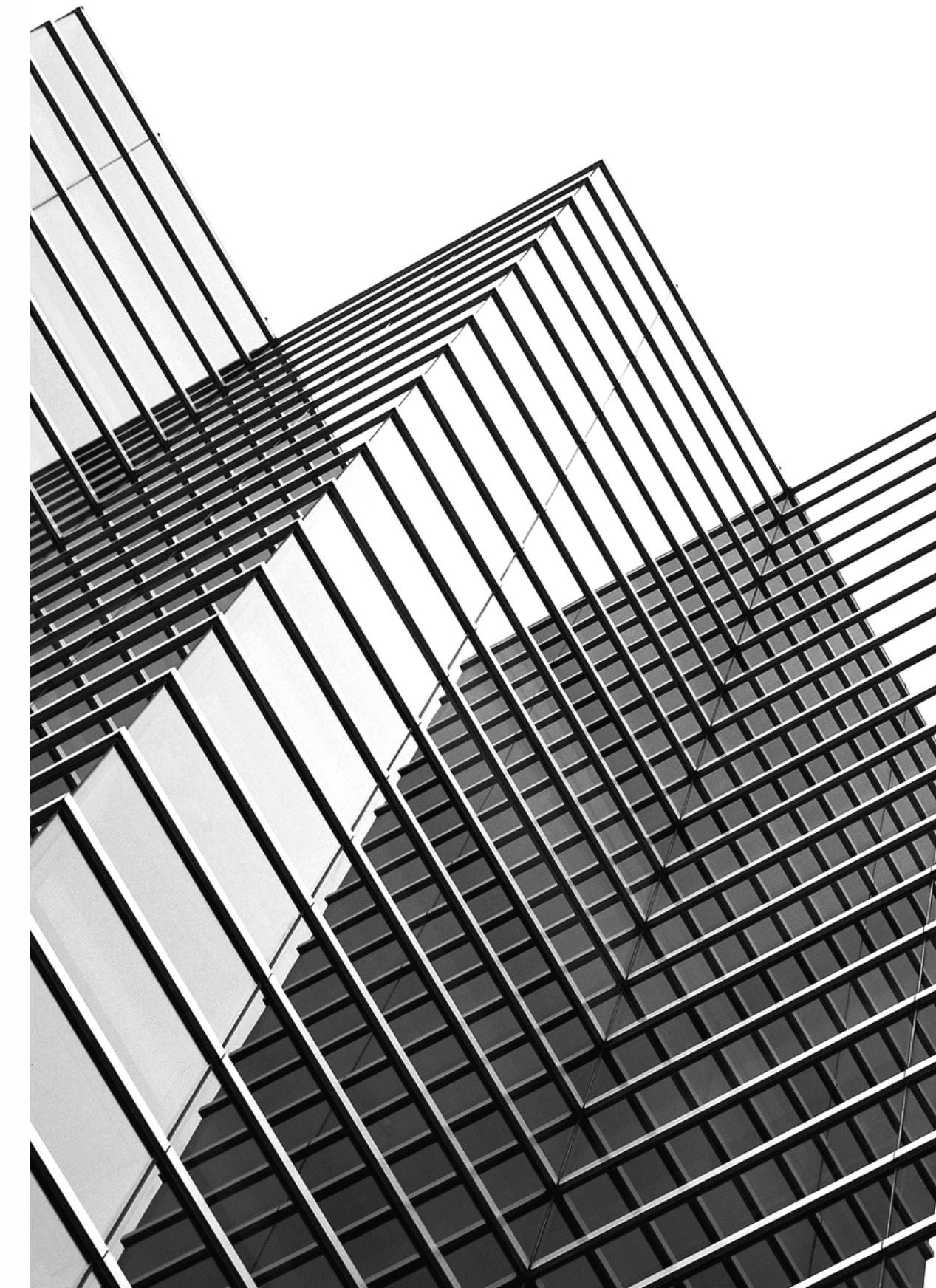


PROJECT 11

FINAL PRESENTATION

AXA INVESTMENT MANAGERS
PTE LTD

BUILDING A LOW
VOLATILITY INDICATOR OF
CHINESE A-SHARE STOCKS



DATA AND BUSINESS ANALYTICS



**Investment
Managers**

COMPANY BACKGROUND

CONTEXT

AXA (IM) believes low volatility can be a very effective predictor for future returns in the China A-shares market.

PROJECT OBJECTIVES

Build a company-level predictive model to identify stocks with low future volatility

- COMPANY INDEX
- FINANCIAL INDICATORS
 - RATE OF RETURN (MONTHLY)
 - DATE

DATA PROVIDED

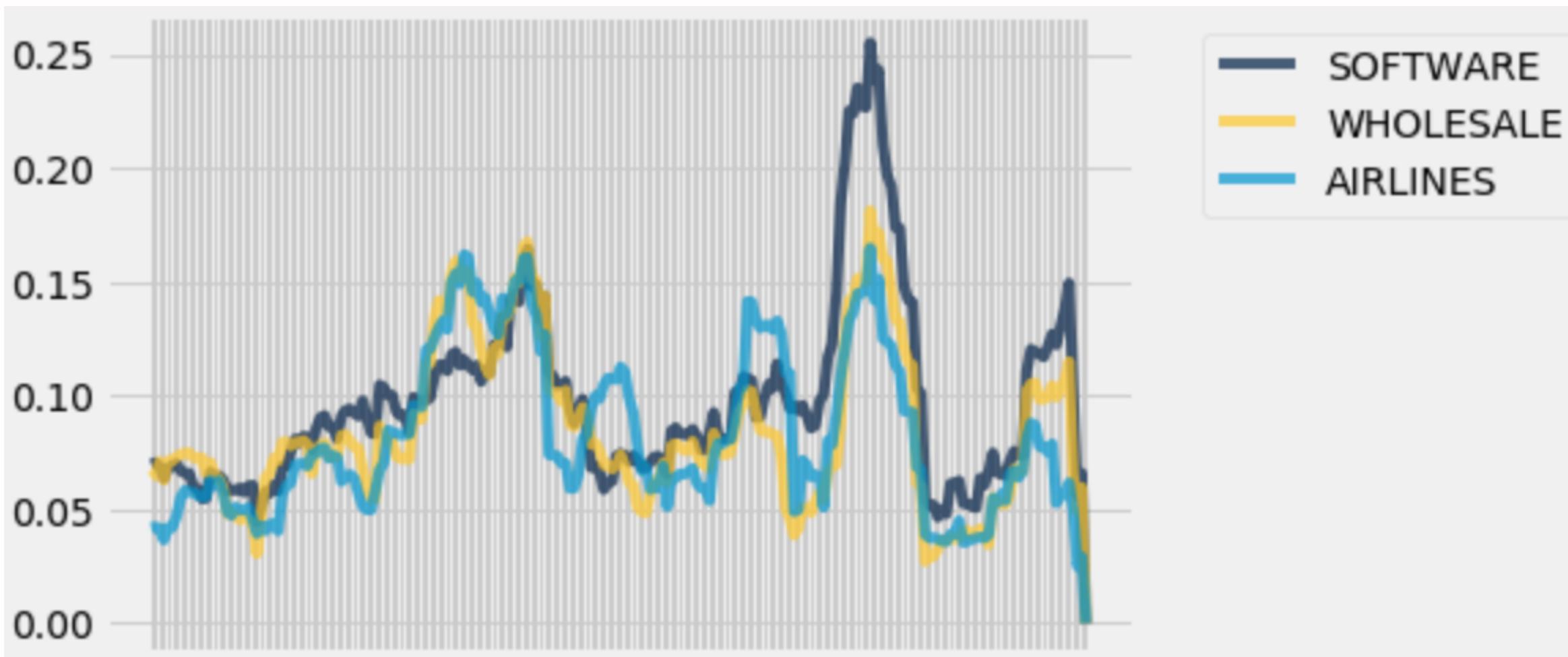
DEFINING VOLATILITY

Taking the standard deviation of monthly rate of return

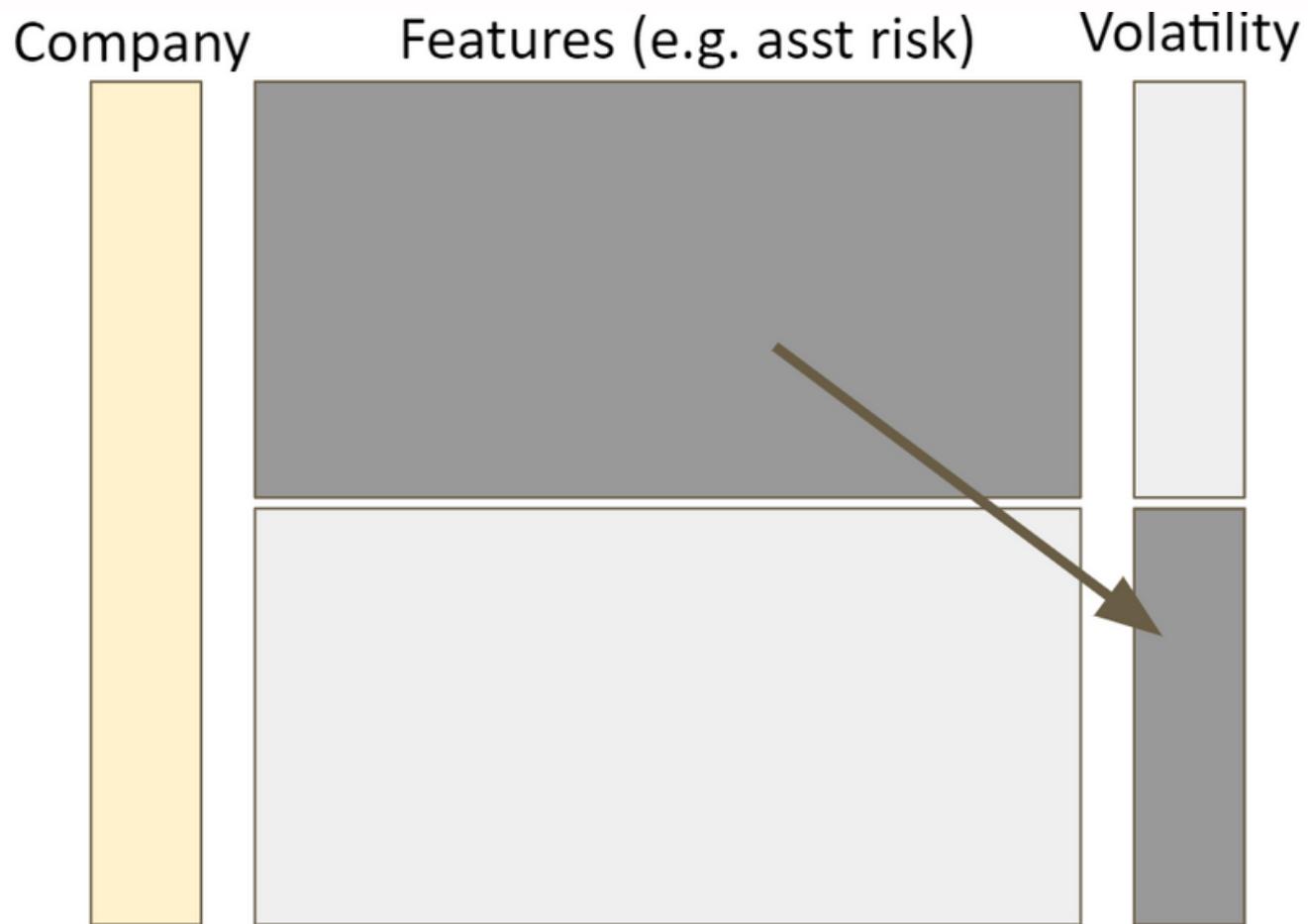
cxrf	returns	date	rolling_std
3544	0.5076	Jan 18	
3544	0.8275	Feb 18	
3544	0.3782	Mar 18	
3544	0.4761	Apr 18	0.236268513
3544	0.9074	May 18	0.281560159
3544	0.3025	Jun 18	0.31146446
3544	0.1246	Jul 18	0.410351122
3544	0.9623	Aug 18	0.438084996
3544	0.1385	Sep 18	0.098505482
3544	0.2920	Oct 18	0.438084996
3544	0.3222	Nov 18	0.098505482
3544	0.7232	Dec 18	0.236268513

MONTHLY VOLATILITY

Variance plot of three industries



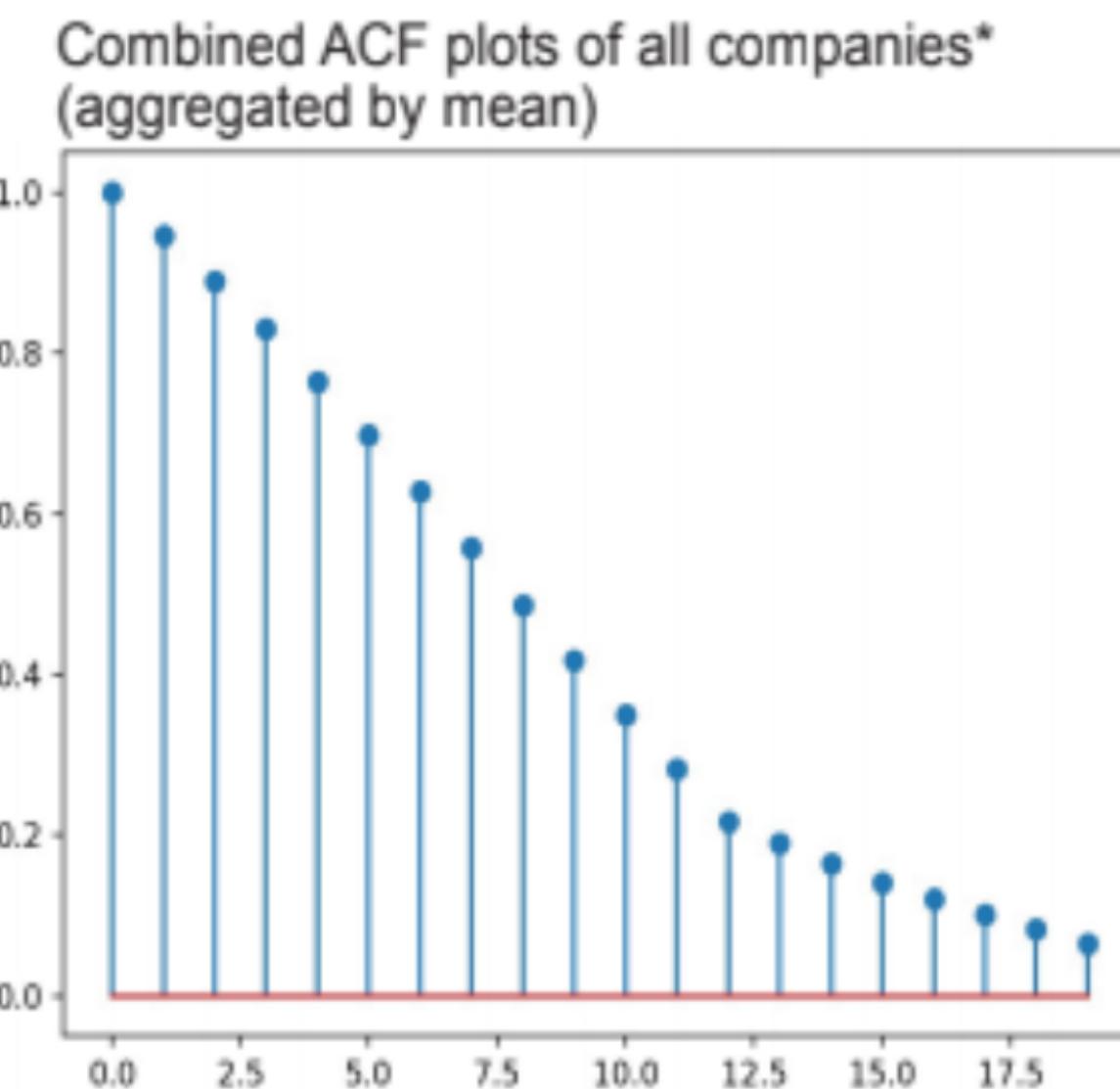
REGRESSION APPROACH



Exploring the correlation between the volatility and the previous year feature value

	12816	12707	9643	12698	12697	9644	12693	9645	9646	12689	12688	9647	12684	12683	9648	9649	9650	12674	9651	9652	
cxrf																					
accr	0.094	-0.164	-0.1522	0.0808	0.1362	0.0989	0.0313	-0.1066	0.0897	-0.2345	0.0759	-0.2425	0.4146	-0.1863	-0.0967	0.4616	-0.0668	-0.3062	0.1588	-0.122	
agro	-0.018	-0.5226	-0.185	0.2533	-0.2184	-0.0236	-0.0337	-0.0922	-0.3902	-0.4075	-0.033	0.0558	-0.1843	0.1057	0.0172	0.1849	0.1314	0.212	0.0439	-0.23	
aroe	0.3789	0.3853	0.3802	0.4489	0.1898	0.4674	0.1371	0.3088	0.3114	0.3063	0.3697	0.0816	0.4479	0.4174	0.4613	0.3456	0.3642	-0.1058	0.4892	0.0733	
asst_risk	0.2269	-0.3861	-0.0038	-0.0332	-0.1068	0.274	0.1881	-0.203	0.3532	-0.4513	-0.1807	-0.0014	-0.0908	0.1698	0.2024	0.3326	0.4694	0.1185	0.2432	-0.2003	
blev	-0.1481	0.2657	0.2588	0.3996	0.4256	0.3932	0.5255	0.8101	0.2792	-0.3339	0.3148	0.0638	0.0832	0.0678	0.5106	-0.2717	0.2295	-0.0973	0.0401	-0.0815	
bps	0.2324	-0.353	-0.1005	-0.286	-0.3645	0.134	0.0691	-0.4533	-0.2328	-0.5908	-0.1003	-0.1203	-0.1295	0.1478	-0.1034	0.1778	0.1133	0.032	-0.15		
btop_risk	-0.1189	-0.3757	-0.211	-0.0729	-0.3502	-0.0424	-0.0653	-0.5399	-0.4365	0.0709	-0.183	-0.0756	0.3793	-0.064	-0.2572	0.0598	-0.1018	0.015	0.2805	0.0245	
cflow	0.2307	-0.3342	-0.0618	-0.2134	-0.1185	0.2018	-0.1466	-0.3837	-0.1073	-0.0529	-0.0696	-0.1184	-0.0337	0.1021	0.498	-0.0738	0.2798	0.0272	-0.3679	-0.2628	
ctop	0.181	-0.3966	0.0288	-0.0557	-0.0209	0.0694	-0.0657	-0.3273	-0.4002	-0.0123	-0.1079	-0.1051	0.2332	-0.0827	-0.0088	-0.0621	0.2211	-0.0646	-0.3837	-0.1702	
dct	0.0643	-0.0354	0.5762	0.2054	-0.0216	0.356	-0.2658	-0.1743	0.0941	-0.1354	-0.3171	0.2862	-0.0612	0.1606	0.5848	0.3692	0.3301	0.39	0.0471	-0.0427	
dsuseh			-0.2378				-0.1131			0.161	-0.1984			-0.3304			-0.4969	0.0868	-0.3699	-0.194	0.0943
dtoa	-0.2627	0.241	0.2386	0.4268	0.2863	0.424	0.501	-0.2497	0.0786	-0.3854	0.2453	0.1164	0.1208	0.209	0.5288	-0.4061	0.1975	-0.1303	0.156	-0.0085	
e_p	0.296	-0.2567	0.1807	-0.1631	-0.2444	0.0831	-0.122	-0.3419	-0.1498	-0.1571	-0.2147	0.0913	-0.1222	-0.0185	0.2448	0.1924	0.2315	0.007	-0.4228	-0.1799	
epsn	0.2439	-0.2841	0.0445	-0.2739	-0.3175	-0.1574	-0.0413	-0.3459	-0.2092	-0.2232	-0.1699	-0.0496	-0.3881	0.1243	0.2475	-0.1816	0.2022	-0.0085	-0.4685	-0.1931	
erhp	0.2158	-0.3385	0.0635	-0.1271	-0.0722	0.0697	-0.1794	-0.2998	-0.1506	-0.2161	-0.147	0.136	-0.0767	0.0191	0.1814	-0.3155	0.2381	0.0216	0.3193	-0.1853	
erv3			-0.0822			-0.1496			0.0735	-0.0666			-0.0596			-0.0907	0.0253	-0.2163	-0.2953	0.0471	
etop_risk	0.2084	-0.345	0.0124	-0.1245	-0.0414	-0.0357	-0.2271	-0.2985	-0.3495	-0.1906	-0.1781	-0.0268	-0.0533	0.0056	0.1519	-0.3111	0.2103	0.0321	-0.4199	-0.1611	
fisn	-0.2258	0.2157	0.3496	0.478	0.4361	0.3749	0.5922	0.1302	-0.054	0.2017	0.1834	0.1151	0.1777	0.602	-0.2887	0.3263	-0.0945	0.2215	0.01		
funq	0.183	-0.2154	0.3423	-0.3474	-0.4172	0.328	-0.3652	-0.5158	0.0583	-0.14	-0.3154	-0.1609	-0.02	-0.2406	0.2151	-0.0943	0.1894	0.344	-0.3805	-0.0531	
grex	0.3278	0.1634	0.2101	-0.194	-0.0483	0.2211	-0.0809	-0.225	0.1096	-0.2026	-0.0767	0.0118	-0.0874	0.1582	0.3688	-0.4583	0.1347	0.1668	-0.4397	-0.027	
gro5	0.3176	0.1634	0.1852	-0.194	-0.1764	0.2156	-0.1789	-0.244	0.069	-0.2339	-0.0632	0.0118	-0.1222	0.1728	-0.0706	-0.4608	0.1235	0.3444	-0.4397	-0.0276	
grot	0.1354	-0.2144	0.3961	-0.3067	-0.2346	0.3281	-0.052	-0.24	0.3796	-0.0504	0.0594	-0.0453	-0.2855	0.1477	0.2619	-0.3697	0.4528	0.4876	-0.4036	-0.2275	
hbet	-0.0324	0.1281	-0.2183	-0.0515	-0.3044	-0.094	-0.3533	-0.4736	-0.1747	0.1665	-0.1726	0.145	-0.2927	0.206	0.3027	-0.0096	-0.5666	-0.3128	-0.1267		
hsig	0.0928	0.0909	-0.3667	-0.0657	-0.1098	0.1081	0.1917	0.0581	0.4866	-0.3419	-0.4853	-0.2105	-0.2001	0.1458	0.2353	-0.0174	0.2712	0.0607	0.1903	-0.078	
ogro	-0.205	0.0277	0.1031	-0.0363	0.1654	0.2872	-0.2473	-0.3167	0.0562	-0.2222	0.3914	0.1777	-0.007	-0.0884	0.3963	-0.4189	0.192	0.4114	-0.5297	-0.1411	
optp	0.088	-0.4156	0.0042	0.1691	0.1035	0.0599	-0.0962	-0.2351	0.1538	-0.0175	0.1763	0.2094	-0.0804	0.0028	-0.0723	0.2002	0.01	-0.2793	-0.1675		
PAIM	-0.1562	-0.1323	-0.1408	-0.0957	-0.063	0.0569	-0.0102	-0.0779	-0.4511	-0.292	-0.0477	0.1293	-0.1188	-0.2819	-0.103	-0.0241	-0.1819	0.1044	0.1987	-0.0207	
pncv	-0.2408	-0.1301	0.0027	-0.1264	0.4928	-0.1986	0.467	0.4261	0.4413	0.2923	0.0085	-0.1753	-0.2742	0.1587	-0.1014	-0.0759	-0.1555	-0.1096	0.3142	-0.0499	
rusr	0.4452	0.4483	0.2889	-0.0492	0.4579	0.3188	0.2095	0.5142	-0.222	0.1816	0.2159	0.1689	0.0381	0.5219	-0.0665	0.2671	0.0164	0.4339	0.1565		
size	0.0506	-0.3914	-0.0819	-0.4913	-0.1809	-0.1108	-0.1426	-0.277	-0.2937	-0.2648	-0.0936	0.106	-0.3174	0.0354	0.2147	-0.006	-0.054	0.1993	-0.2938	-0.2767	
stvi	0.406	0.6003	0.2985	0.4461	0.4366	0.6020	0.5027	0.2046	0.4043	0.3344	0.29										

ARIMA MODEL



Auto Regressive

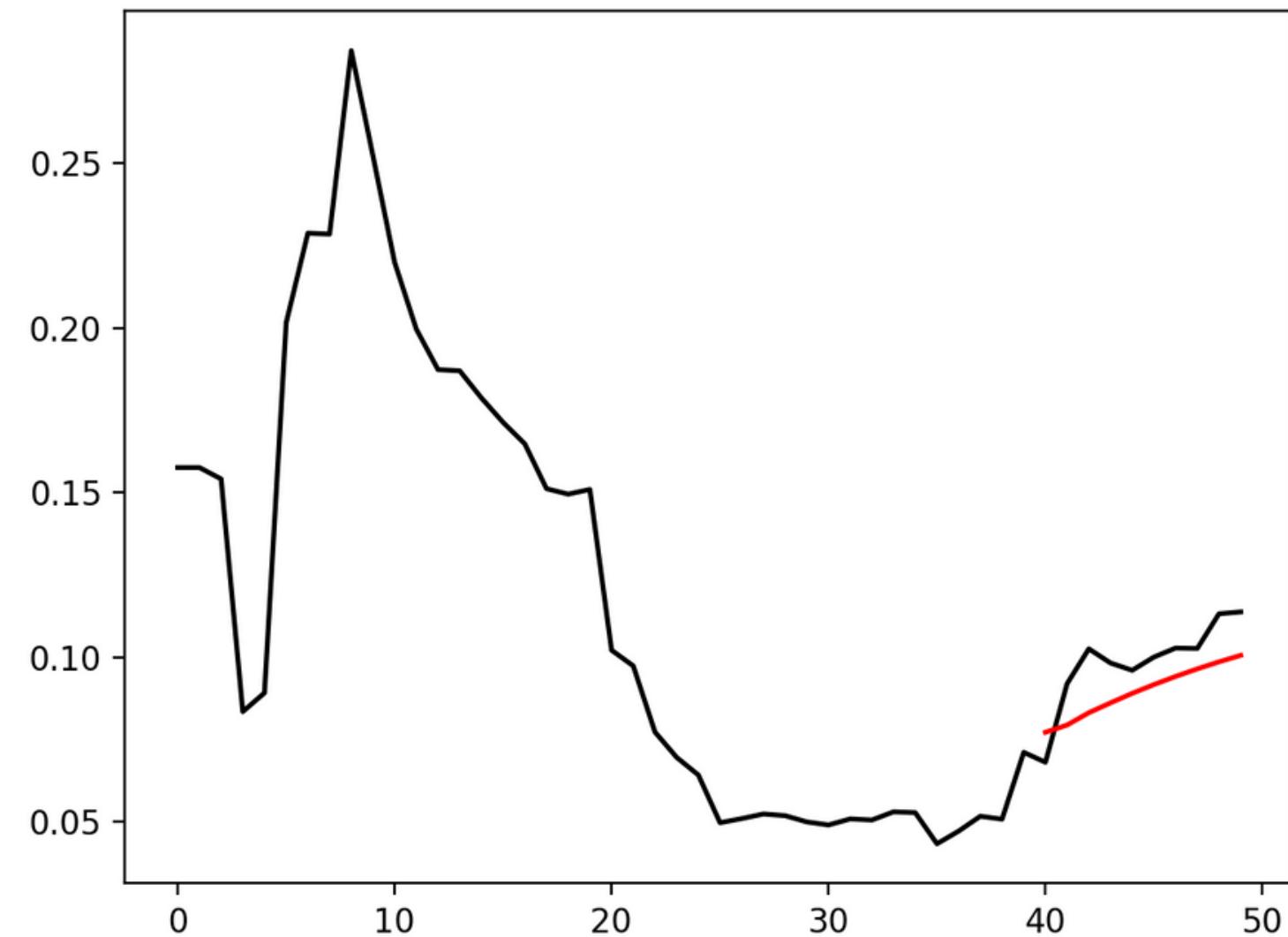
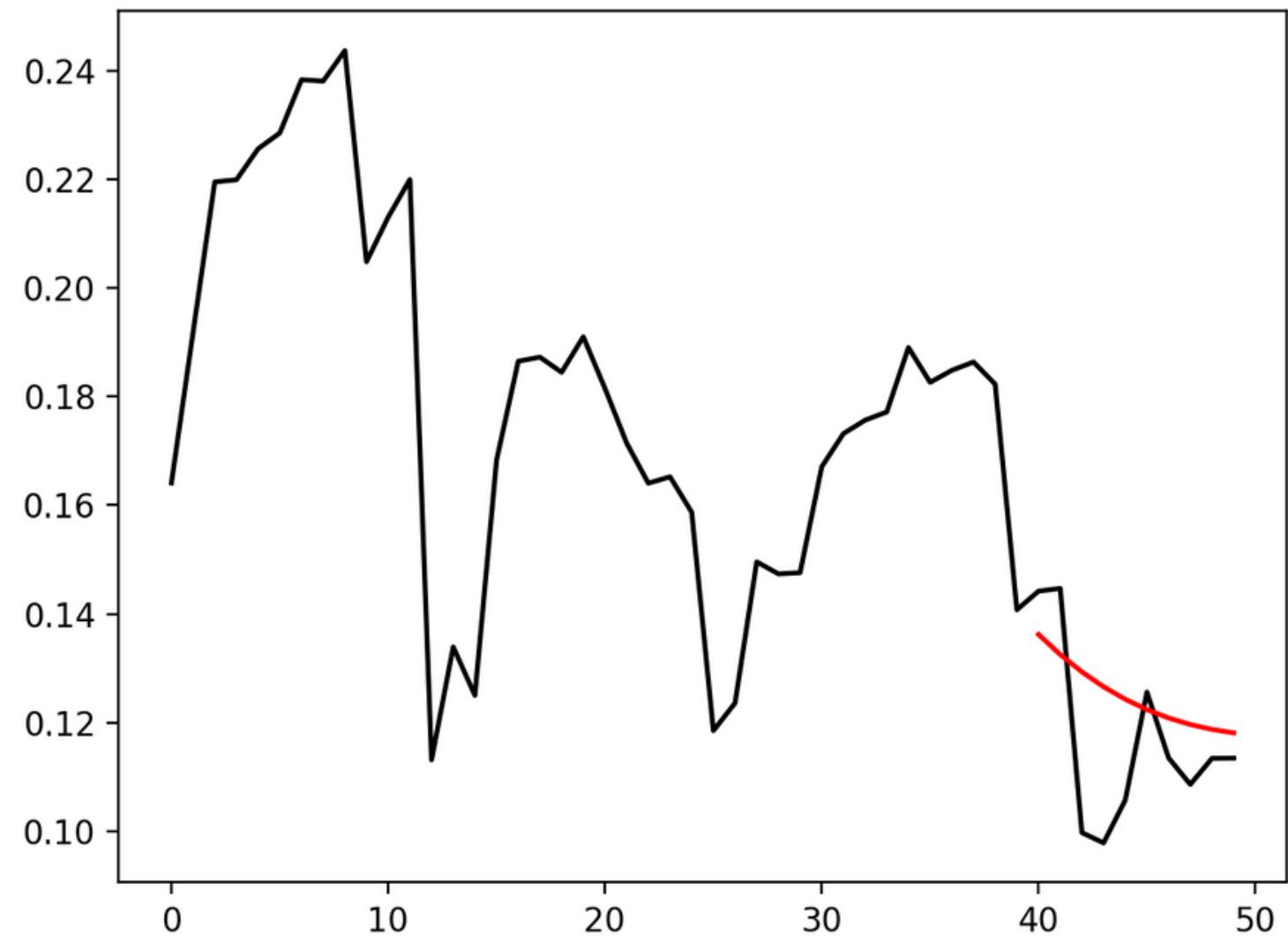
Explore the relationship between current value and previous value

Take into account of lags of forecast error

Moving Average

Include a linear combination of past errors

AT A GLANCE



BUILDING A NAIVE MODEL

Guesstimating the variance by taking the average of the last twelve values of variance

cxrf	variance	date
3544	0.5076	Jan 18
3544	0.8275	Feb 18
3544	0.3782	Mar 18
3544	0.4761	Apr 18
3544	0.9074	May 18
3544	0.3025	Jun 18
3544	0.1246	Jul 18
3544	0.9623	Aug 18
3544	0.1385	Sep 18
3544	0.2920	Oct 18
3544	0.3222	Nov 18
3544	0.7232	Dec 18

NAIVE MODEL
ANALYSIS

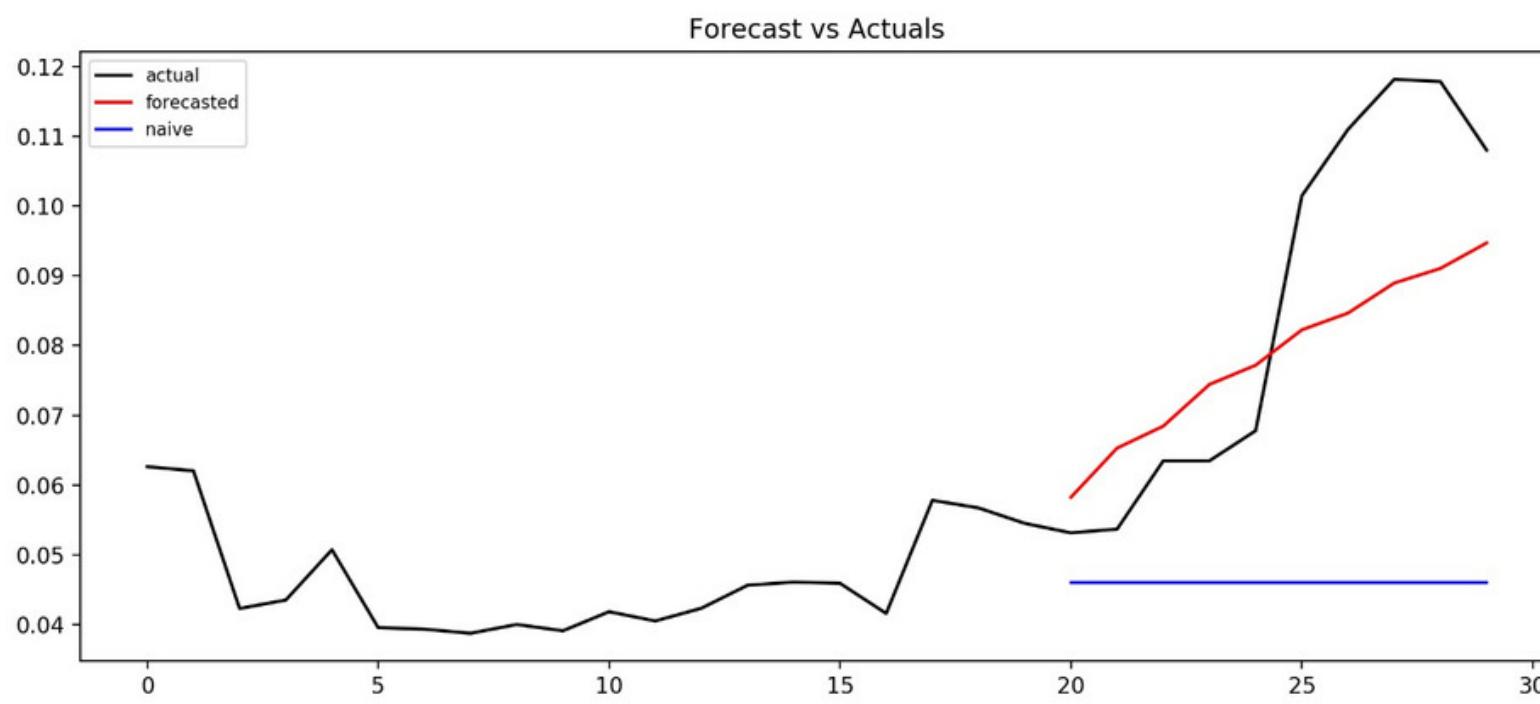
OUR MODEL CAN PREDICT STOCK'S VOLATILITY

52%

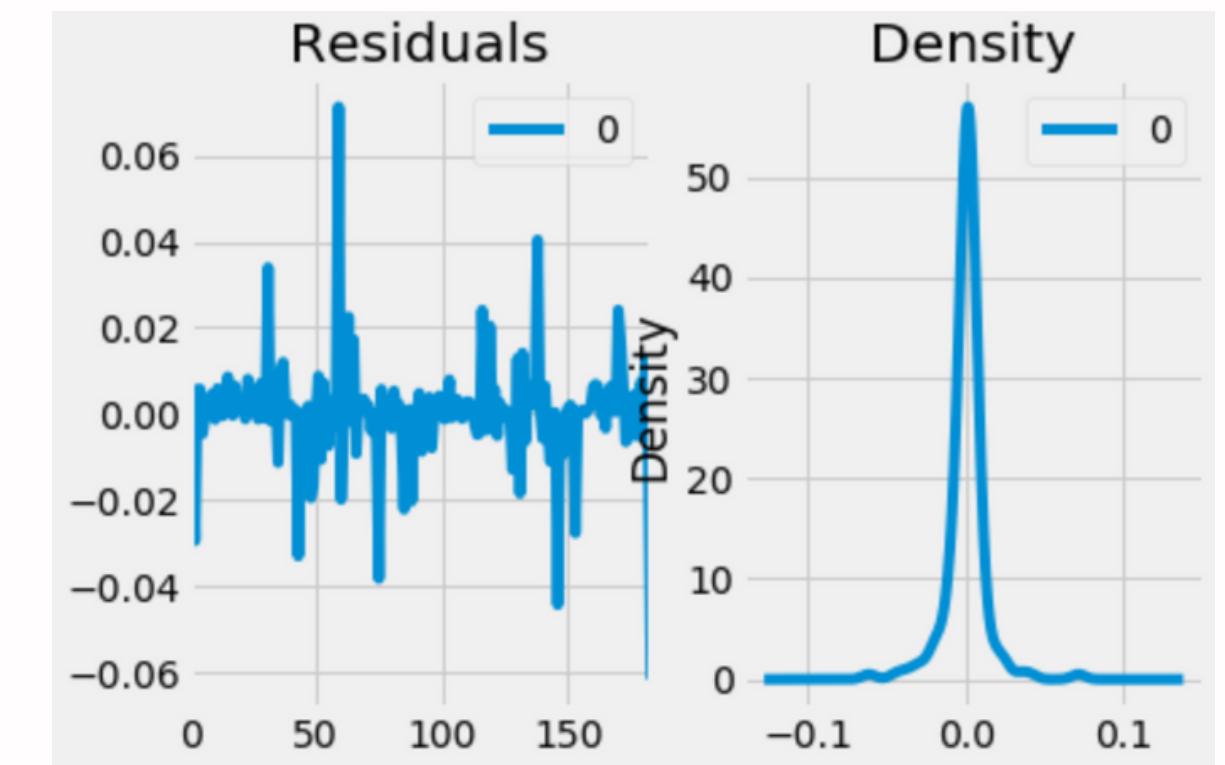
MORE ACCURATELY THAN YOU CAN

EVALUATING OUR MODEL

Forecasting results



Residual plots
(actual vs forecast)



ASSUMPTIONS & LIMITATIONS

LIMITED DATA

We only used companies with a full data set in building our model

SUBJECT TO WORLD EVENTS

Our model doesn't take into account large-scale global happenings

STATIONARITY

The more global spikes and plummets we have, the less accurate our model gets

COMPANY LEVEL APPROACH

AXA IM's go-to approach has always been towards industry-level analysis which gives a broader overview of trends in the markets.

AXA expressed that they liked our company-level analysis that brought about fresh insights to the analysis of China A-shares.

The company level approach brings out tangible features that the industry-level approach may lack, giving us greater depth into our insights of the nature of A-shares

INSIGHTS TO AXA

A BIG FAT THANK YOU

AND A MERRY CHRISTMAS

