



STOCK MARKET ANALYSIS THROUGH BUSINESS CYCLE APPROACH

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Abstract. It is often claimed that stock prices are determined on the basis of some key macroeconomic indicators. Presumably, stock market movements reflect positions taken by market participants based on their assessment about the current state of the economy. Given the forward-looking behaviour of OECD Composite Leading Indicator which identifies business cycle phase, this paper explores the possibility of improving risk-adjusted returns of portfolio of US stocks. Using portfolios which are composed only of US stocks we show that asset weights should be modified to accommodate cyclical shifts in the economy if return/risk efficiency is to be maintained over the full cycle. Monthly data applied were from March 1955 to May 2011.

Keywords: business cycle, cyclical reallocation, stock market, investment strategies, OECD leading indicators.

JEL Classification: G11, E32.

AKCIJŲ RINKOS ANALIZĖ VERSLO CIKLO ASPEKTU

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Santrauka. Dažnai teigiama, kad akcijų kainos priklauso nuo kai kurių pagrindinių makroekonominių rodiklių. Akcijų rinkose atsispindi rinkos dalyvių pozicijos ir tai, kaip jie vertina dabartinę ekonomikos būklę. Vertinant EBPO apenkiančius rodiklius, identifikuojančius verslo ciklo fazę, šiame straipsnyje nagrinėjamos galimybės pagerinti grąžos/rizikos santykį investuojant į akcijų rinkas. Naudojant portfelius, sudarytus tik iš JAV akcijų, straipsnyje atkleidžiama, kad investiciniai portfeliai turėtų būti nuolatos perskirstomi atsižvelgiant į esamą verslo ciklo fazę. Tokiu būdu gali būti labai padidintas investicijų efektyvumas su didesne grąža ir mažesne rizika. Analizėje buvo naudojami mėnesiniai duomenys nuo 1955 m. kovo mėn. iki 2011 m. gegužės mėn.

Reikšminiai žodžiai: verslo ciklai, ciklinis perskirstymas, akcijų rinka, investavimo strategijos, EBPO apenkiantys rodikliai.

1. Introduction

An established phenomenon in financial markets is the dissimilar performance characteristics displayed by equity versus debt assets over the economic business cycle. Typically, total returns of equity assets rise during expansions while those of fixed income debt instruments do better during downturns.

Business cycles are the results of cyclical changes in major macroeconomic forces in the economy. These same forces are responsible for alterations in the “fundamentals” that affect asset’s prices. Thus, it is not surprising that research on asset valuation overwhelmingly finds a positive and statistically significant relationship between various assets and the state of the economy. Each asset has unique cash flow and risk characteristics during different stages of business cycle.

Fama and French (1989) find business conditions to be responsible for the common variation in the expected return on both stocks and bonds. They detect dividend yield accurately forecasting bond returns and the default and term spread of bonds accurately forecasting stock returns.

For investors there are two ways to approach the business cycle. One is to attempt to spot the turning points and shift asset allocation between bonds, stocks, commodities and cash accordingly. Equity managers will also try to shift the balance between cyclical stocks and growth stocks and defensive stocks. The forecasting and detection of turning points in the economy is one of the most studied and practiced areas in macroeconomics. Leading and coincident indicators play an important role in signalling the different phases of the business cycle. A cautious approach, in the face of this uncertainty, runs the risk that stock weightings may be too light when they rise. Most professional investors only change their asset weighting within certain limits and always keep a core of bonds and stocks in their portfolios. The second approach is to ignore the business cycle completely and concentrate on picking good companies or identifying investment themes.

In this paper work we are going to examine first way of approaching business cycles. The purpose of this paper is to adapt business cycle investment strategy and quantify portfolio return/risk performance when asset proportions are keyed to OECD leading indicator which determines phases of business cycle.

This paper will present a quantitative approach that improves risk-adjusted returns in portfolio of US stocks.

Research methods used in this paper are the logical analysis and synthesis of scientific literature, the comparison and generalization method, quantitative methods. Statistical analysis was taken on the grounds of business cycle approach.

2. Literature review

The casual relationship between stock market prices and macroeconomic indicators has been the topic for research-

ers and practitioners. The literature is very rich in developed, more material markets such as the US, UK, Japan, Singapore and others (Abdullah, Hayworth 1993; Chen *et al.* 1986; Maysami, Koh 2000; Maysami, Sim 2002).

The thesis that stock prices mimic the rises and falls in the business cycle is strongly supported in the related manner. With few exceptions, research shows that stock prices lead the level of economic activity. This phenomenon follows from the belief that current stock prices correctly impound expectations of future economic activity. Moore (1983), for example, shows that 18 of the 23 business cycle peaks (troughs) occurring between 1873 and 1970 are anticipated by the stock market, with an average lead-time of about five to six months. Moreover, from 1948 through 1970 his research shows 100% of peaks and troughs being correctly anticipated. More contemporary research using Granger methods shows bidirectional causality between stock returns and real economic activity (Tunah 2010; Ali *et al.* 2010).

Adjasi and Biekepe (2006) pointed out that the stock exchanges can provide quick paths to acquiring capital quickly, due to the ease with which securities are traded. Stock exchange activity therefore plays an important role in helping to determine country’s macroeconomic condition. Literature review contains a number of studies that examine stock price changes. Probably one of the most interesting and important subjects that has received increasing attention from economists, financial investors and policy makers is dynamic effects of macroeconomic indicators on stock prices.

Ibrahim (1999) found that macroeconomic forces influence stock prices through their impact on the expected future cash flows. Mehr (2001) noted that the public policy impact on growth can be measured by stock prices. Charkravarty (2005) also stated that stock prices are highly sensitive to key macroeconomic indicators. Frankel, Saravelos (2010) stated that international reserves and real exchange rate overvaluation were the top two indicators which stood out as useful leading indicators of the current financial crisis.

Through the employment of Hendry’s approach, Maysami & Sim analyzed the influence of interest rates, inflation, money supply, exchange rate and real activity, along with a dummy variable to capture the impact of the 1997 Asian financial crisis. The results confirmed the influence of macroeconomic indicators on the stock market indices in Hong Kong and Singapore, Malaysia and Thailand, Japan and South Korea, though the type and magnitude of the associations differed depending on the country’s financial structure (Maysami, Sim 2001a, 2001b, 2002).

Additionally, McQueen and Roley, who use daily data, find that stock returns exhibit an asymmetrical response to innovations in certain macroeconomic data that depend on the current level of the economic activity. The findings suggest that recurring patterns in stock prices are the result

of changing expected returns, which are somehow related to business conditions. There is evidence that the means and higher moments of stock returns are subject to systematic shifts that in some cases have also been tied to current economic conditions. Finally, stock returns can respond differently to economic factors depending on the state of the economy (DeStefano 2004; Xiufang 2010)

Hartmann *et al.* (2008) found that the use of publicly available and easily accessible information on economic and financial crises to detect structural breaks in the link between stock returns and macroeconomic predictor variables improves the performance of simple trading rules in real time.

According to Džikevičius and Zamžickas (2009) the most grounded explanation for recent economic downturns comes from Austrian business cycle theory. This confirms that even during structural breaks, business cycle theory can be used to explain major shifts in economy.

Business cycles are dissected into four stages so that broad movements in stock returns and determinants across the stages can be analyzed and the possible existence of asymmetrical effects of determinants within stages can be explored. Based on average returns for the four business-cycle stages, returns are found to decrease throughout economic expansions and into the first half of recessionary periods. Average returns are negative and reach their lowest values during the first half of recessions, yet quickly rebound to their highest levels as the recession concludes. Falling expectations for future earnings and rising long-term interest rates appear to be the driving force behind the falling returns that occur during economic expansions and changes in short-term rates coupled with rising expectations are major contributing factors to the rising returns that occur during economic recessions (DeStefano 2004; Bordo, Helbling 2010).

3. Business cycle analysis

Business cycles have been documented at least since the eighteenth century and seem to be an inescapable feature of the market economy. Periodically, usually near the height of an economic boom, people begin to argue that business cycles have been abolished but, so far, every upswing has ended in recession (or at least a severe drop in the growth rate) and every recession has given way to recovery. Business cycles are crucial for investors, most of whom spend a great deal of time trying to guess when the next turning point is coming. In practice the length of the cycle, the strength of the upswing and the depth of the recession vary considerably and are impossible to predict accurately. Nevertheless, it is crucial that investors are aware of the pattern.

Cycle analysis provides investors with a compass reading of the whereabouts of the global markets. This is essential

information which they need before they can begin to decide on the appropriate allocation of assets – equities, bonds, cash and other investments – within their portfolios. It also helps to determine geographic weighting. By setting stock selection within the context of cycle analysis, investors will know whether it is appropriate to chase momentum or pursue a more defensive strategy (Sinai 2010; Owen, Griffiths 2006).

In practice market timing is much more difficult because each cycle varies in length and amplitude (height of the boom and depth of the recession). Investors are often afraid of buying too soon or selling too late. When the market is falling, fear tends to be prevalent, with investors believing that the market could go much lower; and when the market is rising, 'greed' tends to be the dominant sentiment with investors frequently believing that 'it is different this time'. Moreover, since the overall pattern is well known everyone else is trying to move just ahead of the market. This is one reason why the stock market is seen as a leading indicator of the economy: investors try to jump in and out before the economy turns (Calverley 2002).

At this moment we can find several business cycle indicators which are appropriate for business cycle analysis: OECD Composite Leading Indicators (CLI), The Conference Board Leading Economic Index (LEI), ECRI U.S. Weakly Leading Index, Economic Sentiment Indicator. In the research we are going to focus on the most popular indicator – OECD Composite Leading Indicator, which was chosen for availability of the long historical data.

The leading indicator approach is based on the view that market-oriented economies experience repetitive and non-periodic fluctuations of economic activity. During the 1980's the OECD developed its system of leading indicators and business cycle analysis to provide economic analysts with early signals of turning points in economic activity. This information is of prime importance for economists, businesses and policy makers to enable correct analysis of the current economic situation and for the anticipation of economic developments. Composite Leading Indicators (CLI) data are compiled and disseminated by the Statistics Directorate of the OECD (Slaper, Cohen 2010).

OECD CLIs are aggregate time series which show a leading relationship with the growth cycles of key macro-economic indicators (the average lead is 6-months). Typically, they are constructed to predict the cycles of total industrial production or gross domestic product in industry, which are chosen as proxy measures for the aggregate economy. CLIs are calculated by combining component series in order to cover, as far as possible, the key sectors of the economy. These component series cover a wide range of short-term indicators such as observations or opinions about economic activity, housing permits, financial and monetary data, etc. The range of indicators depend on each country, CLI for US is calculated from these components:

- Dwellings started (number).
- Net new orders for durable goods (US dollar - million).
- Share prices: NYSE composite (2000 = 100).
- Consumer sentiment indicator (normal = 100).
- Weekly hours of work: manufacturing (hours).
- Purchasing managers index (BS) (% balance).
- Spread of interest rates (% per annum).

Stock and Watson (2003) say that every decline in economic activity declines in its own way – is not new. Indeed, one of the reasons that Mitchell and Burns (1961) suggested looking at many indicators was that each measured a different feature of economic activity, which in turn can play different roles in different recessions. In light of the variable performance of individual indicators and the evident difficulty professional forecasters had during this episode, the results from the combination forecasts are encouraging and suggest that, taken together, leading economic indicators did provide some warning of the economic difficulties of last decades (Stock, Watson 2003).

4. Data and methodology

As it was mentioned before, macroeconomic indicators will represent OECD Composite Leading Indicator (CLI) for the United States. Monthly data applied were from March 1955 to May 2011, which was taken directly from OECD web page. OECD Business cycle is divided into four phases:

- Downturn (the series is decreasing but above 100).
- Slowdown (the series is decreasing and below 100).
- Recovery (the series is increasing but below 100).
- Expansion (the series is increasing and above 100).

The hypothesis that movements in the economic indicators on the CLI contain useful information concerning sub-

sequent movements in common stock prices was backtested by applying business cycle filter rules on S & P 500 index comparing the investment results of various investment strategies with those that would have attended a buy-and-hold investment policy.

All hypothetical investments were in the S & P 500 index, employed as a proxy for the market portfolio, and were effected at the current, not an average, value of that index. We used monthly S & P 500 index data applied from March 1955 to May 2011. The data was taken from <http://finance.yahoo.com/> database.

Each S & P index period is labelled according to business cycle phase determined by CLI, consequently it enables to make investment decisions according to the policies of investment strategies.

Aniūnas *et al.* (2009) emphasized that investors need to evaluate acceptable risk level during analysis of investment models and before making decisions. Hence, in addition to return rates, standard deviation, Ulcer index, the biggest fall from peak and the biggest monthly fall are used to evaluate risk of investment strategies.

5. Results

The average return on each business cycle phase varies considerably. As we can see in the Figure 1, the best period for US stocks is in “Recovery” phase with average of 1.85% of monthly growth. Then we see 0.82% average monthly return in “Expansion” phase and 0.31% average monthly return in “Slowdown” phase. The worst period for US stocks is “Downturn” phase with average of –0.15% of monthly growth.

Table 1 confirms our proposition that “Recovery” is the best period for US stocks; profit/risk ratio indicates the best returns with least risk. Standard deviation in this period is 3.76%, when in “Full period” it is 4.26%, in “Slowdown” –

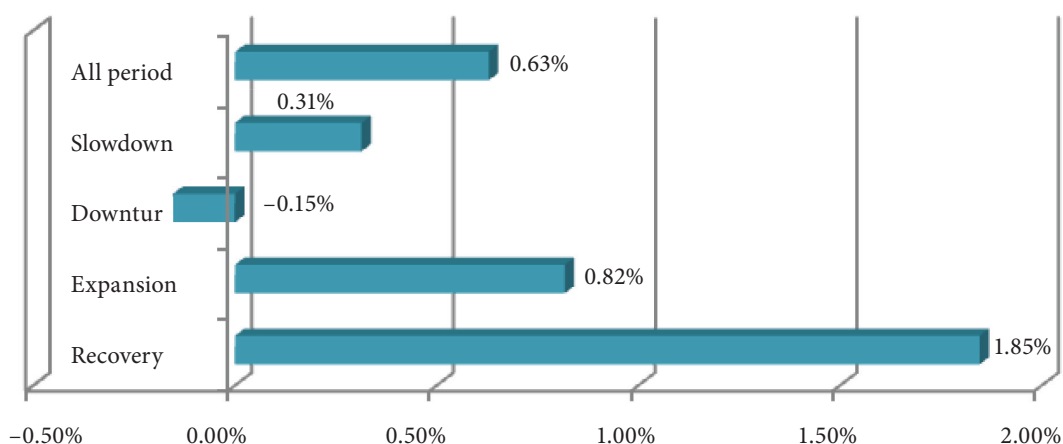


Fig. 1. Average US stocks return on different business cycle phases

5.55%, in “Downturn” – 4.27% and in “Expansion” – 3.15%. The least volatile period is in “Expansion” phase. Standard deviation treats up and down movement equally, but an investor does not mind upward movement. To measure down movement volatility we are using Ulcer index, which is constructed as a measure of volatility, but only volatility in the downward direction, i.e. the amount of drawdown or retracement occurring over a period. Ulcer index shows that least volatile to the down movement is “Recovery” phase with value of 9.51%, while in “Expansion” – 13.22%. This indicator reveals, what “Recovery” phase has higher potential for big up movement, what is why “Recovery” has worse standard deviation.

These results gave us helpful insights about behaviour of US stock market, which we used in constructing Investing strategies. In this work we tested 7 different strategies:

- Buy & Hold (1). According to this strategy we simply follow index and do not make any decisions through all investigated period. Our portfolio consists of 100% of stocks all the time.
- Full recovery & expansion (2). We are managing our portfolio actively, the decision is based on phases of Business cycle. We invest in stocks if CLI indicates “Recovery” or “Expansion”. During “Slowdown” and “Downturn” periods we stay with 100% cash.
- Full recovery, expansion & Slowdown (3). We are managing our portfolio actively, the decision is based on phases of Business cycle. We invest in stocks if CLI indicates “Recovery”, “Expansion” or “Slowdown”. During “Downturn” periods we stay with 100% cash.
- Leveraged recovery 2x (4). In this strategy during “Recovery” phase we are full in stocks and use 2x leverage which provides twice the monthly percentage change in the level of their reference index. In “Expansion”

phase we are full in stocks, but without leverage, during “Slowdown” we are 50% in stocks and during “Downturn” we out of the market.

- Leveraged recovery 3 (5). In this strategy during “Recovery” phase we are full in stocks and use 3x leverage. In “Expansion” phase we are full in stocks, but without leverage.
- Leveraged recovery and expansion (6). In this strategy during “Recovery” phase we are full in stocks and use 2x leverage. In “Expansion” phase we are full in stocks and use 2x leverage.
- Full leverage (7). This strategy is designed for comparison and using 2x leverage all the time. According to this strategy we simply follow index and do not make any decisions through all investigated period.

The simulation of investment strategies showed controversial results (Table 2). “Full recovery & Expansion” strategy has slightly higher Compound Annual Growth Rate (CAGR) than “Buy & Hold” strategy, but the risk level is much lower. Ulcer index of this strategy is 4.38%, whereas “Buy & Hold” – 15.19%, therefore the return/risk ratios are notably better.

The leveraged market-timing portfolios produced larger returns with smaller Ulcer index, biggest fall from peak, biggest monthly fall and slightly bigger standard deviation.

Simulations show that an investor could realize a compound annual return of 7.06–14.77 percent following from our market-timing strategies versus 6.63 percent from a stock-only buy-and-hold strategy with the lower risk. These results can be treated as economically significant.

An investor can readily replicate our market-timing strategy by easily switching between various ETF with different leverages. The relationship between business cycle indicators and other asset classes can be the topic for future researches.

Table 1. Performance of US stock market during phases of business cycle

03.1955–05.2011		Recovery	Expansion	Downturn	Slowdown	All period
Frequency		128	204	189	153	674
Profit	Average monthly return	1.85%	0.82%	–0.15%	0.31%	0.63%
	Biggest monthly growth	13.18%	9.67%	10.63%	16.30%	16.30%
Risk	Ulcer index	9.51%	13.22%	17.51%	28.95%	15.43%
	Biggest fall from peak	–29.00%	–28.83%	–33.48%	–46.19%	–71.66%
	Biggest monthly fall	–7.25%	–8.20%	–21.76%	–16.94%	–21.76%
	Standard Deviation	3.76%	3.15%	4.27%	5.55%	4.26%
Ratio	Return/Ulcer index	0.194	0.062	–0.009	0.011	0.041
	Return/The biggest fall from peak	0.064	0.028	–0.005	0.007	0.009
	Return/biggest monthly fall	0.255	0.100	–0.007	0.019	0.029
	Return/standard deviation	0.491	0.260	–0.036	0.057	0.148

Table 2. Performance of investment strategies

03.1955–05.2011		1	2	3	4	5	6	7
Profit	Growth per period	3609%	4542%	5825%	43174%	231782%	142970%	37753%
	CAGR	6.63%	7.06%	7.53%	11.40%	14.77%	13.79%	11.13%
Risk	Ulcer index	15.19%	4.38%	11.30%	7.79%	8.16%	8.66%	29.79%
	The biggest fall from peak	-52.56%	-13.78%	-48.25%	-37.78%	-38.37%	-26.59%	-81.52%
	The biggest monthly fall	-21.76%	-8.20%	-16.94%	-14.49%	-21.74%	-16.40%	-43.53%
	Standard deviation	4.26%	2.48%	3.61%	4.15%	5.60%	4.96%	8.53%
Ratio	CAGR/Ulcer index	0.44	1.61	0.67	1.46	1.81	1.59	0.37
	CAGR/The biggest fall from peak	0.13	0.51	0.16	0.30	0.38	0.52	0.14
	CAGR/standard deviation	1.56	2.85	2.08	2.75	2.64	2.78	1.31
	Overall rating	0.06	0.39	0.14	0.28	0.34	0.39	0.10

6. Conclusions

Using portfolios which are composed only from US stocks we show that asset weights should be modified to accommodate cyclical shifts in the economy if return/risk efficiency is to be maintained over the full cycle.

In particular the following points can be made. First, we find recoveries and expansions favouring stocks. Within this general structure, however, we see a varied pattern of cyclically induced asset proportion alterations. Second, our portfolio's return/risk structure changes considerably with the phase of the business cycle. This fact reveals a useful finding: in the absence of tactical rebalancing, investment benefits enjoyed during recoveries and expansions are substantially diluted during drawdowns and slowdowns. We find slowdowns producing a stock return Ulcer index about treble as great as that for recoveries. Hence, cyclical reallocation appears to be more important during recessions relative to expansions. Third, for those investors committed to buy and hold, our results indicate passive management can result in a less than optimal return/risk profile over a complete business cycle.

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