzing mentioned above formula it is logically to start from deciding what will be a market proxy. It is rather difficult question to answer and it could not be one definite opinion on this question. Finding a true proxy (or reflection) of the market as a whole may not be possible, because a proxy will only be a fragment of the entire market for all risky assets. As well, every proxy for the market would need to be unique, according to what is being traded or measured. In this

particular study we use Public Joint Stock Company „Державна енергогенеруюча компанія “Центренерго” (Ticker on UX: CEEN). It gives us a broad representation (see Figure 1) of the overall market and takes 20,48% of Index Basket. From this graph we can see that CEEN and UX are highly correlated ($R^2 = 0,92$).

The next step was to calculate standard deviation of the market proxy returns and the local index returns. Also for calculating I we need to know the b_{iM} , which was also calculated. The results are represented in table 1.

The next step was to calculate CR , which is the difference between Ukrainian Government Bonds and US Treasury Bond rates. Accordingly to the data, the average rates from 29.07.2009 to 05.08.2011 were 10,1% and 3,3% correspondingly.

After some calculations, the CAPM [12] for chosen companies having regard to country risk was determined. The results are represented in Table 2.

The results of these table clearly shows high value of country risk at the Ukrainian Stock Market. This should be taken to the account of the investors.

It is very important to be aware that there is no such thing as a unique value for a firm, and that this is even more definite in highly volatile emerging markets. The best an investor in emerging markets can do is to make a well-educated decision as to a reasonable price range. The higher the price, the higher the probability that the true value be lower.

Conclusion. In most emerging market valuations a risk adjustment is accomplished by adding a spread called the “country risk premium” to the discount rate for an equivalent investment in a developed market.

In the paper a modified CAPM is proposed. The model allows for income and expenses in different countries and uses a (representative) developed stock market as the proxy for the market portfolio and the basis for the computation of project beta. The correct incorporation of systematic risk remains a challenge for different reasons.

The first problem with the application of modified CAPM is connected with indirect estimation of beta. Publicly traded securities are the natural information source for those interested in estimating beta for a real investment. In developed countries it is straightforward process to select one or more publicly traded companies in the same or similar line of business as the company being analyzed. Then their corresponding betas are obtained from an information service. The project beta should be within the range of these company betas. However, generally this procedure is not as easily done in developing countries because of short history and high volatility of the stock markets, illiquidity of these markets, limited number of firms in many lines of businesses and low frequency at which each stock is traded with respect to the average.

Secondly, we have to consider impact of country

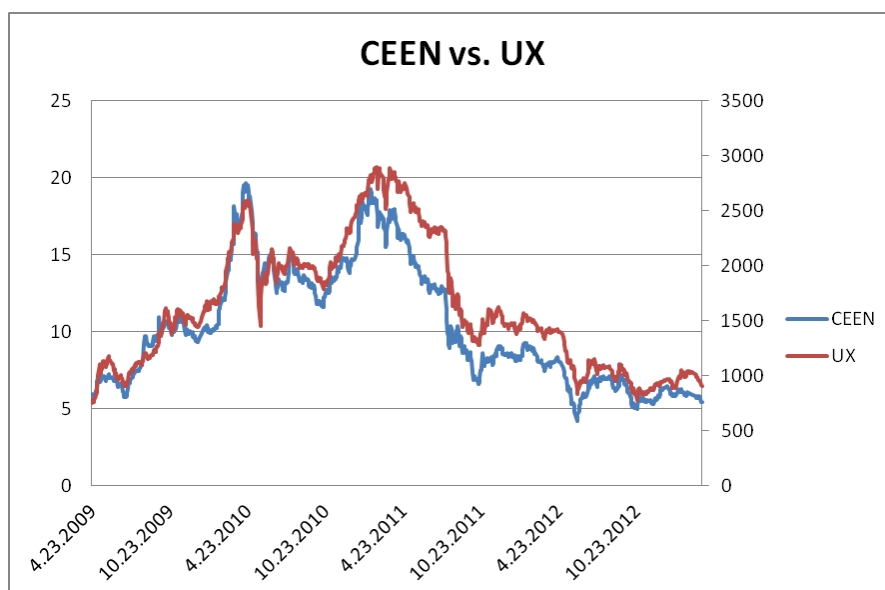


Figure 1. CEEN and UX dependence

Table 1

Results of calculating the components for I

Ticker	St. dev
CEEN (s_M)	0,02807
UX (s_i)	0,02331
$b_{iM} = 0,997$	
$I = 1,441767$	

risk and its correct evaluation. There is no clear-cut solution to this problem, and we must accept a degree of ambiguity in systematic risk. The only way out is to add this imprecision to the other factors associated with the estimation of beta and experiment with different values of this parameter. This problem alternatively could be solved using another proxy for the developing economy. In this case the problem with searching for representative indicator begins. This indicator must be provided by frequent data and statistically estimated.

Third problem stems from the quality of information sources. Of course, this problem deals with level of experience and qualification of analysts. Every approach requires deep gradual analysis of particular developing market for more accurate evaluation of country risk and, consequently, more accurate CAMP evaluation. As a solution, one can use useful web pages with data and information on many countries (Transparency International, Reuters, Bloomberg etc.) information of main rating agencies.

Risk and flexibility is the final problem in the correct application of modified CAPM. Country risk is often manageable. The task for investors in developing countries

is to structure investments in such a way that country risk is minimized (hence expected cash flows are maximized). A common country risk management strategy is to build in future project flexibility.

Finally, we must realize that no modified CAPM could be a panacea. Not all kind of risks could be obvious and manageable. In every particular market we could face with specific, peculiar only to this particular economy, risks, which need to be taken into consideration. However, in spite of these important limitations we believe it to be a more appropriate model for emerging countries than the traditional country risk premium approach.

References

1. **Markowitz H. M.** (1959): Portfolio Selection: Efficient Diversification of Investments, 2nd ed., New York: John Wiley & Sons (reprinted by Yale University Press).
2. **Solnik B., McLeavey D.** (2003): International investments, 5th ed., Pearson.
3. **Lintner J.** (1965): The valuation of risk assets and selection of risky investments in stock portfolios and capital budgets, Review of Economics and Statistics, p. 40 – 47.
4. **McLaney E. J.**

Table 2

Systematic Country Risk Modulator estimations

Equity	Beta	CAPM	SCRM
ALMK	1,45	17,23%	27,03%
AZST	1,25	16,24%	26,04%
USCB	1,21	16,02%	25,82%
CEEN	1,12	15,58%	25,38%
ZAEN	0,64	13,24%	23,04%
ENMZ	1,33	16,64%	26,44%
UTLM	0,56	12,84%	22,64%
BAVL	0,88	14,41%	24,21%
AVDK	1,01	15,08%	24,88%
DOEN	1,01	15,04%	24,84%
MZVM	-0,03	9,97%	19,77%
SGOK	0,91	14,55%	24,35%
KVBZ	0,81	14,06%	23,86%
STIR	1,17	15,86%	25,66%

(2006): Business Finance: Theory and practice, Moscow: Prentice Hall Financial Times (An imprint of Pearson Education). 5. **Magni, C. A.**: Correct or incorrect application of CAPM? Correct or incorrect decisions with CAPM? European Journal of Operational Research 137, 2007, p. 206 – 217. 6. **Kristofik P.** (2010): Application of CAPM for investment decisions in emerging countries. 5th International Conference Management and Modelling Financial Risk Ostrava, 2010. 7. **Damodaran A.** 2003, “Country Risk and Company Exposure: Theory and Practice”, Journal of Applied Finance, Fall. 8. **Sabal J.** 2002, “Financial Decisions in Emerging Markets”, Oxford University Press. 9. **Sabal J.** 2004, “The Discount Rate in Emerging Markets: A Guide”, Journal of Applied Corporate Finance, Summer. 10. **Sabal J.** 2008, “A Practical Approach for Quantifying Country Risk”, Revista Journal, GCG Georgetown University – Universia, 2008, Vol. 2 Num. 3 11. **Malyshko A. V., Molchanov O. I., Sheyka K. S.** 2012, “Testing the CAPM on the Ukrainian Stock Market: Beta Coefficient Determination”, 2012, № 4 (30), p. 86 – 91. 12. **Ukrainian Stock Exchange**, <http://www.ux.ua/>. 13. **U.S. Department of the Treasury**, <http://www.treasury.gov/> 14. **Investopedia**, <http://www.investopedia.com/>

Хоменко Я. В., Молчанов О. І., Шейка К. С.
Практичний підхід для кількісного виміру ризику країни на українському фондовому ринку

У цій статті відображено теоретичні основи розрахунків ризику країни для ринків, що розвиваються, а також результати тестування модифікованих з урахуванням ризику країни САМР для українського фон-

дового ринку. Дослідження базується на даних Української фондової біржі та індексу UX за 2009 – 2011.

Ключові слова: український ринок цінних паперів, країнових ризиків, моделі оцінки фінансових активів, бета коефіцієнт, інвестиції.

Хоменко Я. В., Молчанов А. И., Шейка Е. С.
Практический подход для количественного измерения страновых рисков на украинском фондовом рынке

В данной статье отображены теоретические основы расчетов странового риска для развивающихся рынков, а также результаты тестирования модифицированных с учетом странового риска САМР для украинского фондового рынка. Исследование базируется на данных Украинской фондовой биржи и индекса UX за 2009 – 2011.

Ключевые слова: украинский рынок ценных бумаг, страновой риск, модель оценки финансовых активов, бета коэффициент, инвестиции.

Khomenko Ya. V., Molchanov O. I., Sheyka K. S.
A Practical Approach for Quantifying Country Risk on the Ukrainian Stock Market

This article represents the theoretical basis of country risk evaluating for emerging markets. It also contains the results of testing modified CAPM which include country risk premium for Ukrainian stock market. The study is based on data from the Ukrainian Stock Exchange and UX index for 2009 – 2011.

Key words: ukrainian stock market, country risk, capital asset pricing model, beta coefficient, investment.

Received by the editors: 09.10.2013
 and final form 04.12.2013