

Appendix A

Initial List of Features

Group	Ticker	Feature name	source
Original Features			
Government Bond Yields			
U.S.	1M	U.S. Treasury bond yield (1M)	U.S. Department of the Treasury
	3M	U.S. Treasury bond yield (3M)	U.S. Department of the Treasury
	6M	U.S. Treasury bond yield (6M)	U.S. Department of the Treasury
	1Y	U.S. Treasury bond yield (1Y)	U.S. Department of the Treasury
	2Y	U.S. Treasury bond yield (2Y)	U.S. Department of the Treasury
	3Y	U.S. Treasury bond yield (3Y)	U.S. Department of the Treasury
	5Y	U.S. Treasury bond yield (5Y)	U.S. Department of the Treasury
	7Y	U.S. Treasury bond yield (7Y)	U.S. Department of the Treasury
	10Y	U.S. Treasury bond yield (10Y)	U.S. Department of the Treasury
	20Y	U.S. Treasury bond yield (20Y)	U.S. Department of the Treasury
	30Y	U.S. Treasury bond yield (30Y)	U.S. Department of the Treasury
Europe	ECB2Y	Euro area 2Y Govt Benchmark bond yield	Quandl
	ECB3Y	Euro area 3Y Govt Benchmark bond yield	Quandl
	ECB5Y	Euro area 5Y Govt Benchmark bond yield	Quandl
	ECB7Y	Euro area 7Y Govt Benchmark bond yield	Quandl
	ECB10Y	Euro area 10Y Govt Benchmark bond yield	Quandl
Japan	JGB1Y	Japan Govt bond yield (1Y)	Quandl
	JGB2Y	Japan Govt bond yield (2Y)	Quandl
	JGB3Y	Japan Govt bond yield (3Y)	Quandl
	JGB4Y	Japan Govt bond yield (4Y)	Quandl
	JGB5Y	Japan Govt bond yield (5Y)	Quandl
	JGB6Y	Japan Govt bond yield (6Y)	Quandl
	JGB7Y	Japan Govt bond yield (7Y)	Quandl
	JGB8Y	Japan Govt bond yield (8Y)	Quandl
	JGB9Y	Japan Govt bond yield (9Y)	Quandl
	JGB10Y	Japan Govt bond yield (10Y)	Quandl
	JGB15Y	Japan Govt bond yield (15Y)	Quandl
	JGB20Y	Japan Govt bond yield (20Y)	Quandl
	JGB25Y	Japan Govt bond yield (25Y)	Quandl
	JGB30Y	Japan Govt bond yield (30Y)	Quandl
	JGB35Y	Japan Govt bond yield (35Y)	Quandl
	JGB40Y	Japan Govt bond yield (40Y)	Quandl
U.K.	BOE5Y	British Govt bond yield (5Y)	Quandl
	BOE10Y	British Govt bond yield (10Y)	Quandl
	BOE20Y	British Govt bond yield (20Y)	Quandl
Coporate Bond Yield			
	DAAA	Moody's Seasoned Aaa Corporate Bond Yield	FRED
	BAA10Y	DAAA Relative to Yield on 10Y Treasury bond yield	FRED
Interest Rate			
U.S.	DFF	Effective Federal Funds Rate	FRED
	DPRIME	U.S. Commercial Bank Prime Loan Rate	FRED
Europe	ECBinterest	Ecb Interest Rates For Main Refinancing Operations	Quandl
U.K.	USD1MTD156N	1-Month London Interbank Offered Rate (LIBOR)	FRED
	USD3MTD156N	3-Month London Interbank Offered Rate (LIBOR)	FRED
Equities			
	^DJI	Dow Jones Industrial Average	Yahoo Finance
	^GSPC	S&P 500 Index	Yahoo Finance
	^IXIC	NASDAQ Composite	Yahoo Finance
	FX.F	Euro Stoxx 50	Stooq
	X.F	FTSE 100 - Euronext	Stooq
	ES.F	S&P 500 E-Mini - CME	Stooq
	^W5000	Wilshire 5000 Total Market Index	Yahoo Finance
	^RUT	Russell 2000	Yahoo Finance
	^RUA	Russell 3000	Yahoo Finance
	^HSI	HANG SENG INDEX	Yahoo Finance
Currencies			
	JPY=X	USD/JPY	Yahoo Finance
	GBP=X	USD/GBP	Yahoo Finance
	EUR=X	USD/EUR	Yahoo Finance
	CHF=X	USD/CHF	Yahoo Finance
	CNY=X	USD/CNY	Yahoo Finance
	DX-Y.NYB	US Dollar/USDX (US Dollar Index)	Yahoo Finance

Commodities			
	^CRY	Commodity Research Bureau (CRB) Index	Yahoo Finance
	CL=F	Crude Oil Dec 20	Yahoo Finance
	GC=F	Gold Dec 20	Yahoo Finance
Forward Rates			
U.S.	THREEFF1	Fitted Instantaneous Forward Rate 1 Years Hence	FRED
	THREEFF2	Fitted Instantaneous Forward Rate 2 Years Hence	FRED
	THREEFF3	Fitted Instantaneous Forward Rate 3 Years Hence	FRED
	THREEFF5	Fitted Instantaneous Forward Rate 5 Years Hence	FRED
	THREEFF7	Fitted Instantaneous Forward Rate 7 Years Hence	FRED
	THREEFF10	Fitted Instantaneous Forward Rate 10 Years Hence	FRED
Futures			
U.S.	ZB=F	CBOT U.S. Treasury Bond Futures price	Yahoo Finance
	YM=F	Mini Dow Jones Indus.-\$5 Dec 20	Yahoo Finance
Volatility			
U.S.	VIXCLS	CBOE Volatility Index: VIX	FRED
	EMVMONETARYPOL	Equity Market Volatility Tracker: Monetary Policy	FRED
	EMVEXRATES	Equity Market Volatility Tracker: Exchange Rates	FRED
	EMVMACROINFLATION	Equity Market Volatility Tracker: Inflation	FRED
	EMVGOVTSPEND	Equity Market Volatility Tracker: Government Deficits	FRED
	EMVMACROINTEREST	Equity Market Volatility Tracker: Interest Rates	FRED
	INFECTDISEMVTACKD	Equity Market Volatility: Infectious Disease Tracker	FRED
Economic Indicators			
Global Indicators	EA19CLI	COMPOSITE LEADING INDICATOR: 19 EA COUNTRIES	OECD
	G-7CLI	COMPOSITE LEADING INDICATOR: G7	OECD
	USACLI	COMPOSITE LEADING INDICATOR: US	OECD
	OECDCLI	COMPOSITE LEADING INDICATOR: total	OECD
	CHNCLI	COMPOSITE LEADING INDICATOR: China	OECD
Govt Deficits	LUXdeficit	Government deficit /GDP	Trading Economics
	JPNdeficit	Government deficit /GDP	Trading Economics
	IRLdeficit	Government deficit /GDP	Trading Economics
	GBRdeficit	Government deficit /GDP	Trading Economics
	CHNdeficit	Government deficit /GDP	Trading Economics
	CHEdeficit	Government deficit /GDP	Trading Economics
	BRAdeficit	Government deficit /GDP	Trading Economics
	USAdeficit	Government deficit /GDP	Trading Economics
U.S. Inflation	HKdeficit	Government deficit /GDP	Trading Economics
	BOGZ1FL075035503Q	Commercial Real Estate Price Index	FRED
	GDPDEF	Gross Domestic Product: Implicit Price Deflator	FRED
	CPILFESL	Consumer Price Index for All Urban Consumers	FRED
	MICH	University of Michigan: Inflation Expectation	FRED
FED Balance Sheets	RELACBW027SBOG	Real Estate Loans: All Commercial Banks	FRED
	WALCL	FED Total Assets:Wednesday Level	FRED
	TOTBORR	Total Borrowings of Depository Institutions from FED	FRED
	WRESBAL	Reserve Balances with Federal Reserve Banks	FRED
	BOGZ1FL614090610Q	Finance Companies' Total Assets (Balance Sheet)	FRED
U.S. Employment	PAYEMS	All Employees, Total Nonfarm	FRED
	UNRATE	Unemployment Rate (percentage)	FRED
	ICSA	Initial Claims	FRED
U.S. GDP	GDPC1	Real Gross Domestic Product	FRED
	DSPIC96	Real Disposable Personal Income	FRED
	GPDIC1	Real Gross Private Domestic Investment	FRED
	GCEC1	Real Govt Consumption and Gross Investment	FRED
	ROWFDNQ027S	Foreign Direct Investment in U.S (Level)	FRED
	FBDIAEQ027S	U.S. Direct Investment Abroad (Level)	FRED
	ROWFDIQ027S	Foreign Direct Investment in U.S.(Current Cost)	FRED
	MEHOINUSA672N	Real Median Household Income in the U.S.	FRED
	PSAVERT	Personal Saving Rate	FRED
Others (U.S.)	M2	M2 Money Stock	FRED
	INDPRO	Industrial Production: Total Index	FRED
	FBTFASQ027S	Domestic Total Financial Assets (Level)	FRED
	TCU	Capacity Utilization: Total Index	FRED
	PMI	PMI Composite Index	FRED
Generated Features			
Government Bond Spreads			
Inter-markets	USJPBDSP1Y	U.S.-Japan Govt bond yield Spread (1Y)	
	USJPBDSP2Y	U.S.-Japan Govt bond yield Spread (2Y)	
	USJPBDSP3Y	U.S.-Japan Govt bond yield Spread (3Y)	
	USJPBDSP5Y	U.S.-Japan Govt bond yield Spread (5Y)	

	USJPBDSPP7Y	U.S.-Japan Govt bond yield Spread (7Y)
	USJPBDSPP10Y	U.S.-Japan Govt bond yield Spread (10Y)
	USJPBDSPP20Y	U.S.-Japan Govt bond yield Spread (20Y)
	USJPBDSPP30Y	U.S.-Japan Govt bond yield Spread (30Y)
	USEUBDSP2Y	U.S. -Euro Govt bond yield Spread (2Y)
	USEUBDSP3Y	U.S. -Euro Govt bond yield Spread (3Y)
	USEUBDSP5Y	U.S. -Euro Govt bond yield Spread (5Y)
	USEUBDSP7Y	U.S. -Euro Govt bond yield Spread (7Y)
	USEUBDSP10Y	U.S. -Euro Govt bond yield Spread (10Y)
Intra-markets	US1Y-2Y	U.S. Treasury bond yield Spread (1Y-2Y)
U.S.	US1Y-3Y	U.S. Treasury bond yield Spread (1Y-3Y)
	US1Y-5Y	U.S. Treasury bond yield Spread (1Y-5Y)
	US1Y-7Y	U.S. Treasury bond yield Spread (1Y-7Y)
	US1Y-10Y	U.S. Treasury bond yield Spread (1Y-10Y)
	US1Y-15Y	U.S. Treasury bond yield Spread (1Y-15Y)
	US1Y-20Y	U.S. Treasury bond yield Spread (1Y-20Y)
	US1Y-30Y	U.S. Treasury bond yield Spread (1Y-30Y)
	US2Y-3Y	U.S. Treasury bond yield Spread (2Y-3Y)
	US2Y-5Y	U.S. Treasury bond yield Spread (2Y-5Y)
	US2Y-7Y	U.S. Treasury bond yield Spread (2Y-7Y)
	US2Y-10Y	U.S. Treasury bond yield Spread (2Y-10Y)
	US2Y-20Y	U.S. Treasury bond yield Spread (2Y-20Y)
	US2Y-30Y	U.S. Treasury bond yield Spread (2Y-30Y)
	US3Y-5Y	U.S. Treasury bond yield Spread (3Y-5Y)
	US3Y-7Y	U.S. Treasury bond yield Spread (3Y-7Y)
	US3Y-10Y	U.S. Treasury bond yield Spread (3Y-10Y)
	US3Y-20Y	U.S. Treasury bond yield Spread (3Y-20Y)
	US3Y-30Y	U.S. Treasury bond yield Spread (3Y-30Y)
	US5Y-7Y	U.S. Treasury bond yield Spread (5Y-7Y)
	US5Y-10Y	U.S. Treasury bond yield Spread (5Y-10Y)
	US5Y-20Y	U.S. Treasury bond yield Spread (5Y-20Y)
	US5Y-30Y	U.S. Treasury bond yield Spread (5Y-30Y)
	US7Y-10Y	U.S. Treasury bond yield Spread (7Y-10Y)
	US7Y-20Y	U.S. Treasury bond yield Spread (7Y-20Y)
	US7Y-30Y	U.S. Treasury bond yield Spread (7Y-30Y)
	US10Y-20Y	U.S. Treasury bond yield Spread (10Y-20Y)
	US10Y-30Y	U.S. Treasury bond yield Spread (10Y-30Y)
	US20Y-30Y	U.S. Treasury bond yield Spread (20Y-30Y)
Europe	ECB2Y-ECB3Y	Euro area Govt Benchmark bond yield Spread (2Y-3Y)
	ECB2Y-ECB5Y	Euro area Govt Benchmark bond yield Spread (2Y-5Y)
	ECB2Y-ECB7Y	Euro area Govt Benchmark bond yield Spread (2Y-7Y)
	ECB2Y-ECB10Y	Euro area Govt Benchmark bond yield Spread (2Y-10Y)
	ECB5Y-ECB3Y	Euro area Govt Benchmark bond yield Spread (5Y-3Y)
	ECB5Y-ECB7Y	Euro area Govt Benchmark bond yield Spread (5Y-7Y)
	ECB5Y-ECB10Y	Euro area Govt Benchmark bond yield Spread (5Y-10Y)
	ECB7Y-ECB3Y	Euro area Govt Benchmark bond yield Spread (7Y-3Y)
	ECB7Y-ECB10Y	Euro area Govt Benchmark bond yield Spread (7Y-10Y)
	ECB10Y-ECB3Y	Euro area Govt Benchmark bond yield Spread (10Y-3Y)
Moving Averages		
1,2,3,5,7,10, 20,30Y (n)	n_SMA5	5-day Moving Average for variable n
	n_SMA10	10-day Moving Average for variable n
	n_SMA15	15-day Moving Average for variable n
	n_SMA20	20-day Moving Average for variable n
	n_SMA50	50-day Moving Average for variable n
	n_SMA200	200-day Moving Average for variable n
	n_SMA10_4	10-day MA minus 4-day MA for variable n
	n_SMA24_14	24-day MA minus 14-day MA for variable n
	n_SMA48_35	48-day MA minus 35-day MA for variable n
Percentage Change		
	BOGZ1FL075035503Q_ptc	Commercial Real Estate Price Index
	RELACBW027SBOG_ptc	Real Estate Loans: All Commercial Banks
	BOGZ1FL614090610Q_ptc	Finance Companies' Total Assets (Balance Sheet)
	FBDIAEQ027S_ptc	U.S. Direct Investment Abroad (Level)
	GDPC1_ptc	Real Gross Domestic Product
	DSPIC96_ptc	Real Disposable Personal Income
	GPDIC1_ptc	Real Gross Private Domestic Investment
	INDPRO_ptc	Industrial Production: Total Index
	FBTFASQ027S_ptc	Domestic Total Financial Assets (Level)
	ROWFDNQ027S_ptc	Foreign Direct Investment in U.S (Level)
	PAYEMS_ptc	All Employees, Total Nonfarm
	M2_ptc	M2 Money Stock