**Supplementary Table 4**

| protein | p-value |
|:---:|:---:|
| PB2 | $3 * 10^{-10}$ |
| PB1 | $2.7 * 10^{-7}$ |
| PA | $4.97 * 10^{-9}$ |
| HA1 | $2.38 * 10^{-2}$ |
| HA2 | $6.005 * 10^{-1}$ |
| NP | $1.46 * 10^{-3}$ |
| NA | $1.33 * 10^{-2}$ |
| M1 | $65 * 10^{-5}$ |
| M2 | $6.89 * 10^{-1}$ |
| NS1 | $1.48 * 10^{-1}$ |
| NS2 | $15.34 * 10^{-4}$ |

**Table S4: Kolmogorov–Smirnov-test.**

We applied the Kolmogorov–Smirnov-test (KS-test; $H_0$: $dN/dS$ distribution of pH1N1 protein is smaller than $dN/dS$ distribution of H3N2 protein) to all proteins individually and showed that the global $dN/dS$ distributions of pH1N1 proteins were significantly larger than those of H3N2 proteins, except for HA2, NS1 and M2.