a) ① Because when item B is actually an item with high $Pr(B)$, which means it is justed purchased frequently, it will turns out that many different item "A". will have high confidence $Pr(B|A)$. This actually shows nothing about association.

② Lift $(A \to B) = \frac{conf(A \to B)}{S(B)}$ does not suffer from this drawback because if $Pr(B)$, which equals to $S(B)$ is high, $\frac{conf(A \to B)}{S(B)}$ can still show ~~that how much~~ the frequency that A and B appear together despite B appears how often.

③ Similarly. $conv(A \to B) = \frac{1 - S(B)}{1 - conf(A \to B)}$ actually shows the opposite side version of lift $(A \to B)$, so it does not ~~suffer~~ from the high $Pr(B)$, either.

b) ① $conf(A \to B)$ is not symmetrical.

$conf(A \to B) = Pr(B|A) = \frac{Pr(AB)}{Pr(A)}$, $conf(B \to A) = Pr(A|B) = \frac{Pr(AB)}{Pr(B)}$. So when $Pr(A) \neq Pr(B)$, it is not symmetrical

② $lift(A \to B)$ is symmetrical.

$lift(A \to B) = \frac{conf(A \to B)}{S(B)} = \frac{Pr(AB)}{Pr(A) \cdot Pr(B)}$, $lift(B \to A) = \frac{conf(B \to A)}{S(A)} = \frac{Pr(AB)}{Pr(B) \cdot Pr(A)}$,

so it is symmetrical

③. $conv(A \to B)$ is not symmetrical.

$conv(A \to B) = \frac{1 - S(B)}{1 - conf(A \to B)} = \frac{1 - Pr(B)}{1 - \frac{Pr(AB)}{Pr(A)}} = \frac{Pr(A) - Pr(A) \cdot Pr(B)}{Pr(A) - Pr(AB)}$

$conv(B \to A) = \frac{1 - S(A)}{1 - conf(B \to A)} = \frac{1 - Pr(A)}{1 - Pr(AB)} = \frac{Pr(B) - Pr(A) \cdot Pr(B)}{Pr(B) - Pr(AB)}$

so it is not symmetical (e.g. $Pr(A) = \frac{1}{2}$, $Pr(B) = \frac{1}{3}$, $Pr(AB) =$

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): ① conf(A→B) has the property, because when the associated probability is 1, conf(A→B) = 1, reaches its maximum achievable value. (Normalization of Probability).

② lift(A→B) hasn't the property, because $lift(A\to B) = \frac{Pr(AB)}{Pr(A)\cdot Pr(B)}$ when ~~the~~ associated probability is 1, $lift(A\to B) = \frac{1}{Pr(B)}$ but lift(A→B) does not ~~have~~ reaches its maximum achievable value (it can be ~~greater than 1~~) changed by different Pr(B)).

③ conv(A→B) hasn't the property, because $conv(A\to B) = \frac{1-S(B)}{1-conf(A\to B)}$ when the associated probability is 1, conf(A→B) = 1, ~~con~~ $\lim_{\to} conv(A\to B) = \infty$

n't reach~~es~~ its maximum achievable value.