Growth-Trend Timing and 60-40 Variations: Lethargic Asset Allocation (LAA)

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Abstract

Growth-Trend (GT) timing from Philosophical Economics is a brilliant timing strategy which only signals a bear market when both the trend in the unemployment (UE) rate and the SP500 index are bearish. As a result, it captures most market downturns while switching to cash in less than 15% of the time. In this sense, its crash protection is much less drastic than our own "canary" protection in our DAA strategy (25% in cash) or the breadth protection in our VAA strategy (around 50% in cash). In this paper we apply GT timing to the well-known 60-40 static benchmark (60% SPY - 40% IEF), and search in-sample for variations on 60-40 with GT timing. For these variations, we in particular consider risky portfolios which are also agnostic for inflation and yield, inspired by the various static portfolio like the Permanent Portfolio and its siblings. Our final strategy switches between two static portfolios based on GT timing. This strategy is called the Lethargic Asset Allocation (LAA).

1. Introduction

Growth-Trend (GT) timing is a strategy from Philosophical Economics (PE, 2016) which only signals a bear market when both the trend in the unemployment (UE) rate and the S&P500 index are bearish. As a result, it captures most market downturns while switching to "cash"[3] in less than 15% of the time. GT timing is a monthly trading strategy, rebalancing and changing position at the close on the last trading day of each month. We use the UE rate from Jan 1948 – Oct 2019 from Fred (2019).

The GT timing is designed by PE (2016) to circumvent whipsaw losses from trend following by using trend following only in recessions, signalled by the uptrend of the US Unemployment (UE) rate. Recessions are based on the uptrend (positive momentum) of UE using a 12-month simple moving average (SMA12) of the UE figures of the previous months[4]. Our backtest start at Feb 1949.

Outside recessions, the original GT strategy is long the S&P500 stock market (eg. by using an ETF like SPY), while *within* recessions trend following on S&P500 (SPY) is applied, using a well-know[5] 10-months simple moving average (SMA10) as trend filter on SPY. When a downtrend (negative momentum) is signalled inside a recession, the strategy goes to cash (ETF BIL). In other words, the original PE strategy goes to cash when both UE AND S&P are bearish. From Feb 1949 – Oct 2019 this only happened 13% of the months, while over the last 10 years this happens less than 2%.

In this paper we start by looking at the well know static 60-40 (SPY-IEF) benchmark and see if we can improve it by using GT timing from Feb 1949 – Oct 2019. We show that we can improve the return R (CAGR) of the 60-40 strategy from 10% to 13% by using GT timing to switch between SPY and IEF

[1] I thank Jos van den Berkmortel, Corey Hoffstein, Walter Jones, Steve LeCompte, Paul Novell, Hugo van Putten, Pim van Vliet, and Valeriy Zakamulin for comments on earlier drafts. All errors are mine.

[2] In this version an additional section 5 on robustness is added to v0.95.

[3] We will use the term "cash" broadly, including all Treasury Bills/Notes/Bonds as "risk-off" assets.

[4] So at ultimo Oct. 2019 we use the UE rates over Nov. 2018 - Oct. 2019 in the SMA12 momentum formula of UE. The SMA12 momentum in month 12 of eg. a price P is defined by MOM12 = P12/AVERAGE(P1:P12) - 1. A positive momentum signals an uptrend. In section 5 we will introduce an additional publication lag for UE.

[5] See eg. Faber (2007). On GT timing, see Novell (2019) who used SPY plus the UE index to switch between bonds, and Newfound (2019a) for some criticism on UE/SMA12 and SPY/SMA10.

while the max monthly drawdown D[6] decreases from 30% for 60-40 to 29% to GT timing of SPY (S&P500) to IEF (intermediate US government bonds). So , we will use IEF (7-10y government bond) as “cash” instead of BIL in the original PE strategy, in view of our 60-40 focus. As for notation, we will use “SPY-IEF” (60-40%) for the static benchmark, and “SPY/IEF” for our (non-static) switching strategy based on GT timing.

Although this improved R/D by GT timing of SPY/IEF is a nice result, we wonder if we can improve this result (in particular max drawdown D) even further by replacing both parts (ie. SPY and IEF) by some simple but robust equal weight portfolios. Here, we are inspired by several static (and equal weight) portfolios like the Permanent portfolio (Browne, 2001) and the Golden Butterfly portfolio from Portfolio Charts (PC, 2016); see also Allocate Smartly (2019). As the 60-40 portfolio, these are all US-only portfolio, so we will limit ourselves primarily to US-only asset classes.

We have proxy ETF data[7] available from Dec 1947 for the following US asset classes (ETFs): SPY (S&P500), IWM (Small Caps), IWD (Large Cap Growth), IWF (Large Cap Value), IWO (Small Cap Growth), IWN (Small Cap Value), QQQ (NASDAQ-100), and GLD (Gold) plus the US treasuries BIL (3m TBill), SHV (1y), SHY (1-3y), IEF (7-10y), TLT (20+y). All our ETF proxies (including SPY in the GT timing) are adjusted for dividends and fees.

The above (SPY/IEF) GT timing strategy switches between SPY and IEF, resulting in a very low cash (IEF) fractions, while beating the static 60-40 benchmark. In order to find alternatives for the risky SPY in this simple GT strategy, we will use a simple in-sample optimization and out-of-sample test. We hope this will reduce the data snooping bias.

In view of the very low yield and inflation rates today, we want our GT timing strategy to be maximal agnostic as to rising yields and inflation. Therefore, we will do in-sample (IS) testing from Feb 1949 through June 1981. This is a period starting with very low yearly TBill yields (1%) and inflation (also 1%) in Feb 1949 and ending in the highest yield/inflation period after WW2 (15% yearly yield and 14% inflation in 1980/81), see Fig. 1. Out-of-sample (OS) testing is at the remainder of our history,

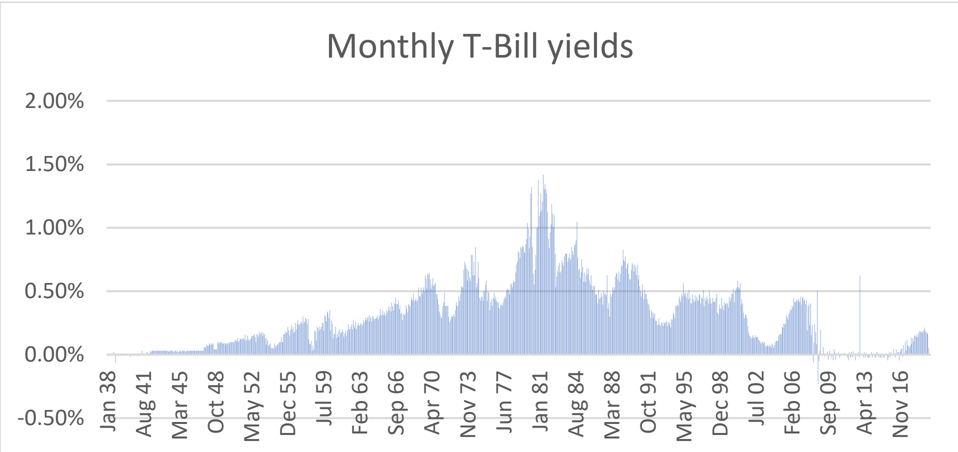

Fig. 1 Monthly T-Bill yields (BIL 3m)

[6] We will always use the notation R for CAGR (Compound Annual Growth Rate) and D for (monthly) Maximum Drawdown.

[7] See our PAA paper (Keller, 2016) for our data construction. We did a linear regression (y =a+bx) between the (longer) index and its (present) ETF to determine fees etc. for the longer proxies. The data before 1970 are mainly based on Ibbotson (2008) and Fama-French (2019) databases. Before 1970, we used FF data for QQQ (using their HiTech sector).

so from Jun 1981 to Oct 2019. The Full Sample (FS) is therefore Feb 1949 – Oct 2019, so nearly 72 years. We also look at results for the most recent 10 and 20 years (denoted RS1 and RS2, resp.).

In order to search for the best equal-weight portfolio(s) in our adapted 60/40 strategy with GT timing, we will optimize a return/risk indicator (ie. UPI) over the in-sample (IS) period Feb 1949 – Oct 2019. By using an equal weight risky portfolio combined with our crash protection using sparsely GT timing, we also aim at a near-static strategy with low turnover and limited number of transactions. We will therefore call the resulting strategy the **Lethargic Asset Allocation (LAA)**.

We will also compare the LAA portfolio found with the Permanent Portfolio (Browne, 2001) with SPY, GLD, BIL, TLT equal weighted (each 25%) and the Golden Butterfly (PC, 2016) with SPY, IWN, GLD, SHY, TLT equal weighted (each 20%).

Finally, notice that momentum plays a very marginal role, with only some trend following of SPY and UE in the GT timing. Both trends are based on simple moving average (SMA) momentum filters (SMA12 for UE, SMA10 for SPY). For the risky and cash portfolios themselves we use equal weight allocations, without any trend following or relative momentum rotation applied.

In section 2, we will search (in-sample) for the best static risky portfolio starting from the 60-40 static benchmark (SPY-IEF). In section 3 we will compare the results with other risky portfolios including the two static portfolios mentioned earlier (Permanent and Golden Butterfly) for the risky part. In section 4 we consider different cash assets than IEF (from the 60-40 benchmark) and present the (in-sample optimal) Lethargic Asset Allocation (LAA), which switches between two static portfolios. In section 5 we examine the robustness of LAA for different parameters. Section 6 concludes. Readers not interested in our path to LAA can skip the next sections and find the recipe for LAA summarized in section 6.

Notice that although we present many alternatives in the (long) path to LAA, the chosen LAA strategy is solely based on formal *in-sample optimization* and *out-of-sample testing*, in order to limit any data snooping bias.

2. In search for 60-40 variations with GT timing

In this section we will gradually build up the base components for our LAA strategy. We start with the 60-40 static benchmark (60% SPY and 40% IEF), then add GT Timing to switch between both asset classes (SPY/IEF) and finally replace SPY by a simple but robust equal weight portfolio, using in-sample optimization . First, we show the static 60-40 strategy from Feb 1949 – Oct 2019, see fig. 2.

Period	Start	Stop	R	D	V	K25	UPI	CF	TTC
IS	Feb 49	Jun 81	8.5%	27.4%	8.7%	0.0%	**0.86**	0.0%	0.00%
OS	Jun 81	Oct 19	10.4%	29.5%	9.3%	0.0%	**1.14**	0.0%	0.00%
RS2	Oct 99	Oct 19	6.3%	29.5%	8.2%	0.0%	**0.66**	0.0%	0.00%
RS1	Oct 09	Oct 19	10.2%	6.9%	6.9%	6.9%	**6.21**	0.0%	0.00%
FS	Feb 49	Oct 19	9.5%	29.5%	9.0%	0.0%	**1.02**	0.0%	0.0%

Fig. 2 The static 60-40 (SPY-IEF) benchmark[8]

[8] Legend (per period): R= annualized Return (CAGR), D= (monthly) Max Drawdown, V= (yearly) Volatility, K25= our return/max drawdown risk Ratio[9], UPI= Ulcer Performance Indicator (excess return/Ulcer index), see Ulcer

We use the following symbols: V= yearly Volatility, K25 our own return/risk indicator[9] (see Keller, 2018), UPI the Ulcer (2019) Performance Index (similar to the Sharpe ratio but with the Ulcer drawdown index instead of volatility) and CF and TTC the "cash" fraction and yearly Total Transaction Cost (based on a 0.1% one-sided transaction fee), resp.

So, over the full sample (FS: Feb 1949 – Oct 2019) this static 60-40 benchmark has a return R=9.5% and a max drawdown D=29.5%. These are nice results for such a long static backtest (nearly 72 years)! Since this is a static strategy, CF and TTC are zero (we don't count the minimal monthly rebalancing to static weights like 60-40% here).

But what happens when we use the GT timing, switching between SPY and IEF (notation SPY/IEF) based on the trend in UE and SPY? See fig. 3 for the results. NR in the figure refers to the size of the risky portfolio (here NR=1 with only SPY) and NC to size of the cash portfolio for GT timing (here NC=1 with only IEF).

As in all our tests we use a 0.1% one-sided transaction fee, which now shows up in TTC (yearly Total Transaction Costs) since switching occurs, see also the non-zero CF. This Cash Fraction equals the fraction of the time the GT strategy is in "cash". On the far right (R6040) we also show the returns R of the static 60-40 portfolio for the five periods IS, OS, RS2, RS1 and FS, plus its monthly max drawdown D=29.5% on the Full Sample (FS) below for comparison.

Period	Start	Stop	R	D	V	K25	UPI	CF	TTC	R6040
IS	Feb 49	Jun 81	12.2%	22.2%	12.0%	2.4%	**1.30**	12.9%	0.15%	8.5%
OS	Jun 81	Oct 19	14.0%	29.4%	12.7%	0.0%	**1.87**	13.9%	0.12%	10.4%
RS2	Oct 99	Oct 19	11.3%	16.2%	11.3%	5.9%	**2.21**	18.7%	0.10%	6.3%
RS1	Oct 09	Oct 19	12.5%	16.2%	12.4%	6.5%	**2.56**	1.7%	0.04%	10.2%
FS	Feb 49	Oct 19	13.2%	29.4%	12.4%	0.0%	**1.59**	13.4%	0.10%	9.5%
Parms:	**NR=**	**1**	**NC=**	**1**	**GTT**	**UE/SPY**			D=	29.5%

Fig. 3 SPY (100%) switched to IEF (100%) using GT timing[8]

As we can see in fig. 3, the return R (CAGR) improved nearly 4% (from 9.5% to 13.2%) in the full-sample period FS, while monthly max drawdown D was slightly decreased over FS from 29.5% to 29.4%.

But we think the max drawdown D=29.4% on FS is still too much. Therefore, we consider the following alternative to the SPY-only risky portfolio: an equal weighted[10] (50-50) SPY-IEF combination as risky portfolio with GT timing switched to 100% IEF again as cash (notation SPY+IEF/IEF), see fig 4. Notice that switching only involves two trades (SPY and IEF).

In fig. 4, we see the same CF figures (averaging to 13.4% on FS, see also fig. 3). This will be the case over and over in this paper: they are all based on the GT timing. Notice that during the last 10 years (see RS1), the cash fraction CF equals 1.7%. This implies that over the last 10 years the strategy is in cash only three out of 120 months while asset trading occurs only six (=2x3) times in 10 years! This is

(2019), CF= average Cash Fraction, TTC= (yearly) Total Transaction Costs, NR/NC= Number of Risky/Cash assets. Periods: IS= In-Sample, OS= Out-of-Sample, RS2= 20 years Recent Sample, RS1= 10 years Recent Sample, FS= Full-Sample.

[9] K25 = R*(1-2*D/(1-2*D) with K25=0 when D>=25%, see Keller (2018).

[10] We used equal weighting for the risky portfolio to be comparable with the static portfolios, see section 4.

exclusive of the very small trading for equal weight (like 50-50 in fig. 4) rebalancing we do each month (which is not counted in TTC). In practice, rebalancing could be done when switching or yearly (12 months after the last rebalance). Also, since IEF is part of the risky (and cash) portfolio, switching to IEF is only necessary for 50% of the assets (SPY), limiting turnover.

Now, with the equal weight (50-50) risky portfolio SPY+IEF switching to/from cash (IEF) based on GT timing, we have R=9.8% and D=14.1% over the Full Sample (FS) of Feb 1949 – Oct 2018, see fig. 4. This SPY+IEF/IEF variant is therefore much less risky as the switching SPY/IEF variant, with a max drawdown D on FS being less than halve the D=29.4% in fig. 3. However, the price we pay is a return R=9.8% on FS, which is less than that of fig. 3 (although slightly better than 60-40 with R=9.5%).

Period	Start	Stop	R	D	V	K25	UPI	CF	TTC	R6040
IS	Feb 49	Jun 81	8.0%	10.6%	7.0%	5.9%	**1.29**	12.9%	0.08%	8.5%
OS	Jun 81	Oct 19	11.3%	14.1%	7.8%	6.9%	**3.18**	13.9%	0.06%	10.4%
RS2	Oct 99	Oct 19	8.6%	7.2%	6.2%	7.2%	**3.90**	18.7%	0.05%	6.3%
RS1	Oct 09	Oct 19	8.6%	5.4%	5.6%	7.6%	**5.70**	1.7%	0.02%	10.2%
FS	Feb 49	Oct 19	9.8%	14.1%	7.4%	5.9%	**2.21**	13.4%	0.07%	9.5%
Parms:	**NR=**	**2**	**NC=**	**1**	**GTT**	**UE/SPY**			D=	29.5%

Fig. 4 SPY+IEF (50-50%) switched to IEF (100%) using GT timing[8]

A simple way to improve returns (and risk) is to try to find a replacement for SPY in this setup of fig. 4. That is where our in-sample optimizations are coming in. So we search in-sample (on IS: Feb 1949 – Jun 1981) in order to replace SPY by a broader set of risky assets, using the available US ETF proxies QQQ (NASDAQ), IWM (MSCI Small Caps), GLD (Gold), IWD (Large Cap Growth), IWF (Large Cap Value), IWO (Small Cap Growth), IWN (Small Cap Value) and SPY (S&P500). We aim at a broader risky portfolio similar to the equal weighted (25%) Permanent portfolio and its siblings.

For our in-sample search procedure we should have a target. We will use a return/risk ratio, the Ulcer Performance Index (UPI), which is the ratio of the excess return over the Ulcer (2019) drawdown index[11]. The advantage of UPI over our own return/risk performance index K25 (see Keller 2018), which is solely based on R and D, is the following.

First, the nominator in the UPI ratio (*excess* return) takes the T-Bill yield into account (which is important for our chosen IS period with strong rising yields, see fig. 1). Second, the Ulcer index takes *all* drawdowns into account (with overweighting longer drawdowns by squaring) instead of only the single (monthly) max drawdown D over the whole period as in the K25/K50 formula.

We will now do a simple stepwise search on the in-sample period (IS: Feb 1949 – Oct 1981). In each step, we will add the best (in terms of UPI on IS) additional risky asset to the portfolio.

The first step is to find the best (in terms of UPI on in-sample/IS) single risky asset to replace SPY in the risky portfolio (SPY+IEF). This turns out to be the **IWD** ETF (US Large Cap Value). The result is an equal weighted (50-50) risky portfolio consisting **IWD+IEF** which switches by GT timing to IEF (see fig. 5).

[11] The Ulcer drawdown index equals the square root of the average squared drawdowns per month.

Period	Start	Stop	R	D	V	K25	UPI	CF	TTC	R6040
IS	Feb 49	Jun 81	9.1%	9.7%	7.0%	7.0%	**2.30**	12.9%	0.08%	8.5%
OS	Jun 81	Oct 19	11.2%	12.8%	7.6%	7.4%	**3.15**	13.9%	0.06%	10.4%
RS2	Oct 99	Oct 19	8.7%	8.0%	6.3%	7.0%	**3.79**	18.7%	0.05%	6.3%
RS1	Oct 09	Oct 19	7.8%	4.7%	5.5%	7.0%	**4.80**	1.7%	0.02%	10.2%
FS	Feb 49	Oct 19	10.3%	12.8%	7.4%	6.8%	**2.78**	13.4%	0.07%	9.5%
Parms:	**NR=**	**2**	**NC=**	**1**	**GTT**	**UE/SPY**			D=	29.5%

Fig. 5 IWD+IEF (50-50%) switched to IEF (100%) using GT timing[8]

This IWD+IEF/IEF portfolio is a clear improvement over SPY+IEF/IEF (see fig 4) at FS where UPI is 26% better (2.78 vs 2.21). The UPI over the out-of-sample (OS) period is nearly the same (3.15 vs 3.18). The return R is slightly improved over FS (10.3% vs 9.8%) as is the max drawdown D (12.8 vs 14.1%).

The second step is to find the best (in terms of UPI on in-sample/IS) additional risky asset, starting with IWD+IEF, the result of the first step. As before we will use an equal weight (EW) portfolio for the risky part. The optimal in-sample additional risky asset risky turns out to be **GLD** (gold). So the risky portfolio becomes **IWD+GLD+IEF** (equal weighted, each 33%), so we now use GT timing to switch between IWD+GLD+IEF to IEF. The results of this second iteration are shown in fig. 6.

Period	Start	Stop	R	D	V	K25	UPI	CF	TTC	R6040
IS	Feb 49	Jun 81	8.8%	13.4%	7.4%	5.6%	**2.19**	12.9%	0.10%	8.5%
OS	Jun 81	Oct 19	9.3%	13.7%	7.3%	5.8%	**2.14**	13.9%	0.08%	10.4%
RS2	Oct 99	Oct 19	8.6%	8.4%	7.2%	6.8%	**2.86**	18.7%	0.07%	6.3%
RS1	Oct 09	Oct 19	6.4%	8.4%	7.3%	5.1%	**2.18**	1.7%	0.03%	10.2%
FS	Feb 49	Oct 19	9.0%	13.7%	7.3%	5.6%	**2.18**	13.4%	0.09%	9.5%
Parms:	**NR=**	**3**	**NC=**	**1**	**GTT**	**UE/SPY**			D=	29.5%

Fig. 6 IWD+GLD+IEF (33.3% each) switched to IEF (100%) using GT timing[8]

In this iteration the portfolio did not Improve in terms at OS and FS; in fact it has become worse since UPI decreased from 2.78 to 2.18 on FS. This is also reflected in R and D which are less than in fig. 5.

Therefore, we quickly move to **the third iteration**, which adds the final[12] risky asset again by optimising UPI on in-sample/IS. This asset is the tech ETF **QQQ** (NASDAQ-100, Large Caps), so the switch becomes **IWD+GLD+QQQ+IEF/IEF,** again with equal weights for the risky part (now each 25%). The buy and sell trades (when GT timing is signalled) now involves only four assets and simple equal portions: eg. sell all IWD, GLD, QQQ and buy 100% IEF or sell 75% of IEF and buy 25% of IWD, GLD, and QQQ each. The results are show in fig. 7.

Now, for the out-of-sample period (OS) and two other periods (RS2, and FS), the return R is clearly better than that of the 60-40 benchmark, although less on the recent 10 years (RS1: 9.1% vs. 10.2%) but 1.7% better on the full-sample (FS). The max drawdown on the out-of-sample (OS) period is with

[12] Notice that our risky portfolio is now very similar to the Permanent portfolio: both have four equal weighted assets (each 25%) and include large cap, gold and treasury bonds. Since a stepwise search is not necessarily optimal we also tried other combinations of three risky assets (plus IEF) out of SPY, QQQ, IWM, IWD, IWF, IWO, IWN and GLD. but were unable to find a better UPI on in-sample/IS with NR=4.

D=13.6% (on IS) around half of the 60-40 benchmark (D= 29.5%), as it is on FS (D=15.1%). The UPI=4.50 on the last 10 years (see RS1) is very impressive, although less than the 60-40 UPI (=6.21, see fig. 2)

Again, the average cash fraction (CF) is between 1.7% on RS1 (ie. the last 10 years) and 18.7% on RS2 (ie. the last 20 years), so still much less that with our DAA (CF=25%) and VAA (50%) strategies, while trading (when GT timing signals) only involved two GT trading months over the last 10 years (RS1), with a simple equal weighted risky portfolio (IWD, GLD, QQQ, IEF) when not in cash and 100% IEF when in cash. Over the full-sample (FS: nearly 72 years) trading only occurs in 25 months, so on average only once in (nearly) three years.

Period	Start	Stop	R	D	V	K25	UPI	CF	TTC	R6040
IS	Feb 49	Jun 81	10.7%	15.1%	8.3%	6.1%	**2.44**	12.9%	0.12%	8.5%
OS	Jun 81	Oct 19	11.6%	13.6%	8.8%	7.2%	**2.46**	13.9%	0.09%	10.4%
RS2	Oct 99	Oct 19	10.1%	10.5%	8.2%	7.5%	**3.13**	18.7%	0.07%	6.3%
RS1	Oct 09	Oct 19	9.1%	5.5%	7.8%	8.0%	**4.50**	1.7%	0.03%	10.2%
FS	Feb 49	Oct 19	11.2%	15.1%	8.6%	6.3%	**2.46**	13.4%	0.10%	9.5%
Parms:	**NR=**	**4**	**NC=**	**1**	**GTT**	**UE/SPY**			D=	29.5%

Fig. 7 QQQ+IWD+GLD+IEF (25% each) switched to IEF (100%) using GT timing[8]

And since our risky N4 portfolio is "trained" at the in-sample period (IS: Feb 1949 – Jun 1981) with stark rising yields and inflation, we might hope that even if the GT timing misses a crash, the risky portfolio should be robust enough to handle the crash well. Therefore we look at the *static* risky portfolio IWD, GLD, QQQ, IEF now without crash protection. Then we find (see fig. 8):

Period	Start	Stop	R	D	V	K25	UPI	CF	TTC	R6040
IS	Feb 49	Jun 81	10.5%	19.8%	8.9%	3.6%	**1.58**	0.0%	0.00%	8.5%
OS	Jun 81	Oct 19	9.8%	26.8%	9.7%	0.0%	**0.91**	0.0%	0.00%	10.4%
RS2	Oct 99	Oct 19	7.6%	26.8%	9.4%	0.0%	**0.77**	0.0%	0.00%	6.3%
RS1	Oct 09	Oct 19	9.8%	5.5%	7.9%	8.6%	**5.30**	0.0%	0.00%	10.2%
FS	Feb 49	Oct 19	10.1%	26.8%	9.3%	0.0%	**1.11**	0.0%	0.00%	9.5%
Parms:	**NR=**	**4**	**NC=**	**0**	**Static**				D=	29.5%

Fig. 8 QQQ+IWD+GLD+IEF (25% each) static[8]

The return of this static portfolio is over the full sample (FS: Feb 1949 – Oct 2018) better than the 60-40, (10.1% vs 9.5%, see fig. 2) while the max drawdown D is only slightly better (26.8% vs. 29.5%). The UPI is slightly better on FS (1.11 vs 1.02), with a very impressive UPI=5.30 on the last 10 years (RS1), although less than 60-40 (UPI=6.21, see fig. 2). So it seems that our static (risky) portfolio is also a decent diversified static (buy & hold) portfolio for the future in case GT timing is missing some market crashes.

3. Comparison with other static portfolios with GT timing

In this section we will compare our final strategy in fig. 7 with the same GT switching strategy but with the risky portfolio replaced by well-known static equal-weight US-only portfolios. First, we consider the famous **Permanent portfolio** (Browne, 2001): **SPY** (Large Caps)**, GLD** (Gold)**, BIL** (TBill 3m)**, TLT** (long term government bonds) all equal weighted (so 25% each). Again, we which switch this to IEF (as cash) based on GT timing signals. Fig. 9 shows the results.[13]

This is clearly worse than our final strategy in fig. 7 on returns R on our in-sample (IS) period as well as on the other four periods (OS, RS2, RS1, and FS), although the max drawdowns on FS are substantial less than in fig. 7 (10.9% vs. 15.1%). But our main (return/risk) criterium, UPI, is less than fig. 7 in all periods.

Period	Start	Stop	R	D	V	K25	UPI	CF	TTC	R6040
IS	Feb 49	Jun 81	6.8%	9.8%	6.1%	5.2%	**1.39**	12.9%	0.15%	8.5%
OS	Jun 81	Oct 19	8.7%	10.9%	6.3%	6.3%	**2.23**	13.9%	0.12%	10.4%
RS2	Oct 99	Oct 19	7.7%	7.6%	6.2%	6.3%	**2.61**	18.7%	0.10%	6.3%
RS1	Oct 09	Oct 19	6.1%	7.6%	5.9%	5.0%	**2.20**	1.7%	0.04%	10.2%
FS	Feb 49	Oct 19	7.9%	10.9%	6.2%	5.7%	**1.89**	13.4%	0.14%	9.5%
Parms:	**NR=**	**4**	**NC=**	**1**	**GTT**	**UE/SPY**			D=	29.5%

Fig. 9 Permanent portfolio (SPY+GLD+BIL+TLT, 25% each), switched to IEF (100%) using GT timing[8]

Let's therefore check the second equal weight static portfolio: the **Golden Butterfly** (PC, 2016) with **SPY** (Large Caps), **IWN** (Small Caps Value)**, GLD** (Gold)**, SHY** (Short government bonds)**, TLT** (long government bonds) equal weighted (each 20%), switched to IEF on GT timing. Here are the results (with GT timing and IEF as cash). See fig. 10.[14]

Period	Start	Stop	R	D	V	K25	UPI	CF	TTC	R6040
IS	Feb 49	Jun 81	8.5%	12.2%	7.0%	5.7%	**1.76**	12.9%	0.15%	8.5%
OS	Jun 81	Oct 19	10.0%	10.2%	7.0%	7.4%	**2.84**	13.9%	0.12%	10.4%
RS2	Oct 99	Oct 19	8.9%	6.8%	6.5%	7.5%	**3.73**	18.7%	0.10%	6.3%
RS1	Oct 09	Oct 19	7.1%	6.0%	6.2%	6.2%	**3.37**	1.7%	0.04%	10.2%
FS	Feb 49	Oct 19	9.3%	12.2%	7.0%	6.3%	**2.32**	13.4%	0.14%	9.5%
Parms:	**NR=**	**5**	**NC=**	**1**	**GTT**	**UE/SPY**			D=	29.5%

Fig. 10 Golden Butterfly portfolio (SPY+IWN+GLD+SHY+TLT, 20% each), switched to IEF (100%) using GT timing[8]

Again, this is not better than our final strategy in fig. 7 on returns R on our in-sample (IS) period as well as on the other four periods (OS, RS2, RS1, and FS), while max drawdown D is slightly better (12.2% vs 15.1% on FS). UPI is worse on the in-sample (IS) period (2.44 vs 1.76) and on the full sample FS (2.32 vs 2.46) and better on OS and RS2 but not on IS, FS and the most recent 10 year period RS1. But UPI on FS is definitely better than in fig. 9 (with the Permanent portfolio).

[13] Without GT timing, the Permanent portfolio had R/D= 9.4%/15.5% and UPI= 1.84 on FS, and R/D=7.2%/8.0% and UPI= 2.81 on RS1. So GT timing improved most statistics.

[14] Without GT timing, the Golden Butterfly portfolio had R/D= 9.8%/17.3% and UPI= 1.74 on FS, and R/D= 7.6%/11.5% and UPI= 2.50 on RS1. So GT timing improved most statistics.

So this risky N5 (equal weight) universe of the Golden Butterfly (**SPY, IWN, GLD, SHY, TLT)** comes closer than the Permanent portfolio to our final (equal weight) N4 solution in fig. 7 with **QQQ, IWN, GLD, IEF.** This is not surprising, given that Golden Butterfly also taps on value stocks (IWN instead of our IWD) while the other asset classes (large cap stocks, gold and government bonds) are similar and also equal weighted. But our large cap Tech ETF (QQQ) instead of SPY improves in particular our strategy in recent years.

4. The cash universe and the Lethargic Asset Allocation (LAA)

In this section we consider the effect of changing the cash universe in our optimal solution in fig. 7. First, we will test in-sample (IS) our risky solution (**QQQ, IWN, GLD, IEF**) with different but single cash assets instead of IEF (which was chosen in line with the static 60-40 benchmark, see fig. 2). What would be the result with US treasuries like BIL (3m), SHV (1y), SHY (1-3y) and TLT (20+) as only cash (instead of IEF)? First we tried BIL, see fig. 11.

Period	Start	Stop	R	D	V	K25	UPI	CF	TTC	R6040
IS	Feb 49	Jun 81	10.1%	15.1%	7.8%	5.7%	**2.21**	12.9%	0.15%	8.5%
OS	Jun 81	Oct 19	10.0%	14.7%	8.2%	5.9%	**1.62**	13.9%	0.12%	10.4%
RS2	Oct 99	Oct 19	8.9%	10.5%	7.5%	6.5%	**2.49**	18.7%	0.10%	6.3%
RS1	Oct 09	Oct 19	9.2%	5.5%	7.8%	8.0%	**4.50**	1.7%	0.04%	10.2%
FS	Feb 49	Oct 19	10.1%	15.1%	8.0%	5.7%	**1.82**	13.4%	0.14%	9.5%
Parms:	**NR=**	**4**	**NC=**	**1**	**GTT**	**UE/SPY**			D=	29.5%

Fig. 11 QQQ+IWD+GLD+IEF (25% each), switched to BIL (100%) using GT timing[8]

This is not bad, but somewhat less than fig. 7 on return R and UPI for the in-sample (IS) period. But returns R in recent RS1 are slightly better than in fig. 7 (9.2% vs 9.1%) and slightly worse in all other periods (on IS, OS, RS2, and FS). Drawdowns D are very similar (both 15.1% on FS). UPI for recent years RS1 is the same (4.50), but worse on FS (1.82 vs 2.46), OS, RS2 and in-sample IS (2.21 vs. 2.44).

With short US treasuries SHV (1y) and SHY (1-3y) instead of BIL as "cash" we arrive at very similar results (not shown) which also did not improve over fig. 11 or our final (IEF) solution in fig. 7. With TLT (20+ years) as cash the results were even worse than that with BIL, SHV or SHY (with larger drawdowns D= 20.2% on FS and lower UPIs). This also holds for UPI on the in-sample (IS) period. So our IEF cash solution seems in-sample optimal.

So far for single asset replacements of IEF. But what if we use a robust static portfolio for our cash universe? For this purpose we again look at our equal weight risky portfolio of four assets, ie. QQQ, IWD, GLD, IEF. This is of course not a cash universe because 75% of the portfolio are risky (QQQ, IWD, GLD), with only 25% IEF as bond. This 25% also makes this risky portfolio less yield sensitive in present days than eg. the 60-40 benchmark (40% cash) or the Permanent portfolio (50% cash).

From this four assets, the most volatile one is QQQ, which also has the highest market beta. What should happen if we replace QQQ by the best (in terms of UPI on our in-sample period) government bond, in order to arrive at our new cash universe?

That best bond in-sample turns out to be **SHY** (1-3 year US treasury)[15]. Then we have (as cash portfolio) only one (value) stock ETF (IWD), one alternative ETF (GLD) and two US treasury ETFs, i.e. one short term (SHY) and one intermediate term bond (IEF). This cash portfolio is similar to both the Permanent portfolio (SPY, GLD, BIL, TLT) and the Golden Butterfly portfolio (SPY, IWN, GLD, SHY, TLT), but with somewhat less mature bonds (SHY, IEF). Here are the results, see fig. 12.

Period	Start	Stop	R	D	V	K25	UPI	CF	TTC	R6040
IS	Feb 49	Jun 81	10.6%	15.0%	8.2%	6.1%	**2.17**	12.9%	0.04%	8.5%
OS	Jun 81	Oct 19	10.4%	14.4%	8.8%	6.2%	**1.68**	13.9%	0.03%	10.4%
RS2	Oct 99	Oct 19	9.0%	13.1%	8.1%	5.8%	**2.22**	18.7%	0.02%	6.3%
RS1	Oct 09	Oct 19	9.5%	5.5%	7.8%	8.3%	**5.13**	1.7%	0.01%	10.2%
FS	Feb 49	Oct 19	10.5%	15.0%	8.5%	6.0%	**1.86**	13.4%	0.03%	9.5%
Parms:	**NR=**	**4**	**NC=**	**4**	**GTT**	**UE/SPY**			D=	29.5%

Fig. 12 LAA: QQQ+IWD+GLD+IEF (25% each), switched to SHY+IWD+GLD+IEF (25% each) using GT timing[8]

Comparing this solution with our final solution in fig. 7, we see that all returns R on all periods except RS1 (so on IS, OS, RS2, and FS) are slightly less (eg. 10.5% vs. 11.2% on FS). However, they are still at or above the 60-40 benchmark returns on the same periods (IS, OS, RS2, and FS), with R=10.5% vs 9.5% on the full-sample (FS). Only for the most recent 10 years (RS1) the return R is slightly less than 60-40 (9.5% vs 10.2%), as is UPI (5.13 vs 6.21). Max drawdown D on FS is slightly better than fig. 7 (15.0% vs. 15.1%) and around half of the 60-40 benchmark (D= 29.5%).

UPI is clearly better than 60-40 in all periods except RS1 (see fig. 2), but worse than fig. 7 in all periods (including IS) except for the most recent 10 years, RS1 (with an very high UPI=5.13 vs 4.50). So, it is slightly less “optimal” than fig. 7, looking at UPI for the in-sample period IS (2.17 vs 2.44).

But the main feature which distinguish fig. 12 from fig. 7 is the amount of trading when GT switches. Since we have the same universe for both risky and cash portfolios except for the replacement of QQQ by SHY, there are only two 25% trades (sell QQQ and buy SHY or vice versa) needed to make the GT switch back and forth.

This also shows in the transaction cost TTC: over the full sample (FS) it decreased from 0.10% (fig 7) to 0.03% (fig. 12), so by 70%[16], and so did turnover! Together with the very low cash fraction (CF) of our GT timing this really makes for a very lazy (and **near-static**) strategy. Therefore we will call this strategy the **Lethargic Asset Allocation (LAA).**

Below we show (fig. 13 and 14) the equity and drawdown curves of LAA and the 60-40 benchmark on FS (Feb 1949 – Oct 2019). From the equity curve the similarity with the 60-40 benchmark is clear: the relative price LAA/6040 is often very close to or above one, in particular in the 20 recent years (RS2: Oct 1999 – Oct 2019). But the most interesting graph is the drawdown curve below, which shows the limited drawdowns over nearly 72 years (max. 15% in Mar 1980) compared to 60-40 (max. 30% in Feb 2009). This graph also shows the GT timing (cash fraction CF) in grey bands.

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[15] We choose SHY based on the best in-sample (IS) government bond (in terms of UPI), in order to prevent data snooping, considering all our available government bonds from 1948, ie. BIL, SHV, SHY, IEF and TLT.
[16] Even when we take a ten times higher transaction fee (TC=1% instead of the default 0.1%), the return R on FS only changes three decimal points (from 10.5% to 10.2%).

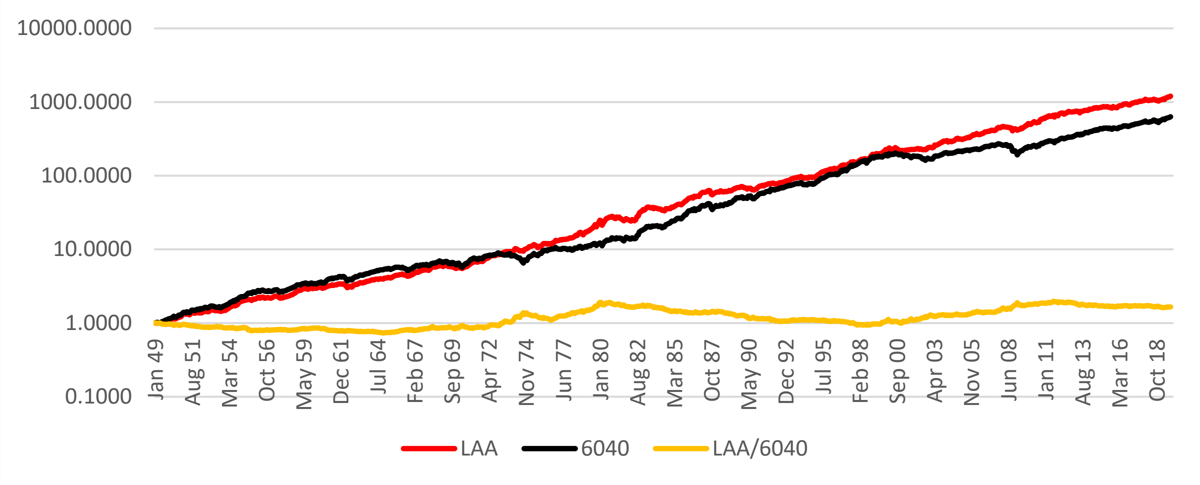

Fig. 13 The LAA equity curve (red) compared to the 60-40 benchmark (black), plus the relative price (yellow), Feb 1949 -Oct 2019

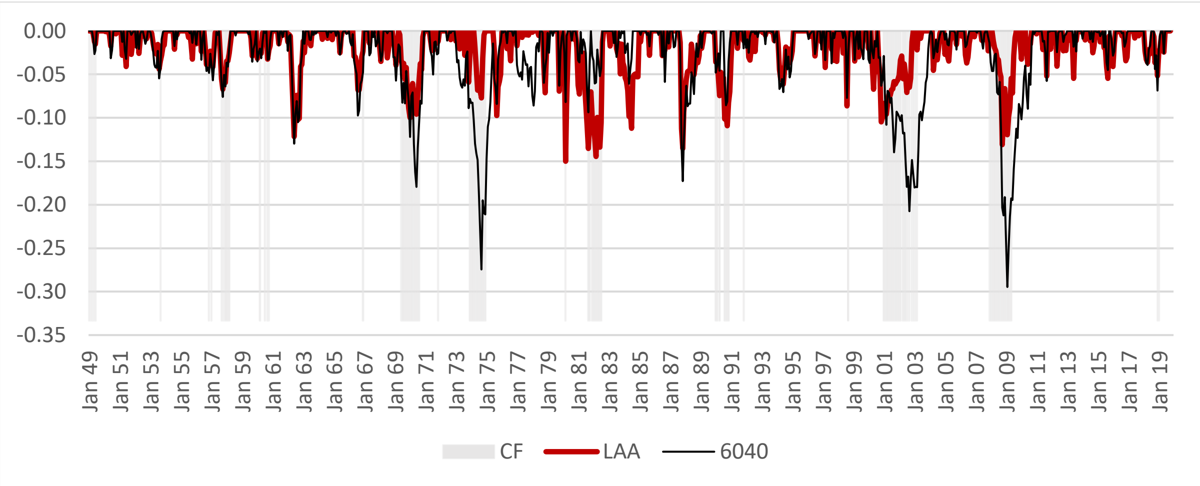

Fig. 14 The LAA Drawdown curve (red) compared to the 60-40 benchmark (black), and the cash (CF) fraction (based on GT timing), Feb 1949 -Oct 2019

We also (as a bonus) made a Global version of LAA, called LAA-G4, with QQQ replaced by a constructed[17] World ETF (named WRLD), with GT timing still based on the US (UE/SPY)[18]. This gives the following result (see fig. 16). Although this LAA-G4 strategy looks interesting, it is clearly not as performing as the default (US based) LAA strategy in fig. 15, in particular in recent years (RS1).

Period	Start	Stop	R	D	V	K25	UPI	CF	TTC	R6040
IS	Feb 49	Jun 81	9.7%	12.8%	7.2%	6.3%	**2.13**	12.9%	0.04%	8.5%
OS	Jun 81	Oct 19	9.4%	14.6%	7.8%	5.5%	**1.68**	13.9%	0.03%	10.4%
RS2	Oct 99	Oct 19	8.2%	13.1%	7.5%	5.3%	**2.39**	18.7%	0.02%	6.3%
RS1	Oct 09	Oct 19	7.4%	7.0%	7.7%	6.2%	**2.82**	1.7%	0.01%	10.2%
FS	Feb 49	Oct 19	9.5%	14.6%	7.5%	5.6%	**1.85**	13.4%	0.03%	9.5%
Parms:	**NR=**	**4**	**NC=**	**4**	**GTT**	**UE/SPY**			D=	29.5%

Fig. 16 The LAA-G4 strategy: WRLD+IWD+GLD+IEF (25% each), switched to IWD+GLD+SHY+IEF (25% each) using GT timing[8]

[17] WRLD returns are chosen equal to (3*SPY+2*VEA+1*VWO)/6, with SPY the SPY returns, etc.
[18] See Newfound (2019b) on global GT timing with non-US indicators.

5. Robustness of LAA

In this section we will consider the robustness of LAA wrt. several parameters. It also allows us to correct a debatable assumption about the availability of the published UE rate. In practice, the published UE rate over say Oct 2019 is not available at the end of Oct 2019 but some days later. Therefore, we will here test the robustness of our results after the introduction of an additional lag of one month before using the published UE rate. Here are the results (fig. 17).

Period	Start	Stop	R	D	V	K25	UPI	CF	TTC	R6040
IS	Feb 49	Jun 81	10.7%	15.0%	8.2%	6.1%	**2.10**	11.8%	0.03%	8.5%
OS	Jun 81	Oct 19	10.2%	14.0%	8.9%	6.2%	**1.40**	13.0%	0.03%	10.4%
RS2	Oct 99	Oct 19	8.4%	14.0%	8.2%	5.1%	**1.44**	18.3%	0.03%	6.3%
RS1	Oct 09	Oct 19	9.7%	5.5%	7.9%	8.6%	**5.34**	0.8%	0.01%	10.2%
FS	Feb 49	Oct 19	10.4%	15.0%	8.6%	6.0%	**1.63**	12.5%	0.03%	9.5%
Parms:	**NR=**	**4**		**NC=**	**4**	**GTT**	**UE/SPY**		D=	29.5%

Fig. 17 The LAA strategy with an additional publication lag of one month for UE[8]

Focussing on the Full Sample (FS) results of fig. 17, we see that R/D= 10.4/15.0% instead of 10.5/15.0% in fig.12, so this result seems rather robust. The returns on IS and RS2 are even slightly better than the default in fig. 12, and slightly worse for OS, RS2, and FS. Max (monthly) drawdown is the same (IS, RS1, FS) or better (OS) in all periods except for RS2 (D=14.0 vs 13.1%). UPI is slightly worse for FS (1.63 vs 1.83) as for IS, OS, and RS2, and slightly better for RS1 (5.34 vs 5.13). V, K25, CF and TTS are all of the same order of magnitude.

We also considered the in-sample (IS) optimizations in section 2 and 4 leading to the near-static portfolio QQQ+IWD+GLD+IEF (25% each), switched to SHY+IWD+GLD+IEF (25% each) using GT timing. Repeating the same steps as in section 2 and 4 we found the same optimal in-sample portfolio's when adding an additional publication lag of one month. So we conclude that our LAA results are rather robust with respect to a one month publication lag for UE.

Next we consider the SMA12 trend (momentum) formula for UE, used to detect the upward trend in unemployment to signal a recession. Changing this trend formula to the much faster SMA5 formula (with the additional publication lag discussed above), also does not had a great impact in our results, see fig. 18:

Period	Start	Stop	R	D	V	K25	UPI	CF	TTC	R6040
IS	Feb 49	Jun 81	10.3%	15.0%	8.2%	5.9%	**1.81**	12.6%	0.04%	8.5%
OS	Jun 81	Oct 19	10.0%	15.6%	8.9%	5.5%	**1.32**	12.6%	0.04%	10.4%
RS2	Oct 99	Oct 19	8.5%	15.6%	8.5%	4.6%	**1.44**	16.2%	0.04%	6.3%
RS1	Oct 09	Oct 19	9.7%	5.5%	7.9%	8.6%	**5.34**	0.8%	0.01%	10.2%
FS	Feb 49	Oct 19	10.2%	15.6%	8.6%	5.6%	**1.49**	12.6%	0.04%	9.5%
Parms:	**NR=**	**4**		**NC=**	**4**	**GTT**	**UE/SPY**		D=	29.5%

Fig. 18 The LAA strategy with SMA5 for the UE trend (plus extra UE lag)[8]

Notice again the relative robustness of eg. the returns and the maxdrawdowns (R/D= 10.2/15.6% vs 10.4/15.0% on FS in fig 17). The same robustness on FS with R>10% and D<16% holds for all slower UE trend formula's (SMA6 through SMA12), while only with very fast UE momentums we arrive at drawdowns of 18% and 20% (for SMA4 and SMA3, respectively), still with R>10% on FS .

Next, we will check the robustness with respect to the SPY market trend, based on the well-known SMA10 momentum formula above. Here we show the results for much faster trend filter for SPY based on SMA5, see fig. 19.

Period	Start	Stop	R	D	V	K25	UPI	CF	TTC	R6040
IS	Feb 49	Jun 81	10.5%	15.0%	8.2%	6.0%	**1.87**	12.9%	0.06%	8.5%
OS	Jun 81	Oct 19	10.0%	15.9%	8.9%	5.3%	**1.24**	12.6%	0.06%	10.4%
RS2	Oct 99	Oct 19	8.2%	15.9%	8.3%	4.4%	**1.23**	17.0%	0.06%	6.3%
RS1	Oct 09	Oct 19	9.9%	5.5%	7.9%	8.7%	**5.49**	2.5%	0.03%	10.2%
FS	Feb 49	Oct 19	10.2%	15.9%	8.6%	5.5%	**1.45**	12.6%	0.06%	9.5%
Parms:	**NR=**	**4**	**NC=**	**4**	**GTT**	**UE/SPY**			D=	29.5%

Fig. 19 The LAA strategy with SMA5 for the SPY trend (plus extra UE lag)[8]

With this much faster SPY trend formula (SMA5), and the same additional publication lag, we arrive at nearly the same picture as in fig. 17, with returns R>10% and max (monthly) drawdowns D<16% on FS. The same holds for slower SPY trends up to a year (SMA6 through SMA 12). Only when we use a very fast SPY momentum (SMA3 or SMA4), we arrive at slightly larger D>16% but still R>10% on FS.

When we combine both slow trends (for UE and SPY, both based on SMA5) with the extra publication lag for UE, we arrive at a slightly worse (monthly) max drawdown D=20% and a return R=9.9% on FS, which still clearly beats 60-40 with R/D= 9.5/30%, see Fig. 20:

Period	Start	Stop	R	D	V	K25	UPI	CF	TTC	R6040
IS	Feb 49	Jun 81	10.0%	16.6%	8.2%	5.0%	**1.56**	12.9%	0.07%	8.5%
OS	Jun 81	Oct 19	9.8%	20.2%	8.9%	3.1%	**1.10**	13.4%	0.08%	10.4%
RS2	Oct 99	Oct 19	8.2%	20.2%	8.4%	2.6%	**1.11**	17.0%	0.08%	6.3%
RS1	Oct 09	Oct 19	9.9%	6.6%	7.9%	8.4%	**5.03**	4.1%	0.05%	10.2%
FS	Feb 49	Oct 19	9.9%	20.2%	8.6%	3.2%	**1.25**	13.1%	0.07%	9.5%
Parms:	**NR=**	**4**	**NC=**	**4**	**GTT**	**UE/SPY**			D=	29.5%

Fig. 20 The LAA strategy with SMA5 for the UE and SPY trend (plus extra UE lag)[8]

Finally, notice that our near-static portfolio (QQQ+IWD+GLD+IEF, 25% each) was optimized in-sample in a rising yields regime (1949 – 1981), possibly similar to the present future, while being inspired by all-weather strategies like the Permanent Portfolio.

So, we conclude that our LAA results are robust for momentum parameter changes (both for SPY and UE) and an additional UE publication lag, while it is also designed to be regime independent (all-weather).

6. Summary and conclusions

We presented in this paper a very "lazy" strategy, called the *Lethargic Asset Allocation (LAA)*. This strategy infrequently switches between an equal-weight, near-static portfolio (with four US assets) to a slightly more cash variant. The near-static portfolio is based on in-sample optimization of the Ulcer Performance Index (UPI), a return/risk ratio with risk based on drawdowns. We avoid data snooping using an in-sample (1949-1981) optimization and out-of-sample (1981-2019) test period.

Switching between the two portfolios is done using the monthly Growth-Trend (GT) timing strategy from Philosophical Economics (2016). This timing strategy only signals a bear market when both the trend in the unemployment (UE) rate and SPY (S&P500) are bearish. Both trends are based on Simple Moving Averages (SMA10 and SMA12 for SPY and UE, resp).

The two optimal (equally weighted US) portfolios are as follows (using ETF proxies):

- The "risky" portfolio equals **QQQ, IWD, GLD, IEF** (25% each)
- The "cash" portfolio equals **SHY, IWD, GLD, IEF** (25% each)

So they differ with respect to one asset: QQQ in the (near-static) risky portfolio is replaced by SHY in the cash portfolio. Both portfolios are similar to well-known equal weighted static portfolios like the Permanent portfolio and the Golden Butterfly portfolio. These "All Season" portfolios work well in the four possible economic conditions — growth, recession, inflation, and deflation.

The same can be said about our risky portfolio: it has all the elements (growth, value, bonds, and gold) and can therefore be seen as an "All Season" portfolio. Also, both our two LAA portfolios (risky and cash) are constructed in-sample over Feb 1949 – Jun 1981 when yields and inflation have risen from zero to more than 14%. In addition, our results are shown to be robust for parameter changes.

And our (in-sample optimal) large cap growth ETF QQQ in the risky portfolio replaces the more common large cap growth SPY in the traditional all-season portfolios, taking (out-of-sample) advantage of the boom in tech stocks recently. The "cash" universe holds two bonds, where SHY helps in rising yield and inflationary circumstances while IEF acts as universal safe harbour.

Finally, the number of transactions for our LAA strategy is very limited for two reasons. First, due to limited GT signals, cash fractions over time compared to traditional trend following signals are much lower (see CF in fig. 21 below), while GT trading occurs only once in three years on average. Second, we only have to replace QQQ by SHY (both 25% of the portfolio) when the crash signal arrives. So trading, turnover and transaction costs are nearly zero, making this a **near-static** strategy with half the drawdown of its static parent, the 60-40 SPY-IEF benchmark. See fig. 21 where we repeat fig. 12 for our LAA strategy. Notice the UPI of 5.13 for the last 10 years out-of-sample period (RS1).

Period	Start	Stop	R	D	V	K25	UPI	CF	TTC	R6040
IS	Feb 49	Jun 81	10.6%	15.0%	8.2%	6.1%	**2.17**	12.9%	0.04%	8.5%
OS	Jun 81	Oct 19	10.4%	14.4%	8.8%	6.2%	**1.68**	13.9%	0.03%	10.4%
RS2	Oct 99	Oct 19	9.0%	13.1%	8.1%	5.8%	**2.22**	18.7%	0.02%	6.3%
RS1	Oct 09	Oct 19	9.5%	5.5%	7.8%	8.3%	**5.13**	1.7%	0.01%	10.2%
FS	Feb 49	Oct 19	10.5%	15.0%	8.5%	6.0%	**1.86**	13.4%	0.03%	9.5%
Parms:	**NR=**	**4**		**NC=**	**4**	**GTT**	**UE/SPY**		D=	29.5%

Fig. 21 The LAA strategy: QQQ+IWD+GLD+IEF (25% each), switched to SHY+IWD+GLD +IEF (25% each) using GT timing[8]

References

Allocate Smartly, 2019, www.allocatesmartly.com

Browne, H., 2001, Fail-Safe Investing: Lifelong Financial Security in 30 Minutes, https://www.amazon.com/Fail-Safe-Investing-Lifelong-Financial-Security/dp/031226321X

Faber, M. T., 2007, A Quantitative Approach to Tactical Asset Allocation, Journal of Wealth Management, Spring 2007. Updated in Faber (2014).

Faber, M. T., 2014, A Quantitative Approach to Tactical Asset Allocation, SSRN 962461. Update of Faber (2007), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=962461

Fama French (FF), 2019, Data Library, http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library/f-f_factors.html

Fred (Fed. Reserve Bank of St. Louis), 2019, Unemployment Rate, https://fred.stlouisfed.org/series/UNRATE

Ibbotson SBBI Yearbook, 2008, https://www.amazon.com/Stocks-Bonds-Bills-InflationYearbook/dp/0979240220

Keller, W.J., and J.W. Keuning, 2016, Protective Asset Allocation (PAA), SSRN 2759734, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2759734

Keller, W.J., and J.W. Keuning, 2017, Vigilant Asset Allocation (VAA), SSRN 3002624, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3002624

Keller, W.J., and J.W. Keuning, 2018, Defensive Asset Allocation (DAA), SSRN 3307823, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3212862

Newfound, 2019a, Macro Timing with Trend following, https://blog.thinknewfound.com/2019/10/macro-timing-with-trend-following/

Newfound, 2019b, Global Growth Trend Timing, https://blog.thinknewfound.com/2019/11/global-growth-trend-timing/

Novell, P., 2019, Enhancing Returns of TAA Bond Strategies,, https://investingforaliving.us/2019/07/18/enhancing-returns-of-taa-bond-strategies/

Philosophical Economics (PE), 2016, In Search of the Perfect Recession Indicator, http://www.philosophicaleconomics.com/2016/02/uetrend/

Portfoliocharts (PC), 2016, The theory behind the Golden Butterfly, https://portfoliocharts.com/2016/04/18/the-theory-behind-the-golden-butterfly/

Ulcer index (2019), Wikipedia, https://en.wikipedia.org/wiki/Ulcer_index