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Economic Research

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Business Cycle: U.S. Treasury Securities and Currency

The Dukascopy Bank research department continues the study of asset performance across a business cycle. The research focuses on asset dynamics under changing economic conditions and its meaning for an investor.

The current issue covers the performance of U.S. Treasury securities and the U.S. dollar.

Methodology

We have chosen to investigate three marketable types of Treasuries: 3 month T-Bills as short term, 10 year T-Notes as medium term, and 30 year T-Bonds as long term bonds. The currency is represented by the U.S. Dollar Index (DXY). Further explanations can be found in the appendix.

To describe the performance of assets numerically, we use logarithmic returns and volatility.

Volatility is a measure of how unstable the price of a financial instrument is on a time scale. The more fluctuation the financial instrument experiences, the higher the volatility is.

Correlations between different asset returns are examined to compare their performances and look for a general trend among asset classes.

Correlation is a measure of how similar the performances of two financial instruments are. It varies from -1 to 1, with -1 being a perfectly opposite movement and 1 – a perfectly unidirectional one.

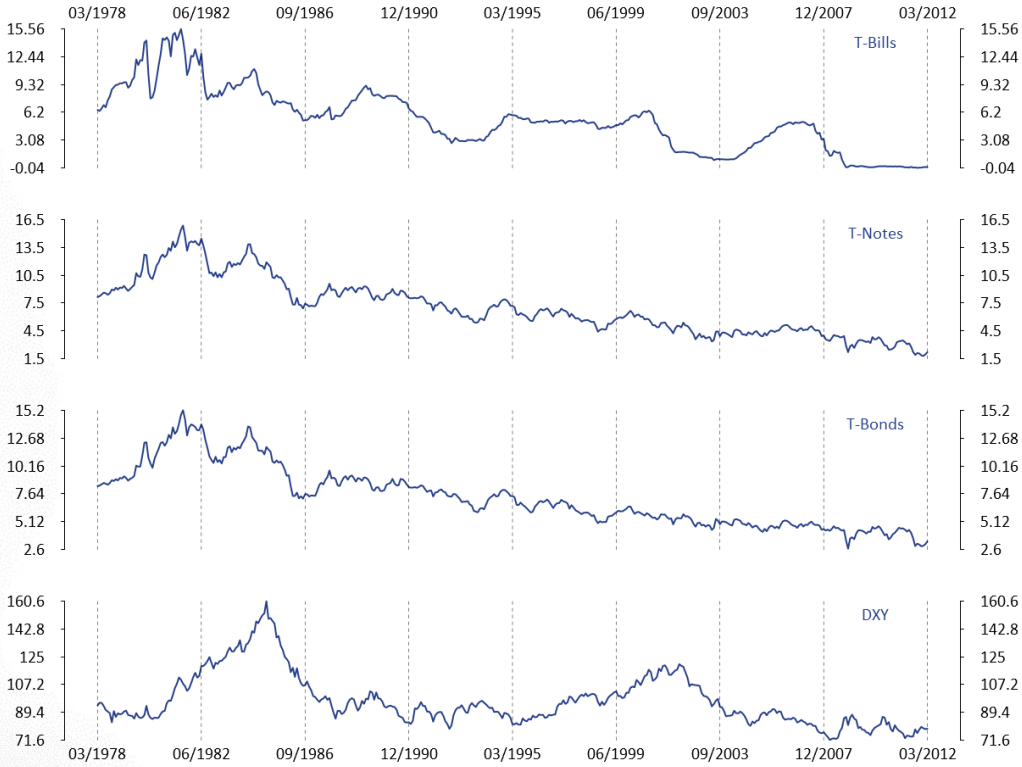


Figure 1 Historical data

Economic regimes within a business cycle are classified by the composite index. The index is designed to reflect the performance of the U.S. economy and is calculated as an average of four standardised macroeconomic indicators: GDP (gross domestic product), unemployment rate, manufacturing PMI (purchasing managers' index), and the difference between the yields of 30 year T-Bonds and 3 month T-Bills. The last indicator is a leading one, and thus is used with a 12 month lag.

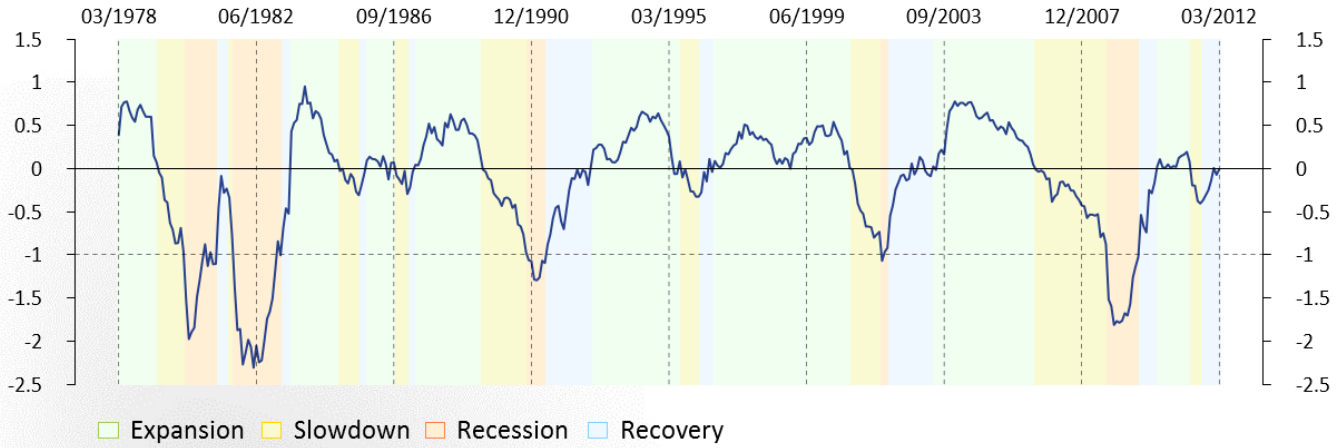


Figure 2 The composite index

Figure 2 shows how economic regimes are distinguished in accordance to the index values. A solid line on the zero level represents an economic equilibrium. Values above it indicate periods of expansion. Decreasing negative values are associated with a slowdown, increasing – with recovery. Values below -1 (dotted line) mark periods of recession. Precise time frames for the regimes are given in Table 1.

Expansion	1978 III - 1979 V		1983 VII - 1984 XII	1985 XI - 1986 IX	1987 V - 1989 V	1992 XI - 1995 VII	1996 VIII - 2000 X	2003 V - 2006 VI	2010 IV - 2011 IV
Slowdown	1979 VI - 1980 III	1981 VIII - 1981 IX	1985 I - 1985 VIII	1986 X - 1987 II	1989 VI - 1990 X	1995 VIII - 1996 II	2000 XI - 2001 IX	2006 VII - 2008 IX	2011 V - 2011 VIII
Recession	1980 IV - 1981 III	1981 X - 1983 III			1990 XI - 1991 V		2001 X - 2001 XII	2008 X - 2009 IX	
Recovery	1981 IV - 1981 VII	1983 IV - 1983 VI	1985 IX - 1985 X	1987 III - 1987 IV	1991 VI - 1992 X	1996 III - 1996 VII	2002 I - 2003 IV	2009 X - 2010 III	2011 IX - 2012 III

Table 1 Business cycle periods since 1978

Results

1. Profitability of government debt securities and national currency changes throughout an economic cycle.

On average, all Treasuries follow developments in economy, i.e., their performance is similar to that of the composite index (see Table 2). Thereby, lowest returns are typical for recessions, but highest – for expansions. It is best visible in T-Bills results, which show the greatest differences between economic regimes. Short term securities are also the ones that offer highest returns in good economic situations and are the most unprofitable in recessions. Periods of slowdown and recovery can be called transitional, as they correspond to decreasing and increasing returns respectively.

	Expansion	Slowdown	Recession	Recovery
T-Bills	1.3 %	-2.7 %	-4.11 %	0.36 %
T-Notes	0.16 %	-0.77 %	-0.92 %	-0.53 %
T-Bonds	-0.09 %	-0.25 %	-0.84 %	-0.08 %
DXY	0.01 %	-0.41 %	0.51 %	-0.06 %

Table 2 Average monthly returns during different economic regimes

The U.S. Dollar Index, on the other hand, has almost the opposite performance. Recession is a period of highest currency returns, while the worst values are associated with a slowdown. This confirms the notion of inflation during a business cycle: it is believed to fall in a recession and rise during a slowdown. The ideas about expansion and recovery are not quite clear, suggesting that inflation might or might not be still falling or feebly rising. Averaged results for these periods are close to zero, and Figure 3 shows various situations of both positive and negative returns. This might suggest that national currency does not have a general performance model for periods of recovery and expansion.

Figure 3 also shows a recent change in performance of short term bonds, or T-Bills. Other assets seem to be fluctuating on the same scale throughout the whole examined time period. T-Bills, in turn, have started to experience greater leaps since 2001. This goes as far as putting the returns for the latest expansion and slowdown below any recession level, and the results for current recovery above the previous maximum. Such developments can indicate either a general change in performance or, more likely, a local instability.

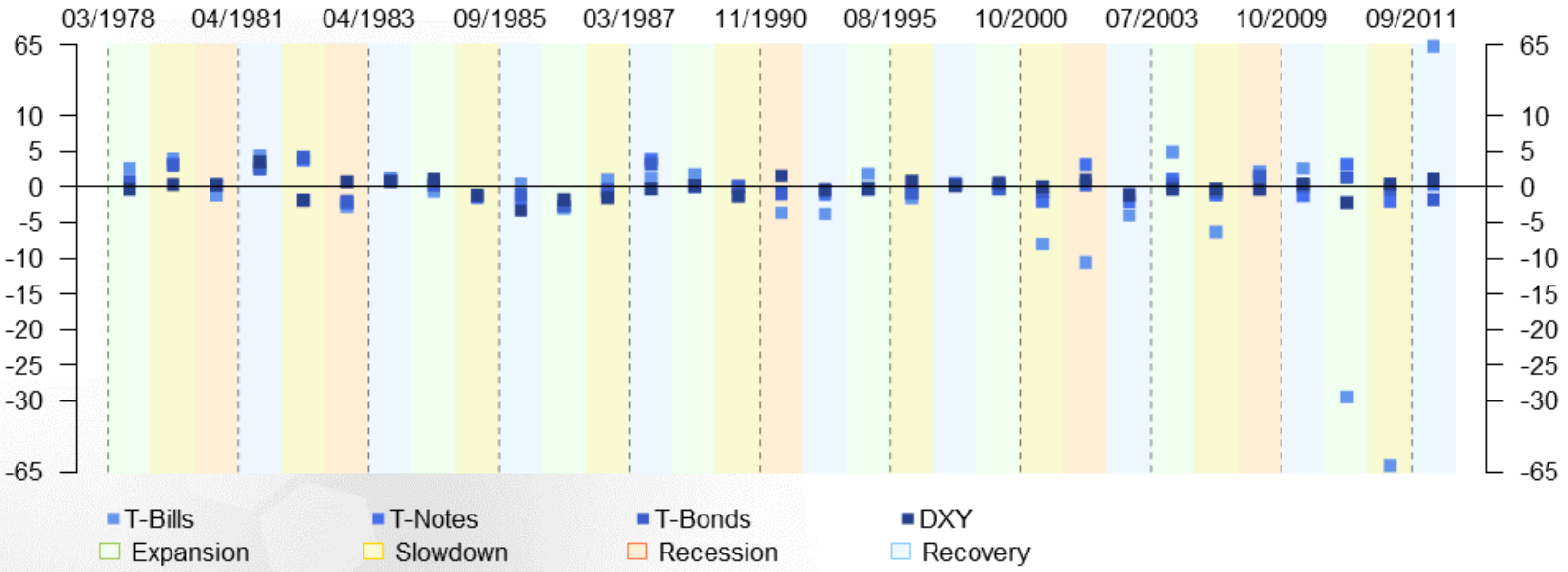


Figure 3 Average returns during economic regimes since 1978

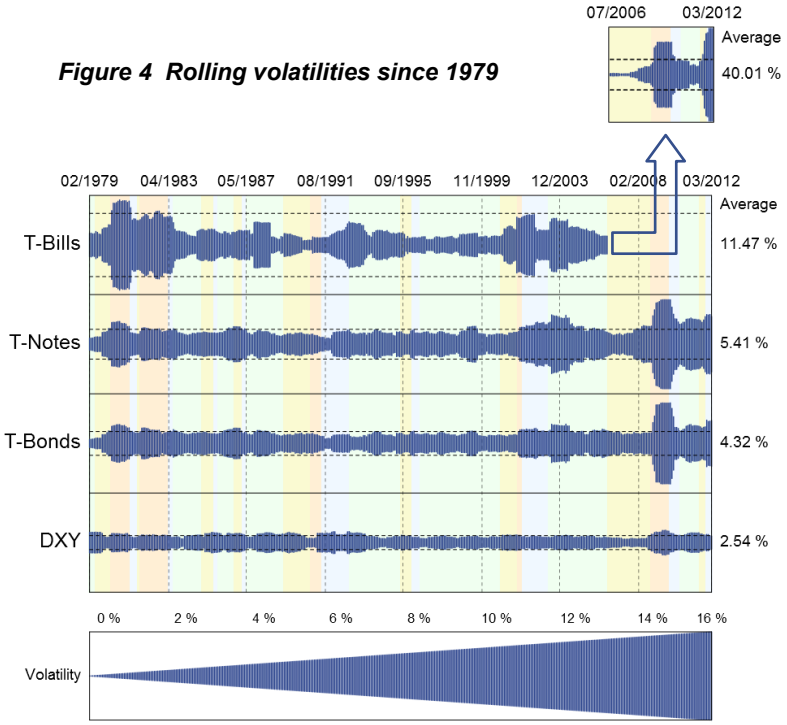
2. Recession is the period of greatest volatility, while the most stable periods vary over asset classes.

Table 3 shows that average volatility classifies economic regimes for Treasuries in the same way returns do. Expansion, which was associated with greatest returns, is also the period of highest stability, with volatility below the all-time average. The least profitable period, recession, is the riskiest one, as volatility here is 2-3 times higher than in expansion. Slowdown and recovery express the same transitional nature mentioned above: a slowdown can be named a worsening after an expansion, but a recovery – an improvement following a recession.

	Expansion	Slowdown	Recession	Recovery
T-Bills	6.35 %	12.15 %	19.74 %	18.61 %
T-Notes	4.99 %	5.38 %	8.99 %	6.63 %
T-Bonds	3.94 %	3.96 %	8.04 %	5.05 %
DXY	2.54 %	2.49 %	3.07 %	2.83 %

Table 3 Volatilities during different economic regimes

Figure 4 Rolling volatilities since 1979



Currency, too, is most volatile during recessions, but, in contrary to Treasuries, for DXY it is the period of highest positive returns. This makes it both the most profitable and the most risky at the same time. The most negative returns occur in the most stable period, slowdown. Such results might create an impression of the currency being a generally unprofitable asset. However, as can be seen in Table 3, the differences between volatility values of economic regimes are not as significant for DXY as they are for bonds. In fact, rolling volatility in Figure 4 shows that the U.S. Dollar index always fluctuates in a 2-3% volatility channel. That is half the value for T-Bonds, the most stable government debt security. Thereby an increase from -0.41% to +0.52% in returns should not be considered beaten by a minor rise of volatility.

Another notable thing is a recent dramatic increase in bond volatility. As displayed in Figure 4, during the last five years volatility of T-Bills, which were already mentioned for change in their performance, has been exceeding the average by up to 10 times. Moreover, the values for other Treasuries show similar changes, though nothing of that kind was apparent while investigating assets returns. This might be considered an argument in support of local instability as a cause of abnormal returns, for such high volatility suggests irregular leaps rather than systematic development.

3. T-Notes and T-Bonds are the only assets with stable strong correlation.

Medium and long term bonds are well known to be tightly bound. Their rolling correlation always stays above a 0.75 level, with no evidence of dips or rallies being associated with any particular economic regime. Values in Table 4 never drop lower than 0.9 with minor to zero discrimination between periods. This indicates that the economy has the same effect on these assets regardless of its state.

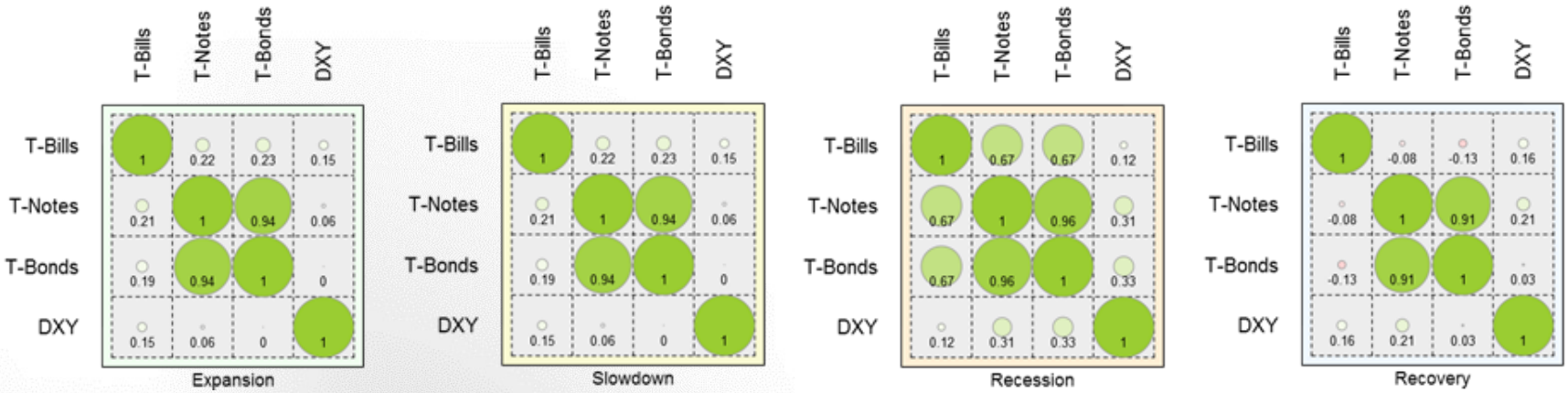


Table 4 Correlations during different economic regimes

Table 4 also suggests that recession positively affects T-Bills and currency correlations with T-Notes and T-Bonds, which are otherwise insignificant. However, rolling correlations in Figure 5 show no such interplay. Here it becomes clear that the high values are due to early 80s recessions, and later cases do not provoke the same unity. Note that these correlations are positive even for DXY and bonds, while returns claim that the regime has an opposite effect on asset groups. Such results might be due to a distinctive feature of the two recessions: they are associated with extremely high inflation, while normally this indicator would fall during the regime.

Average correlations (dotted lines on Figure 5) give a more generalised idea of the relationship between assets. T-Bills seem to share a feeble bond with the rest of Treasuries, as they hold their average correlations slightly above the significance level of 0.3. Correlations with currency, on the other hand, have average values of about 0.1, which indicate no general relationship. Combined with the differences in asset performance during economic regimes, this might be effectively used in portfolio risk management.

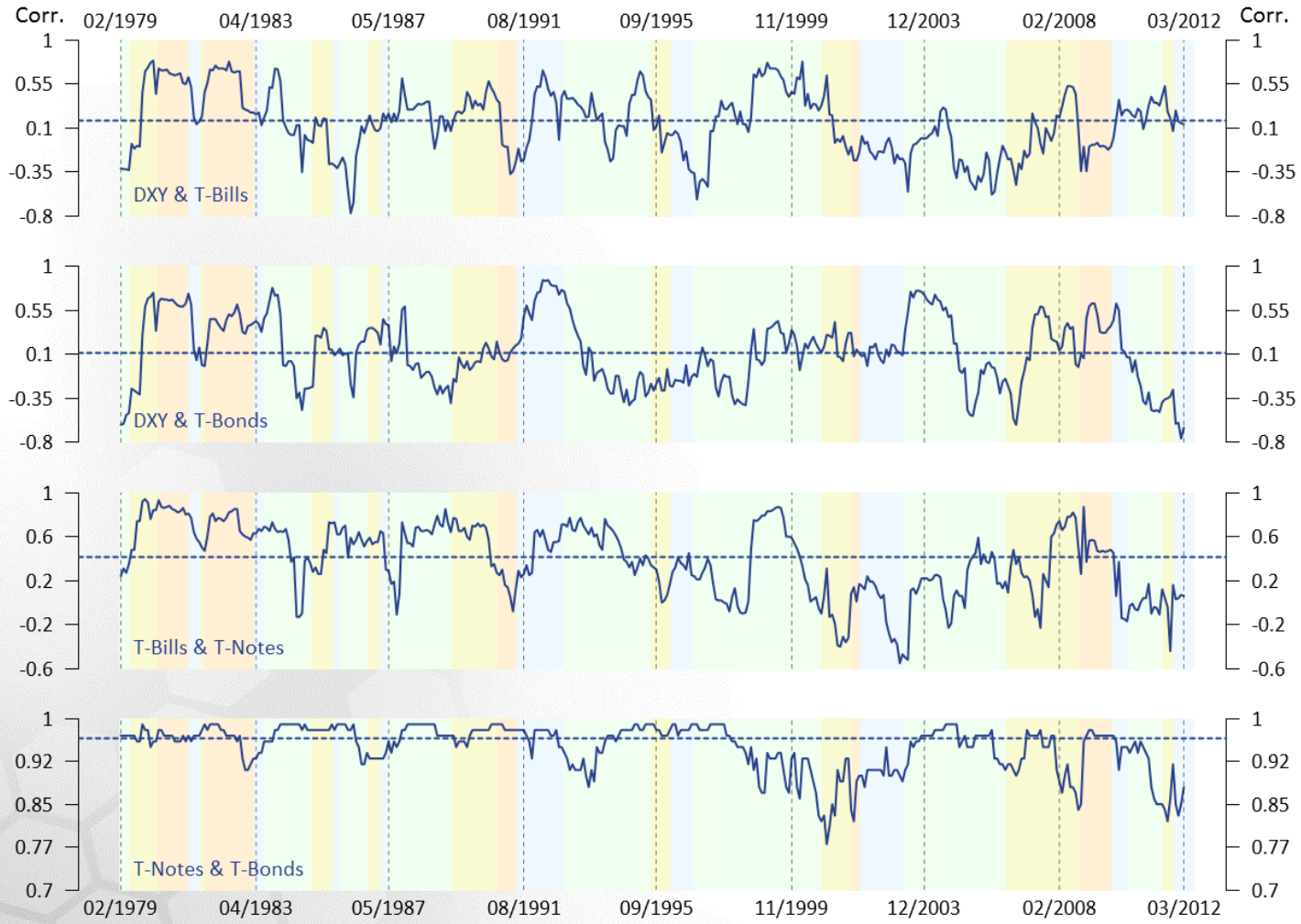


Figure 5 Rolling correlations since 1979

Conclusion

Analysing the U.S. indices and securities, we have established that changes in economic conditions do have an impact on financial assets.

Government debt securities seem to go in parallel with the business cycle. Returns and volatilities show that Treasuries are most profitable and stable during an economic upturn, and most unprofitable and volatile in recessions. National currency, on the other hand, performs differently. It makes a recession the period of both greatest returns and greatest volatility, while its lowest returns and smallest fluctuations occur during slowdowns.

U.S. equities, which were covered in the previous issue, have yet another type of performance, sharing some characteristics with bonds and others with currency. Overall results for asset returns and volatility throughout an economic cycle are given in Table 5:

S&P 500		Russell 2000		MSCI Value		MSCI Growth		T-Bills		T-Notes		T-Bonds		DXY	
return	volatility	return	volatility	return	volatility	return	volatility	return	volatility	return	volatility	return	volatility	return	volatility
1.09 %	3.76 %	1.12 %	4.91 %	1.05 %	3.7 %	1.1 %	4.34 %	1.3 %	6.35 %	0.16 %	4.99 %	-0.09 %	3.94 %	0.01 %	2.54 %
-0.22 %	4.49 %	-0.62 %	5.93 %	-0.32 %	4.1 %	-0.21 %	5.11 %	-2.7 %	12.15 %	-0.77 %	5.38 %	-0.25 %	3.96 %	-0.41 %	2.49 %
1.56 %	5.52 %	2.72 %	6.97 %	1.2 %	5.62 %	1.84 %	5.66 %	-4.11 %	19.74 %	-0.92 %	8.99 %	-0.84 %	8.04 %	0.51 %	3.07 %
0.51 %	4.47 %	0.72 %	5.7 %	0.4 %	4.6 %	0.59 %	4.75 %	0.36 %	18.61 %	-0.53 %	6.63 %	-0.08 %	5.05 %	-0.06 %	2.83 %

Expansion Slowdown Recession Recovery

Figure 6 Returns and volatilities during different economic regimes

All in all, it seems that expansion might be a good time to invest in bonds. Meanwhile, stocks and national currency tend to be stable and not unprofitable, so one should not be overly concerned with having them in a portfolio. A slowdown is a generally disadvantageous period for stocks and bonds in terms of both risk and profit. Currency, at the same time, is expected to be stably weakening, which makes playing against it an option worth considering. A recession is the worst time to invest in bonds and the most risky, but potentially the most profitable period for stocks and currency. During a recovery volatilities are still high, but returns are either moderately positive or feebly negative. Stocks seem to be the most promising asset in this period, but higher than average volatility still marks it as unstable.

Appendix

T-Bills (Treasury bills) – marketable U.S. government debt security that matures in one year or less and does not pay interest prior to maturity

T-Notes (Treasury notes) – marketable U.S. government debt security with 2-10 year maturity and semiannual coupon payment

T-Bonds (Treasury bonds) - marketable U.S. government debt security with maturity between 20 and 30 years and semiannual coupon payment

Source data on Treasuries is expressed in pre-tax yield to maturity.

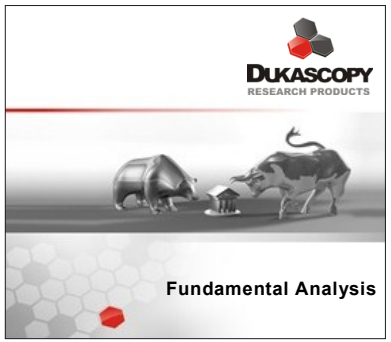
DXY (The U.S. Dollar Index) – trade-weighted geometric mean of the USD value against the EUR (57.6% weight), the JPY (13.6% weight), the GBP (11.9% weight), the CAD (9.1% weight), the SEK (4.2% weight) and the CHF (3.6% weight)

S&P 500 (Standard & Poor's 500 Index) - U.S. stock market index consisting of the 500 large-cap shares widely traded on the New York Stock Exchange and the NASDAQ

Russell 2000 - the U.S. small-cap stock market index that includes approximately 2000 of the smallest securities and is traded at the Chicago Board Options Exchange

MSCI USA Standard Value Index – MSCI Inc. large- and mid-cap U.S. stock market index designed for value investment style

MSCI USA Standard Growth Index – MSCI Inc. large- and mid-cap U.S. stock market index designed for growth investment style



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